Virginia Storm List Appendix F

This appendix contains all the storm data used to adjust each storm in-place. Information is provided for each storm of the SPAS analyzed data, the information used to locate the storm representative dew point/SST location, and other pertinent information regarding the In-place storm representative dew point and rainfall. The adjustments applied to each storm to each grid point to calculate the MTF, OTF, and TAF over the entire Virginia domain are contained in the PMP Tool database as described in Section 5.6 of the calculation.

Each storm spreadsheet in this appendix provides information on the location of the storm representative dew point/SST location (in latitude and longitude) and the value derived at that location. All storm representative values have been reviewed and accepted as appropriate by the Review Board. To complete the IPMF calculation, the climatological maximum dew point/SST value at the same location as the storm representative value must be determined after applying the 15 day towards the warm season temporal adjustment (See Equation 4 of the calculation). This calculation was completed for this study using an automated process in GIS and can be verified using the GIS database of climatological maximum dew point and SST data included in this calculation. As an alternative, a user can utilize the maps in Appendix B. All maps are developed as representing the 15th of the month. In this scenario, the user would note the latitude and longitude location of the storm representative value and the temporal transposition date. Then, go to the map or maps representing the temporal transposition date. For example, if the temporal transposition date was September 15th for a given storm, only the September monthly data would be required. However, if the temporal transposition date was October 5th, then both the September and October monthly maps would be required and the climatological maximum value would represent 1/3rd October and 2/3rd September.

In this appendix, daily synoptic weather maps are provided for a period starting a few days before each storm and continuing to a few days after each storm. Daily weather maps covering the period from 1871 through 2002 are from the U.S. Daily Weather Maps Archive, NOAA Climate Database Modernization Program (CDMP), National Climatic Data Center, Asheville, NC, and the NOAA Central Library Data Imaging Project. Daily synoptic weather maps from 2002 through 2014 are from the NOAA Weather Prediction Center Daily Weather Maps web page, http://www.hpc.ncep.noaa.gov/dailywxmap/index.html.

For all storms which had a USACE Storm Studies analysis completed, those pertinent data sheet pages are included. These data came from the USACE Storm Rainfall in the United States, Depth-Area-Duration Data files (USACE, 1973). In addition, there are several storms which include a hand drawn transposition limit map complete by the NWS. These maps were recovered from the HydroMeteorological Design Studies Center office in Silver Spring, MD and are archived on AWA's server. Descriptions of transposition limits of key storms are contained in several HMRs (e.g. HMR 52 Figure 26 and HMR 53 Table 2 (Ho and Reidel, 1980)).

Table F.1 Short storm list used for PMP Development-general storms. Maximum Total Storm Rainfall is the location with the largest rainfall accumulation for the total storm duration.

							Max	Precipitation
Storm Name	State	Lat	Lon	Year	Month	Day	Rainfall	Source
WELLSBORO	PA	41.7042	-77.2292	1889	5	30	10.11	SPAS 1339
VADE MECUM	NC	36.3100	-80.2800	1908	8	23	18.00	SPAS 1514
ELBA	AL	31.363	-86.121	1929	3	12	29.73	SPAS 1305
FAIRFIELD	TX	31.680	-96.130	1932	9	2	19.58	SPAS 1428
PINKHAM NOTCH	NH	44.246	-71.221	1936	3	9	9.70	SPAS 1194
PINKHAM NOTCH	NH	44.246	-71.221	1936	3	16	12.37	SPAS 1195 Zone 1
PADDY MOUNTAIN	WV	39.0200	-78.5600	1936	3	16	8.32	SPAS 1195 Zone 2
MCKENZIE	TN	36.4400	-87.9100	1937	1	17	19.86	SPAS 1311
BLUE RIDGE DIVIDE	NC	35.0375	-83.0792	1940	8	28	14.09	SPAS 1346
HEMPSTEAD	TX	30.130	-96.054	1940	11	22	21.29	SPAS 1430
BIG MEADOWS	VA	38.5458	-78.4042	1942	10	12	19.77	SPAS 1340
WARNER	OK	35.479	-95.329	1943	5	6	25.24	SPAS 1431
COLLINSVILLE	IL	38.671	-90.004	1946	8	12	19.07	SPAS 1433
HARRISONBURG DAM	LA	31.788	-91.813	1953	5	11	25.34	SPAS 1435
ROSMAN	NC	37.7375	-81.5958	1964	9	26	9.22	SPAS 1312A Zone 1
ROSMAN	NC	35.1458	-82.8042	1964	9	26	17.86	SPAS 1312A Zone 2
EDGERTON	MO	40.413	-95.513	1965	7	18	20.76	SPAS 1183
BURTON DAM	GA	34.796	-83.696	1967	8	21	18.42	SPAS 1380
BURNSVILLE	TN	34.8375	-88.3958	1973	3	14	12.15	SPAS 1357
MONTEBELLO	VA	37.813	-79.163	1985	11	1	22.56	SPAS 1533
HALIFAX	VT	42.7700	-72.7500	2005	10	7	15.40	SPAS 1201
TAMAQUA	PA	41.6750	-75.3750	2006	6	26	12.26	SPAS 1047
DOUGLASVILLE	GA	33.870	-84.769	2009	9	19	25.37	SPAS 1218
WARNER PARK	TN	36.0611	-86.9056	2010	4	30	19.71	SPAS 1208
NEW BERN	NC	35.1750	-77.2150	2010	9	27	23.44	SPAS 1350

Table F.2 Short storm list used for PMP Development-local storms. Maximum Total Storm Rainfall is the location with the largest rainfall accumulation for the total storm duration.

							Max	Precipitation
Storm Name	State	Lat	Lon	Year	Month	Day	Rainfall	Source
JEWELL	MD	38.7300	-76.5700	1897	7	26	15.88	SPAS 1489
COOPER	MI	42.371	-85.588	1914	8	31	13.39	SPAS 1426
JOHNSON CITY	TN	36.3042	-82.0625	1924	6	13	16.14	SPAS 1343
BOYDEN	IA	43.196	-95.996	1926	9	17	24.22	SPAS 1427
SIMPSON	KY	38.104	-83.296	1939	7	4	20.82	SPAS 1344
EWAN	NJ	39.688	-75.181	1940	9	1	24.30	SPAS 1534
HALLETT	OK	36.246	-96.613	1940	9	2	24.00	SPAS 1429 Zone 2
SMETHPORT	PA	41.8722	-78.2771	1942	7	17	34.91	SPAS 1345
BIG MEADOWS	VA	38.5458	-78.4042	1942	10	12	19.77	SPAS 1340
MOUNDS	OK	35.846	-96.071	1943	5	15	19.27	SPAS 1432
GLENVILLE	WV	38.8950	-80.7708	1943	8	4	15.04	SPAS 1536
HOLT	MO	39.454	-94.329	1947	6	18	17.62	SPAS 1434
LITTLE RIVER	VA	38.8625	-79.1875	1949	6	17	15.13	SPAS 1546
ROSEDALE	TN	36.1792	-84.2292	1965	7	24	13.32	SPAS 1402 Zone 2
COEBURN	VA	37.2792	-81.8042	1977	4	2	15.66	SPAS 1362
JOHNSTOWN	PA	40.3958	-78.9542	1977	7	18	12.64	SPAS 1550
DANDRIDGE	TN	37.2625	-84.9708	1984	5	7	9.62	SPAS 1376
RAPIDAN	VA	38.4150	-78.3350	1995	6	27	28.39	SPAS 1406
REDBANK	PA	41.2600	-79.1600	1996	7	19	9.42	SPAS 1548
SPARTA	NJ	41.030	-74.640	2000	8	11	16.70	SPAS 1017
TABERNACLE	NJ	39.881	-74.690	2004	7	13	15.63	SPAS 1040
DELAWARE COUNTY	NY	42.010	-74.900	2007	6	19	11.69	SPAS 1049
ISLIP	NY	40.805	-73.065	2014	8	13	14.23	SPAS 1415

Table F.3 Short storm list used for PMP Development-tropical storms. Maximum Total Storm Rainfall is the location with the largest rainfall accumulation for the total storm duration.

							Max	Dinitation
Storm Name	State	Lat	Lon	Year	Month	Day	Niax Rainfall	Precipitation Source
ST GEORGE	GA	30.521	-82.020	1911	8	28	19.10	SPAS 1515
ALTA PASS	NC	35.8792	-81.8708	1916	7	13	24.90	SPAS 1299 Zone 1
KINGSTREE	NC	33.6625	-79.8292	1916	7	13	16.79	SPAS 1299 Zone 2
GLENVILLE	GA	34.8600	-84.2900	1929	9	23	21.20	SPAS 1516
GLENVILLE	GA	34.8833	-84.2833	1929	9	23	20.88	SPAS 1516 Zone 2
MONCURE	NC	35.600	-79.070	1929	9	29	11.55	SPAS 1517 Zone 2
SETTLE	NC	35.9500	-80.7000	1929	9	29	9.97	SPAS 1517 Zone 3
EASTON	MD	38.8600	-76.0700	1935	9	4	17.00	SPAS 1490
MT MITCHELL	NC	36.3000	-81.4500	1940	8	10	20.27	SPAS 1342
SLIDE MOUNTAIN	NY	42.017	-74.417	1955	8	11	14.70	SPAS 1003
WESTFIELD	MA	42.120	-72.700	1955	8	17	20.09	SPAS 1243
WEST SHOKAN	NY	41.950	-74.320	1955	10	14	18.50	SPAS 1006
ROSMAN	NC	35.1375	-82.8375	1964	10	3	17.53	SPAS 1312B Zone 2
TYRO	VA	37.8125	-79.0042	1969	8	19	27.23	SPAS 1491
ZERBE	PA	40.5375	-76.6208	1972	6	18	18.79	SPAS 1276
AMERICUS	GA	32.096	-84.229	1994	7	4	28.09	SPAS 1317
ANTREVILLE	SC	34.855	-82.225	1995	8	26	19.99	SPAS 1373
SOUTHPORT 5 N	NC	34.0050	-77.9950	1999	9	14	24.30	SPAS 1552 Zone 1
YORKTOWN	VA	37.2750	-76.5550	1999	9	14	19.22	SPAS 1552 Zone 2
POMTON LAKE	NJ	40.995	-74.285	1999	9	15	14.62	SPAS 1552 Zone 3
CAIRO	NY	42.295	-74.005	1999	9	15	11.71	SPAS 1552 Zone 4
PINKHAM NOTCH	NH	44.260	-71.340	1999	9	15	10.55	SPAS 1198 Zone 1
MT MANSFIELD	VT	44.5300	-72.8100	1999	9	15	11.35	SPAS 1198 Zone 2
EDENTON	NC	35.8625	-76.5042	2003	9	17	7.96	SPAS 1535 Zone 1
UPPER SHERANDO	VA	37.913	-79.029	2003	9	17	20.22	SPAS 1535 Zone 2
MONTGOMERY DAM	PA	40.6450	-80.3850	2004	9	18	8.79	SPAS 1275
MONTEGOMERY DAM	PA	40.605	-76.465	2004	9	18	8.80	SPAS 1275 Zone 2
RICHMOND	VA	37.7050	-77.3750	2004	8	30	14.38	SPAS 1551
RALEIGH	NC	34.340	-81.010	2006	6	13	9.32	SPAS 1526
MAPLECREST	NY	42.300	-74.160	2011	8	27	22.91	SPAS 1224
HARRISBURG	PA	39.9850	-76.4950	2011	9	4	18.32	SPAS 1298

Table of Contents

GENERAL STORMS	1
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1339 SPAS ANALYSIS	2
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1514 SPAS ANALYSIS	15
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1305 SPAS ANALYSIS	27
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1428 SPAS-GENERAL ANALYSIS	39
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1194 SPAS-GENERAL ANALYSIS	50
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1195 SPAS-GENERAL ANALYSIS	61
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1195 SPAS-GENERAL ANALYSIS	71
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1311 SPAS ANALYSIS	81
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1346 SPAS ANALYSIS	93
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1430 SPAS ANALYSIS	103
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1340 SPAS ANALYSIS	114
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1431 SPAS ANALYSIS	127
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1433 SPAS ANALYSIS	139
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1435 SPAS ANALYSIS	150
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1312A SPAS ANALYSIS	163
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1312A SPAS ANALYSIS	174
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1183 SPAS-GENERAL ANALYSIS	185
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1380 SPAS ANALYSIS	195
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1357 SPAS ANALYSIS	203
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1533 SPAS ANALYSIS	209
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1201 SPAS-NEXRAD ANALYSIS	216
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1047 SPAS-NEXRAD ANALYSIS	224
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1218 SPAS-NEXRAD ANALYSIS	231
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1208 SPAS-NEXRAD ANALYSIS	240
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1350 SPAS ANALYSIS	248

LOCAL STORMS	256
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1489 SPAS ANALYSIS	257
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1426 SPAS-NEX ANALYSIS	
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) STORM # 1343 SPAS ANALYSIS	279
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) STORM # 1427 SPAS ANALYSIS	287
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1344 SPAS ANALYSIS	297
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1534 SPAS ANALYSIS	307
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1429 SPAS ANALYSIS	316
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1345 SPAS ANALYSIS	328
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1340 SPAS ANALYSIS	339
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1432 SPAS ANALYSIS	350
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1536 SPAS ANALYSIS	362
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1434 SPAS ANALYSIS	368
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1546 SPAS ANALYSIS	380
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1402 SPAS ANALYSIS	387
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1362 SPAS ANALYSIS	394
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1550 SPAS ANALYSIS	402
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1376 SPAS ANALYSIS	408
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1406 SPAS ANALYSIS	414
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1548 SPAS ANALYSIS	421
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1017 SPAS ANALYSIS	427
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1040 SPAS ANALYSIS	434
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1049 SPAS ANALYSIS	440
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1415 SPAS ANALYSIS	447
TROPICAL STORMS	454
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1515 SPAS ANALYSIS	455
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1299 SPAS ANALYSIS	467
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1299 SPAS ANALYSIS	479
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1516 SPAS ANALYSIS	491
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1516 SPAS ANALYSIS	503
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1517 SPAS ANALYSIS	515
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1517 SPAS ANALYSIS	528
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1490 SPAS ANALYSIS	541
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1342 SPAS ANALYSIS	551

STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1003 SPAS ANALYSIS	561
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1243 SPAS ANALYSIS	567
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1006 SPAS ANALYSIS	576
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1312B SPAS ANALYSIS	582
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1491 SPAS ANALYSIS	591
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1276 SPAS ANALYSIS	600
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1317 SPAS ANALYSIS	608
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1373 SPAS-NEXRAD ANALYSIS	615
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1552 SPAS-NEXRAD ANALYSIS	620
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1552 SPAS-NEXRAD ANALYSIS	629
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1552 SPAS-NEXRAD ANALYSIS	638
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1552 SPAS-NEXRAD ANALYSIS	647
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1198 SPAS-NEXRAD ANALYSIS	656
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1198 SPAS-NEXRAD ANALYSIS	664
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1535 SPAS ANALYSIS	672
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1535 SPAS ANALYSIS	679
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1551 SPAS ANALYSIS	686
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1275 SPAS ANALYSIS	692
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1275 SPAS ANALYSIS	699
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1526 SPAS ANALYSIS	706
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1224 SPAS ANALYSIS	713
STORM PRECIPITATION ANALYSIS SYSTEM (SPAS) FOR STORM #1298 SPAS ANALYSIS	720

General Storms

Storm Precipitation Analysis System (SPAS) For Storm #1339 SPAS Analysis

General Storm Location: Northeastern United States, Johnstown Flood

Storm Dates: May 29 (0600) - June 3 (0500), 1889

Event: Flash Flood Event

DAD Zone 1

Latitude: 41.7042

Longitude: -77.2292

Max. Grid Rainfall Amount: 10.11"

Max. Observed Rainfall Amount: 9.80"

Number of Stations: 176 (33 Daily, 5 Hourly, and 138 Supplemental)

SPAS Version: 9.5

Basemap: Monthly Weather Report Isohyetal Grid

Spatial resolution: 00:00:30 (~ 0.30 mi²)

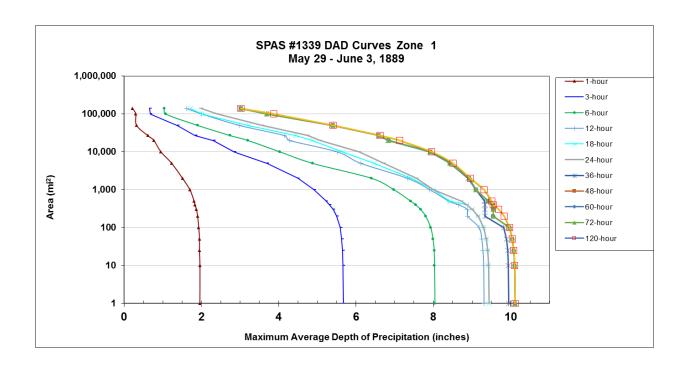
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

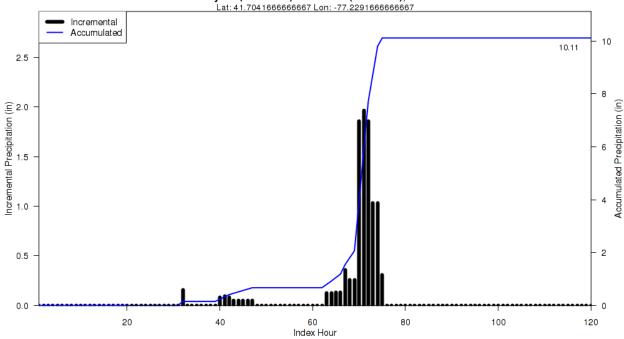
Reliability of results: This analysis was based on hourly data, daily data, and supplemental station. We have a high degree of confidence in the station based storm total results, the spatial pattern is dependent on the basemap, and the timing is based on hourly stations.

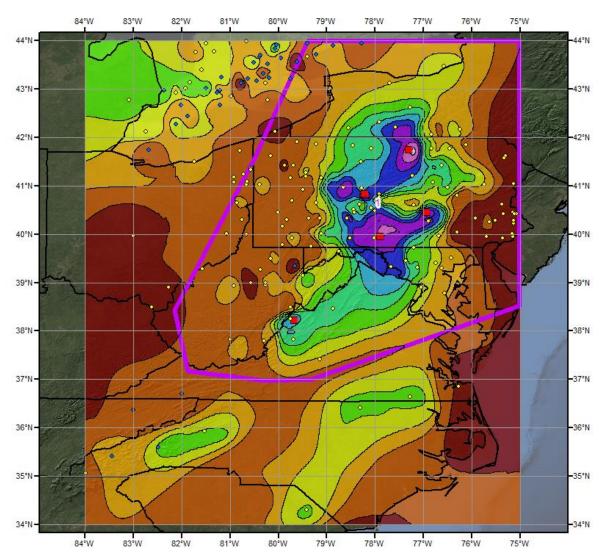
Storm Nam	e SPAS 1330	-Wellsbor	ο ΡΔ								
Storm Date			.U, I A		S	torm A	dinstm	ent for	Virgini	ia	
	ysis Date: 11/14/2015						ajastin		V 11 S111		
Temporal T	Transposition Date	15-Jun									
		Lat	Long			Moisture 1	Inflow Dire	ection	SSE @ 535	miles	
torm Cent	ter Location	41.70 N	77.23 W			Basin Ave	rage Elevat	tion	N/A	feet	
Storm Rep	SST Location	34.00 N	76.00 W			Storm Cer	nter Elevat	ion	1,800	feet	
	ion SST Location					Storm Ana	alysis Dura	tion	24	hours	
Basin Loca	tion					Effective I	Barrier He	ight	N/A	feet	
	The storm representa		76.0 F		tal precipita					2.99	inches.
	The in-place maxir		80.0 F		tal precipita					3.60	inches.
The	e transpositioned maxir		0.0		tal precipita					#N/A	inches.
	The in-place storm of		1,800		ch subtracts			f precipitabl		76.0 F	
7	The in-place storm		1,800		ch subtracts	0.52		f precipitabl		80.0 F	
	The transposition basin of		N/A		ch subtracts			f precipitabl		0.0	-
The infic	ow barrier/basin elevation	on neight is	N/A	reet whi	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
	The in place storms		ft	1.21		Notac: DAD	volues telson	from LICACI	ESA 1-1. Used	1 CCT	1
	The in-place storm The transposition/elev					values on Ma		HOIH USACE	3A 1-1. USE	1 00 1	
		vation to bas ier adjustme		_		, and s on ivid	., 51.				
	The part	ici aujustille	in ractor 18	π1 \ //Δ							
		. 1		11877							
	The to	tal adjustme	ent factor is	#N/A]						1
											-
	Observed Storm Dept		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		1 2 1 22		T ==	1			
	10 11	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	фисикиономического	120 Hours		
	10 sq miles	7.4	8.6	9.1	9.2	9.8	9.8	9.8	9.8		-
	100 sq miles	7.2	8.3	8.9	9.0	9.6	9.6	9.6	9.6		-
	200 sq miles	7.1	8.2	8.7	8.8	9.4	9.4	9.4	9.4		-
	500 sq miles	7.0	8.0	8.5	8.6	9.1	9.1	9.1	9.1		
	1000 sq miles 2000 sq miles	6.7 5.8	7.7 6.5	8.2 7.7	8.3 7.8	8.8 8.5	8.8 8.5	8.8 8.5	8.8 8.5		-
	5000 sq miles	3.9	4.9	6.4	6.8	8.1	8.1	8.1	8.1		~
00	10000 sq miles	2.8	4.0	5.0	5.7	7.7	7.7	7.7	7.7		~
	20000 sq miles	2.1	3.2	4.0	4.7	7.0	7.0	7.0	7.0		~
	50000 sq miles	1.4	2.4	3.1	3.6	5.6	5.6	5.6	5.6		~
	82000 sq miles	1.0	1.8	2.4	2.8	4.4	4.4	4.4	4.4		
-											1
	Storm or Storm Center	Name		SPAS 1339	9 -Wellsbor	ro. PA					1
	Storm Date(s)			5/29-6/3/1		.,					1
	Storm Type			Synoptic							1
	Storm Location			41.70 N	77.23 W						
	Storm Center Elevation			1,800							
	Precipitation Total & D			10.11 Inch	es 120-hour	s					
	Storm Representative S			76.0 F	24						
	Storm Representative S	ST Location	n	34.00 N	76.00 W			May	June		
	Maximum SST			80.0 F					80.5		1
	Moisture Inflow Vector			SSE @ 535	5						
	In-place Maximization	Factor		1.21	-						4
<u> </u>	T 1 T	D-4-		15 T							1
	Temporal Transposition			15-Jun							
	Transposition SST Loca										1
	Transposition Maximum			#N/A	-						1
	Transposition Adjustment Factor Average Basin Elevation			#N/A N/A							
	Average Basin Elevation Highest Elevation in Basin			N/A N/A							1
	riighest die valien ill Dâ	40111						-			1
	Inflow Barrier Height			N/A							
	Inflow Barrier Height Barrier Adjustment Fac	ctor		N/A #N/A							_

		Sto	rm 1339	- May 2	29 (0600	UTC) -	June 3	(0500	JTC), 18	889		
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
Araa (mi²)	Duration (hours)											
Area (mi²)	1	3	6	12	18	24	36	48	60	72	120	Total
0.3	1.96	5.67	8.04	9.31	9.44	9.44	9.96	10.11	10.11	10.11	10.11	10.11
1	1.96	5.67	8.04	9.31	9.44	9.44	9.95	10.11	10.11	10.11	10.11	10.11
10	1.96	5.66	8.03	9.30	9.42	9.43	9.94	10.10	10.10	10.10	10.10	10.10
25	1.95	5.65	8.02	9.28	9.40	9.40	9.92	10.08	10.08	10.08	10.08	10.08
50	1.95	5.63	7.99	9.25	9.37	9.37	9.89	10.04	10.04	10.04	10.04	10.04
100	1.93	5.59	7.93	9.18	9.30	9.30	9.82	9.97	9.97	9.97	9.97	9.97
200	1.90	5.50	7.80	8.89	9.16	9.16	9.34	9.55	9.55	9.55	9.83	9.83
300	1.87	5.41	7.67	8.88	9.01	9.01	9.33	9.55	9.55	9.55	9.69	9.69
400	1.83	5.31	7.54	8.65	8.86	8.86	9.33	9.55	9.55	9.55	9.55	9.55
500	1.81	5.22	7.41	8.40	8.41	8.72	9.32	9.42	9.42	9.42	9.51	9.51
1,000	1.70	4.91	6.98	7.91	8.00	8.00	9.10	9.10	9.10	9.10	9.31	9.31
2,000	1.51	4.49	6.40	7.33	7.42	7.56	8.90	8.93	8.93	8.93	8.96	8.96
5,000	1.23	3.70	4.87	6.12	6.47	6.72	8.43	8.43	8.43	8.43	8.51	8.51
10,000	0.95	2.85	4.03	5.51	5.66	6.08	7.91	7.93	7.93	7.93	7.96	7.96
20,000	0.77	2.31	3.20	4.28	4.88	5.06	6.82	6.84	6.84	6.84	7.13	7.13
27,000	0.61	1.84	2.74	4.14	4.45	4.74	6.58	6.59	6.59	6.59	6.62	6.62
50,000	0.32	1.38	1.90	2.98	3.22	3.56	5.37	5.40	5.40	5.40	5.41	5.41
100,000	0.30	0.68	1.07	2.01	2.02	2.41	3.68	3.69	3.69	3.69	3.87	3.87
139,777	0.22	0.66	1.04	1.62	1.72	2.00	3.00	3.02	3.02	3.02	3.02	3.02

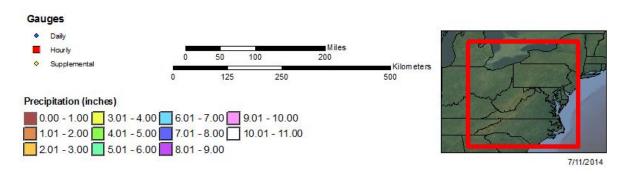


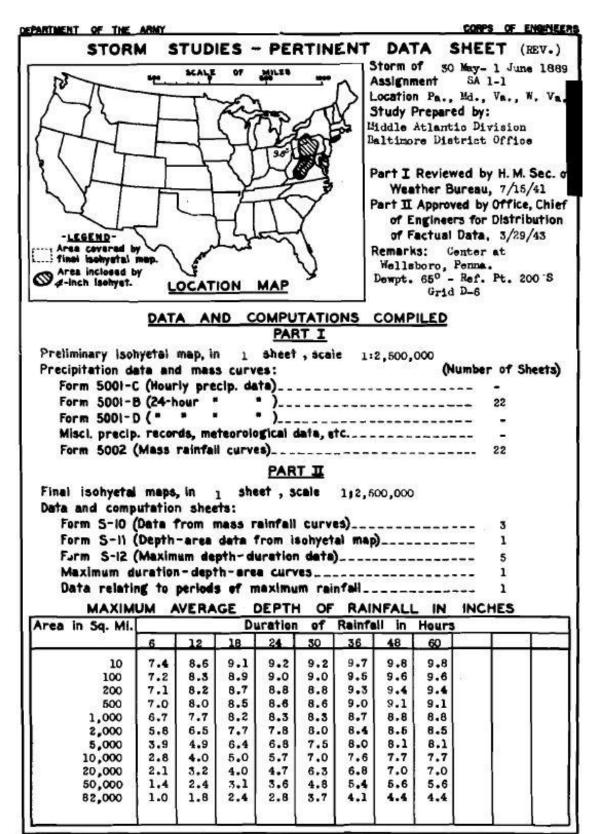
SPAS 1339 Storm Center Mass Curve Zone 1 May 29 (0600UTC) to June 3 (0500UTC), 1889 Lat: 41.7041666666667 Lon: -77.2291666666667



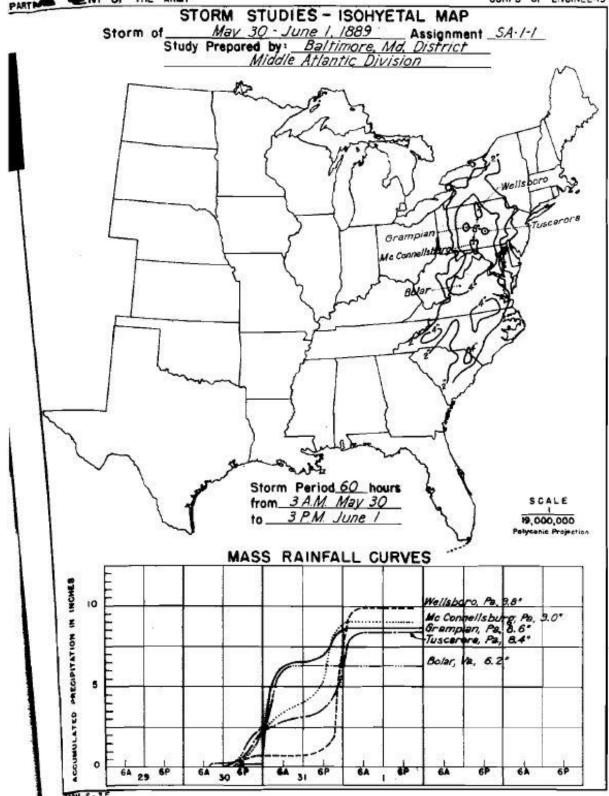


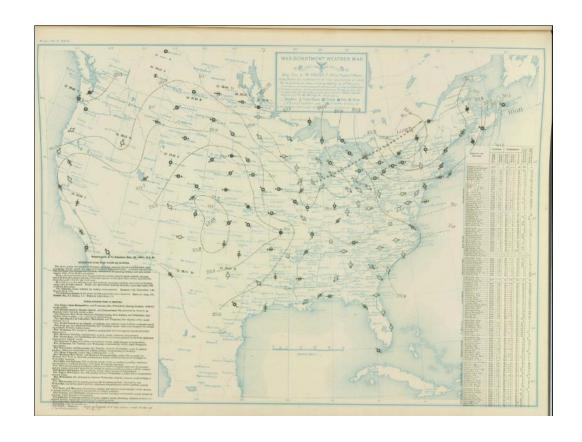
Total Storm (120-hr) Precipitation (inches)
May 29 (0600 UTC) - June 3 (0500 UTC), 1889
SPAS 1339 - Wellsboro, PA

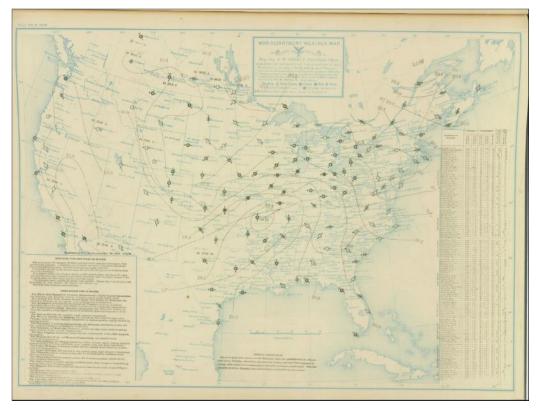


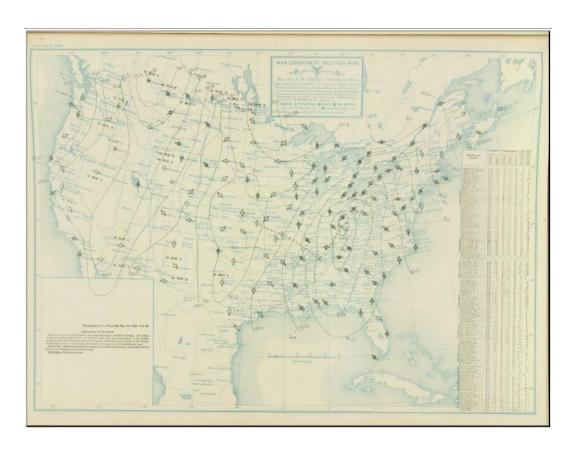


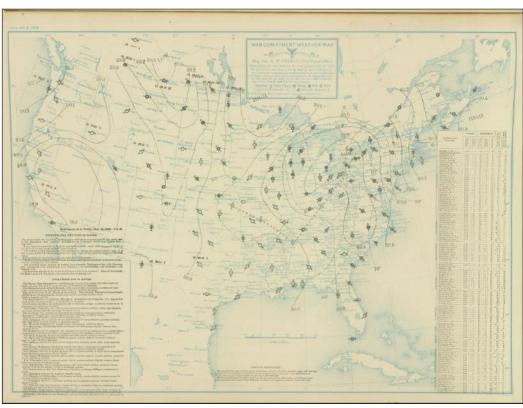
Form 5-2

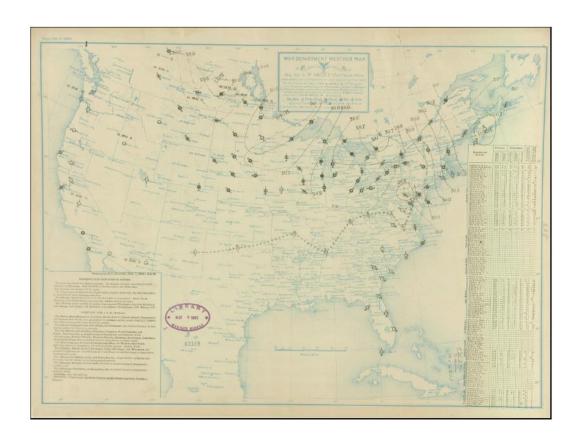


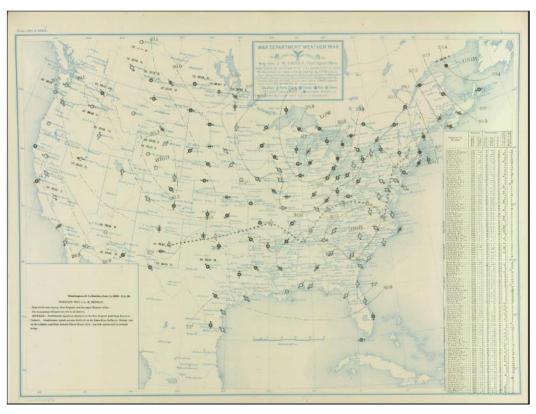


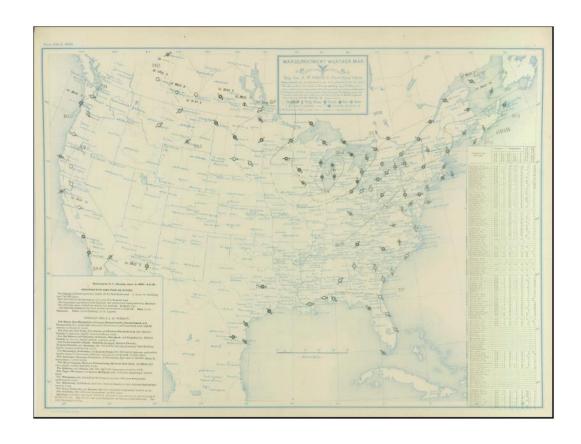


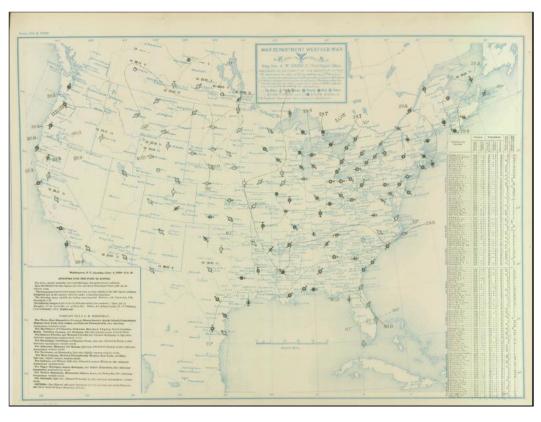




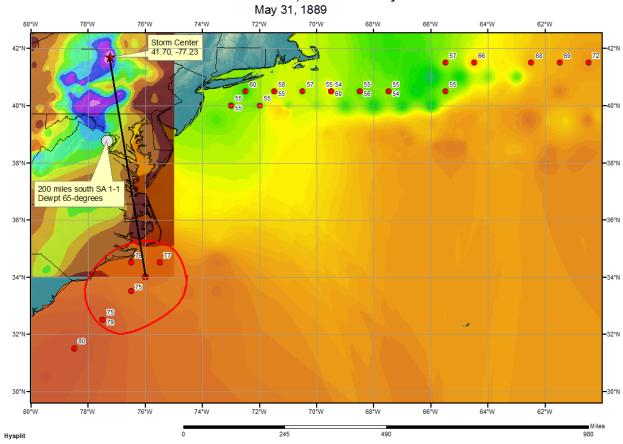


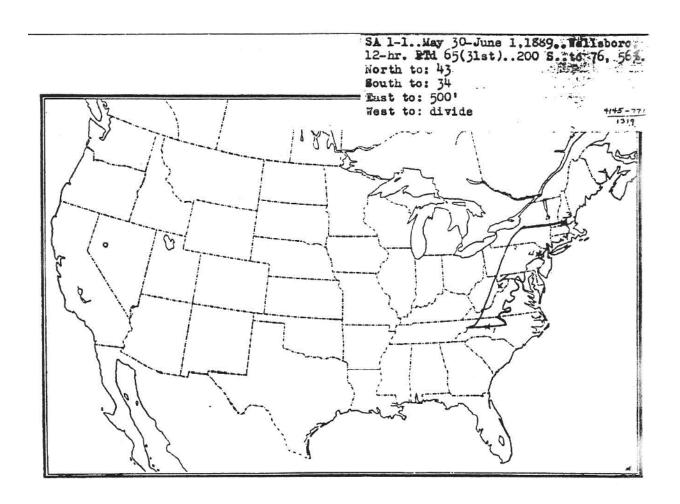






SPAS 1339 Wellsboro, PA Storm Analysis





Storm Precipitation Analysis System (SPAS) For Storm #1514 SPAS Analysis

General Storm Location: Vade Mecum, NC

Storm Dates: August 23-28, 1908

Event: Extreme precipitation event

DAD Zone 1

Latitude: 36.3125

Longitude: -80.2792

Max. Grid Rainfall Amount: 17.91"

Number of Stations: 175

SPAS Version: 10.0

Base Map Used: Combination basemap blending the Prism Conus 2-year 24-hour climatological base

map with the isohyetals from the USACE report.

Spatial resolution: 0.2697

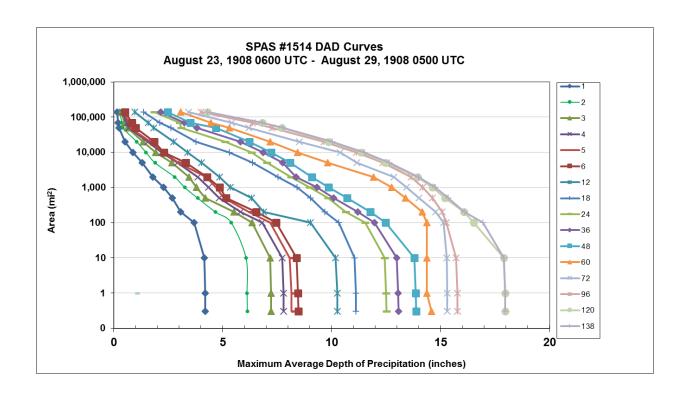
Radar Included: No

Depth-Area-Duration (DAD) analysis: No

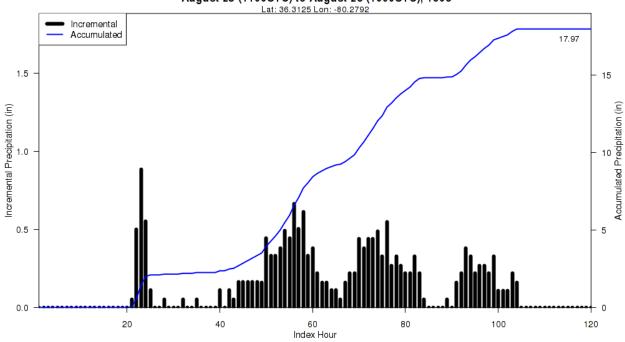
Reliability of Results: Six of the seven hourly stations were manually digitized from the pertinent data sheet of the SA 2-6 CORPS of engineers report. Given that two of the six digitized stations were recorder stations in addition to the one hourly station from NCDC, the data is considered highly reliable. 38 of the 50, or roughly 76% of the supplemental stations were converted from daily due to the need for an additional day's observation. The daily timing of these 38 stations was preserved, meaning that even though they were in the supplemental file they were still, by definition, daily stations. With all of the data being thoroughly inspected, the precipitation pattern and DAD table following closely to the CORP report, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

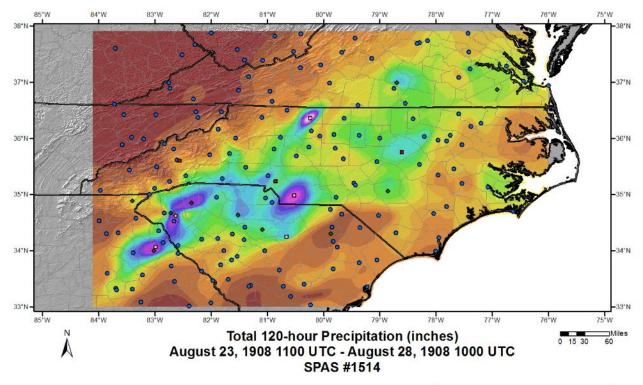
Storm Nam	ie:	SPAS 1514	- Vade Mecu	m, NC									1		
Storm Date		August 23-				Storm Adjustment for Virginia									
AWA Analy						1	T T	1	î			1	<u> </u>		
Temporal T	[ranspositi	on Date	15-Aug		1					GGE 0 205	**		1		
~ ~			Lat	Long				nflow Direc		SSE @ 385	miles				
	ter Locatio		36.31 N	80.28 W				age Elevati		N/A	feet				
	SST Locati		31.00 N	78.20 W				ter Elevatio		900	feet				
	ion SST Lo	cation						lysis Durati		24	hours				
Basin Loca	tion						Effective B	arrier Heig	gnt	N/A	feet				
	The sto	rm represe	ntative SST is	82.5 F	with to	tal precipitab	le water abo	ve sea level o	of		4.00	inches.	1		
		•	cimum SST is	85.0 F		tal precipitab					4.40	inches.			
			imum SST is	0.0		tal precipitab					#N/A	inches.			
	The in	-place storr	n elevation is	900	feet wh	ich subtracts	0.30	inches of	f precipitabl	e water at	82.5 F				
	The in	-place storr	n elevation is	900	feet wh	ich subtracts	0.32	inches of	f precipitabl	e water at	85.0 F				
	The transp	osition basi	n elevation at	N/A	feet wh	ich subtracts	x.xx	inches of	f precipitabl	e water at	0.0				
The in	flow barrier	/basin eleva	tion height is	N/A	feet wh	ich subtracts	x,xx	inches of	f precipitabl	e water at	0.0				
Г		. ,				1	NT . NT .	G.	:	, ,					
			rm maximizati		1.10 #N/A					alue was based selected in regi					
	ine tra	•	elevation to ba		•					a large area a		-			
		ine b	arrier adjustm	em ractor is	#1 N /A			storm center.	, 510						
		The	total adjustm	ent factor is	#N/A										
		THE	totai adjustiii	chi factor is	TI VI										
)bserved S	torm Dept	h-Area-Dur	ation												
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Ho	
	1 sq miles	4.2	6.1	7.2	7.8	8.2	8.5	10.3	12.5	13.9	14.4	15.8	18.0	18.0	
	0 sq miles	4.2	6.1	7.2	7.7	8.1	8.4	10.2	12.4	13.8	14.4	15.7	17.9	17.9	
10	0 sq miles	3.7	5.4	6.4	6.8	7.2	7.5	9.0	11.5	12.5	14.4	15.3	16.5	16.9	
20	0 sq miles	3.1	4.7	5.5	5.8	6.2	6.6	6.9	10.7	11.8	14.2	15.1	16.1	16.1	
	0 sq miles	2.7	3.9	4.2	4.8	5.1	5.2	6.3	9.8	10.7	13.4	14.6	15.2	15.3	
	0 sq miles	2.3	3.3	3.8	4.4	4.7	4.9	5.4	9.0	9.9	12.8	14.2	14.6	14.8	
	0 sq miles	1.8	2.8	3.5	3.9	4.3	4.3	4.9	8.1	9.1	11.9	13.6	14.0	14.0	
	0 sq miles	1.3	1.9	2.7	2.9	3.0	3.3	4.0	7.0	8.1	9.8	12.3	12.5	12.6	
	0 sq miles	0.9	1.5	1.9	2.2	2.3	2.3	3.4	6.3	7.2	8.4	11.1	11.4	11.5	
	0 sq miles	0.5	1.1	1.3	1.6	1.7	1.9	2.8	5.1	6.2	7.2	9.6	9.9	10.0	
5000	0 sq miles	0.2	0.4	0.6	0.7	0.8	1.0	1.8	3.1	4.7	5.3	7.3	7.7	7.8	
	Storm or Sto	orm Contor	Nomo		CDAC 151	4 - Vade Med	um NC								
	Storm Date(1 vanic		August 23-		um, ive					1			
	Storm Type	(3)			Synoptic	20, 1700						1			
	Storm Loca	tion			36.31 N	80.28 W									
	Storm Cente				900							i			
	Precipitatio				18 inches i	n 96 hours						j			
	Storm Repre				82.5 F	24						4			
			STLocation		31.00 N	78.20 W						1			
	Maximum S				85.0 F							1			
	Moisture In In-place Ma				SSE @ 385 1.10)						-			
	m-prace Ma	ATHILZALIUN I	ac 101		1.10							1			
ŀ	Temporal Tr	ansposition	Date		15-Aug							1			
	Transpositio											Ì			
	Transposition Maximum SST											İ			
	Transposition Adjustment Factor				#N/A							Ī			
	Average Bas				N/A										
	Highest Ele				N/A										
	Inflow Barri				N/A										
	Barrier Adju	stment Fact	tor		#N/A										
		ment Factor			#N/A							1			

		s	torm 1	514 - <i>A</i>	August	23 (00	600 UT	C) - Aı	ugust	29 (050	00 UTC	;), 190	3			
		Duration (hours)														
areasqmi	1	2	3	4	5	6	12	18	24	36	48	60	72	96	120	138
0.3	4.19	6.13	7.23	7.79	8.15	8.47	10.27	11.12	12.51	13.07	13.88	14.59	15.30	15.77	17.97	17.97
1	4.19	6.12	7.22	7.79	8.15	8.46	10.26	11.11	12.50	13.06	13.87	14.38	15.30	15.77	17.97	17.97
10	4.16	6.07	7.17	7.73	8.08	8.40	10.18	11.05	12.43	12.98	13.79	14.38	15.29	15.70	17.90	17.90
100	3.68	5.39	6.35	6.81	7.18	7.45	9.03	10.32	11.53	11.97	12.47	14.37	15.13	15.27	16.51	16.94
200	3.07	4.67	5.51	5.81	6.19	6.55	6.88	9.69	10.65	11.21	11.78	14.15	14.78	15.07	16.07	16.09
500	2.70	3.85	4.21	4.83	5.06	5.15	6.33	9.03	9.83	10.10	10.72	13.40	14.00	14.62	15.21	15.34
1000	2.29	3.26	3.80	4.35	4.69	4.85	5.35	8.42	8.99	9.33	9.85	12.76	13.44	14.18	14.63	14.75
2000	1.80	2.79	3.45	3.87	4.25	4.29	4.86	7.55	8.13	8.37	9.10	11.92	12.85	13.64	13.95	13.98
5000	1.30	1.90	2.66	2.92	2.97	3.30	4.04	6.38	7.04	7.76	8.10	9.81	11.15	12.34	12.48	12.64
10000	0.89	1.48	1.92	2.20	2.28	2.31	3.39	5.31	6.32	6.87	7.23	8.43	10.39	11.13	11.37	11.49
20000	0.51	1.05	1.34	1.57	1.69	1.87	2.76	3.78	5.11	5.82	6.22	7.17	8.52	9.64	9.86	10.04
50000	0.24	0.41	0.62	0.70	0.76	1.01	1.84	2.62	3.10	3.82	4.70	5.30	6.20	7.26	7.72	7.78
69600	0.21	0.37	0.49	0.60	0.70	0.84	1.58	2.11	3.02	3.25	3.52	4.45	5.42	6.38	6.81	6.82
137281	0.15	0.28	0.34	0.40	0.45	0.51	0.96	1.38	1.85	2.16	2.48	3.07	3.43	4.00	4.30	4.30

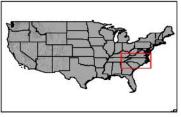


SPAS 1514 Storm Center Mass Curve Zone 1 August 23 (1100UTC) to August 28 (1000UTC), 1908 Lat: 36.3125 Lon: -80.2792

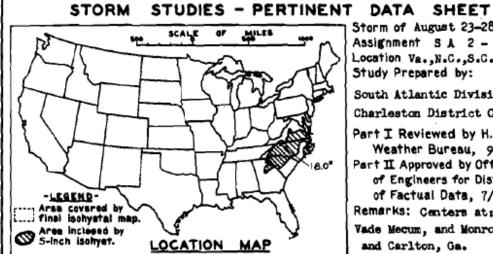








KLL 04/04/2015



Storm of August 23-28, 1908 Assignment SA 2 - 6 Location Va., N.C., S.C., & Ca. Study Prepared by:

South Atlantic Division Charleston District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 9/22/42 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 7/7/45 Remarks: Centers at: Vade Mecum, and Monroe, N. C. and Carlton, Ga.

DATA AND COMPUTATIONS COMPILED PART I

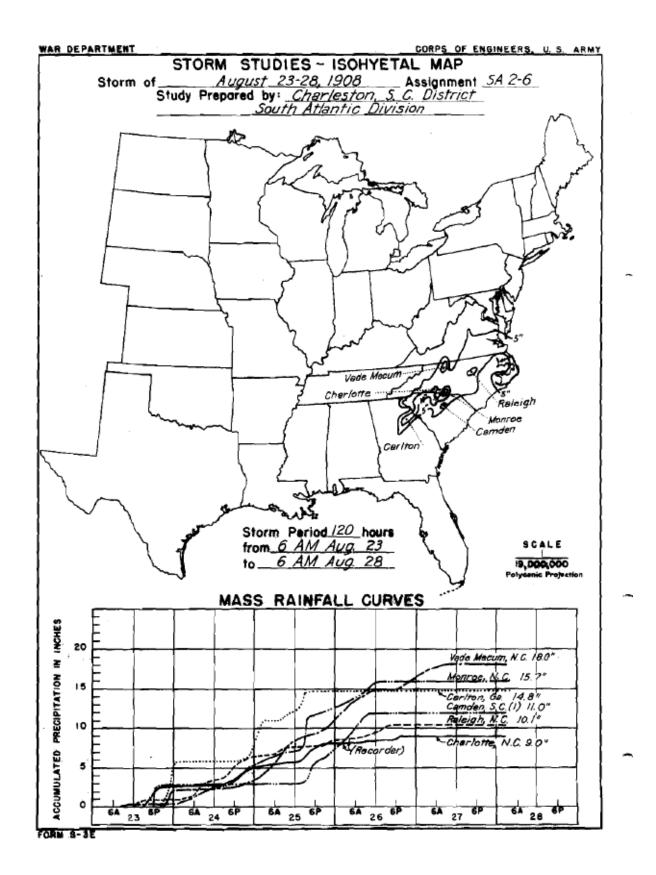
Preliminary isobyetal map, in 4 sheets, scale 1:1,000,000	
Precipitation data and mass curves: (Numb	er of Sheets)
Form 5001-C (Hourly precip. data)	13
Form 5001-B (24-hour " ")	24
Form 5001-D (" " " ")	
Misci. precip. records, meteorological data, etc	
Form 5002 (Mass rainfall curves)	
PART I	

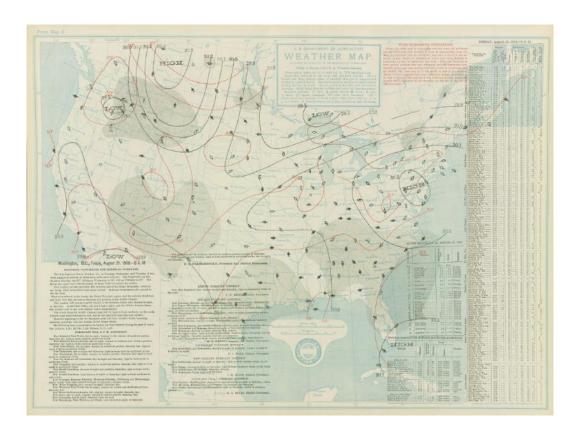
Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets:

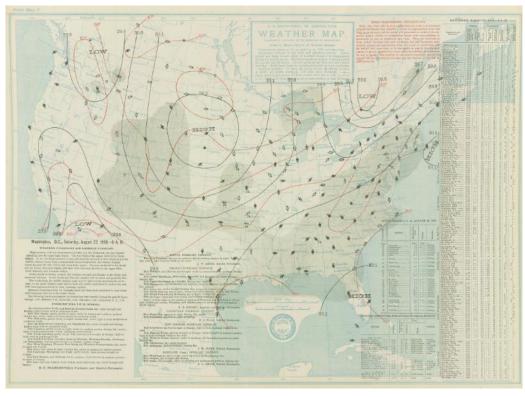
Form S-10 (Data from mass rainfall curves)	4
Form S-II (Depth-area data from isohyetal map)	2
Form S-I2 (Maximum depth-duration data)	10
Maximum duration-depth-area curves	1
Data relating to periods of maximum rainfall	1

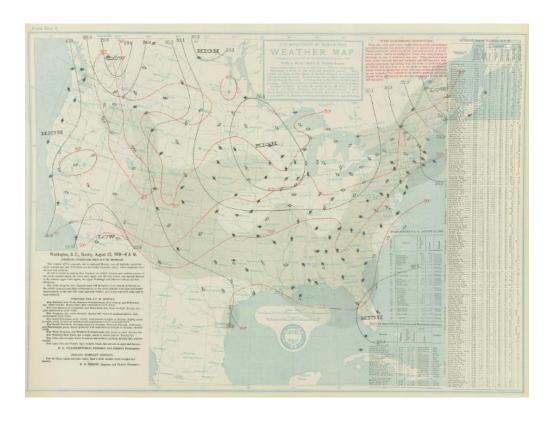
MAXIMUM AVERAGE DEPTH OF RAINFALL

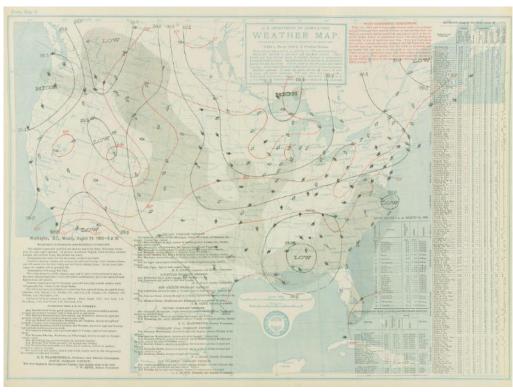
	MC AIM	<u> </u>	JA F LIV	<u> </u>	DEFI	<u> </u>	- 201	TEAL	- 117		IES	
Area	in Sq. Mi.			D	uration	of	Rainfa	il in	Hours			
Ĺ		6	12	18	21/2	30	36	78	60	72	96	120
	10	8.0	10.2	10.8	11.7	13.0	13.6	14.2	14.9	16.2	18.0	18.0
	100	6.h	8.3	9.2	10.8					15.1		16.6
	200	5.9	7.8	8.7	10.4	11.5	11.8	13.6	14.3	14.8	15.9	15.9
	500	5.3	7.0	8.0	9.9	10.9	11.1			14.2		15.0
	1,000	4.7	6.3	7.4	9.5					13.8		
	2,000	4.2	5.6	6.8	8.8		9.9	12.4		13.1	13.4	13.4
	5,000	3.6	4-7	5.8	7.7	8.5	8.8	11.1	11.8	12.1	12.2	
ĺ	10,000	3.0	4.0	5.0	6.6		7.7		10.6			17.5
	20,000	2.3	3.2	4.1	5.4	6.1	6.4	8.0		9.7	9.8	9.9 7.8
1	50,000 69,600	1.4	2.1	2.8	3.7	4.3	4.6	5.6	6.6		7-7	7.8
	69,600	1.1	1.7	2.3	3.1	3.5	4.0	4.8	5.7	6.5	6.8	6.9
		l	ıl	l i	' 1			1	! 1		i	

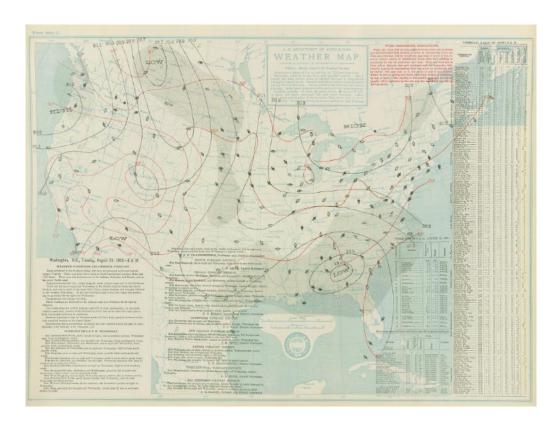


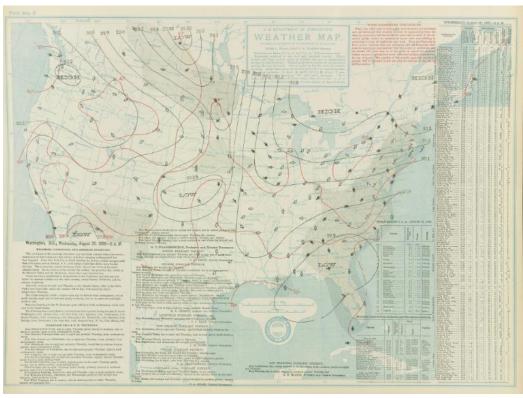


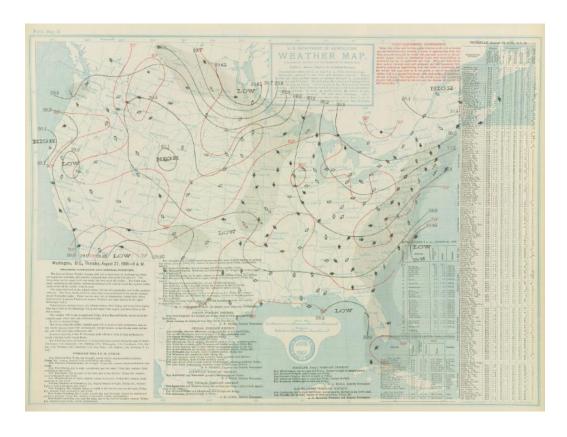


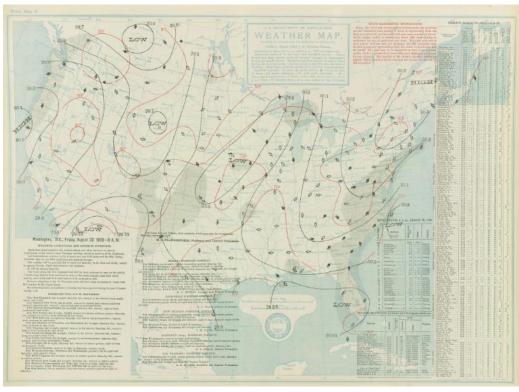




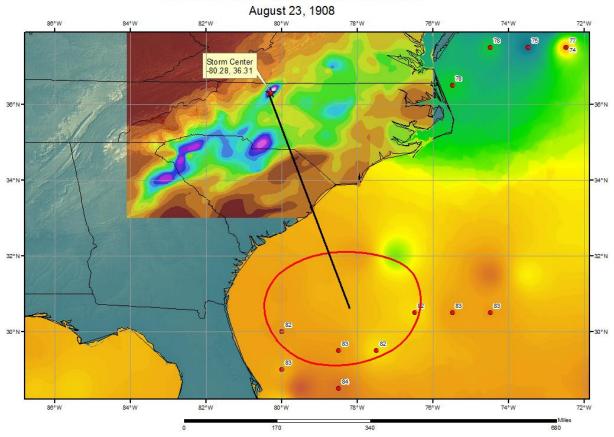








SPAS 1514 Vade Mecum, NC Storm Analysis



Storm Precipitation Analysis System (SPAS) For Storm #1305 SPAS Analysis

General Storm Location: Southern Alabama (Elba, AL)

Storm Dates: Mar 11-16, 1929

Event: Stalled Front

DAD Zone 1

Latitude: 31.3625

Longitude: -86.12083

Max. Grid Rainfall Amount: 29.73" (29.6" at Elba, AL)

Number of Stations: 118 (includes 3 omitted stations)

SPAS Version: 9.5

Base Map Used: NWS-MetStat Blended Isohyetal Map

Spatial resolution: 30 seconds

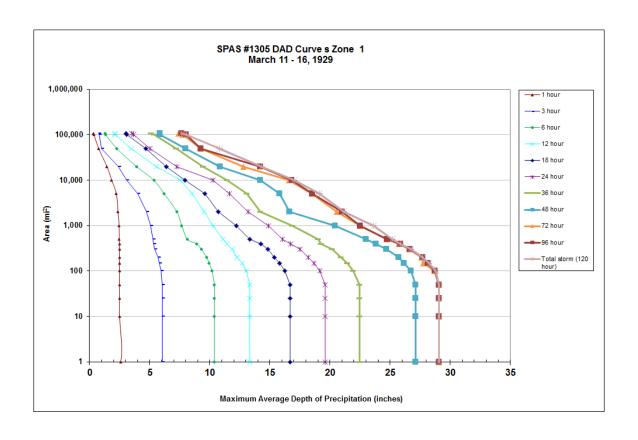
Radar Included: No

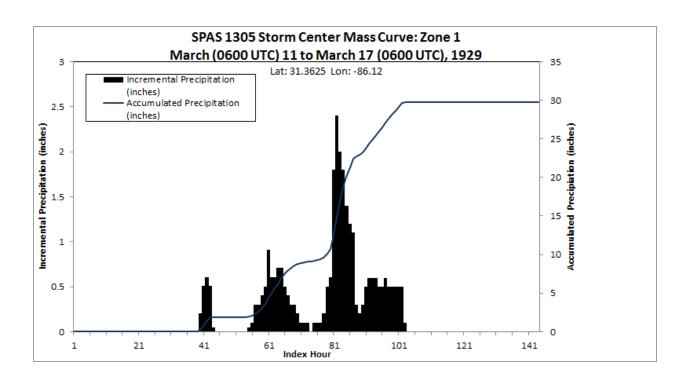
Depth-Area-Duration (DAD) analysis: Yes

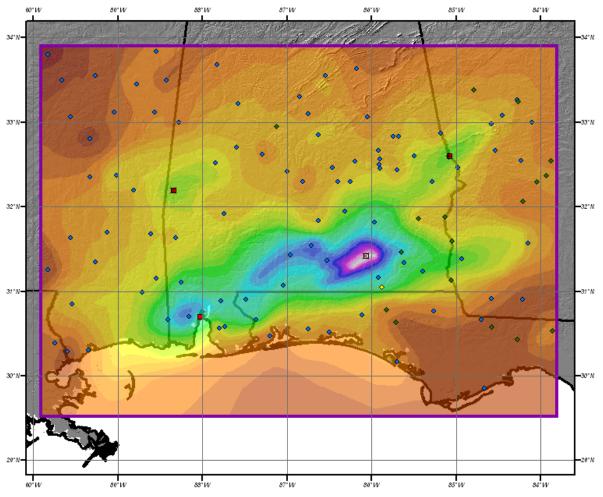
Reliability of Results: Given the lack of hourly data (only 4 stations), there is limited confidence in the timing across much of the region. The timing of the storm center is tied entirely to the estimated hourly data from the USACE storm report. The extent and magnitude of the rainfall is moderately reliable given the surprising large number of daily rain gauges available. The exception to this is the precipitation exists across southern Mississippi where very little rain gauge data was available; We followed the trends of the NWS isohyetal pattern in this area.

Storm Name:	SPAS 1305 - 1	Fibe AI 70	ma 1										
Storm Name: SPAS 1305 - Elba, AL Zone 1 Storm Date: 3/12-16/1929				Storm Adjustment for Virginia									
AWA Analysis Da					5	WI III 11	ujustiii		v II SIII	ıa			
Temporal Transp	osition Date	30-Mar											
		Lat	Long			Moisture 1	Inflow Dire	ection	S @ 75	miles			
Storm Center Location 31.36 N		86.12 W			Basin Ave	rage Elevat	tion	N/A	feet				
Storm Rep Dew Point Location 30.30 N			86.12 W				Storm Center Elevation			feet			
	ew Point Location	00.12 11				alysis Dura		300	hours				
Basin Location					Barrier Hei		N/A	feet					
The sto	orm representative d	dew point is	69.0 F	with to	tal precipital	ole water ab	ove sea leve	l of		2.14	inches.		
	in-place maximum o	71.5 F		tal precipital					2.42	inches.			
The transpo	sitioned maximum o	lew point is	0.0	with to	tal precipital	ole water ab	ove sea leve	l of		#N/A	inches.		
	The in-place storm	elevation is	300	whi	ch subtracts	0.06	inches of	f precipitable	e water at	69.0 F			
	The in-place storm	elevation is	300	whi	ch subtracts	0.07				71.5 F			
The	transposition basin	elevation at	N/A	whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0			
The inflow	barrier/basin elevatio	on height is	N/A	whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0			
					=								
	The in-place storm			1.13				from USACE					
T	he transposition/ele			#N/A		the USACE analyzed storm rep dew p EPRI, Nebraska, TRWD.			nt based on g	udance from			
	The barr	ier adjustme	ent factor is	#N/A		EPKI, Nebra	iskä, IKWD.						
	The to	tal adjustme	nt factor is	#N/A							Į		
Obser	ved Storm Depth-A						1	1					
	10 '1	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles		10.4	13.3	16.67	19.6	22.44	27.13	29.07	29.07	29.07		
	100 sq miles	2.5	10.2	13.0	16.2	19.1	22.0	26.7	28.7	28.7	28.8		
	200 sq miles 500 sq miles	2.5	9.7 8.1	12.3 11.1	15.4 13.4	18.2 16.1	20.9 19.0	25.7	27.6 24.8	27.7 24.8	27.7 25.2		
	1000 sq miles	2.4	7.7	10.3	12.2	14.9	16.9	20.4	22.5	22.5	23.6		
	2000 sq miles	2.2	7.7	9.5	10.7	13.2	14.2	16.6	20.6	21.0	21.2		
·····	5000 sq miles	1.9	6.2	8.5	9.6	11.6	13.1	15.8	18.5	18.5	19.1		
	10000 sq miles	1.5	5.4	7.5	7.9	10.3	11.4	14.2	16.6	16.8	17.0		
***************************************	20000 sq miles	0.8	3.9	5.6	6.4	7.3	9.5	10.9	12.8	14.2	14.3		
	50000 sq miles	0.4	2.3	3.5	4.7	5.0	7.2	8.0	9.3	9.3	10.8		
	100000 sq miles	0.3	1.4	2.1	3.1	3.7	5.4	5.9	7.8	8.0	8.0		
							•	•					
Storm	or Storm Center Na	ame		SPAS 1305	5 - Elba, AL	Zone 1							
Storm	Date(s)			3/12-16/19									
Storm	Type			Frontal									
	Location			31.36 N	86.12 W								
	Center Elevation			300									
Precip	oitation Total & Dura	ation		29.73 in 72	2-hours, USA	CE DAD							
		D :		50.0 =	2.1								
	Representative Dev			69.0 F	24								
	Representative Dev	v Point Loca	tion	30.30 N	86.12 W		March	April			!		
	num Dew Point			71.5 F			70.3469	72.7854					
	ure Inflow Vector ce Maximization Fac	tor		S @ 75							 		
In-plac	ivianiiiizatioii Fac	.101		1.13									
Tempo	oral Transposition (I	Date)		30-Mar									
	osition Dew Point I			50 111ti									
	osition Maximum I												
	osition Adjustment			#N/A									
	ge Basin Elevation			N/A									
	st Elevation in Basin	1		N/A									
Inflow	Barrier Height			N/A									
	r Adjustment Factor			#N/A									
Total A	Adjustment Factor			#N/A									

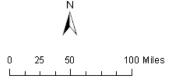
Storm 1305- March 11-16, 1929												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
	Duration (hours)											
area (mi sq)	1	3	6	12	18	24	36	48	72	96	120	Total
0.3	2.58	6.22	10.64	13.65	17.07	20.08	22.99	27.81	29.72	29.73	29.73	29.73
1	2.5	6.07	10.39	13.33	16.67	19.6	22.44	27.13	29.07	29.07	29.07	29.07
10	2.5	6.07	10.39	13.33	16.67	19.6	22.44	27.13	29.07	29.07	29.07	29.07
25	2.5	6.07	10.39	13.33	16.67	19.6	22.44	27.13	29.07	29.07	29.07	29.07
50	2.5	6.07	10.39	13.33	16.67	19.6	22.44	27.13	29.07	29.07	29.07	29.07
100	2.5	5.96	10.18	13.02	16.23	19.14	21.95	26.73	28.66	28.71	28.77	28.77
150	2.5	5.82	9.95	12.7	15.82	18.68	21.42	26.17	27.76	28.16	28.24	28.24
200	2.5	5.69	9.73	12.25	15.39	18.2	20.92	25.71	27.63	27.71	27.72	27.72
300	2.5	5.44	9.3	11.86	14.85	17.51	20.16	24.69	26.6	26.64	26.73	26.73
400	2.48	5.33	8.91	11.42	14.27	16.73	19.24	23.82	25.72	25.85	25.87	25.87
500	2.46	5.26	8.14	11.1	13.35	16.07	19.03	23.02	24.77	24.77	25.2	25.2
1000	2.37	5.07	7.67	10.26	12.21	14.87	16.87	20.41	22.5	22.5	23.61	23.61
2000	2.23	4.75	7.27	9.53	10.7	13.2	14.19	16.62	20.55	20.99	21.16	21.16
5000	1.85	4	6.22	8.51	9.58	11.63	13.07	15.82	18.5	18.52	19.1	19.1
10000	1.45	3.1	5.35	7.54	7.93	10.29	11.44	14.22	16.59	16.84	17.02	17.02
20000	0.76	2.42	3.92	5.56	6.38	7.26	9.47	10.86	12.8	14.2	14.3	14.3
50000	0.37	1.01	2.27	3.49	4.67	5.04	7.22	8.01	9.25	9.25	10.82	10.82
100000	0.3	0.82	1.35	2.14	3.09	3.66	5.39	5.87	7.77	8.04	8.04	8.04





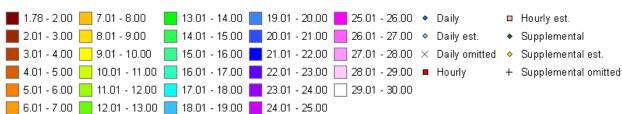


Total 6-day Precipitation (inches) Mar 11-16, 1929 Elba, AL Storm SPAS #1305

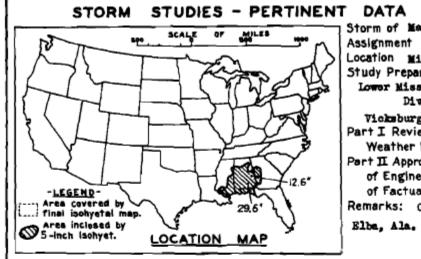




Inches



TWP Oct 30, 2013



Storm of March 11 - 16, 1929
Assignment L M V 2 - 20
Location Miss. Als. and Ga.
Study Prepared by:
Lower Mississippi Valley
Division

Vicksburg District Office
Part I Reviewed by H. M. Sec. of
Weather Bureau, 1/9/39
Part II Approved by Office, Chief
of Engineers for Distribution
of Factual Data, 3/21/13
Remarks: Contors at:
Elba, Ala. and Spring Hill,

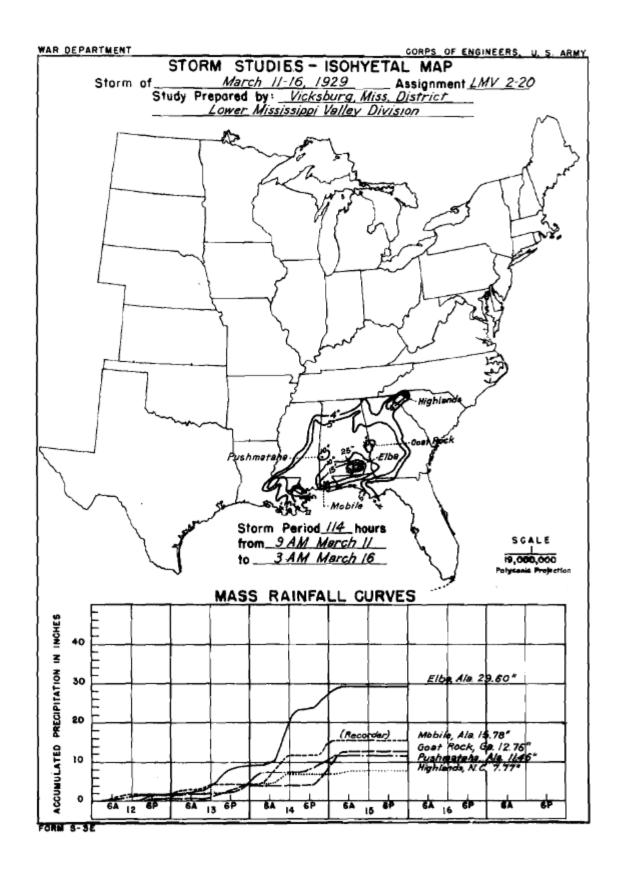
DATA AND COMPUTATIONS COMPILED PART I

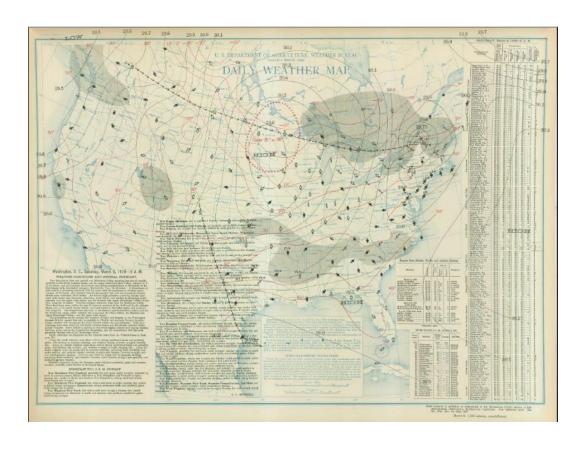
<u></u>	
Preliminary isohyetal map, in - sheet , scale -	
Precipitation data and mass curves: (Number	of Sheets)
	15
Form 5001-B (24-hour ")(Old T.B. Forms 5000-A) 2	apht
Form 5001-D (" * " ")	-
Miscl. precip. records, meteorological data, etc	212
Form 5002 (Mass rainfall curves)	56
PART II	
Final isohyetal maps, in 1 sheet, scale 1:1,000,000	
Data and computation sheets:	
Form S-IO (Data from mass rainfall curves)	7
Form S-II (Depth-area data from isohyetal map)	4
Furm S-12 (Maximum depth-duration data)	15
Maximum duration-depth-area curves	1
Data relating to periods of maximum rainfall	2
MANUAL MERICE SERVICE OF BANKEY IN THE	

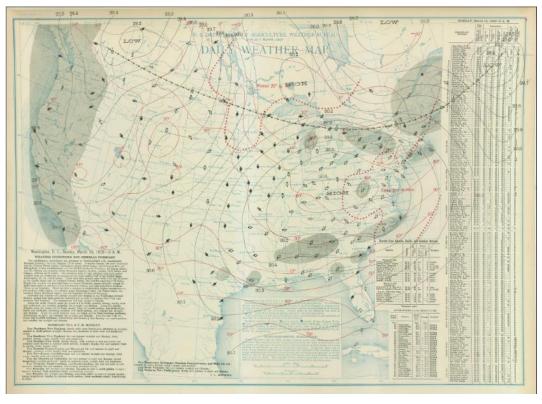
MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES a in Sq. Mi. _____ Duration of Rainfall in Hours

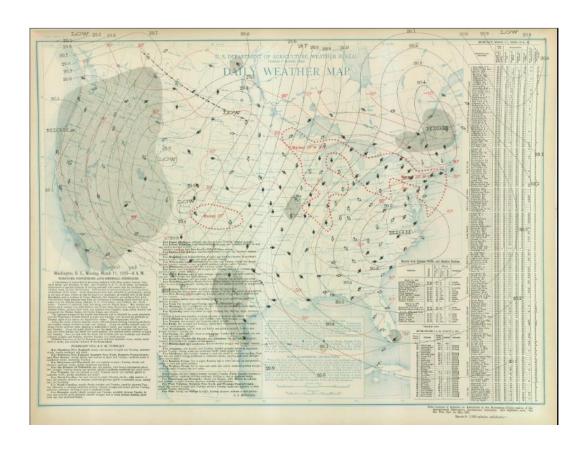
Area in	5q. Mi.			D	<u>uratio</u>	n of	Rainf	all in	Hour:	3		_
		6	12	18	ଥ	30	36	1,8	60	72	96	13/4
	10	14.0	15.4	19.5	20.0	21.4	23.8	27.4	28.0	29.6	29.6	29.6
	100	13.6	14.9	18.9	19.3	20.7	22.9	26.1	26.6	28.4	28.4	يا.28
	200	13.1	14.4	18.3	18.6	20.0	22.2	25.5	26.0	27.6	27.6	27.6
	500	11.6	13.2	16.7	17.2	18.3	20.2	24.0	24.7	26.1	26.1	26.1
	1,000	10.2	11.8	15.4	16.1	17.0	18.6	22.1	22.9	Sitel	24.6	6مبك
	2,000	8.9	10.4	14.1	15.0	15.7	17.0	20.0	20.8	22.3	22.5	22.5
	5,000	7.1	8.6	12.2	13.5	13.9	14.8	17.3	18.1	19.4	19.7	19.7
1	10,000	5.6	7.2	10.1	12.1	12.5	13.1	15.2	15.9	17.1	17.5	17.5
11	20,000	3.8	5-4	7.9	9.6	10.1	11.0	12.5	13.3	24.3	24.7	24.7
	50,000	2.5	3.6	5.3	6.3	7.1	7.9	8.9	9.7	10.5	10.8	10.8
11	100,000	1.6	2+4	3.5	4-3	5.0	5.6	6.5	7-2	7.8	8.2	8.2

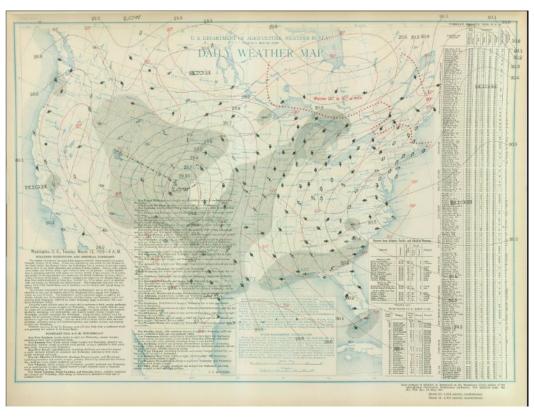
Form S-2

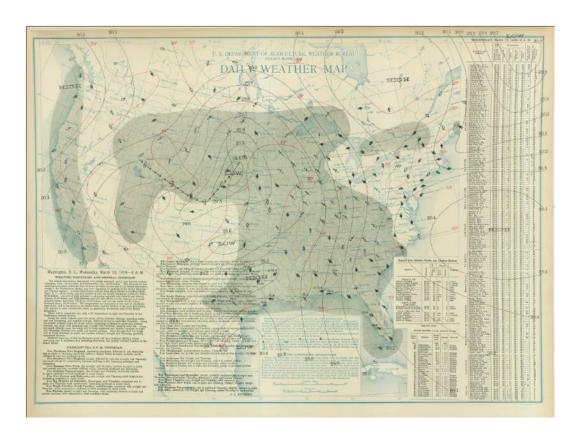


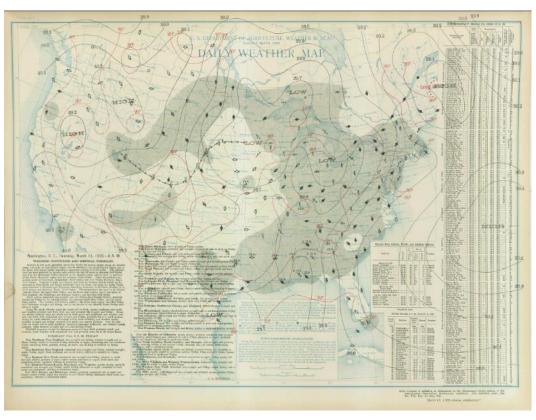


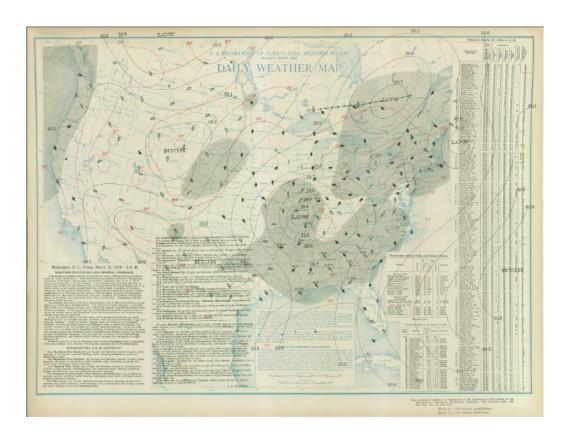


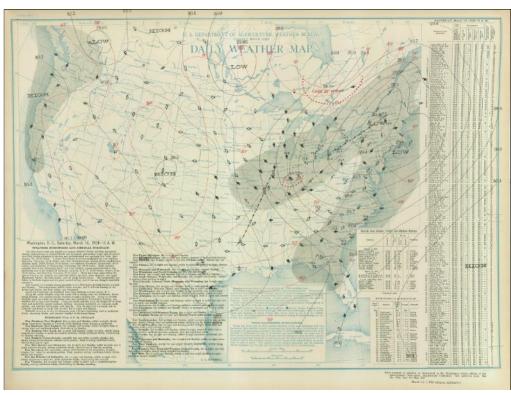


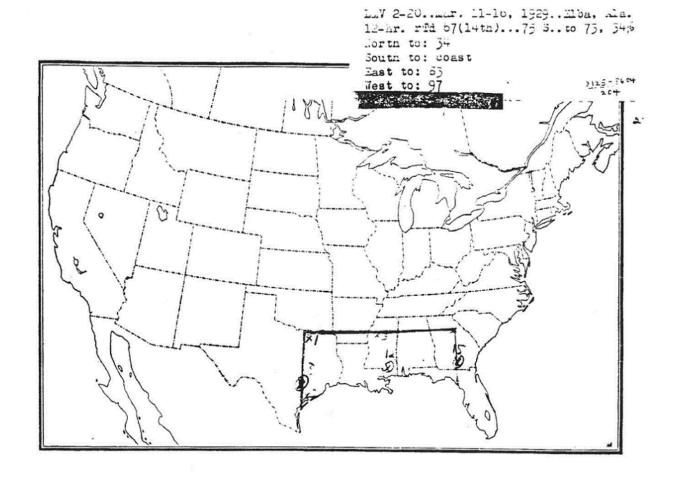












Storm Precipitation Analysis System (SPAS) For Storm #1428 SPAS-General Analysis

General Storm Location: Northeastern Texas

Storm Dates: September 2-5, 1932

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 31.6792

Longitude: -96.1292

Max. Grid Rainfall Amount: 19.58"

Max. Observed Rainfall Amount: 19.50" at Fairfield, TX

Number of Stations: 84 (47 Daily, 1 Hourly, 2 Hourly Estimated, 34 Supplemental)

SPAS Version: 10.0

Base Map Used: Continental United States 2 year 6 hour (conus_0002yr06h)

Spatial resolution: 0.2812

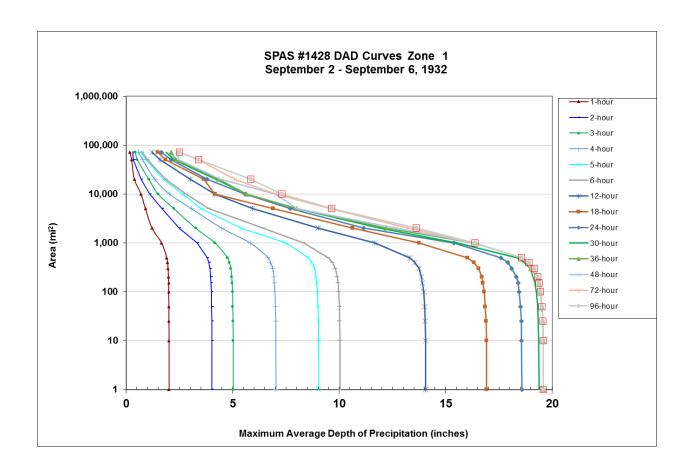
Radar Included: No

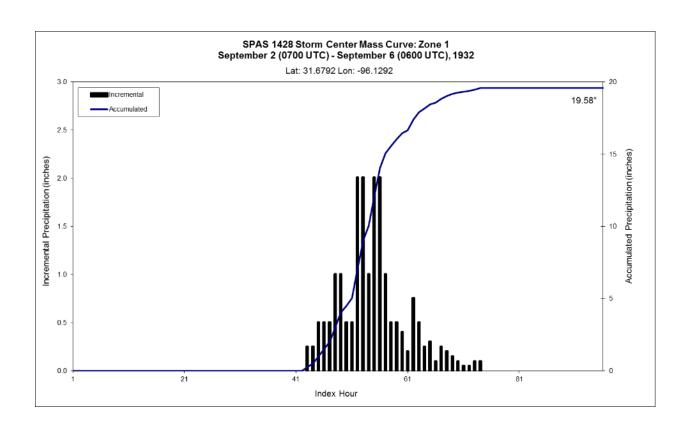
Depth-Area-Duration (DAD) analysis: Yes

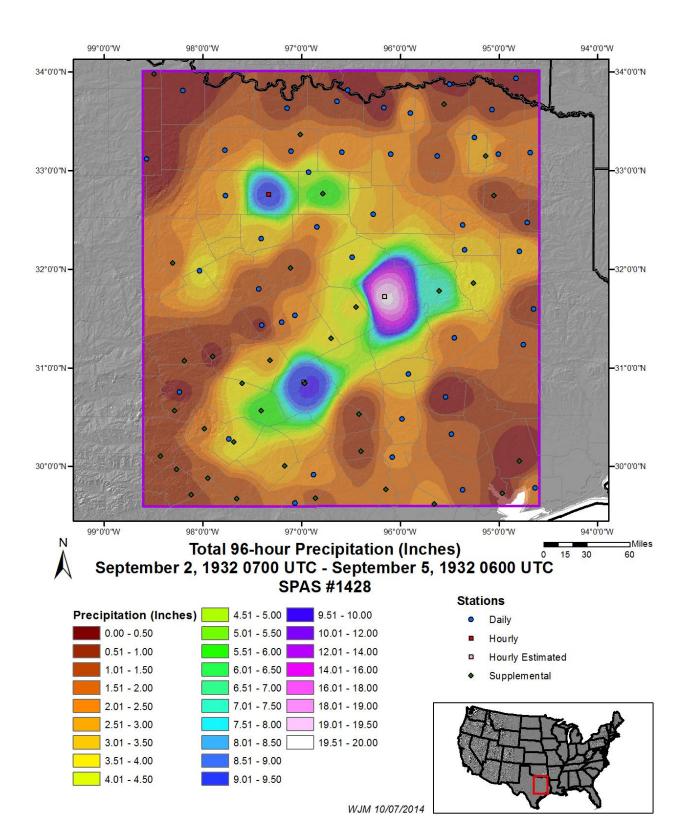
Reliability of results: In addition to the NCDC stations, sixty-four supplemental stations were added to ensure the data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE), three hourly stations were digitized based on the mass rainfall curves. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable.

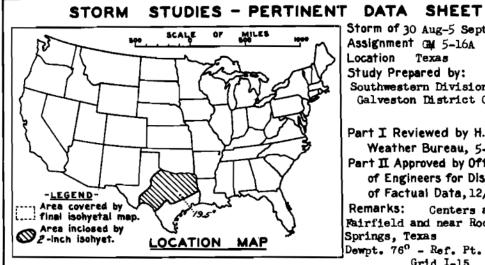
Storm Name:	SPAS 1248 Fa	irfield TX									
Storm Date:	9/2-5/1932				9	Storm A	dinstr	ent for	Virginia	1	
AWA Analysis Date	e: 11/14/2015) (OI III 1	lajastii		v ii giiii	•	
Temporal Transpos	sition Date	19-Aug									
1		Lat	Long			Moisture l	Inflow Dire	ction	SSE @ 180	miles	
Storm Center Loca	ntion	31.68 N	96.13 W			Basin Avei	rage Elevati	on	N/A	feet	
Storm Rep Dew Po		29.30 N	94.80 W				ter Elevatio		400	feet	
Transposition Dew		29.30 14	74.00 11				lysis Durati		24	hours	
Basin Location	1 oint Location						Barrier Hei		N/A	feet	
tion Location						Eliceti (e E		5***	14/14	icci	
The sto	rm representative	Dew Point is	77.5 F	with tot	al precipitabl	e water abox	e sea level c	of		3.22	inches.
	n-place maximum		79.5 F		al precipitabl					3.52	inches.
	sitioned maximum		0.0		al precipitabl					#N/A	inches.
•	The in-place storn	•	400		ich subtracts	0.11		f precipitabl	e water at	77.5 F	menes.
	The in-place storn		400		ich subtracts			f precipitable		79.5 F	
	transposition basis		N/A		ich subtracts			f precipitable		0.0	
	barrier/basin eleva		N/A		ich subtracts			f precipitable		0.0	
THE HILLOW C	barrier/basin ere va	tion neight is	11/71	WII	icii subtracts	Анла	menes o	i precipitaor	e water at	0.0	
	The in-place stor	rm mavimizati	on factor is	1.10	1	Notes: DAD	values taken f	rom SPAS 143	28. Only two sta	tions found	1
т	The transposition/e			#N/A					ative Td value wa		
- 1	•	arrier adjustm		#N/A					emperature and r		
	THE U	arrier adjustin	ciii ractor is	#1 V/A		humidity valu	es from Septer	mber 3, 1932 in	Galveston, TX.		
	Tho	total adjustme	ent factor is	#N/A			-				
	THE	totai aujustini	ent factor is	#1 V/A							ļ
OI	164 D (1.4	D 4:									
Observe	ed Storm Depth-A	·		12 11	10 11	24 11	26 11	40 11	70.11	06 11	
	1	1 Hour 2.0	6 Hours	12 Hours 14.1	18 Hours 16.9	24 Hours 18.6	36 Hours	48 Hours	72 Hours 19.6	96 Hours 19.6	
·	1 sq miles		10.0				19.6	19.6	\		-
	10 sq miles	{	10.0	14.1	16.9	18.6	19.6	19.6	19.6	19.6	-
·····	100 sq miles	2.0	10.0 9.9	14.0	16.8	18.5	19.5 19.3	19.5	19.5	19.5 19.3	-
·	200 sq miles	}(13.9	16.7	18.3	·	19.3	19.3 18.5		-
	500 sq miles 1000 sq miles	1.9 1.7	9.5 8.3	13.3 11.7	16.0 13.7	17.6 15.4	18.5 16.3	18.5 16.4	16.4	18.6 16.4	
	2000 sq miles	}i	6.4	9.0	10.6	11.1	12.2	12.7	13.2	13.6	
	5000 sq miles	0.9	3.9	5.9	6.9	7.7	8.0	8.0	9.6	9.6	
	10000 sq miles	0.7	2.8	4.2	4.2	5.6	5.6	7.0	7.0	7.3	
	20000 sq miles	0.7	1.8	3.0	3.6	3.8	4.3	4.4	5.1	5.9	-
	50,000 sq miles	0.3	1.0	1.6	1.9	2.1	2.3	2.5	3.4	3.4	-
	30,000 sq iiiies	0.5	1.0	1.0	1.7	2.1	2.3	2.3	3.4	3.4	
C4	Ct Ct N.			CD &C 1240	E-:C-1.1 T	W.					1
Storm D	Storm Center Na	me		9/2-5/1932	Fairfield, T	Α					1
Storm T					+						1
Storm Le				Synoptic 31.68 N	96.13 W		-	-	-		1
	enter Elevation			400	70.13 W		-	-	-		1
	ation Total & Dura	tion (10 sa m	i)		hrs from SP	AS 1428			-		1
Пестриа	aron rotal & Dula	(10 sq III	-/	17.50 11190	, ms 110111 SF	1117440	-	-			1
Storm R	epresentative Dew	Point		77.5 F	24		-	-			1
	epresentative Dew		on	29.30 N	94.80 W		AUG	SEP			1
	m Dew Point	- om Locati		79.5 F	2		80.5	78	 		1
	e Inflow Vector			SSE @ 180			30.5	, 0			t
	Maximization Fac	tor		1.10					 		1
III place				-120							1
Tempora	al Transposition (D	Date)		19-Aug							1
	sition Dew Point L										1
	sition Maximum D										1
	sition Adjustment l			#N/A							i –
	Basin Elevation			N/A							i –
	Elevation in Basin			N/A							1
	arrier Height			N/A							1
	Adjustment Factor			#N/A							Î .
	justment Factor			#N/A							1
Total Au	justificiti Fact01			11 L V / / L							

			Storm						ptembei CIPITATIO			1932				
			Duration (hours)													
Area (mi²)	1	2	3	4	5	6	12	18	24	30	36	48	72	96	Total	
0.3	2.0	4.0	5.0	7.0	9.0	10.0	14.1	16.9	18.6	19.4	19.6	19.6	19.6	19.6	19.6	
1	2.0	4.0	5.0	7.0	9.0	10.0	14.1	16.9	18.6	19.4	19.6	19.6	19.6	19.6	19.6	
10	2.0	4.0	5.0	7.0	9.0	10.0	14.1	16.9	18.6	19.4	19.6	19.6	19.6	19.6	19.6	
25	2.0	4.0	5.0	7.0	9.0	10.0	14.0	16.9	18.6	19.4	19.6	19.6	19.6	19.6	19.6	
50	2.0	4.0	5.0	7.0	9.0	10.0	14.0	16.9	18.5	19.3	19.5	19.5	19.5	19.5	19.5	
100	2.0	4.0	5.0	7.0	9.0	10.0	14.0	16.8	18.5	19.3	19.5	19.5	19.5	19.5	19.5	
150	2.0	4.0	5.0	7.0	8.9	9.9	13.9	16.8	18.4	19.2	19.4	19.4	19.4	19.4	19.4	
200	2.0	4.0	5.0	6.9	8.9	9.9	13.9	16.7	18.3	19.1	19.3	19.3	19.3	19.3	19.3	
300	2.0	3.9	4.9	6.9	8.8	9.8	13.8	16.6	18.1	19.0	19.0	19.0	19.0	19.2	19.2	
400	1.9	3.9	4.8	6.8	8.7	9.7	13.6	16.3	17.9	18.7	18.9	18.9	18.9	18.9	18.9	
500	1.9	3.8	4.8	6.7	8.6	9.5	13.3	16.0	17.6	18.4	18.5	18.5	18.5	18.6	18.6	
1,000	1.7	3.3	4.2	5.8	7.5	8.3	11.7	13.7	15.4	15.5	16.3	16.4	16.4	16.4	16.4	
2,000	1.2	2.5	3.3	4.5	5.4	6.4	9.0	10.6	11.1	11.9	12.2	12.7	13.2	13.6	13.6	
5,000	0.9	1.7	2.2	3.1	3.5	3.9	5.9	6.9	7.7	8.0	8.0	8.0	9.6	9.6	9.6	
10,000	0.7	1.1	1.5	2.0	2.6	2.8	4.2	4.2	5.6	5.6	5.6	7.0	7.0	7.3	7.3	
20,000	0.4	0.7	1.1	1.3	1.8	1.8	3.0	3.6	3.8	4.2	4.3	4.4	5.1	5.9	5.9	
50,000	0.3	0.3	0.5	0.8	1.0	1.0	1.6	1.9	2.1	2.2	2.3	2.5	3.4	3.4	3.4	
71,257	0.2	0.3	0.4	0.6	0.7	0.8	1.2	1.5	1.7	1.9	2.1	2.4	2.5	2.5	2.5	









Storm of 30 Aug-5 Sept 1932 Assignment CH 5-16A Location Texas Study Prepared by:

Southwestern Division Galveston District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 5-22-44 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 12/2/47

Remarks: Centers at Fairfield and near Rock Springs, Texas Dewpt. 76° - Ref. Pt. 340 S Grid I-15

DATA AND COMPUTATIONS COMPILED PART I

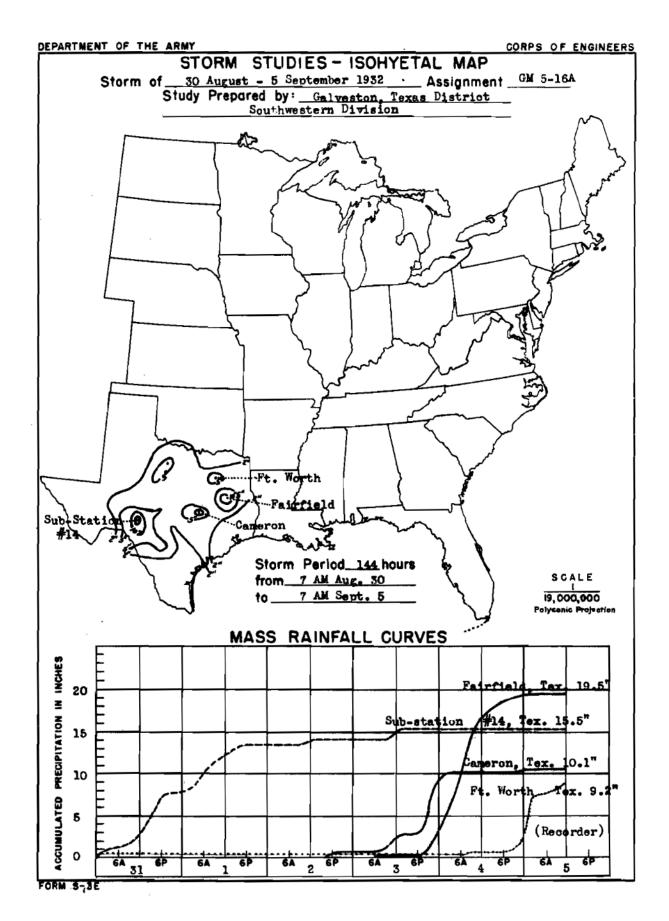
Preliminary isohyetal map, in 2 sheets, scale 1:1,000,000 Precipitation data and mass curves: (Numb	er of Sheets)
Form 5001-C (Hourly precip. data)	20
Form 5001-B (24-hour " ")	
Form 5001-D (" " " ")	_
Miscl. precip. records, meteorological data, etc	16
Form 5002 (Mass rainfall curves)	53
PART I	
Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets:	
Form S-IO (Data from mass rainfall curves)	4
Form S-11 (Depth-area data from isohyetai map)	2 .
Furm S-12 (Maximum depth-duration data)	
Maximum duration-depth-area curves	1

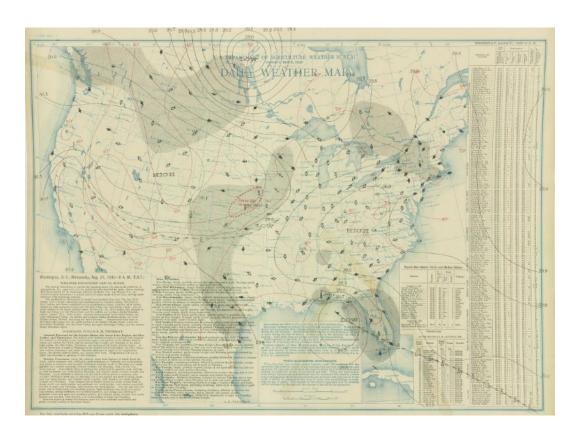
MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

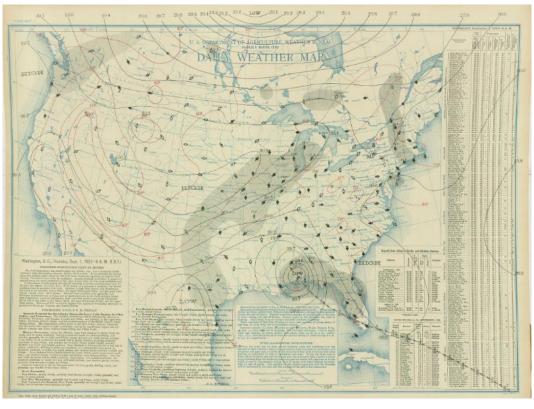
Data relating to periods of maximum rainfall_____

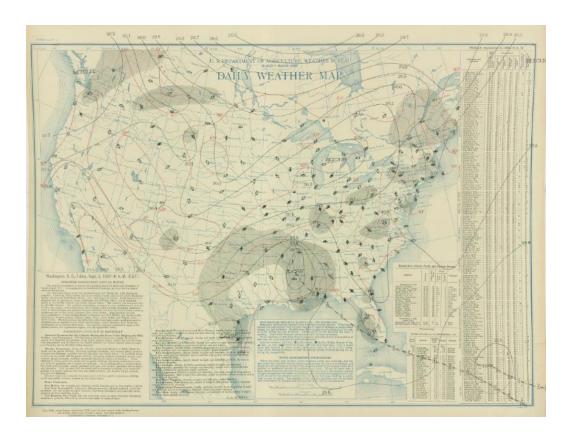
l	Area	in	Sq. Mi.			D	uration	n of	of Rainfall in Hours					
ı				6	12	18	24	30	36	48	72	96	120	114
ı			10	10.0	13.8	16.4	18.3	18.9	19.3	19.5	19.5	19.5	19.5	19.5
ı			100	8.2	12.8	15.9	18.0	18.4	18.5	18.7	18.7	18.7	18.7	18.7
1			200	7.6	12.4	15.5	17.4	17.9	17.9	18.1	18.1	18.1	18.1	18.1
ı			- 500	6.9	11.8	14.6	16.2		16.6	16.8	16.8	16.8	16.8	16.8
ı			1,000	6.3	11.0	13.6	14.8	15.0	15.1	15.2	15.2	15.2	15.2	15.2
ı	1		2,000	5.8	9.8	11.9	12.8	13.0	13.1	13.1	13.2		13.6	13.7
ı			5,000	4.2	6.5	8.1	8.8	9.7	10.0	10.3	10.4	10.8	11.3	11.6
ı			10,000	2.5	4.3	5.4	6.4	7.4	7.8	8.3	8.4	8.8	9.3	9.7
ı			20,000	1.6	2.7	3.7	4.5	5.3	5.9	6.4	6.6	7.0	7.5	7.9
ı			50,000	0.7	1.3	2.0	2.5	3.0	3.6	4.3	4.7	5.0	5.3	5.8
ı	l	1	116,000	0.4	0.7	-1.0	1.3	1.5	1.7	1.9	2.3	3.0	3.9	4.4
ı	1													
l													1	

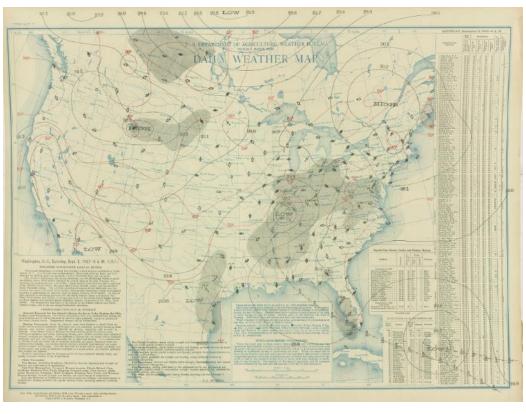
Form 5-2

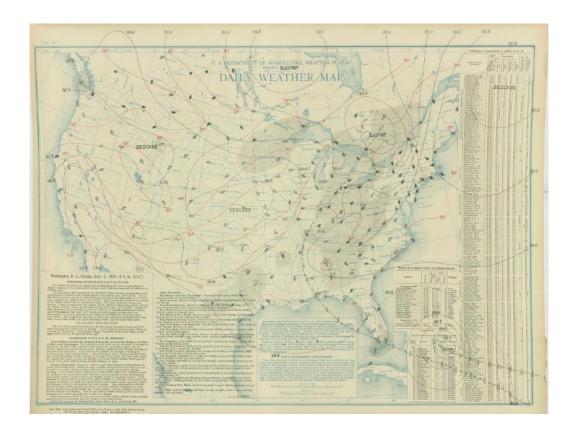


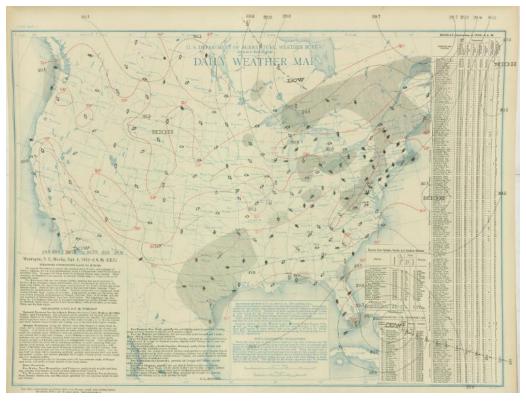


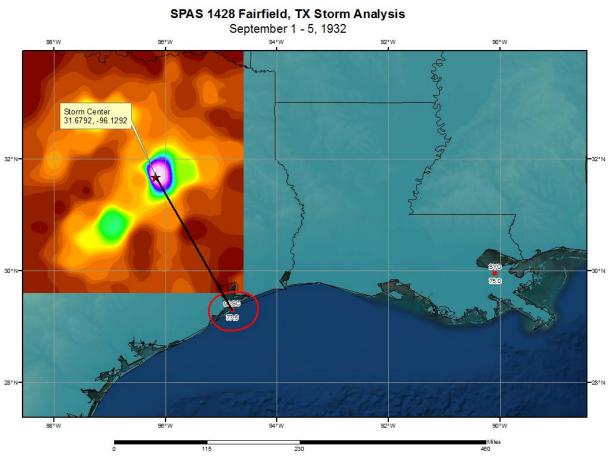












Storm Precipitation Analysis System (SPAS) For Storm #1194 SPAS-General Analysis

General Storm Location: New England and adjacent portions of Canada

Storm Dates: March 9 (2300 UTC) – 13 (0200 UTC), 1936

Event: Synoptic (Major rain-on-snow event)

DAD Zone 1

Latitude: 44.24583333

Longitude: - 71.22083333

Max. Grid Rainfall Amount: 9.70"

Max. Observed Rainfall Amount: 7.85" (Pinkham Notch, NH)

Number of Stations: 493 (317 Daily, 1 Hourly, 9 Hourly Pseudo, 165 Supplemental, and 1 Supplemental

Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM March Precipitation

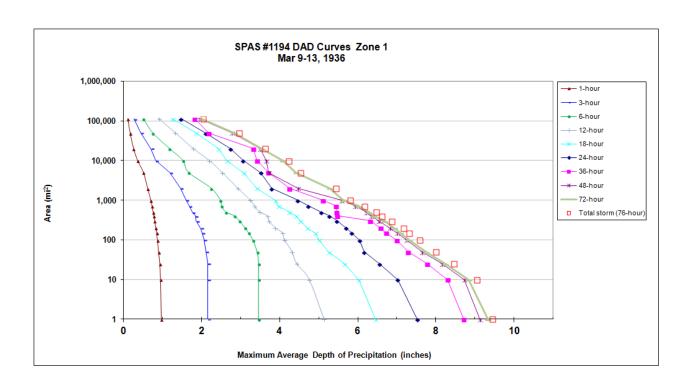
Spatial resolution: 30 seconds

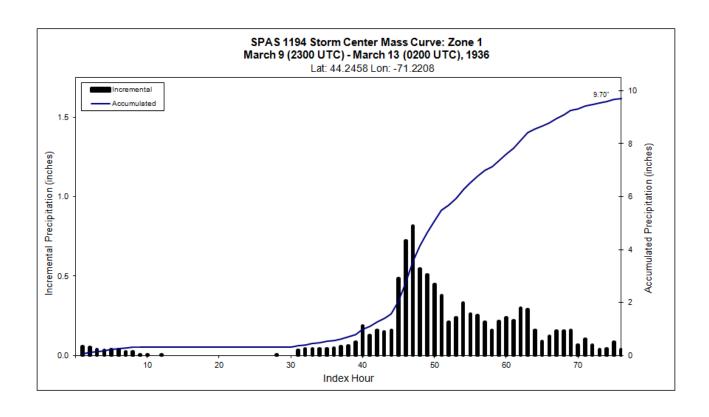
Radar Included: No

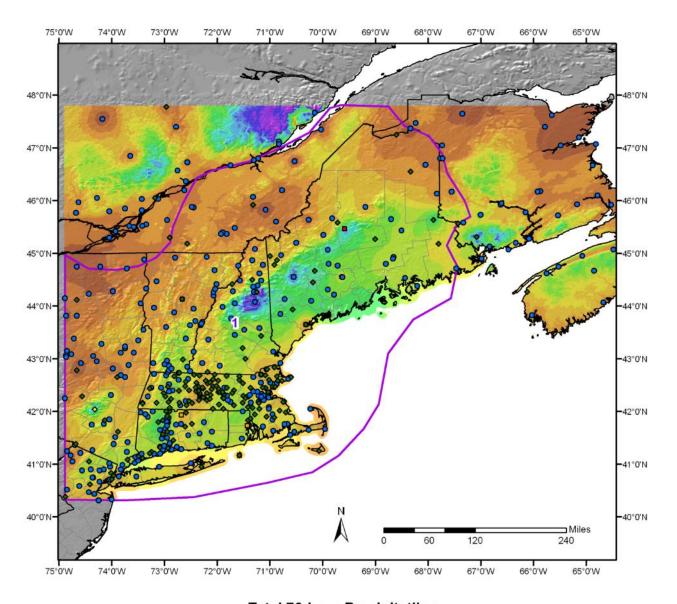
Depth-Area-Duration (DAD) analysis: Yes

Storm Center Location 44.25 N 71.22 W Basin Average Elevation N/A form Rep SST Location 35.00 N 72.00 W Storm Center Elevation 3,700 form Rep SST Location Basin Location Storm Analysis Duration 24 be Effective Barrier Height N/A form The storm representative SST is 67.0 F with total precipitable water above sea level of The in-place maximum SST is 71.0 F with total precipitable water above sea level of The transpositioned maximum SST is 0.0 with total precipitable water above sea level of The in-place storm elevation is 3,700 which subtracts 0.64 inches of precipitable water at The in-place storm elevation at N/A which subtracts 0.74 inches of precipitable water at The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at Company of the subtracts of the subtract of the subtracts of the subtract of	les set set set set set set set set set s
Temporal Transposition Date Lat Long Moisture Inflow Direction S @ 640 m Storm Center Location 44.25 N 71.22 W Basin Average Elevation N/A form Rep SST Location 35.00 N 72.00 W Storm Center Elevation Storm Analysis Duration Basin Location The storm representative SST is The in-place maximum SST is The in-place storm elevation is The in-place storm elevation is 3,700 which subtracts The in-place storm elevation at The in-place storm elevation at The in-place storm elevation at The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition/elevation to basin factor is #N/A Moisture Inflow Direction S @ 640 m N/A the in-place storm elevation And which subtract subtracts The in-place storm elevation is And which subtracts The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition/elevation to basin factor is The transposition/elevation to basin factor is The in-place storm maximization factor is The transposition/elevation to basin factor is	pet
Lat Long Moisture Inflow Direction S @ 640 m	pet
Lat Long Moisture Inflow Direction S @ 640 m	pet
Storm Rep SST Location 35.00 N 72.00 W Storm Center Elevation 3,700 f Transposition SST Location Storm Analysis Duration 24 h Basin Location Effective Barrier Height N/A f The storm representative SST is 67.0 F with total precipitable water above sea level of 1 The in-place maximum SST is 71.0 F with total precipitable water above sea level of 2 The transpositioned maximum SST is 0.0 with total precipitable water above sea level of 2 The in-place storm elevation is 3,700 which subtracts 0.64 inches of precipitable water at 67 The in-place storm elevation at N/A which subtracts 0.74 inches of precipitable water at 71 The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at 60 The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition transposition transposition transposition transposition transposition transposition transposit	95 inches. 36 inches. 37 inches. 38 inches. 39 inches. 39 inches.
Storm Rep SST Location 35.00 N 72.00 W Storm Center Elevation 3,700 f Transposition SST Location Storm Analysis Duration 24 h Basin Location Effective Barrier Height N/A f The storm representative SST is 67.0 F with total precipitable water above sea level of 1 The in-place maximum SST is 71.0 F with total precipitable water above sea level of 2 The transpositioned maximum SST is 0.0 with total precipitable water above sea level of 2 The in-place storm elevation is 3,700 which subtracts 0.64 inches of precipitable water at 67 The in-place storm elevation at N/A which subtracts 0.74 inches of precipitable water at 71 The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at 60 The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition t	95 inches. 36 inches. N/A inches. 0 F 0 I
Transposition SST Location Basin Location The storm representative SST is 67.0 F with total precipitable water above sea level of The in-place maximum SST is 71.0 F with total precipitable water above sea level of The transpositioned maximum SST is 0.0 with total precipitable water above sea level of The in-place storm elevation is 3,700 which subtracts The in-place storm elevation at N/A which subtracts 0.64 inches of precipitable water at 67 The transposition basin elevation at N/A which subtracts 0.74 inches of precipitable water at 71 The in-place storm elevation at N/A which subtracts x.xx inches of precipitable water at 60 The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition tran	95 inches. 36 inches. 37 inches. 47 inches. 48 inches. 48 inches. 49 inches. 40 inches.
The storm representative SST is 67.0 F with total precipitable water above sea level of 2 The in-place maximum SST is 71.0 F with total precipitable water above sea level of 2 The transpositioned maximum SST is 0.0 with total precipitable water above sea level of #1 The in-place storm elevation is 3,700 which subtracts 0.64 inches of precipitable water at 67 The in-place storm elevation at N/A which subtracts 0.74 inches of precipitable water at 71 The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at (0.00 which subtracts x.	95 inches. 36 inches. VA inches. 0 F 0 F .0
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The in-place maximum SST is The transpositioned maximum SST is The in-place storm elevation is The in-place storm elevation is The in-place storm elevation at The in-place storm maximization factor is The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is	36 inches. N/A inches. 0 F 0 F .0
The transpositioned maximum SST is The in-place storm elevation is The in-place storm elevation is The in-place storm elevation at The transposition basin elevation at The inflow barrier/basin elevation height is The in-place storm maximization factor is The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition devaluation factor is The transposition/elevation to basin factor is	N/A inches. 0 F 0 F .0 .0
The in-place storm elevation is 3,700 which subtracts 0.64 inches of precipitable water at 67 The in-place storm elevation is 3,700 which subtracts 0.74 inches of precipitable water at 71 The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at 1 The inflow barrier/basin elevation height is N/A which subtracts x.xx inches of precipitable water at 1 The in-place storm maximization factor is 1.24 Notes: Based SST values on March 9th SST map. 3700 feet used to represent storm elevation based on gridded anlysis of rainfall accumate a ready of the storm.	0 F 0 F .0
The in-place storm elevation is 3,700 which subtracts 0.74 inches of precipitable water at 71 The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at 0 The inflow barrier/basin elevation height is N/A which subtracts x.xx inches of precipitable water at 0 The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition to the transposition transposition to the transposition t	0 F .0 .0
The transposition basin elevation at N/A which subtracts x.xx inches of precipitable water at The inflow barrier/basin elevation height is N/A which subtracts x.xx inches of precipitable water at The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition to the tran	.0
The inflow barrier/basin elevation height is N/A which subtracts x.xx inches of precipitable water at The in-place storm maximization factor is The transposition/elevation to basin factor is The transposition to the tra	.0
The in-place storm maximization factor is 1.24 Notes: Based SST values on March 9th SST map. 3700 feet used to represent storm elevation based on gridded anlysis of rainfall accumarea over general area associated with the storm.	
The transposition/elevation to basin factor is #N/A represent stormelevation based on gridded anlysis of rainfall accumate area over general area associated with the storm.	ılation
The transposition/elevation to basin factor is #N/A represent stormelevation based on gridded anlysis of rainfall accumate area over general area associated with the storm.	ılation
area over general area associated with the storm.	
The outrer adjustment factor is 71411	
The total adjustment factor is #N/A	
Observed Storm Depth-Area-Duration	
6 Hours 12 Hours 18 Hours 24 Hours 48 Hours 72 Hours 96 Hours 120 Hours	***************************************
10 sq miles 3.5 4.8 6.0 7.0 8.7 8.8 9.1 9.1	**************************************
100 sq miles 3.3 4.1 5.0 6.0 7.2 7.3 7.6 7.6	
200 sq miles 3.1 3.9 4.7 5.7 6.8 6.9 7.2 7.2	
500 sq miles 2.6 3.5 4.2 5.1 6.2 6.3 6.5 6.5	
1000 sq miles 2.5 3.2 3.9 4.5 5.6 5.6 5.8 5.8	
2000 sq miles 2.2 2.9 3.4 3.8 4.5 5.3 5.4 5.4	
5000 sq miles 1.7 2.5 3.1 3.5 3.7 4.4 4.5 4.5	
10000 sq miles 1.5 2.2 2.6 3.1 3.7 4.1 4.2 4.2	
20000 sq miles 1.2 1.8 2.4 2.7 3.5 3.5 3.6 3.6 3.6 50000 11 0.7 1.2 1.0 2.1 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0	
50000 sq miles 0.7 1.3 1.9 2.1 2.8 2.8 3.0 3.0 112729 sq miles 0.5 0.9 1.3 1.5 1.9 2.0 2.0 2.0	
112729 sq miles 0.5 0.9 1.3 1.5 1.9 2.0 2.0 2.0	
Specifical Publication National	
Storm or Storm Center Name SPAS 1194 - Pinkham Notch, NH Storm Date(s) 3/9-13/1936	
Storm Type Synoptic	
Storm Location 44.25 N 71.22 W	
Storm Center Elevation 3,700 2100 at storm center point	
Precipitation Total & Duration (10 sq mi) 9.70 inches in 76 hours	
Storm Representative SST 67.0 F 24	
Storm Representative SST Location 35.00 N 72.00 W March April	
Maximum SST 71.0 F 70.2 72.2	
Moisture Inflow Vector S @ 640	
In-place Maximization Factor 1.24	
T 17 17 17 17 17 17 17 17 17 17 17 17 17	
Temporal Transposition Date 25-Mar Transposition SST Location	
Transposition SS1 Location Transposition Maximum SST	
Transposition Maximum SS1 Transposition Adjustment Factor #N/A	
Average Basin Elevation N/A	
Highest Elevation in Basin N/A	
Inflow Barrier Height N/A	
Barrier Adjustment Factor #N/A	
Total Adjustment Factor #N/A	

	Storm	1194 -	March	9 (230	0 UTC	- Marc	:h 13 (0	200 UT	TC), 193	36					
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
					Dui	ration (ho	urs)								
Area (mi²)	1	3	6	12	18	24	36	48	72	76	Total				
0.2	0.97	2.26	3.58	5.21	6.55	7.63	8.91	9.38	9.51	9.7	9.70				
1	0.96	2.16	3.46	5.13	6.45	7.52	8.71	9.13	9.33	9.45	9.45				
10	0.94	2.16	3.46	4.75	6.02	7.02	8.3	8.73	8.83	9.05	9.05				
25	0.92	2.15	3.46	4.43	5.65	6.55	7.77	8.15	8.23	8.45	8.45				
50	0.89	2.11	3.42	4.31	5.25	6.16	7.29	7.65	7.74	7.99	7.99				
100	0.86	2.06	3.31	4.12	5	6.04	6.99	7.24	7.31	7.59	7.59				
150	0.84	2.01	3.2	4.06	4.91	5.84	6.73	7.01	7.09	7.32	7.32				
200	0.82	1.97	3.11	3.88	4.7	5.7	6.58	6.81	6.93	7.17	7.17				
300	0.79	1.86	2.97	3.72	4.52	5.46	6.32	6.53	6.68	6.87	6.87				
400	0.77	1.84	2.84	3.68	4.41	5.27	5.47	6.34	6.4	6.61	6.61				
500	0.75	1.76	2.62	3.48	4.24	5.06	5.46	6.21	6.27	6.47	6.47				
715	0.72	1.68	2.51	3.35	3.96	4.73	5.44	5.93	6	6.16	6.16				
1,000	0.69	1.6	2.48	3.24	3.88	4.46	5.1	5.58	5.63	5.8	5.80				
2,000	0.61	1.45	2.24	2.92	3.41	3.79	4.25	4.47	5.27	5.44	5.44				
5,000	0.5	1.19	1.66	2.52	3.07	3.51	3.71	3.72	4.42	4.53	4.53				
10,000	0.35	0.82	1.52	2.19	2.64	3.06	3.42	3.66	4.06	4.22	4.22				
20,000	0.25	0.7	1.17	1.78	2.42	2.73	3.32	3.5	3.53	3.63	3.63				
50,000	0.16	0.44	0.74	1.32	1.85	2.1	2.17	2.78	2.83	2.95	2.95				
112,729	0.1	0.26	0.5	0.9	1.25	1.47	1.82	1.94	1.99	2.04	2.04				



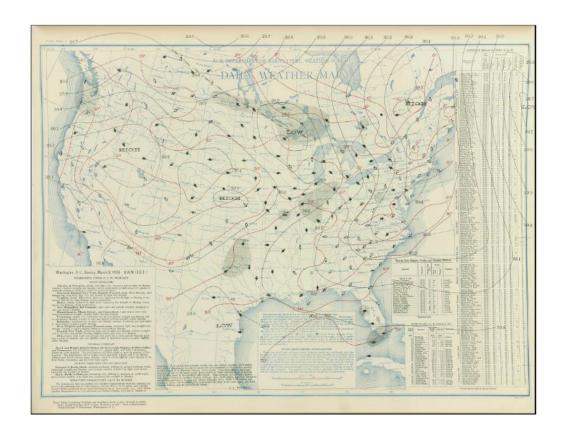


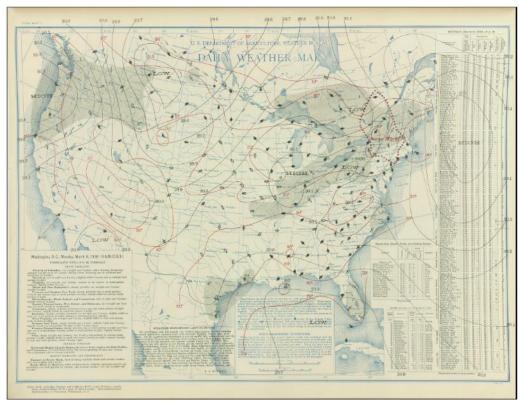


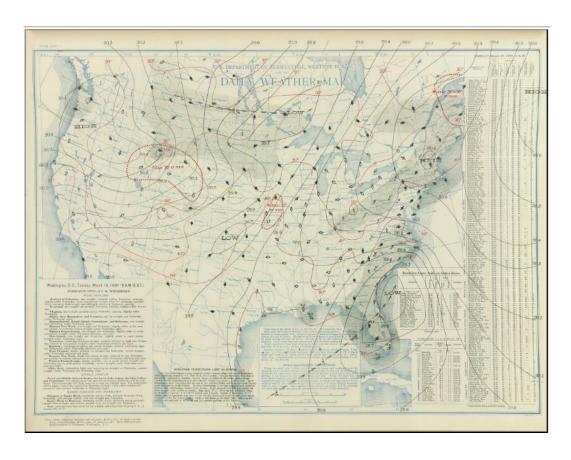
Total 76-hour Precipitatiion SPAS Storm # 1194 03/9/1936 2300 UTC - 03/13/1936 0200 UTC

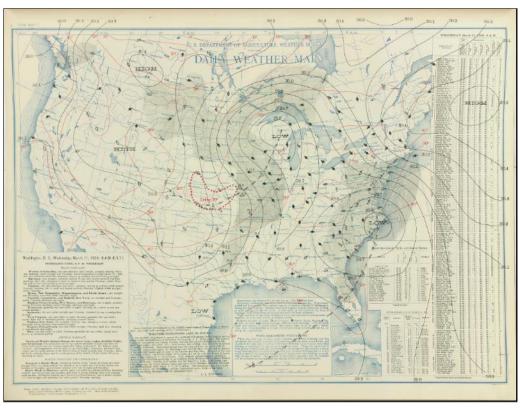


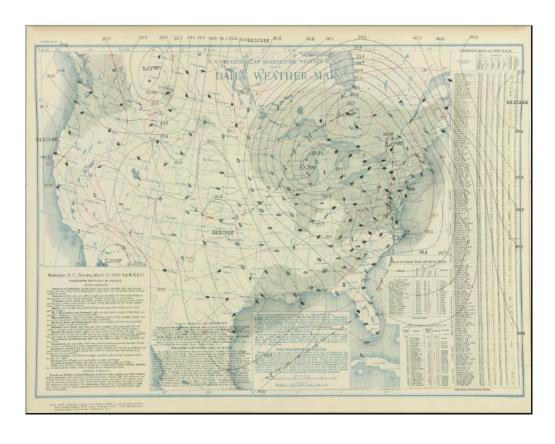
METSTAT, Inc. 11/16/2010 (updated 10/16/2012)

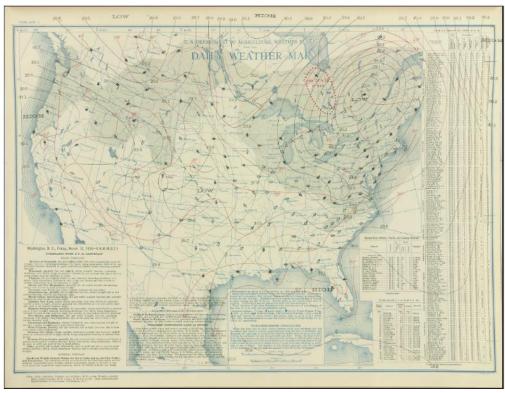


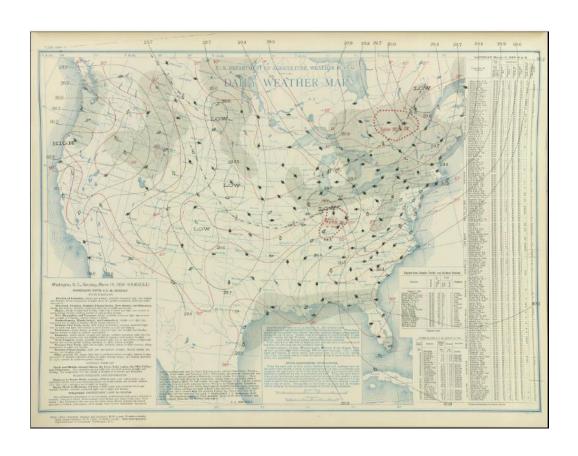




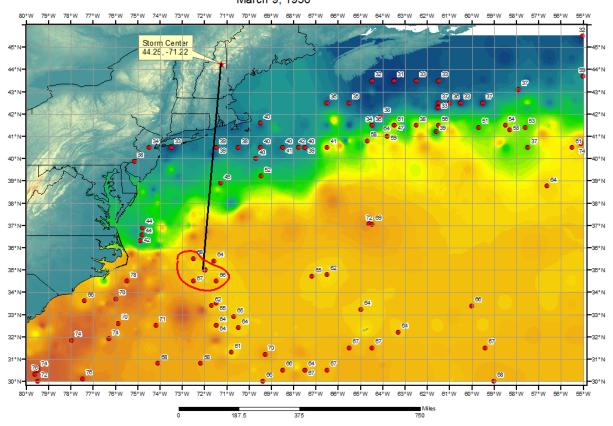


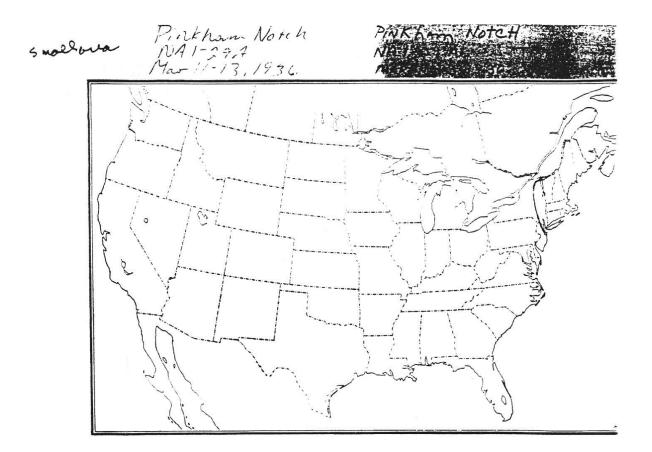






SPAS 1194 Pinkham Notch, NH Sea Surface Tempertures (F)
March 9, 1936





Storm Precipitation Analysis System (SPAS) For Storm #1195 SPAS-General Analysis

** Updated Domain & Timing Expansion **

This storm originally covered New England and part of Canada, but was expanded south and west to include NY, PA, VA, MD, DE, and parts OH and WV. The original analysis ended on March 20, but this analysis includes an extra day to accurately capture precipitation across the expanded area. This notes page pertains to the expanded domain.

General Storm Location: Northeastern U.S. and adjacent portions of Canada

Storm Dates: March 16–21, 1936

Event: Synoptic (Major rain-on-snow event)

DAD Zone 1

Latitude: 44.245833

Longitude: -71.22083

Max. Grid Rainfall Amount: 11.30" in 126 hours - smaller than previous analysis due to lower

elevation threshold (2800 ft vs. 4000 ft); 13.67" is the all-type precipitation maximum

Max. Observed Rainfall Amount: 12.14" (Pinkham Notch, NH)

DAD Zone 2

Latitude: 39.0208

Longitude: -78.5625

Max. Grid Rainfall Amount: 8.31" in 126 hours (USACE SA-1-27: 10-sq-mi 7.9")

Number of Stations: 966 (696 Daily, 6 Hourly, 11 Hourly Pseudo, 252 Supplemental, and 1

Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM March Precipitation (extrapolated into Canada)

Spatial resolution: 30 seconds

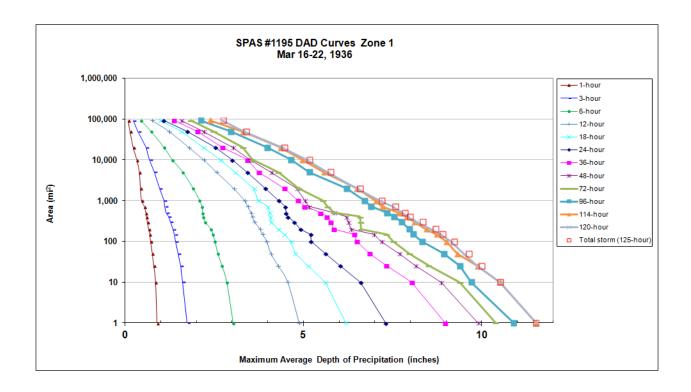
Radar Included: No

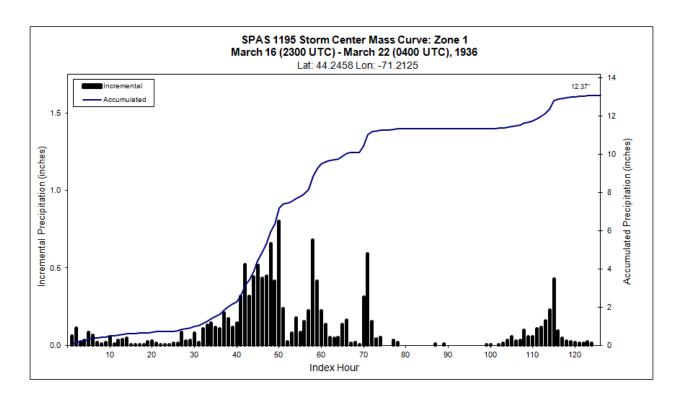
Depth-Area-Duration (DAD) analysis: Yes

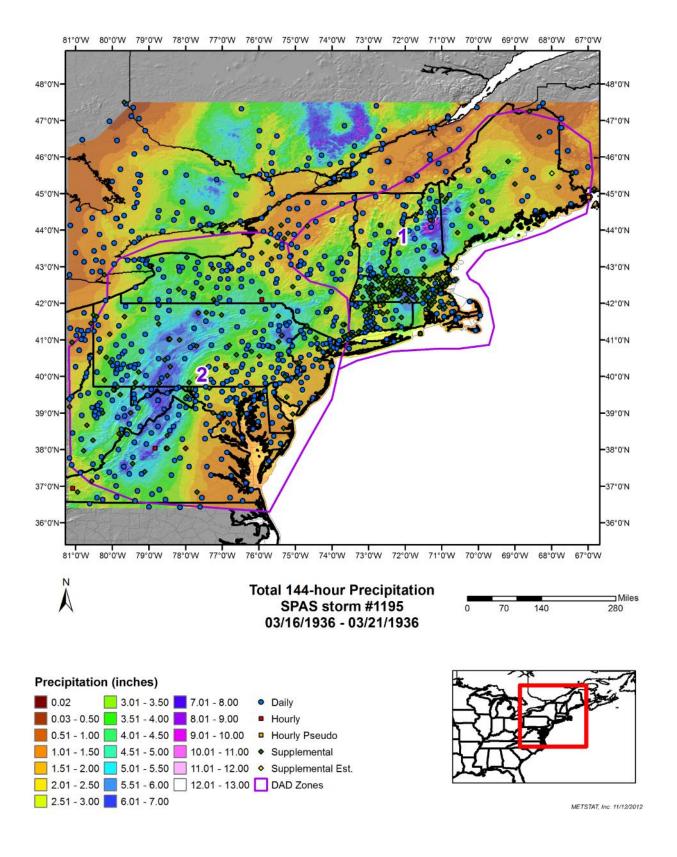
Reliability of Results: The lack of hourly data makes the temporal characteristics of this analysis less accurate than usual. However, a relatively high density of daily and supplemental stations provides good confidence in the magnitudes. At times, particularly at the highest elevations (above 3,000 feet) and across the northern most areas, snow and ice may have compromised the precipitation amounts given difficult in measurements.

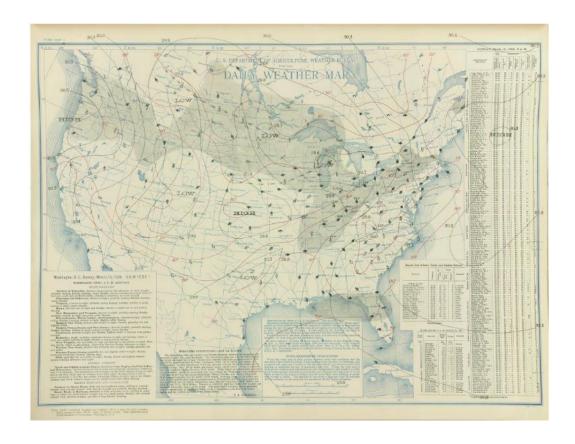
Storm Name:	SDAC 1105	- Pinkham	Notch NI								
Storm Date:	3/16-20/19		Notell, NE		S	torm A	diustm	ent for	Virgini	9	
AWA Analysis Dat				۰	В	torm A	ujustin		v ii giiii	а	
Temporal Transpo	*	1-Apr									
		Lat	Long	1		Moisture 1	Inflow Dire	ction	SSE @ 530	miles	
Storm Center Loc	ation	44.25 N	71.22 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep SST Lo		37.00 N	68.00 W				nter Elevati		3,700	feet	
Transposition SST		37.0011	00.00 11				dysis Durat		24	hours	
Basin Location	Location						Barrier Hei		N/A	feet	
						Effective	Juli I I I I I I I I I I I I I I I I I I I	SIII	11/21		
The	storm represent	ative SST is	68.5 F	with to	tal precipital	ole water ab	ove sea level	of		2.10	inches.
	ne in-place maxi		69.5 F		tal precipital					2.20	inches.
	positioned maxin		0.0		tal precipital					#N/A	inches.
	in-place storm		3,700		ich subtracts	0.68	1	f precipitabl	le water at	68.5 F	
	in-place storm		3,700	whi	ich subtracts	0.70		f precipitabl		69.5 F	
	nsposition basin		N/A	whi	ich subtracts	x.xx		f precipitabl		0.0	
	ier/basin elevati		N/A	whi	ich subtracts	x.xx		f precipitabl		0.0	
				•							
The	e in-place storm	maximizatio	on factor is	1.06					map. 1250' feet u		
The tr	ansposition/ele	vation to bas	in factor is	#N/A			m elevation base eral area associa		ınlysis of rainfall a	nccumulation	
	The barr	ier adjustme	nt factor is	#N/A		aica ovei gelle	ana area associa	ica willi liic St	7111L		
	The to	tal adjustme	nt factor is	#N/A							
Observ	ed Storm Dept	h-Area-Dur	ation								
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	3.1	4.9	6.2	7.4	9.8	10.6	11.1	11.8		
	100 sq miles	2.6	4.1	4.8	5.4	7.7	8.3	8.6	9.7		
	200 sq miles	2.4	3.9	4.6	5.4	7.2	7.7	8.2	9.1		
	500 sq miles	2.2	3.6	4.2	4.6	6.4	6.8	7.7	8.1		
***************************************	1000 sq miles	2.1	3.4	3.8	4.4	5.2	5.7	6.6	7.3		
	2000 sq miles	1.9	3.1	3.7	4.0	5.0	5.0	5.7	6.7		
	5000 sq miles	1.6	2.6	3.1	3.5	4.1	4.4	5.4	5.7		
	10000 sq miles	1.4	2.2	2.7	3.0	3.6	3.6	4.7	5.0		
	20000 sq miles	1.1	1.8	2.2	2.4	3.1	3.3	4.1	4.4		_
	50000 sq miles	0.7	1.2	1.6	1.8	2.2	2.5	3.0	3.3		
	92846 sq miles	0.5	0.8	1.0	1.1	1.6	1.9	2.1	2.4		_
											_
	or Storm Center	Name			5 - Pinkham	Notch, NH	I-DAD Zone	1			_
Storm I				3/16-20/19	936						-
Storm 7	71			Synoptic	71.00 117						-
	Location			44.25 N	71.22 W	2100		.:			-
	Center Elevation tation Total & D		a mi`	3700	on in 126 b		orm center po	JIII			1
Precipi	tation fotal & D	uration (10	sq IIII)	12.3 / Inch	es in 126 hou	шs					1
Storm T	Representative S	ST		68.5 F	24						1
	Representative S			37.00 N	68.00 W		March	April			1
	ım SST	51 Location		69.5 F	30.00 **		67.5	70.2			1
	re Inflow Vector			SSE @ 530			37.3	. 0.2			1
	Maximization l			1.06							1
In place	- I I I I I I I I I I I I I I I I I I I										1
Tempor	al Transposition	n Date		1-Apr							1
	sition SST Loca			- T*							
	sition Maximun										1
	sition Adjustme			#N/A							1
	Basin Elevation			N/A							1
	Elevation in Ba			N/A							Ī
				N/A							
	Barrier Height										
Inflow l	Adjustment Fac	tor		#N/A							

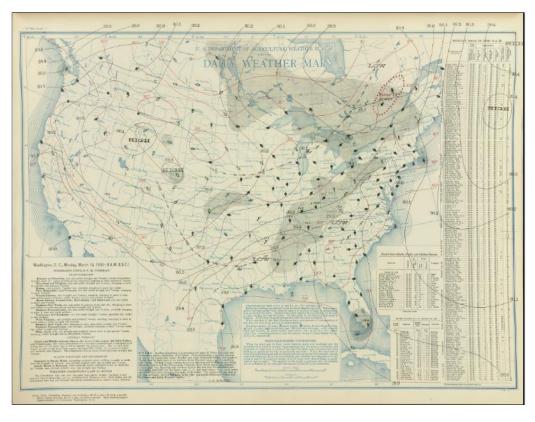
		Sto	orm 11	95 - Ma	rch 16	(2300 l	JTC) - I	March :	22 (040	0 UTC)	,1936					
						•		ECIPITA	•		•					
		Duration (hours)														
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	114	120	125	Total		
0.2	0.92	1.88	3.28	5.27	6.65	7.84	9.54	10.51	11.18	11.73	12.37	12.37	12.37	12.37		
1	0.89	1.74	3.02	4.88	6.18	7.3	8.98	9.89	10.39	10.89	11.52	11.52	11.52	11.52		
10	0.85	1.61	2.84	4.56	5.61	6.6	8.04	8.86	9.39	9.71	10.51	10.51	10.51	10.51		
25	0.8	1.55	2.71	4.29	5.12	6.02	7.33	8.14	8.52	9.38	9.87	9.87	10	10.00		
50	0.76	1.48	2.59	4.09	4.77	5.61	6.86	7.68	7.97	8.94	9.31	9.49	9.64	9.64		
100	0.71	1.41	2.51	3.97	4.65	5.21	6.49	7.18	7.52	8.32	9	9.14	9.22	9.22		
150	0.69	1.38	2.45	3.85	4.46	5.2	6.42	6.97	7.33	8.08	8.72	8.84	8.91	8.91		
200	0.66	1.34	2.4	3.78	4.29	4.91	5.86	6.33	6.62	7.96	8.44	8.57	8.71	8.71		
300	0.62	1.27	2.23	3.63	4.09	4.73	5.76	6.26	6.61	7.75	8.1	8.14	8.35	8.35		
400	0.6	1.21	2.19	3.57	4.07	4.56	5.66	6.19	6.59	7.54	7.88	7.91	7.99	7.99		
500	0.58	1.15	2.17	3.53	4.05	4.51	5.48	5.85	5.86	7.33	7.67	7.77	7.85	7.85		
715	0.54	1.11	2.15	3.44	4	4.49	5.03	5.14	5.67	6.89	7.2	7.49	7.57	7.57		
1,000	0.46	1.09	2.08	3.35	3.72	4.31	4.84	5.03	5.54	6.71	7.02	7.12	7.19	7.19		
2,000	0.43	0.96	1.9	3.04	3.61	3.92	4.46	4.81	4.86	6.2	6.49	6.49	6.59	6.59		
5,000	0.4	0.82	1.61	2.56	3.08	3.43	3.75	4.09	4.3	5.16	5.57	5.67	5.75	5.75		
10,000	0.33	0.68	1.32	2.2	2.67	3	3.43	3.5	3.57	4.65	4.95	5.07	5.17	5.17		
20,000	0.23	0.58	1.09	1.79	2.19	2.53	2.72	3.01	3.3	3.98	4.35	4.39	4.46	4.46		
50,000	0.14	0.36	0.72	1.23	1.57	1.73	2.03	2.19	2.47	2.96	3.28	3.31	3.39	3.39		
92,846	0.09	0.22	0.44	0.75	0.98	1.08	1.37	1.57	1.84	2.12	2.38	2.72	2.75	2.75		

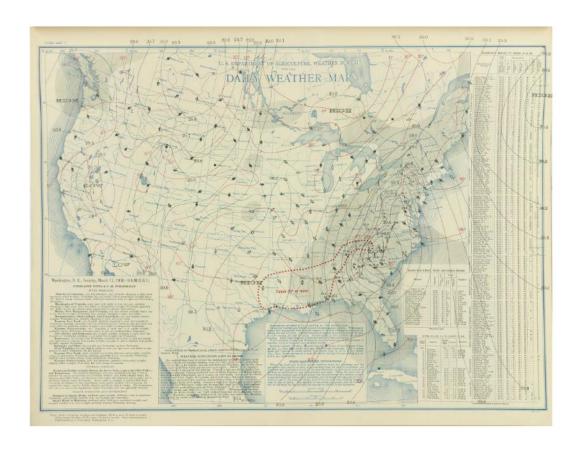


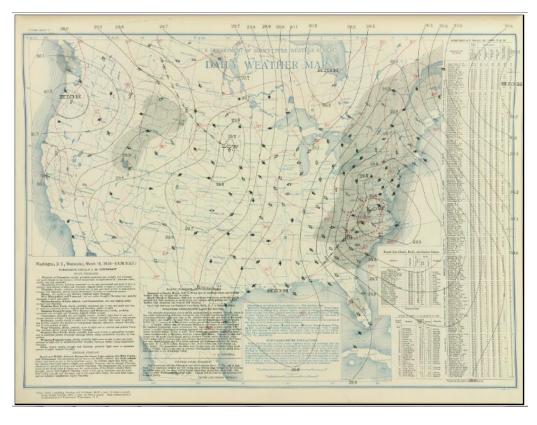


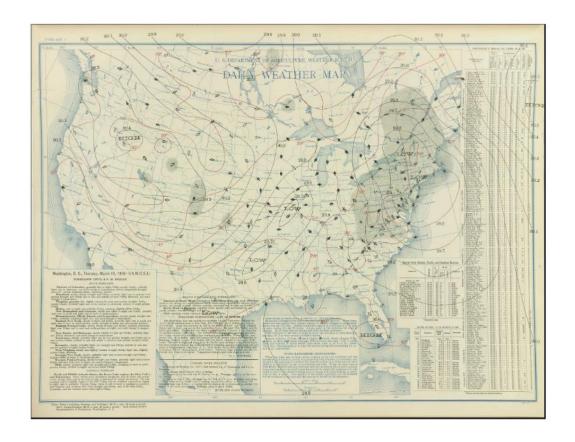




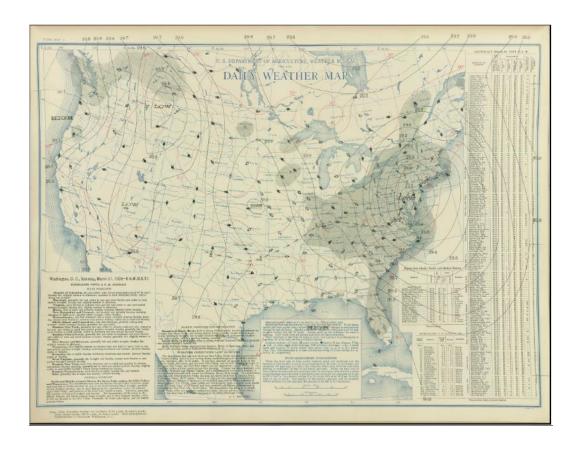




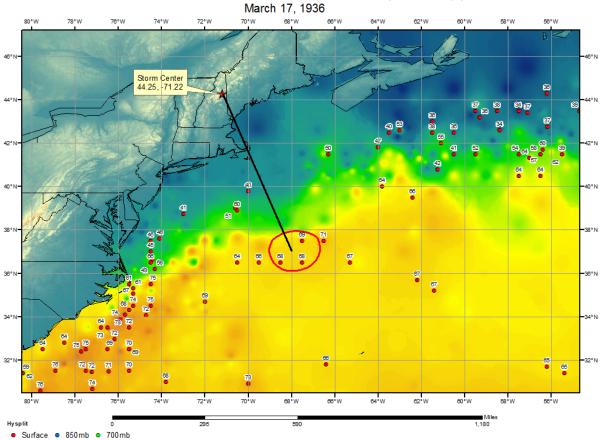








SPAS 1195 Pinkham Notch, NH Sea Surface Temperatures (F)



Storm Precipitation Analysis System (SPAS) For Storm #1195 SPAS-General Analysis

** Updated Domain & Timing Expansion **

This storm originally covered New England and part of Canada, but was expanded south and west to include NY, PA, VA, MD, DE, and parts OH and WV. The original analysis ended on March 20, but this analysis includes an extra day to accurately capture precipitation across the expanded area. This notes page pertains to the expanded domain.

General Storm Location: Northeastern U.S. and adjacent portions of Canada

Storm Dates: March 16–21, 1936

Event: Synoptic (Major rain-on-snow event)

DAD Zone 1

Latitude: 44.245833

Longitude: -71.22083

Max. Grid Rainfall Amount: 11.30" in 126 hours - smaller than previous analysis due to lower

elevation threshold (2800 ft vs. 4000 ft); 13.67" is the all-type precipitation maximum

Max. Observed Rainfall Amount: 12.14" (Pinkham Notch, NH)

DAD Zone 2

Latitude: 39.0208

Longitude: -78.5625

Max. Grid Rainfall Amount: 8.31" in 126 hours (USACE SA-1-27: 10-sq-mi 7.9")

Number of Stations: 966 (696 Daily, 6 Hourly, 11 Hourly Pseudo, 252 Supplemental, and 1

Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM March Precipitation (extrapolated into Canada)

Spatial resolution: 30 seconds

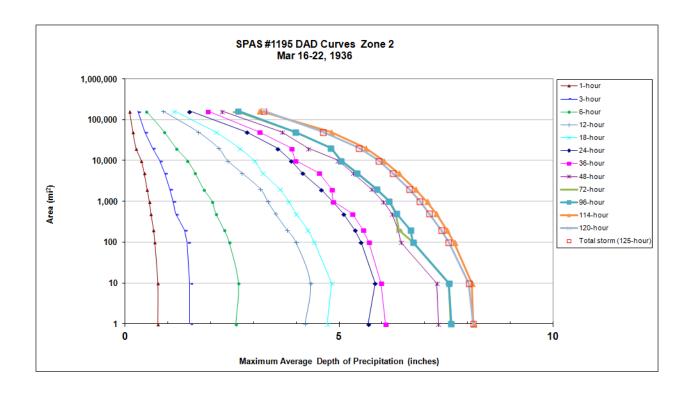
Radar Included: No

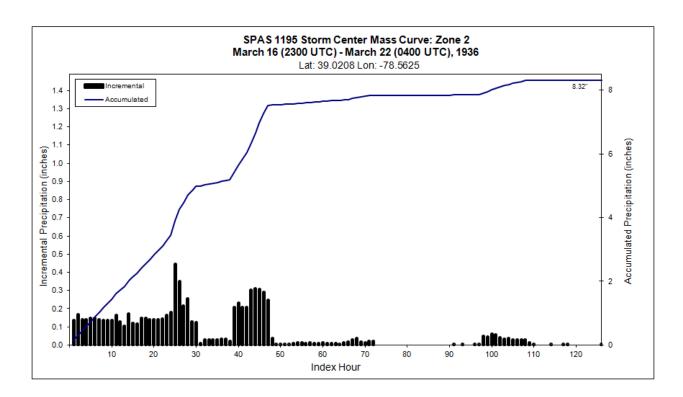
Depth-Area-Duration (DAD) analysis: Yes

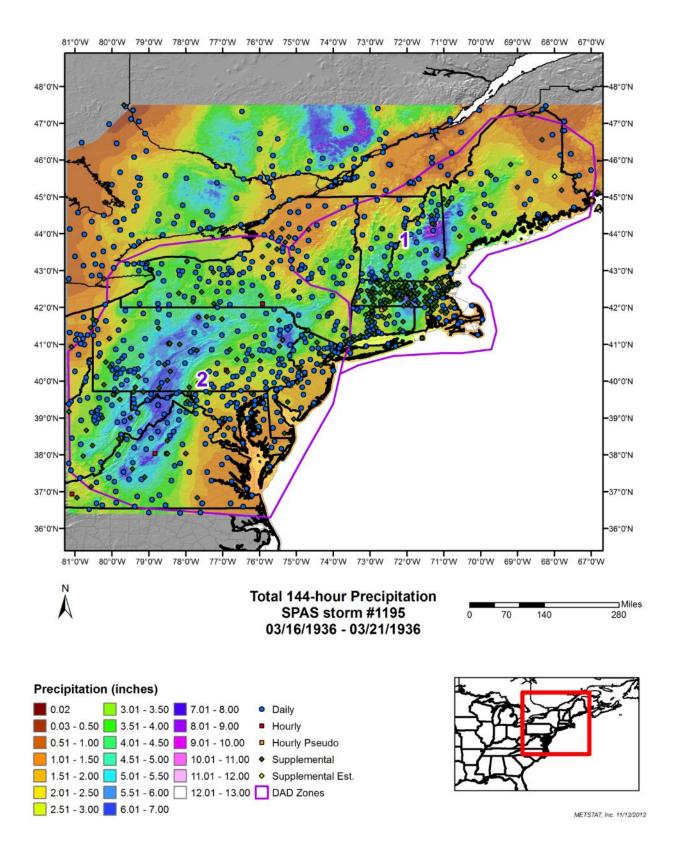
Reliability of Results: The lack of hourly data makes the temporal characteristics of this analysis less accurate than usual. However, a relatively high density of daily and supplemental stations provides good confidence in the magnitudes. At times, particularly at the highest elevations (above 3,000 feet) and across the northern most areas, snow and ice may have compromised the precipitation amounts given difficult in measurements.

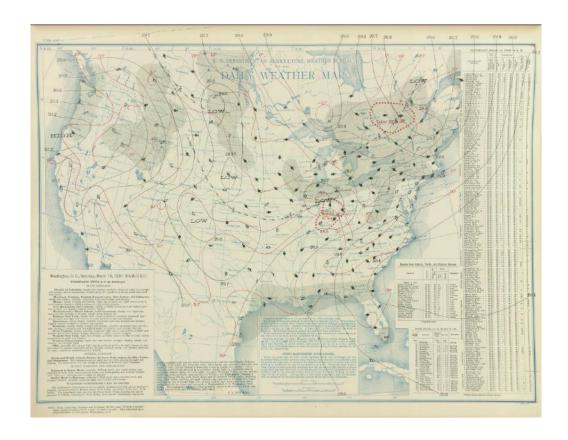
Storm Name:	SPAS 1195 -	Paddy Mor	ıntain WW								
Storm Date:	3/16-21/193		11111111, VV V 1		S	torm A	dinstm	ent for	Virgini	9	
AWA Analysis Date:	11/14/2015					101111111	ujustii	ciit ioi	v II gilli	a	
Temporal Transposit	ion Date	1-Apr									
		Lat	Long			Moisture l	Inflow Dire	ction	SE @ 465	miles	
Storm Center Locati	on	39.02 N	78.56 W				rage Elevat		N/A	feet	
	orm Rep SST Location 34.00 N		73.00 W				ter Elevati		2,200	feet	
Transposition SST L		34.0011	75.00 11				lysis Durat		24	hours	
Basin Location	ocution .						Barrier Hei		N/A	feet	
						Elicetive	ALL THE THE	5111			
The s	torm represent	tative SST is	68.0 F	with to	tal precipital	ole water abo	ve sea level	of		2.05	inches.
	in-place maxi		72.0 F			ole water abo				2.47	inches.
The transp	ositioned maxi	mum SST is	0.0	with to	tal precipital	ole water abo	ve sea level	of		#N/A	inches.
The	in-place storm	elevation is	2,200	whi	ch subtracts	0.42	inches of	f precipitable	e water at	68.0 F	
	in-place storm		2,200	whi	ch subtracts	0.48	inches of	f precipitable	e water at	72.0 F	
The trans	sposition basin	elevation at	N/A	whi	ch subtracts	x.xx	inches of	f precipitable	e water at	0.0	
The inflow barri	er/basin elevati	ion height is	N/A	whi	ch subtracts	x.xx	inches of	f precipitable	e water at	0.0	
					_						
	e in-place storr			1.22					SST map, sele	-	
The tr	ansposition/ele			#N/A				•	a degree over	_	
	The bar	rrier adjustm	ent factor is	#N/A				hin 500-mi rac	lius around stor	m center	
						instead of poi	in elevation.				
	The t	total adjustm	ent factor is	#N/A							J
Observed	Storm Depth-							T			T
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles		2.6	4.2	4.7	5.7	6.1	7.3	7.6	7.6	8.1
	10 sq miles	<u> </u>	2.5	4.1	4.6	5.7	6.0	7.1	7.4	7.4	8.0
	100 sq miles	1	2.3	3.7	4.3	5.3	5.7	6.4	6.5	6.7	7.6
	200 sq miles	//	2.2	3.6	4.1	5.1	5.6	6.3	6.4	6.4	7.4
	500 sq miles		2.0 1.9	3.4	3.7 3.6	4.8 4.6	5.3 4.9	6.1 5.9	6.1	6.2	7.1 6.9
	1000 sq miles	· 		3.0	·	4.0	4.9	5.6	5.7	5.7	6.6
	2000 sq miles 5000 sq miles	·}	1.8 1.6	2.6	3.4	4.1	4.5	5.1	5.4	5.4	6.3
1	0000 sq miles		1.4	2.3	2.9	3.7	4.0	4.8	5.0	5.0	5.9
	0000 sq miles		1.1	2.1	2.6	3.3	3.9	4.2	4.5	4.5	5.5
	0000 sq miles	· 	0.8	1.6	2.0	2.7	3.1	3.5	3.8	3.8	4.6
	oooo sq miles	0.2	0.0	110	2.0		3.1		5.0	5.0	-1.0
Storm or S	Storm Center N	Jame.		SPAS 1195	- Paddy M	ountain, W	V Zone 2				1
Storm Dat		, tarre		3/16-21/19			, Lone L				
Storm Typ				Synoptic							
Storm Loc				39.02 N	78.56 W						
Storm Cer	nter Elevation			2200							
Precipitati	on Total & Du	ration (10 sq	mi)	8.32 inches	in 126 hou	rs					
Storm Rep	oresentative SS	Т		68.0 F	24						
Storm Rep	presentative SS'	TLocation		34.00 N	73.00 W						
Maximum				72.0 F							
	Inflow Vector			SE @ 465							
In-place N	Iaximization Fa	actor		1.22							
		(7)									
	Transposition (1-Apr							ł
	ion SST Locati										ł
	ion Maximum			HNT/A							
	ion Adjustmen			#N/A							
	asin Elevation			N/A							1
	evation in Basi	ın		N/A	-				-		
Intiow Bat	rier Height			N/A							
	liustmost Esst-										
Barrier Ac	ljustment Facto stment Factor	or		#N/A #N/A							

	Storm 1195 - March 16 (2300 UTC) - March 22 (0400 UTC),1936 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
		Duration (hours)													
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	114	120	125	Total	
0.3	0.78	1.61	2.67	4.36	4.93	5.88	6.29	7.54	7.84	7.85	8.31	8.32	8.32	8.32	
1.0	0.76	1.51	2.59	4.21	4.73	5.68	6.09	7.32	7.61	7.62	8.14	8.14	8.14	8.14	
10.0	0.76	1.51	2.65	4.33	4.83	5.84	5.98	7.28	7.56	7.57	8.1	8.03	8.03	8.03	
100.0	0.69	1.45	2.43	3.99	4.42	5.51	5.7	6.44	6.73	6.73	7.69	7.56	7.56	7.56	
200.0	0.66	1.38	2.31	3.78	4.27	5.37	5.56	6.39	6.4	6.67	7.52	7.39	7.39	7.39	
500.0	0.6	1.18	2.12	3.51	3.99	5.1	5.3	6.24	6.33	6.34	7.27	7.11	7.11	7.11	
1,000.0	0.56	1.12	2.03	3.33	3.82	4.84	4.86	6.02	6.17	6.17	7.05	6.89	6.89	6.89	
2,000.0	0.51	1.04	1.83	3.16	3.62	4.58	4.83	5.76	5.88	5.88	6.78	6.64	6.64	6.64	
5,000.0	0.44	0.92	1.63	2.72	3.21	4.14	4.53	5.32	5.41	5.42	6.39	6.25	6.25	6.25	
10,000.0	0.37	0.8	1.45	2.39	3.02	3.87	3.97	4.97	5.04	5.04	6.03	5.92	5.92	5.92	
20,000.0	0.25	0.63	1.19	2.18	2.68	3.56	3.88	4.28	4.81	4.81	5.62	5.47	5.47	5.47	
50,000.0	0.18	0.45	0.91	1.7	2.12	2.84	3.13	3.66	3.98	3.98	4.81	4.63	4.63	4.63	
161,541.0	0.1	0.29	0.49	0.88	1.14	1.5	1.93	2.26	2.58	2.64	3.14	3.24	3.24	3.24	

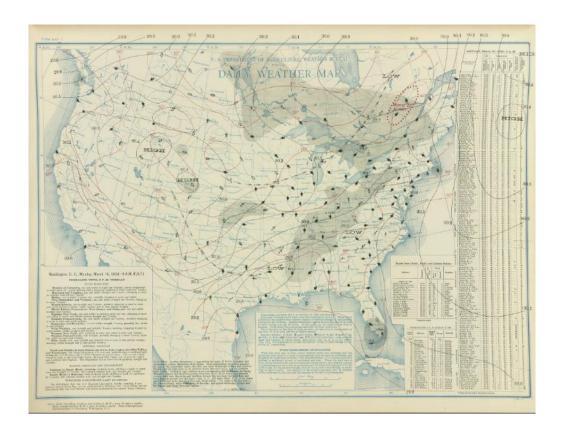


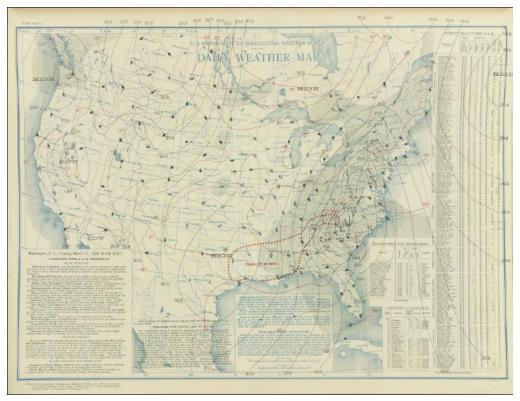


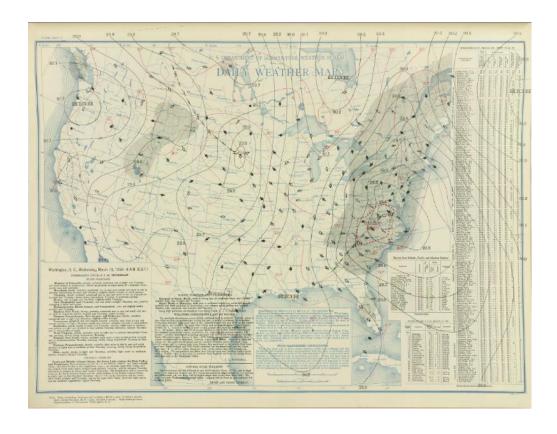






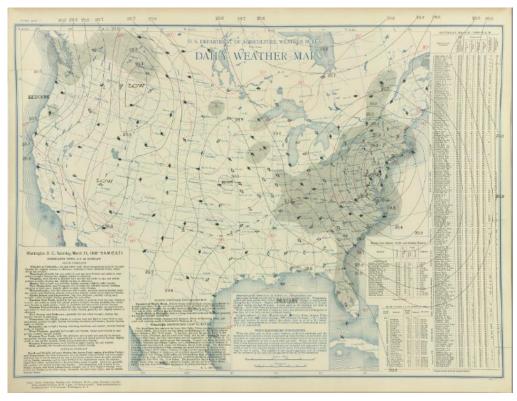




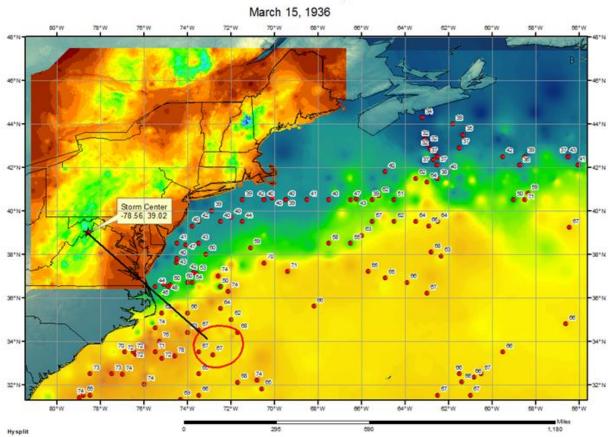








SPAS 1195 Storm Analysis



Storm Precipitation Analysis System (SPAS) For Storm #1311 SPAS Analysis

General Storm Location: Ohio River Basin

Storm Dates: January 17-25, 1937

Event: Frontal activity accompanied by almost continuous rain

DAD Zone 1

Latitude: 36.4375

Longitude: -87.9125

Max. Grid rainfall amount: 19.86"

Max. Observed rainfall amount: 19.75" (DOVER 1 NW, TN)

Number of Stations: 995

SPAS Version: 9.5

Base Map Used: Digitized TVA Isohyetal Map (storm total Jan 16-25)

Spatial resolution: 30 seconds

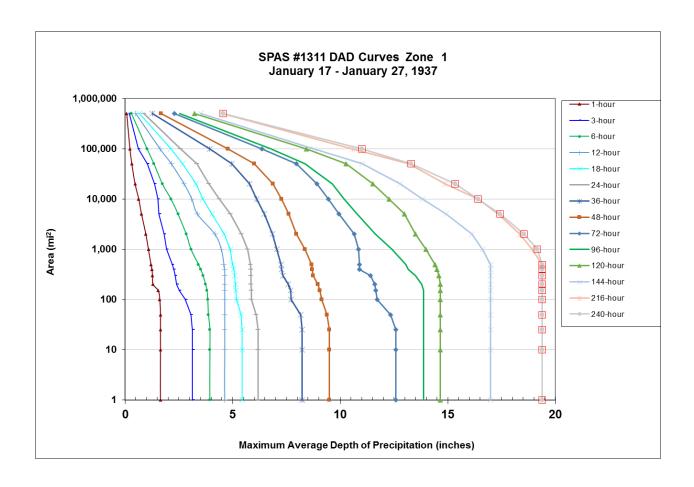
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

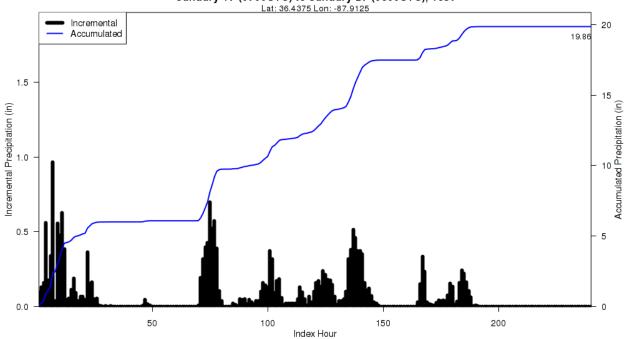
Reliability of Results: Although only 13 hourly stations were available, they resided at locations in/near the storm center, therefore increasing confidence amongst the heaviest precipitation. Given this was a synoptic storm with large areas of nearly continuous precipitation (rainfall), it's believed the temporal distribution of precipitation is reliable. A surprisingly high number (979) of daily and hourly stations, coupled with a total storm map prepared by TVA, provides a high degree of confidence in the spatial patterns and magnitude of precipitation.

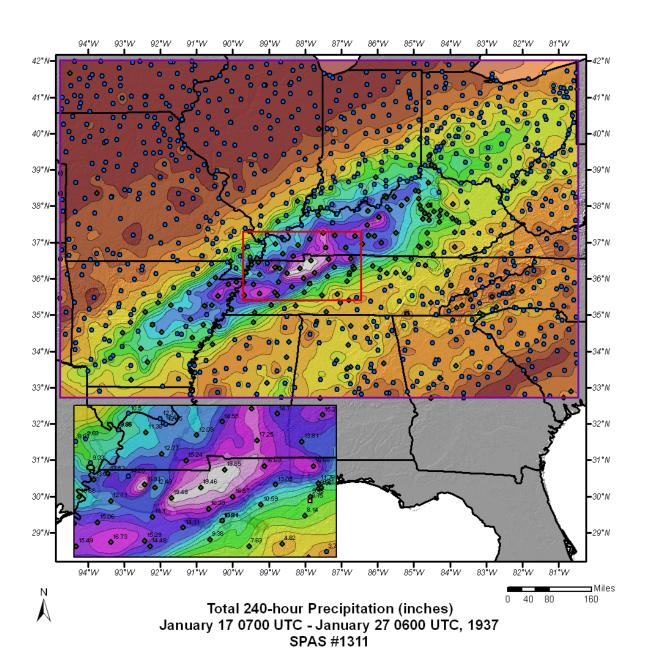
Storm Nam	ne: SPAS 1311 - N	Ackenzie T	'N								
Storm Date		rekenze, i	11		S	Storm A	Adiustn	nent for	Virgini	ล	
AWA Analy	rsis Date: 1/24/2014						Lajastii	101101	, , , , , , , , , , , , , , , , , , ,	ш	
Temporal T	Transposition Date	1-Jan									
		Lat	Long			Moisture	Inflow Dire	ection	SSE @ 295	miles	
Storm Cent	ter Location	36.44 N	87.91 W			Basin Ave	rage Elevat	tion	N/A	feet	
Storm Rep	Dew Point Location	32.38 N	86.35 W			Storm Cer	nter Elevati	ion	700	feet	
Transpositi	ion Dew Point Location					Storm An	alysis Dura	tion	24	hours	
Basin Loca	tion					Effective 1	Barrier He	ight	N/A	feet	
									I		
	The storm representative of	-	65.5 F		tal precipital					1.82	inches.
TI- 4	The in-place maximum o		67.5 F		tal precipital					2.00 #N/A	inches.
THE U	ranspositioned maximum of The in-place storm	•	700		tal precipital ch subtracts			f precipitabl	a water at	65.5 F	inches.
	The in-place storm		700		ch subtracts			f precipitabl		67.5 F	
	The transposition basin		N/A		ch subtracts			f precipitabl		0.0	
The is	nflow barrier/basin elevation		N/A		ch subtracts	x,xx		f precipitabl		0.0	
	The in-place storm	maximizati	on factor is	1.10		Notes: Storn	n representativ	e dew point v	alue was based	on dew point	
	The transposition/ele			#N/A					e this was 1937,	•	
	The barr	ier adjustme	ent factor is	#N/A					tion of this statio		
						ior storm rep	anatysis and	was consered	l valid for this m	aximization.	
	The to	tal adjustme	ent factor is	#N/A	ļ						
	Observed Storm Depth-A	·					Ţ				
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq mile	1.6	3.9	4.6	5.4	6.2	8.2	9.5	12.6	13.9	14.7
	10 sq miles	1.6	3.9	4.6	5.4	6.2	8.2	9.5	12.6	13.9	14.7
	100 sq miles	1.6 1.3	3.8	4.6 4.6	5.2 5.1	5.9 5.9	7.7 7.6	9.1 9.0	11.7	13.9 13.8	14.7 14.7
	200 sq miles 500 sq miles	1.3	3.4	4.6	5.0	5.9	7.3	8.7	11.6 10.9	13.8	14.7
	1000 sq miles	1.1	3.1	4.5	4.9	5.7	7.0	8.4	10.9	12.4	14.0
	2000 sq miles	1.0	2.8	4.2	4.6	5.4	6.8	8.0	10.7	11.6	13.5
	5000 sq miles	0.8	2.5	3.4	4.0	4.9	6.5	7.6	9.9	10.8	13.0
-	10000 sq miles	0.6	2.1	3.1	3.6	4.4	6.1	7.3	9.5	10.2	12.3
	20000 sq miles	0.5	1.7	2.7	3.3	3.9	5.8	6.9	8.9	9.6	11.5
	50000 sq miles	0.3	1.3	2.2	2.7	3.3	5.0	6.0	8.0	8.4	10.3
	100000 sq miles	0.2	1.0	1.6	2.1	2.6	3.9	4.8	6.4	6.8	8.4
	Storm or Storm Center Na	me			- Mckenzi	e, TN					
	Storm Date(s)			1/17-25/19							
	Storm Type			Frontal Sys							
	Storm Location			36.44 N	87.91 W						
	Storm Center Elevation Precipitation Total & Dura	tion		700	es in 240 ho	urc					
	recipitation fotal & Dula	1011		19.00 HICH	o 111 440 110	ui 3					
	Storm Representative Dew	Point		65.5 F	24						
	Storm Representative Dew		tion	32.38 N	86.35 W		Dec	Jan			
	Maximum Dew Point			67.5 F			68.5	66.5			
	Moisture Inflow Vector			SSE @ 295							
	In-place Maximization Fac	tor		1.10							
	Temporal Transposition (D			1-Jan							
	Transposition Dew Point L						-				
	Transposition Maximum D			#NT/A							
	Transposition Adjustment	ractor		#N/A							
	Average Basin Elevation Highest Elevation in Basin			N/A N/A							
	Inflow Barrier Height			N/A	-		-	-			
	Barrier Adjustment Factor			#N/A							
											l

			Stor						nuary 27			937			
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Area (mi²)							Du	ration (ho	urs)						
Area (IIII)	1	3	6	12	18	24	36	48	72	96	120	144	216	240	Total
0.3	1.69	3.19	4.04	4.79	5.60	6.33	8.45	9.73	12.94	14.25	15.14	17.41	19.86	19.86	19.86
1	1.64	3.13	3.94	4.63	5.44	6.17	8.23	9.50	12.58	13.87	14.65	16.99	19.39	19.39	19.39
10	1.64	3.13	3.94	4.63	5.44	6.17	8.23	9.50	12.58	13.87	14.65	16.99	19.39	19.39	19.39
25	1.64	3.13	3.94	4.63	5.44	6.17	8.23	9.50	12.58	13.87	14.65	16.99	19.39	19.39	19.39
50	1.64	3.05	3.87	4.63	5.39	6.10	8.16	9.39	12.34	13.87	14.65	16.99	19.39	19.39	19.39
100	1.61	2.80	3.84	4.63	5.17	5.87	7.71	9.13	11.71	13.87	14.65	16.99	19.39	19.39	19.39
150	1.54	2.52	3.81	4.63	5.15	5.86	7.69	9.05	11.65	13.87	14.65	16.99	19.39	19.39	19.39
200	1.30	2.40	3.74	4.63	5.13	5.85	7.57	8.96	11.60	13.79	14.65	16.99	19.39	19.39	19.39
300	1.27	2.32	3.62	4.63	5.09	5.85	7.34	8.73	11.40	13.49	14.59	16.99	19.39	19.39	19.39
400	1.24	2.25	3.51	4.62	5.05	5.84	7.26	8.70	10.90	13.15	14.49	16.99	19.39	19.39	19.39
500	1.20	2.18	3.41	4.59	5.00	5.83	7.25	8.68	10.89	13.06	14.40	16.99	19.39	19.39	19.39
1,000	1.08	1.92	3.06	4.47	4.89	5.70	7.04	8.35	10.84	12.40	13.99	16.60	18.92	19.17	19.17
2,000	0.96	1.81	2.84	4.17	4.61	5.41	6.84	7.95	10.66	11.62	13.50	16.12	18.34	18.54	18.54
5,000	0.76	1.57	2.46	3.36	4.04	4.89	6.46	7.61	9.93	10.79	12.99	14.91	17.33	17.42	17.42
10,000	0.63	1.52	2.13	3.10	3.61	4.38	6.12	7.27	9.45	10.19	12.27	13.82	16.40	16.41	16.41
20,000	0.46	1.36	1.73	2.74	3.30	3.90	5.79	6.86	8.92	9.63	11.51	12.79	14.87	15.35	15.35
50,000	0.31	1.03	1.34	2.15	2.67	3.33	4.96	6.00	7.97	8.35	10.26	11.02	13.18	13.29	13.29
100,000	0.22	0.61	1.02	1.62	2.12	2.59	3.93	4.79	6.36	6.78	8.42	8.79	10.57	11.00	11.00
504,363	0.07	0.18	0.29	0.49	0.66	0.86	1.26	1.67	2.30	2.53	3.23	3.51	4.52	4.55	4.55



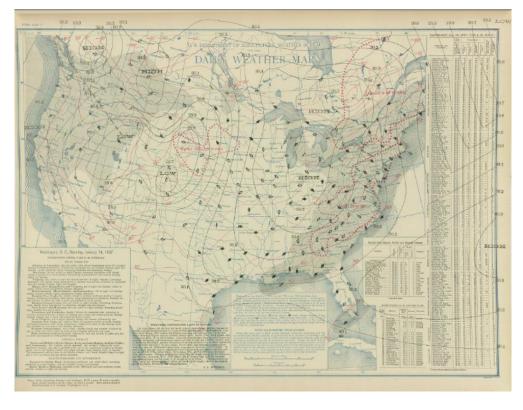


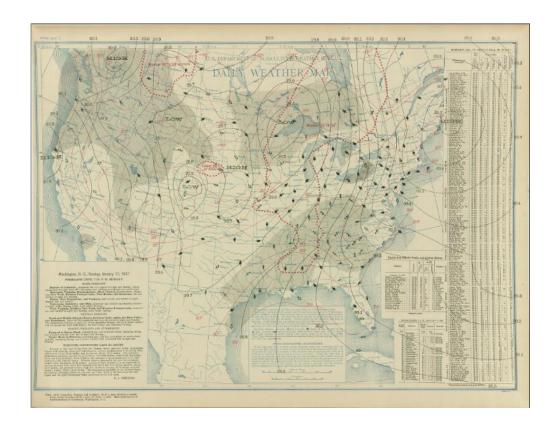


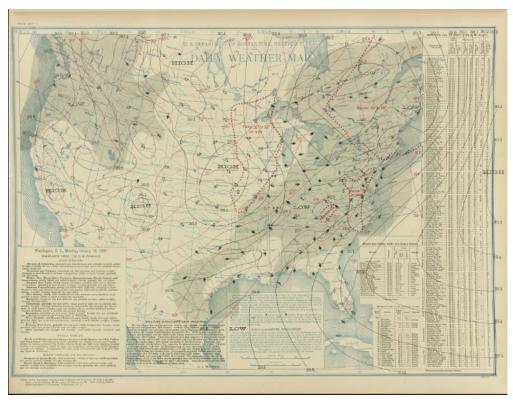


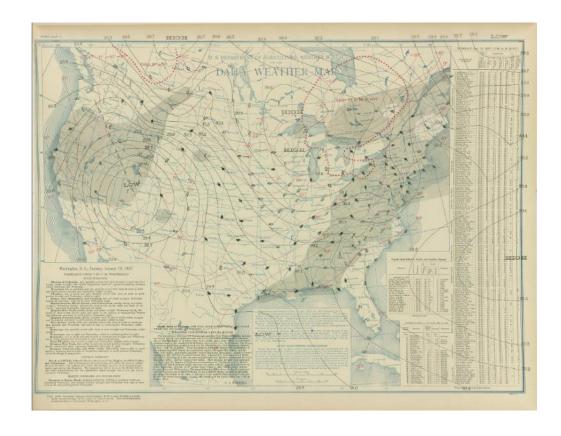


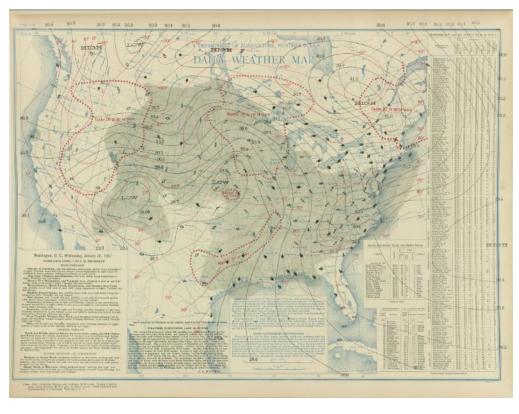


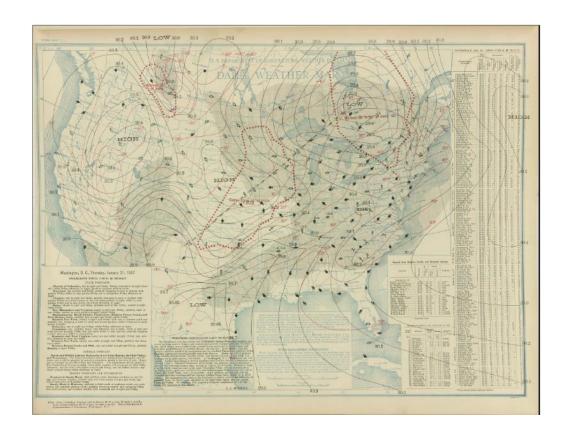


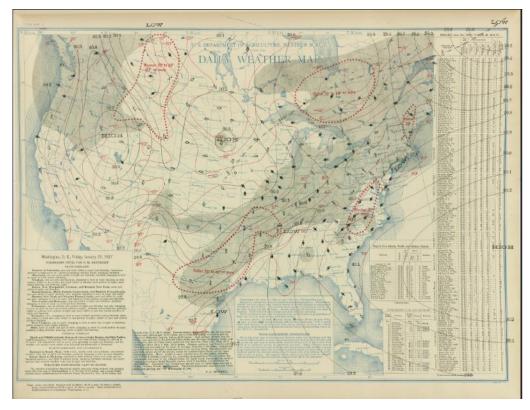




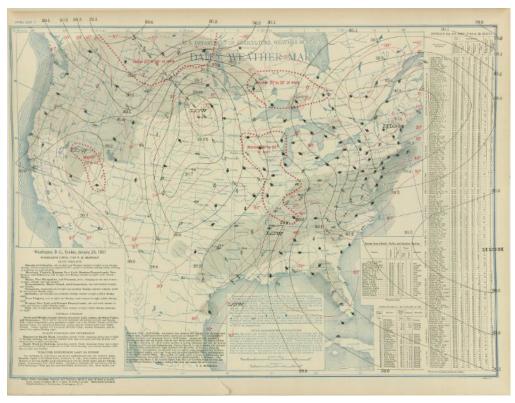


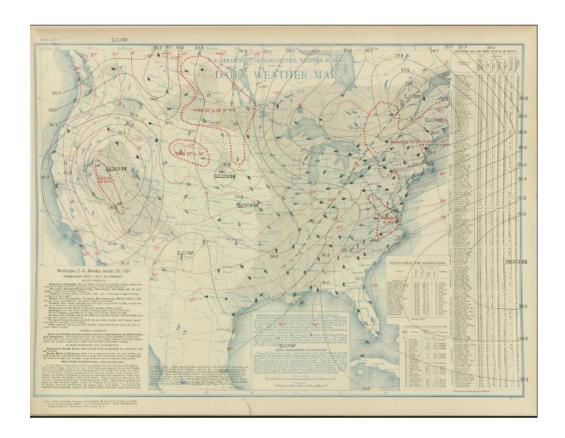












SPAS 1311 Dover, TN Storm Analysis January 15 - 16, 1937 January 16 - 16, 1937

Storm Precipitation Analysis System (SPAS) For Storm #1346 SPAS Analysis

General Storm Location: Tennessee Valley 37.7, -84.8, 33.7, -80.0

Storm Dates: August 28 – August 31, 1940

Event: CORPS of Engineers, US Army Assignment HMB – 25

DAD Zone 1

Latitude: 35.0375

Longitude: -83.0792

Max. Grid rainfall amount: 14.09"

Max. Observed rainfall amount: 13.19" (Rock House, NC)

Number of Stations: 259

SPAS Version: 9.5

Base Map Used: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2689

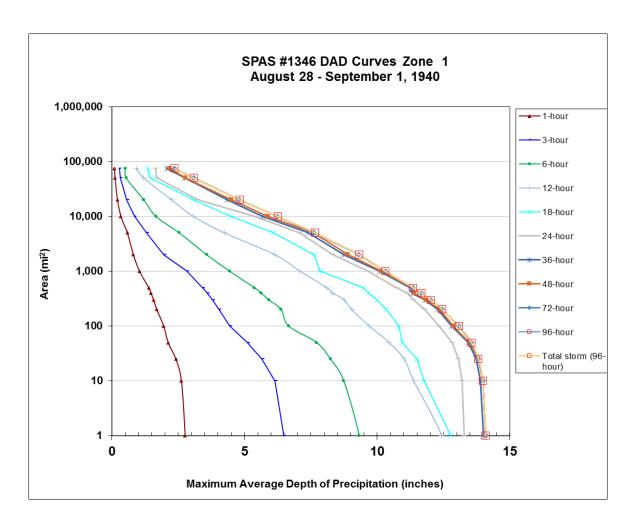
Radar Included: No

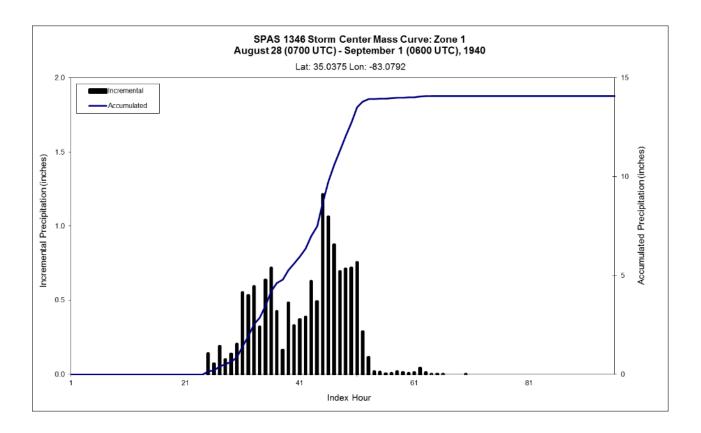
Depth-Area-Duration (DAD) analysis: Yes

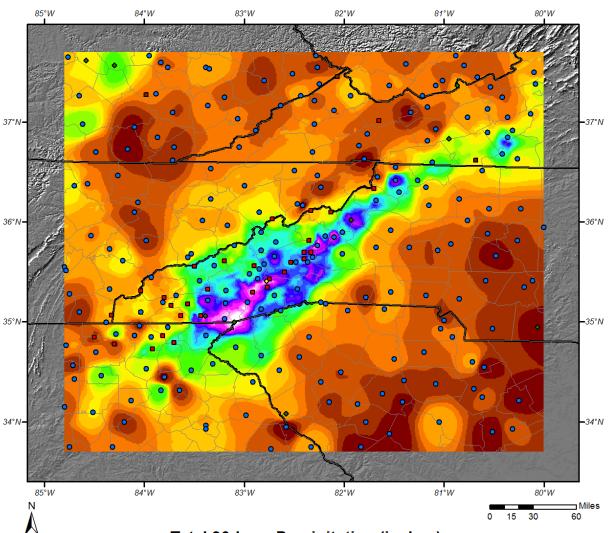
Reliability of Results: Of the 34 hourly stations used in this analysis, 30 were manually digitized from the TVA flood report and three were estimated from NCDC COOP data to fill in where there were areas without hourly stations nearby. This provided very high accuracy of the hourly data, which is essential in the timing of the daily and supplemental stations. With all of the data being thoroughly inspected, the precipitation pattern following closely to the isohyetal maps from the TVA report, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

Storm Name:	SPAS 1346 - B	lue Ridge Di	vide, NC								
Storm Date:	8/28-09/1/1940				S	torm A	diustm	ent for	Virginia		
WA Analysis Date:	11/14/2015				~	•••••			, 8		
emporal Transposi	tion Date	15-Aug									
		Lat	Long			Moisture I	nflow Dire	ction	SSW @ 370	miles	
torm Center Locati	on	35.038 N	83.079 W			Basin Aver	age Elevati	on	N/A	feet	
torm Rep Dew Poir	t Location	30.50 N	86.50 W			Storm Cen	ter Elevatio	on	3,313	feet	
ransposition Dew F							lysis Durat		12	hours	
Basin Location							arrier Hei		N/A	feet	
	rm representative	•	76.0 F		l precipitable					2.99	inches
	n-place maximum		79.5 F		l precipitable					3.52	inches
	tioned maximum	-	0.0		l precipitable					#N/A	inches
	he in-place storn		3,313		ich subtracts	0.79		f precipitabl		76.0 F	
	he in-place storn		3,313		ich subtracts	0.89		f precipitabl		79.5 F	
	ransposition basii		N/A		ich subtracts	X.XX		f precipitabl		0.0	
The inflow ba	arrier/basin elevat	tion height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
	The in alass of		::-	1.20	1	N-4 DAI) l 4-l	f CD A	C 1246 Ct		1
	The in-place s The transposition								S 1346. Storm maximum 12-		
		barrier adjust		-		•		vas based on 40 at KVPS.		ın IU	
	THE	oarrer aujust	ment ractor 18	π1 V/23		varues on A	ugusi 20, 19	→υ at KVI'S.			
	Т	he total adjust	ment factor is	#N/A							
	1.	waa aujust		1111/12	1						1
Observed	Storm Depth-A	rea-Duration									
Observed	Storm Depth-A	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	T
	1 sq miles	2.76	9.32	12.43	12.77	13.29	14.00	14.08	14.08	14.08	
	10 sq miles	2.62	8.74	11.38	11.77	13.21	13.90	13.98	13.98	13.98	
***************************************	100 sq miles	1.95	6.66	9.70	10.82	12.33	12.81	12.86	13.09	13.09	
***************************************	200 sq miles	1.69	6.38	9.04	10.35	11.78	12.27	12.36	12.45	12.45	
	500 sq miles	1.39	5.37	8.10	9.48	10.74	11.26	11.33	11.35	11.36	
	1000 sq miles	1.04	4.44	7.09	7.83	9.66	10.09	10.17	10.31	10.31	
	2000 sq miles	0.81	3.57	6.14	7.63	8.32	8.73	8.90	9.31	9.32	
	5000 sq miles	0.58	2.54	4.25	6.10	7.07	7.39	7.59	7.61	7.65	
	10000 sq miles	0.34	1.66	3.07	4.48	5.39	5.69	5.89	6.23	6.25	
	20000 sq miles	0.21	1.20	2.25	3.09	3.25	4.35	4.51	4.80	4.82	
	50000 sq miles	0.12	0.54	1.20	1.47	1.69	2.76	2.78	3.08	3.08	
	torm Center Nan	ne		SPAS 1346 -		Divide, NO	-				
Storm Dat	` /			8/28-09/1/19	940						
Storm Typ				Convective							
Storm Loc				35.038 N	83.079 W						-
	ter Elevation	. (10		3,313	1 6 02	0.1245					-
Precipitati	on Total & Durat	10n (10 sq mi)	1	14.09" in 96	nrs from SPA	AS 1346		-			1
Storm Don	resentative Dew	Point		760 F	12						1
	resentative Dew		n	76.0 F 30.50 N	12 86.50 W			Aug			1
	Dew Point	i onii Locailo		79.5 F	30.30 W			79.65			1
	nflow Vector			SSW @ 370				17.03			1
	laximization Fact	or		1.20							t
in-place iv.		V.		1.20							1
Temporal '	Transposition (Da	ate)		15-Aug							1
	ion Dew Point Lo										1
	ion Maximum De										
	ion Adjustment F			#N/A							
Average B	asin Elevation			N/A							
Highest El	evation in Basin			N/A							
Inflow Bar	rier Height			N/A							
Barrier Ad	justment Factor			#N/A							
	stment Factor		_	#N/A							

	Stori	n 1346 ·	- Augus	t 28 (07	700 UTC) - Sept	tember	1 (0600	UTC), 1	940						
		MAX	IMUM A	/ERAGE	DEPTH (OF PREC	IPITATIO	N (INCH	ES)							
Araa (m;²)		Duration (hours)														
Area (mi²)	1	3	6	12	18	24	36	48	72	96	Total					
0.3	2.77	6.51	9.37	12.50	12.84	13.30	14.01	14.09	14.09	14.09	14.09					
1	2.76	6.48	9.32	12.43	12.77	13.29	14.00	14.08	14.08	14.08	14.08					
10	2.62	6.15	8.74	11.38	11.77	13.21	13.90	13.98	13.98	13.98	13.98					
25	2.41	5.66	8.24	11.02	11.50	13.07	13.74	13.81	13.82	13.82	13.82					
50	2.12	5.11	7.72	10.45	10.94	12.83	13.44	13.48	13.56	13.56	13.56					
100	1.95	4.44	6.66	9.70	10.82	12.33	12.81	12.86	13.09	13.09	13.09					
200	1.69	4.04	6.38	9.04	10.35	11.78	12.27	12.36	12.45	12.45	12.45					
300	1.57	3.79	5.92	8.75	9.99	11.37	11.81	11.85	12.02	12.02	12.02					
400	1.47	3.59	5.63	8.32	9.67	11.13	11.31	11.39	11.67	11.67	11.67					
500	1.39	3.42	5.37	8.10	9.48	10.74	11.26	11.33	11.35	11.36	11.36					
1,000	1.04	2.83	4.44	7.09	7.83	9.66	10.09	10.17	10.31	10.31	10.31					
2,000	0.81	1.96	3.57	6.14	7.63	8.32	8.73	8.90	9.31	9.32	9.32					
5,000	0.58	1.31	2.54	4.25	6.10	7.07	7.39	7.59	7.61	7.65	7.65					
10,000	0.34	0.85	1.66	3.07	4.48	5.39	5.69	5.89	6.23	6.25	6.25					
20,000	0.21	0.56	1.20	2.25	3.09	3.25	4.35	4.51	4.80	4.82	4.82					
50,000	0.12	0.32	0.54	1.20	1.47	1.69	2.76	2.78	3.08	3.08	3.08					
74,425	0.10	0.28	0.50	0.93	1.34	1.64	2.06	2.19	2.36	2.36	2.36					



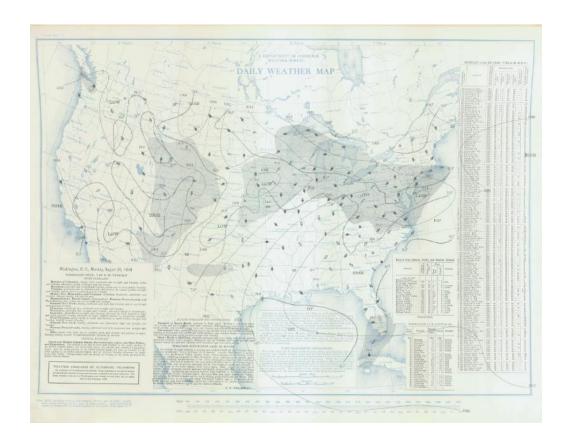




Total 96-hour Precipitation (inches)
August 28, 1940 0700 UTC - September 1,1940 0600 UTC
SPAS #1346

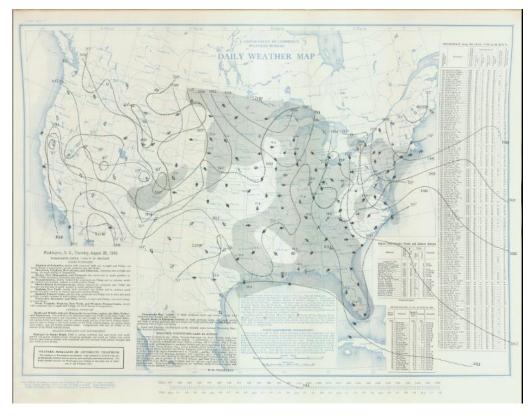


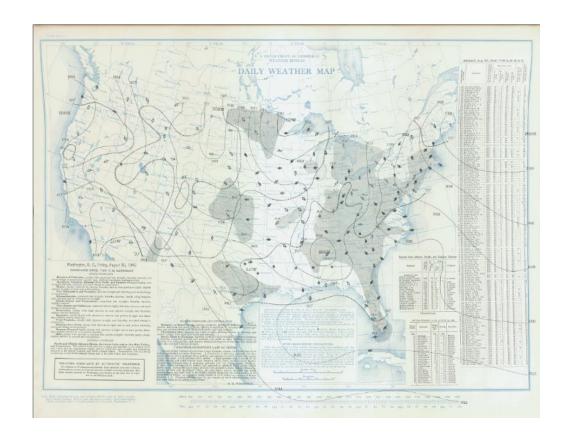
KLL 10/27/2014





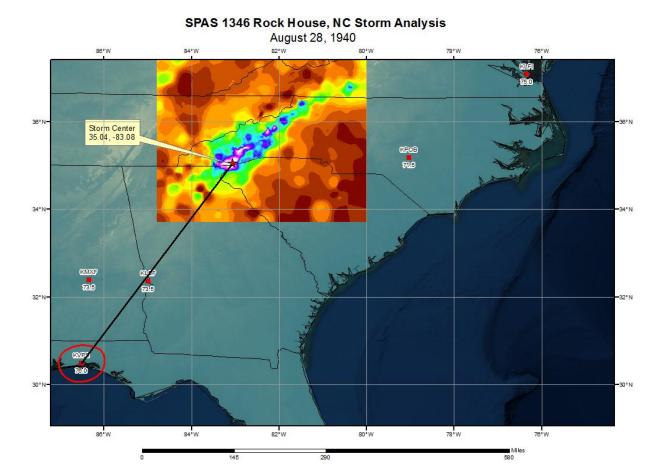












Storm Precipitation Analysis System (SPAS) For Storm #1430 SPAS Analysis

General Storm Location: Southeastern Texas/Louisiana border 32.7, -97.5, 28.6, -93.0

Storm Dates: November 22 - November 25, 1940

Event: CORPS of Engineers, US Army Assignment CM 5 – 13

DAD Zone 1

Latitude: 30.1292

Longitude: -96.0542

Max. Grid rainfall amount: 21.29"

Max. Observed rainfall amount: 21.1" (Hempstead, TX)

Number of Stations: 133

SPAS Version: 10.0

Base Map Used: Manually digitized contours using Monthly Weather Review's isohyetal map from a

report on this storm.

Spatial resolution: 0.2846

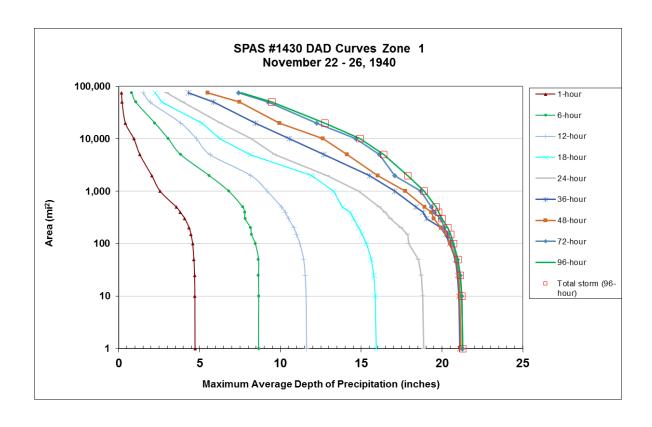
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

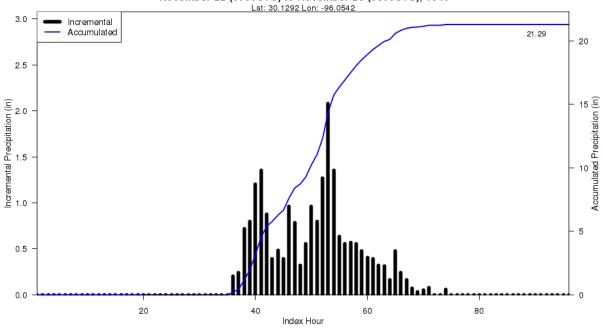
Reliability of Results: Of the 19 hourly stations used in this analysis, six were manually digitized from either the Army CORPS of Engineers' pertinent data report or from a USGS report of the storm. This provided very high accuracy of the hourly data, which is essential in the timing of the daily and supplemental stations. Of the 55 supplemental stations, 32 were formatted as daily stations. These stations were in the supplemental file due to there being more data on either end of the storm duration as defined for this analysis. For example, if the daily station took measurements in the morning, then there may have been more precipitation reported for the remainder of the storm that was actually part of the following day's observation. Alternatively, if a station had an observation time in the evening then there could have been data not used from the day before that was valid for the period of the storm and could be added to the analysis. With all of the data being thoroughly inspected, the DAD and precipitation pattern following closely to the Army CORPS of Engineers report, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

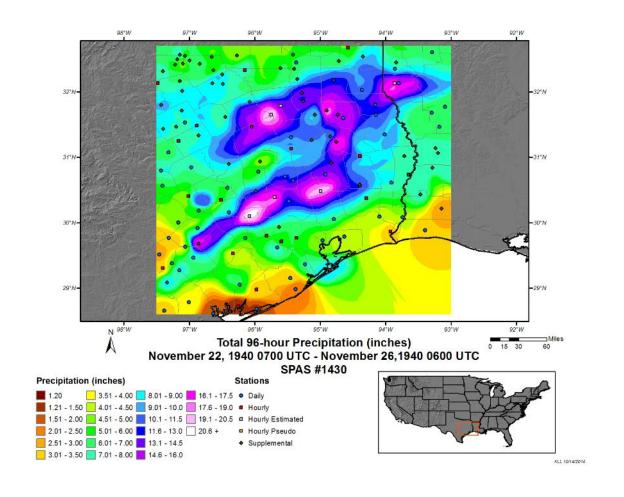
Storm Name:	SPAS 1430 - I	***************************************	X Zone 1								
Storm Date:	11/22-25/1940)			9	Storm A	\djustn	ent for	Virginia	a	
AWA Analysis Date											
Temporal Transpos	sition Date	8-Nov				3.7.1. Y	a Di		T 0 150	.,	
a. a		Lat	Long				nflow Direc		E @ 170	miles	
Storm Center Loca		30.13 N	96.05 W				age Elevati		N/A	feet	
Storm Rep Dew Po		30.23 N	93.21 W				ter Elevatio		200	feet	
Transposition Dew Basin Location	Point Location						lysis Durati arrier Heig		24 N/A	hours feet	
Dasin Location						Effective B	arrier neis	zm.	11//1	icci	
The sto	orm representative	dew point is	70.5 F	with to	tal precipitab	le water abo	ve sea level o	of		2.31	inches.
	in-place maximum		74.0 F		tal precipitab					2.73	inches.
	sitioned maximum	-	0.0		tal precipitab					#N/A	inches.
	The in-place storn	n elevation is	200	wh	ich subtracts	0.05	inches o	f precipitabl	e water at	70.5 F	
	The in-place storn	n elevation is	200	wh	ich subtracts	0.05		f precipitabl		74.0 F	
	transposition basis		N/A		ich subtracts	X.XX		f precipitabl		0.0	
The inflow	oarrier/basin eleva	tion height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
				4.0	_	N	1 . 1 . 2	an . a . :	20. G.		
	The in-place stor			-					 Storm represent daily temperat 		
1	he transposition/e	levation to ba arrier adjustm		-					November 23, 19		
	THE O	arrer adjustin	ciii ractor is	π11//1			·				
	The	total adjustm	ent factor is	#N/A							
	<u> </u>										
Observe	d Storm Depth-A	Area-Duratio	n								
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
	1 sq miles	4.7	8.7	11.6	15.9	18.9	21.1	21.2	21.3	21.3	21.3
	10 sq miles	4.7	8.7	11.6	15.9	18.8	21.0	21.1	21.2	21.2	21.2
	100 sq miles	4.6	8.5	11.2	15.3	18.0	20.5	20.5	20.7	20.7	20.7
	200 sq miles	4.4	8.2	10.8	14.8	17.5	19.9	19.9	20.1	20.4	20.4
	500 sq miles	3.6	7.7	10.1	13.9	16.1	18.4	18.9	19.4	19.6	19.6
·····	1000 sq miles	2.6	6.8 5.6	9.2	13.3	14.9 12.9	17.1	17.7	18.7	18.9	18.9
	2000 sq miles 5000 sq miles	1.3	3.8	8.2 5.7	8.2	9.6	15.5 12.7	16.0 14.1	17.1 16.1	17.9 16.4	17.9 16.4
	10000 sq miles	0.9	3.1	4.8	6.3	8.2	10.6	12.6	14.7	14.9	14.9
	20000 sq miles	0.4	2.2	3.8	5.1	6.3	8.5	9.95	12.24	12.8	12.8
	50000 sq miles	0.2	1.1	·•	~~ ~~~~~~~~~~~~~			ļ	~ ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		9.5
				2.0	2.7	4.0	5.9	7.47	9.23	9.5	
	50000 sq miles	0.2	1.1	2.0	2.7	·····	5.9	7.47	9.23	9.5	7.0
Storm or	Storm Center Na		111		0 - Hempstea	4.0		7.47	9.23	9.5	7.0
Storm or Storm D	Storm Center Na		111) - Hempstea	4.0		7.47	9.23	9.5	
Storm D Storm T	Storm Center Na ate(s)		111	SPAS 1430 11/22-25/1 Synoptic	0 - Hempstea	4.0		7.47	9.23	9.5	
Storm D Storm T Storm L	Storm Center Na ate(s) //pe ocation		-11	SPAS 1430 11/22-25/1 Synoptic 30.13 N) - Hempstea	4.0		7.47	9.23	9.5	
Storm D Storm T Storm L Storm C	Storm Center Na ate(s) /pe ocation enter Elevation	me		SPAS 1430 11/22-25/1 Synoptic 30.13 N 200	96.05 W	d, TX Zone		7.47	9.23	9.5	
Storm D Storm T Storm L Storm C	Storm Center Na ate(s) //pe ocation	me		SPAS 1430 11/22-25/1 Synoptic 30.13 N 200	0 - Hempstea	d, TX Zone		7.47	9.23	9.5	
Storm D Storm T Storm L Storm C Precipita	Storm Center Na ate(s) ppe pocation enter Elevation tion Total & Dura	me tion (10 sq m		SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9	96.05 W	d, TX Zone		7.47	9.23	9.5	
Storm D Storm T Storm L Storm C Precipita	Storm Center Na ate(s) ppe pocation enter Elevation tion Total & Dura epresentative Dew	tion (10 sq m	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29"in 9	96.05 W 6 hrs from SI	d, TX Zone				9.5	
Storm D Storm T Storm L Storm C Precipita Storm R Storm R	Storm Center Na ate(s) ppe pocation enter Elevation tion Total & Dura epresentative Dew	tion (10 sq m	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29"in 9 70.5 F 30.23 N	96.05 W	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm L Storm C Precipita Storm R Storm R Maximu	Storm Center Na ate(s) //pe ocation enter Elevation tition Total & Dura	tion (10 sq m	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F	96.05 W 6 hrs from SI	d, TX Zone				9.5	
Storm D Storm T Storm L Storm C Precipita Storm R Storm R Storm R Maximum Moisture	Storm Center Na ate(s) ppe pocation enter Elevation tion Total & Dura epresentative Dew	tion (10 sq m	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29"in 9 70.5 F 30.23 N	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm L Storm C Precipita Storm R Storm R Storm R Maximum Moisture	Storm Center Na ate(s) //pe //pe //pe //pe //pe //pe //pe //p	tion (10 sq m	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Maximu Moistur In-place	Storm Center Na ate(s) //pe //pe //pe //pe //pe //pe //pe //p	me tion (10 sq m Point Location tor	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Maximum Moisture In-place Tempora	Storm Center Na ate(s) Appe Docation Enter Elevation Ition Total & Dura Expresentative Dew Expresentative Dew Ition Dew Point Entrow Vector Maximization Fac I Transposition (D ition Dew Point I	me Point Point Location tor Date)	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Maximum Moisture In-place Tempora Transpos Transpos	Storm Center Na ate(s) Appe Docation Enter Elevation Ition Total & Dura Expresentative Dew Expresentative Dew Inflow Vector Maximization Fac I Transposition (D ition Dew Point I ition Maximum I	me Point Point Location tor Date) Docation Dew Point	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29"in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19 8-Nov	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Maximum Moisture In-place Tempora Transpos Transpos	Storm Center Na ate(s) ppe ocation enter Elevation tion Total & Dura epresentative Dew peresentative Dew n Dew Point Inflow Vector Maximization Fac ition Dew Point L ition Maximum I ition Adjustment	me Point Point Location tor Date) Docation Dew Point	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29"in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19 8-Nov	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Maximum Moisture In-place Tempora Transpos Transpos Average	Storm Center Na ate(s) //pe //pe //pe //pe //pe //pe //pe //p	me Point (10 sq m Point Location tor Date) Ocation Dew Point Factor	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19 8-Nov #N/A N/A	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipita Storm R Storm R Storm R Maximum Moisture In-place Tempora Transpos Transpos Average Highest	Storm Center Na ate(s) //pe pocation enter Elevation tition Total & Dura expresentative Dew expresentative Dew expresentative Dew in Dew Point I Transposition (I) ition Maximum I ition Adjustment Basin Elevation Elevation in Basin	me Point (10 sq m Point Location tor Date) Ocation Dew Point Factor	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19 #N/A N/A N/A	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	
Storm D Storm T Storm C Precipits Storm R Storm R Maximu Moisture In-place Tempora Transpos Transpos Average Highest Inflow B	Storm Center Na ate(s) //pe //pe //pe //pe //pe //pe //pe //p	me Point Point Location tor Date Location Dew Point Factor	i)	SPAS 1430 11/22-25/1 Synoptic 30.13 N 200 21.29" in 9 70.5 F 30.23 N 74.0 F E @ 170 1.19 8-Nov #N/A N/A	96.05 W 6 hrs from SI	d, TX Zone		Oct	Nov	9.5	

Stor	Storm 1430 - November 22 (0700 UTC) - November 26 (0600 UTC), 1940													
		MAXIMU	M AVER	AGE DEF	TH OF F	RECIPIT	TATION (I	NCHES))					
Area (mi²)					Duration	n (hours)								
Alea (IIII)	1	6	12	18	24	36	48	72	96	Total				
0.3	4.73	8.85	11.63	15.93	18.88	21.23	21.29	21.29	21.29	21.29				
1	4.72	8.66	11.62	15.93	18.87	21.09	21.15	21.29	21.29	21.29				
10	4.71	8.66	11.59	15.87	18.81	21.04	21.10	21.23	21.23	21.23				
25	4.69	8.65	11.53	15.78	18.70	20.96	21.03	21.13	21.13	21.13				
50	4.65	8.65	11.44	15.62	18.53	20.83	20.90	20.96	20.97	20.97				
100	4.57	8.45	11.21	15.33	17.95	20.47	20.50	20.66	20.71	20.71				
150	4.47	8.21	11.00	15.06	17.89	20.21	20.29	20.38	20.53	20.53				
200	4.36	8.16	10.83	14.84	17.45	19.93	19.93	20.14	20.35	20.35				
300	4.09	7.82	10.51	14.53	16.81	19.05	19.50	19.92	20.00	20.00				
400	3.81	7.80	10.30	14.33	16.49	18.82	19.34	19.53	19.80	19.80				
500	3.57	7.67	10.08	13.85	16.12	18.40	18.92	19.35	19.63	19.63				
1,000	2.57	6.82	9.19	13.30	14.85	17.07	17.74	18.68	18.89	18.89				
2,000	2.04	5.60	8.17	11.92	12.89	15.53	16.02	17.08	17.87	17.87				
5,000	1.31	3.84	5.65	8.16	9.64	12.68	14.13	16.13	16.38	16.38				
10,000	0.94	3.07	4.81	6.28	8.19	10.56	12.64	14.66	14.94	14.94				
20,000	0.41	2.24	3.84	5.14	6.31	8.47	9.95	12.24	12.75	12.75				
50,000	0.21	1.06	1.95	2.68	3.97	5.86	7.47	9.23	9.47	9.47				
75,681	0.18	0.81	1.52	2.25	2.96	4.32	5.52	7.43	7.60	7.60				

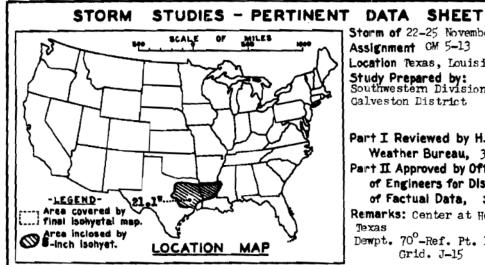


SPAS 1430 Storm Center Mass Curve Zone 1 November 22 (0700UTC) to November 26 (0600UTC), 1940





CORPS OF ENGINEERS



Storm of 22-25 November 1940 Assignment CM 5-13 Location Texas, Louisiana & Miss. Study Prepared by: Southwestern Division Galveston District

Part I Reviewed by H. M. Sec. of Weather Bureau, 3-17-47 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 3-20-50 Remarks: Center at Hempstead. Texas

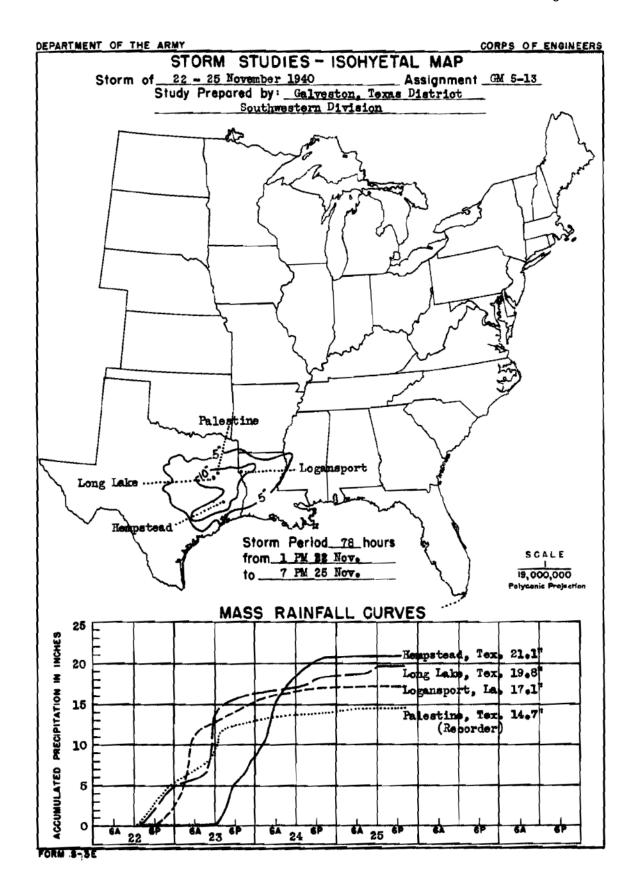
Dewpt. 70°-Ref. Pt. 125 E Grid. J-15

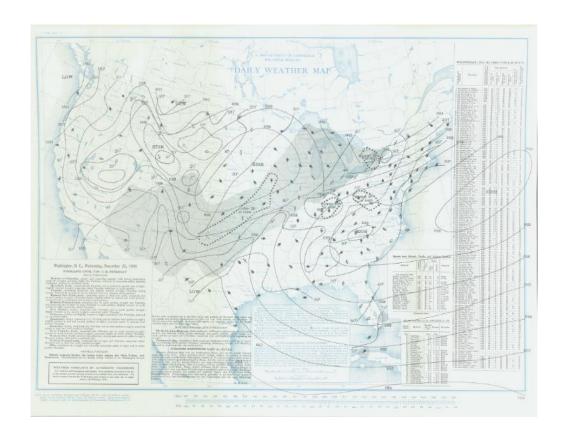
DATA AND COMPUTATIONS COMPILED PART I

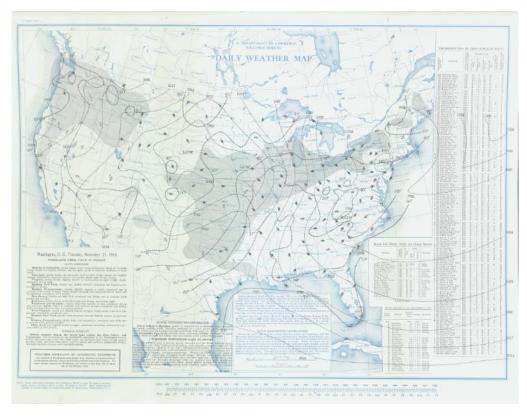
Preliminary isohyetai map, in 1 sheet, scale 1: 1,000,000	
	of Sheets)
Form 5001-C (Hourly precip. data)	109
Form 5001-B (24-hour " ")	127
Form 5001-D (" " " ")	O
Miscl. precip. records, meteorological data, etc	24
Form 5002 (Mass rainfail curves)	127
PART II	
Final isohyetal maps, in 1 sheet, scale 1: 1,000,000 Data and computation sheets:	
Form S-10 (Data from mass rainfall curves)	8
Form S-II (Depth-area data from isohyetal map)	1
Form S-12 (Maximum depth-duration data)	15
Maximum duration-depth-area curves	1
Data relating to periods of maximum rainfall	2
MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCH	ES

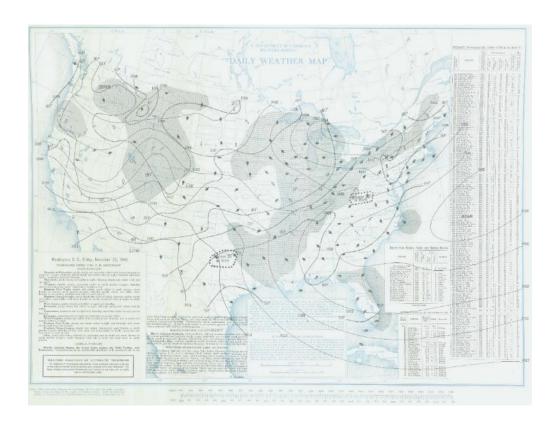
147,1711		TATELLA	10-	DE: 11	<u> </u>	1301	HI AL	- 117	11101	120	
Area in Sq. M	i		D	uratio	n of	Rainf	all in	Hours	3		
	6	12	18	21	30	36	48	60	72	78	
10	9.0	10.5	16.0	18.6	20.2	20.4	20.6	20.8	21.1	21.1	
100	7.5	10.0	14.6	17.6	19.1	19.3	19.5	19.7	20.2	20.2	
200	7.0	9.7	13.6	16.8	18.4	18.7	18.9	19.1	19.6	19.7	1
500	6.4	9.2	12.2	15.5	17.0	17.6		18.2	18.7	18.8	
1,000	5.8	8.6	11.1	14.2	15.6		16.7	17.5	18.0	18.1	
2,000	5.0	7.6	10.0	12.7	14.0	114.8	15.7	16.7	17.3	17.5	1
5,000	3.8	6.0	8.4	10.6	11.7	12.4	14.1	16.4	16.1	16.3	1
10,000	3.0	4.8	7.0	8.3	9.7	10.5	12.8	14.3	14.8	15.1	1
20,000	2.0	3.6	5.3	6.7	7.6	8.7	11.0	12.5	13.0	13.2	1
50,000	1.2	2.4	3.4	4.4	5.3	6.3	8.0	9.2	9.9	10.0	
78,000	1.0	1.9	2.8	3.6	4.4	5.2	6.6	7.8	8.4	8.5	
1	1)						
									L		

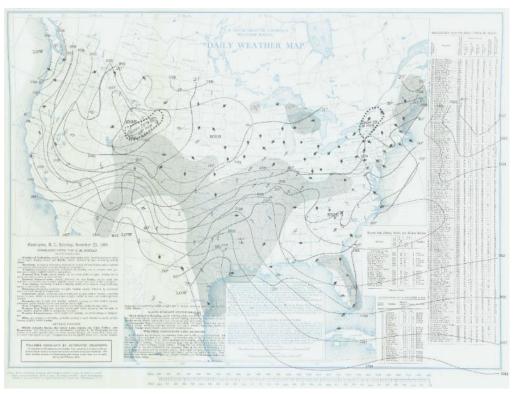
Form 5-2

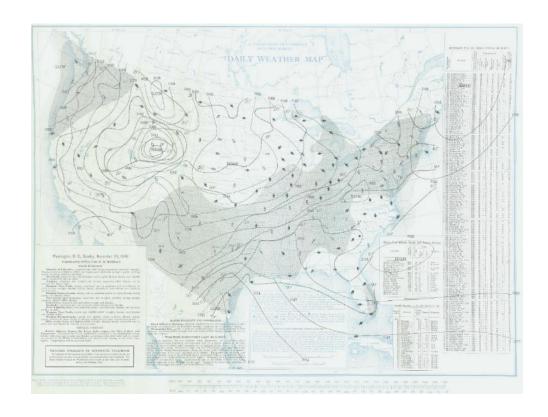


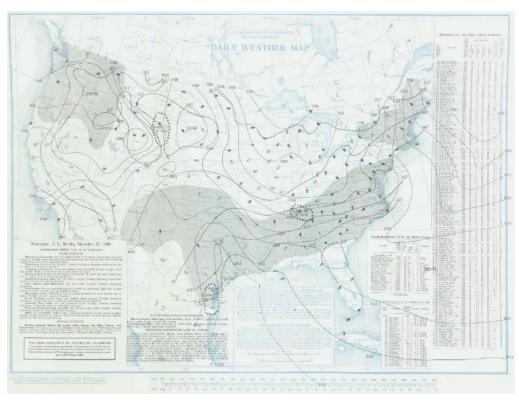


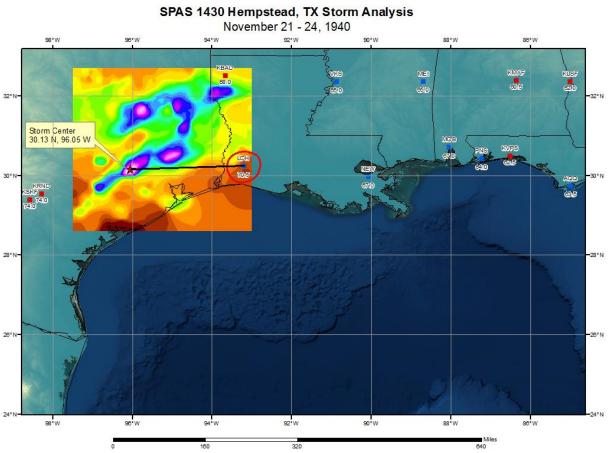


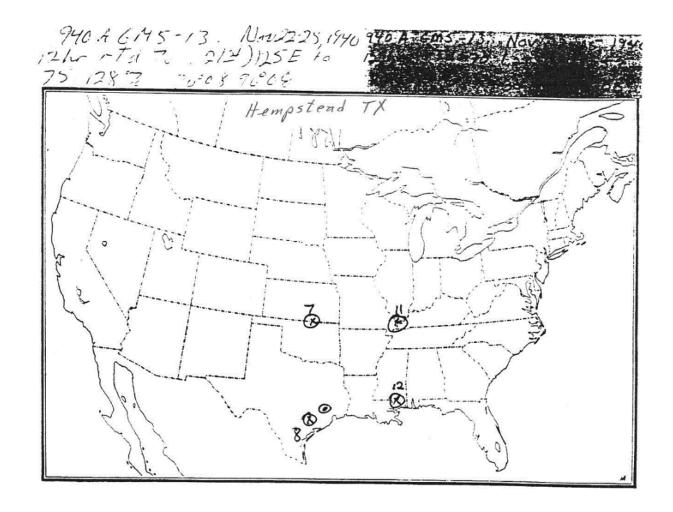












Storm Precipitation Analysis System (SPAS) For Storm #1340 SPAS Analysis

General Storm Location: Big Meadows, VA (USACE SA 1-28a)

Storm Dates: October 12-17, 1942

Event: Flash Flood Event

DAD Zone 1

Latitude: 38.5458

Longitude: -78.4042

Max. Grid Rainfall Amount: 19.77"

Max. Observed Rainfall Amount: 18.92"

Number of Stations: 587 (423 Daily, 2 Hourly, 3 Hourly Pseudo, and 159 Supplemental)

SPAS Version: 9.5

Basemap: PRISM October 1942 Precipitation

Spatial resolution: 00:00:30 (~ 0.30 mi²)

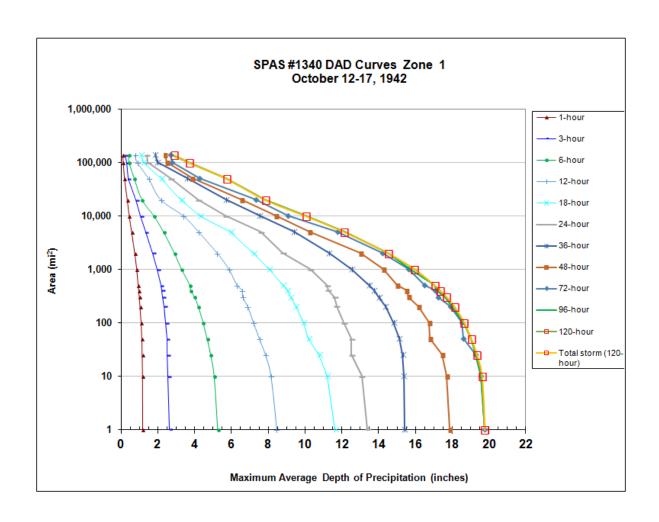
Radar Included: No

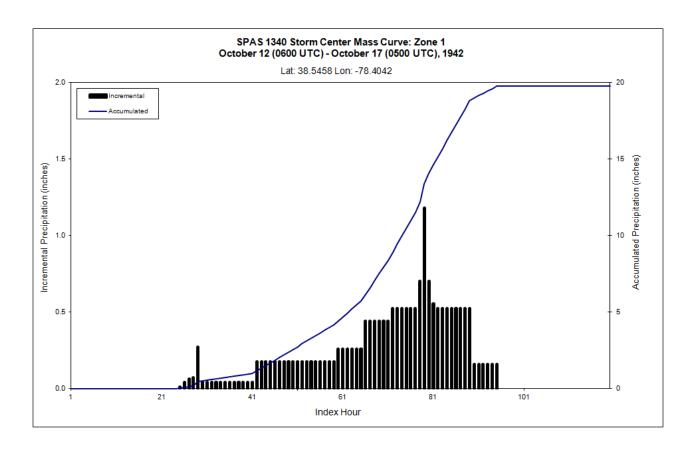
Depth-Area-Duration (DAD) analysis: Yes

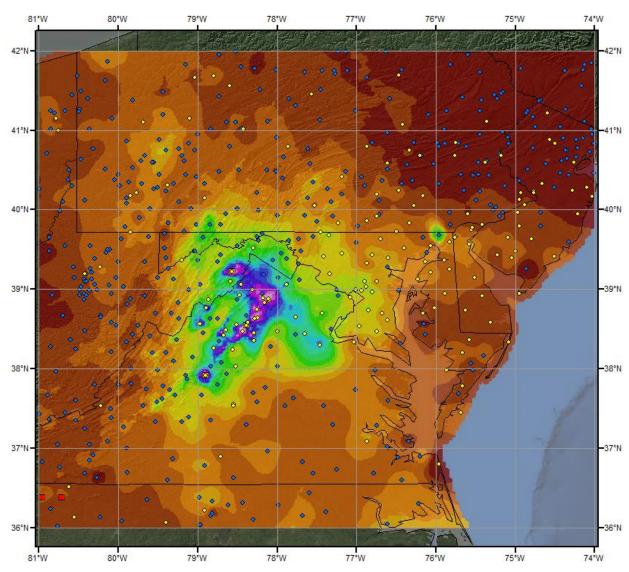
Reliability of results: This analysis was based on digitized hourly data from the USACE SA 1-28a mass curves, daily data, and supplemental station data. We have a good degree of confidence in the station based storm total results, the spatial pattern is dependent on the basemap, and the timing is based on hourly stations.

Storm Name:	SPAS 1340 - B	Big Meadows	, VA								
torm Date:	10/11-18/1942		· · · · · · · · · · · · · · · · · · ·		S	torm A	dinstm	ent for	Virginia		
AWA Analysis Date:				ĺ	D	10111111	ujustiii		v II gillia		
Temporal Transposit		1-Oct									
remporar fransposi	Ion Date	Lat	Long			Moieture l	Inflow Dire	etion	ESE @ 835	miles	
Y C 4 T 4											
Storm Center Locati		38.55 N	78.40 W				rage Elevati		N/A	feet	
Storm Rep SST Loca		34.00 N	70.00 W				ter Elevati		3,300	feet	
Fransposition SST L	ocation						lysis Durat		24	hours	
Basin Location						Effective B	Barrier Hei	ght	N/A	feet	
	e storm represei		78.0 F		ıl precipitable					3.29	inches.
	The in-place max		81.0 F		ıl precipitable					3.76	inches.
	spositioned max		0.0		ıl precipitable					#N/A	inches.
	ne in-place storr		3,300	wh	ich subtracts			f precipitabl		78.0 F	
	ne in-place storr		3,300		ich subtracts	0.93		f precipitabl		81.0 F	
	ansposition basi		N/A	wh	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
The inflow ba	rrier/basin eleva	tion height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
	The in-place stor	rm maximizati	on factor is	1.16					Storm representation		
Th	e transposition/e			#N/A		value was ba	sed on maximu	ım 24-hr SST	values on Octobe	r 13, 1942.	
	The ba	arrier adjustm	ent factor is	#N/A							
	The	total adjustm	ent factor is	#N/A							
Observed	Storm Depth-A	Area-Duration	n								
	***************************************	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	5.1	8.1	11.2	13.1	17.7	19.6	19.6	19.6		1
	100 sq miles		7.2	9.9	12.1	16.8	18.5	18.6	18.6		
	200 sq miles		6.9	9.5	11.7	16.2	17.9	18.0	18.1		
***************************************	500 sq miles	·	6.3	8.8	11.2	15.0	16.5	17.0	17.0		1
	1000 sq miles		5.9	8.1	10.3	14.3	15.6	15.7	15.9		1
	2000 sq miles	·	5.2	7.2	8.8	13.0	14.2	14.5	14.5		7
***************************************	5000 sq miles	·	4.2	6.0	7.6	10.2	11.7	12.1	12.1		_
	10000 sq miles	·	3.4	4.3	5.7	8.4	9.1	10.0	10.0		_
	20000 sq miles	<u> </u>	2.2	3.3	4.2	6.6	7.3	7.8	7.8		-
	50000 sq miles		1.5	2.2	2.7	3.9	4.3	5.7	5.7		
	00000 sq miles		0.9	1.2	1.5	2.5	2.8	3.6	3.7		
***************************************	38434 sq miles		0.8	1.1	1.4	2.4	2.7	2.8	2.9		1
-	30434 sq iiiies	0.4	0.0	1.1	1.7	2.7	2.7	2.0	2.7		
Ctown on C	town Conton No			CDAC 1240	Dia Maada	W. 374					1
	torm Center Na	me		SPAS 1340 - 10/11-18/19		ws, vA			+		1
Storm Tun				Flash Flood					+		1
Storm Typ Storm Loc					78.40 W				+		1
				38.55 N	70.40 W				+		1
	ter Elevation	tion (10	1	3,300	O lano for an OT	AC 1240		-	-		-
Precipitati	on Total & Dura	uion (10 sq mi	.)	19.//"1n 120	0 hrs from SI	AS 1340		-	-		-
C+ P	manamenti CCT			70 0 F	24			-	-		1
	resentative SST	-		78.0 F	=0.00 ***		Con	Oat	+		1
	resentative SST	Location		34.00 N	70.00 W		Sep	Oct	+		1
Maximum				81.0 F	-		81.8	79	-		-
	nflow Vector aximization Fac	100		ESE @ 835	-			-	-		-
In-place M	aximization Fac	LOF		1.16	-			-	-		
T 17	J Buomana siti su (D	Note)		1 Oct	-			-	-		
	Fransposition (D			1-Oct	-			-	-		-
	on SST Location				-			-	-		-
	ion Maximum S			HNT/A					-		-
		ractor		#N/A					-		1
Transposit				N/A							1
Transposit Average B	asin Elevation			37/4							
Transposit Average B Highest El	evation in Basin			N/A							-
Transposit Average B Highest El Inflow Bar				N/A N/A #N/A							

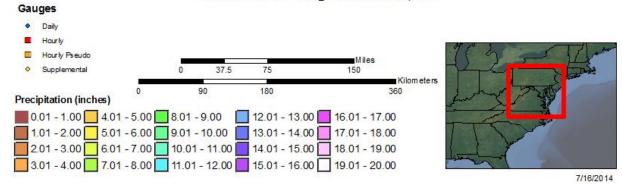
	St	torm 13			•	•					2	
		l	MAXIMU	M AVER	AGE DEF		(hours)	A HON (I	NCHES)			
Area (mi ²)	1	3	6	12	18	24	36	48	72	96	120	Total
0.3	1.18	2.64	5.27	8.48	11.68	13.42	15.74	17.87	19.77	19.77	19.77	19.77
1	1.18	2.63	5.25	8.44	11.63	13.40	15.40	17.86	19.76	19.76	19.76	19.76
10	1.17	2.56	5.06	8.13	11.19	13.08	15.36	17.70	19.57	19.57	19.60	19.60
25	1.15	2.49	4.87	7.83	10.77	12.53	15.30	17.44	19.26	19.26	19.33	19.33
50	1.13	2.48	4.68	7.50	10.18	12.52	15.11	16.78	18.59	19.01	19.02	19.02
100	1.09	2.42	4.46	7.18	9.92	12.11	14.81	16.75	18.53	18.60	18.64	18.64
200	1.03	2.33	4.20	6.87	9.49	11.71	14.37	16.17	17.89	17.98	18.11	18.11
300	0.99	2.26	4.00	6.60	9.22	11.62	14.02	15.61	17.23	17.60	17.69	17.69
400	0.96	2.20	3.78	6.57	9.05	11.25	13.74	15.52	17.06	17.17	17.34	17.34
500	0.93	2.15	3.74	6.29	8.80	11.20	13.48	15.00	16.48	17.04	17.04	17.04
1,000	0.85	1.96	3.29	5.85	8.05	10.27	12.53	14.25	15.62	15.72	15.94	15.94
2,000	0.74	1.71	2.90	5.21	7.20	8.78	11.31	13.00	14.22	14.51	14.51	14.51
5,000	0.57	1.32	2.31	4.21	5.96	7.57	9.41	10.24	11.74	12.12	12.13	12.13
10,000	0.44	1.07	1.78	3.38	4.30	5.67	7.53	8.42	9.07	10.01	10.03	10.03
20,000	0.33	0.79	1.14	2.15	3.26	4.18	5.71	6.55	7.32	7.77	7.83	7.83
50,000	0.18	0.37	0.72	1.49	2.18	2.69	3.59	3.87	4.25	5.67	5.73	5.73
100,000	0.11	0.31	0.44	0.87	1.20	1.46	1.97	2.50	2.78	3.60	3.68	3.68
138,434	0.09	0.23	0.42	0.76	1.09	1.39	1.86	2.38	2.7	2.82	2.89	2.89







Total Storm (120-hr) Precipitation (inches)
October 12 (0600 UTC) - October 17 (0500 UTC), 1942
SPAS 1340 - Big Meadows, VA

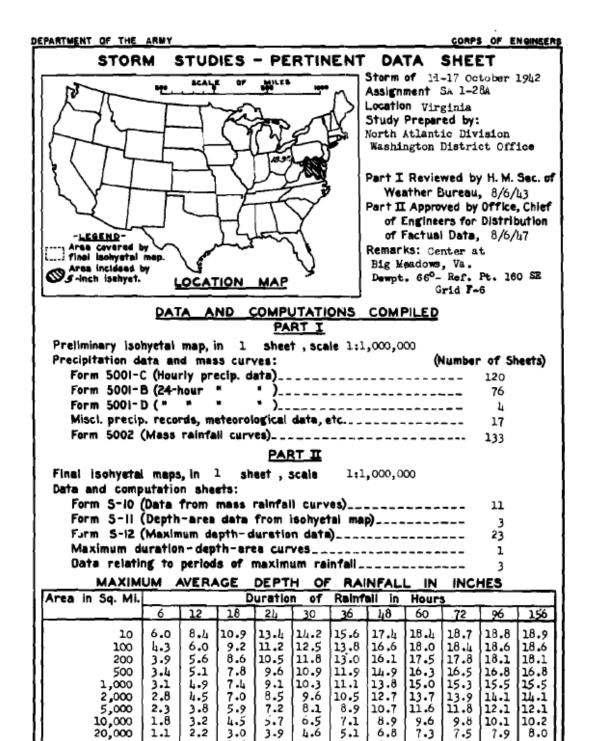


7.9

7.2

7.3

6.8



Form 5-2

25,000

1.0

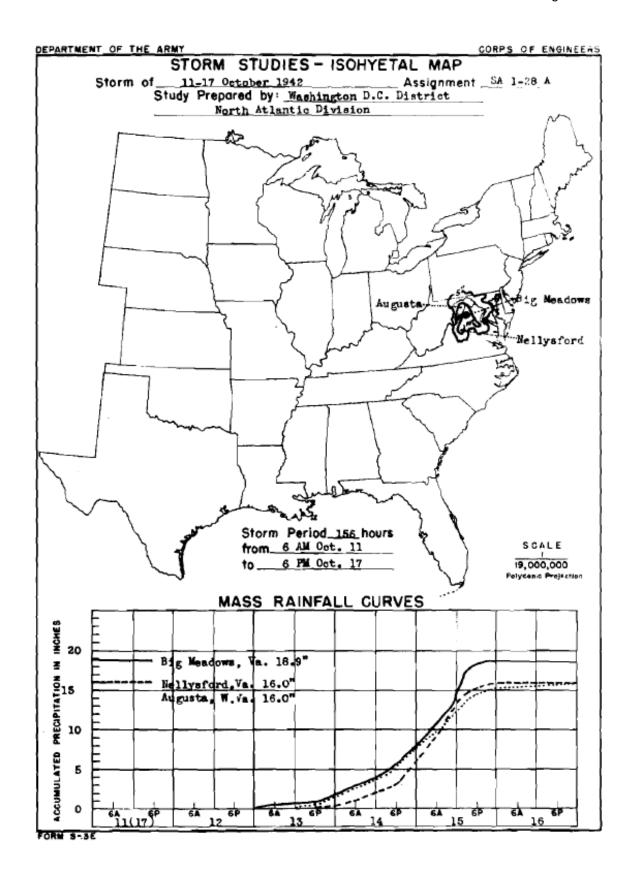
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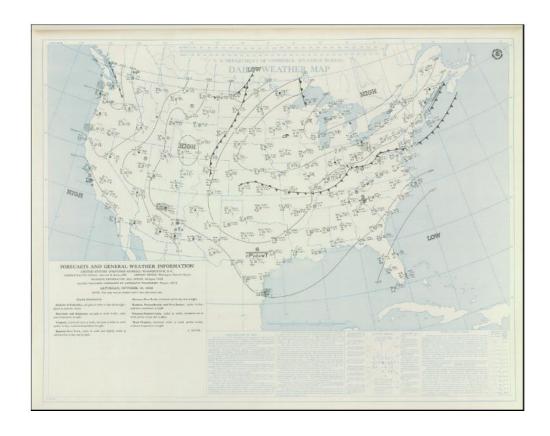
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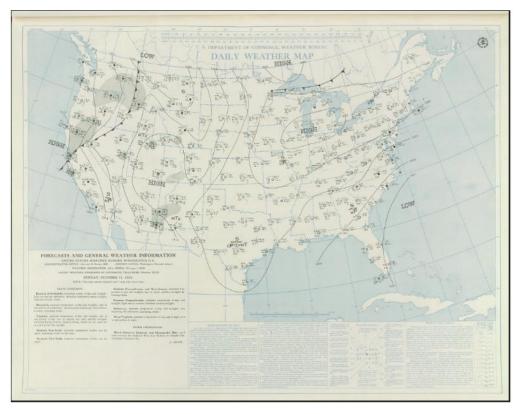
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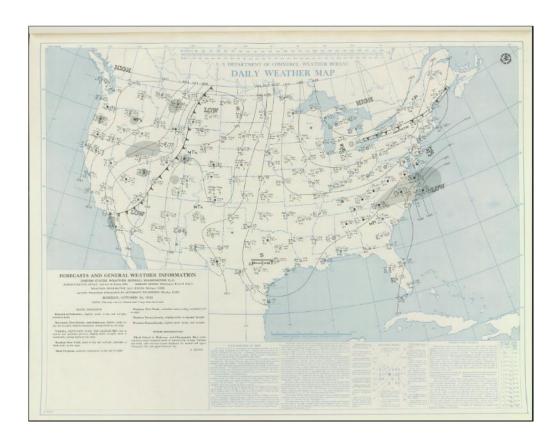
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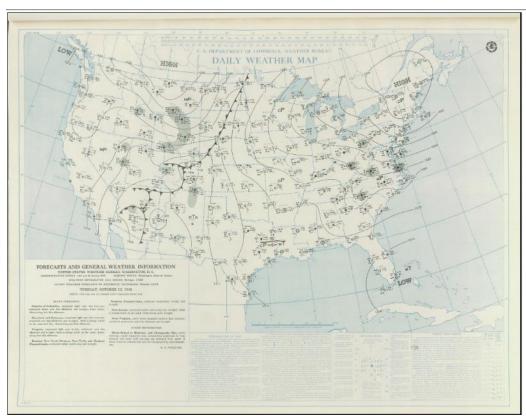
6.0

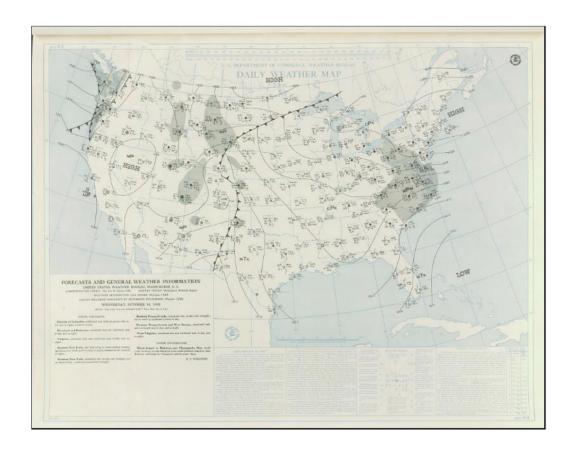


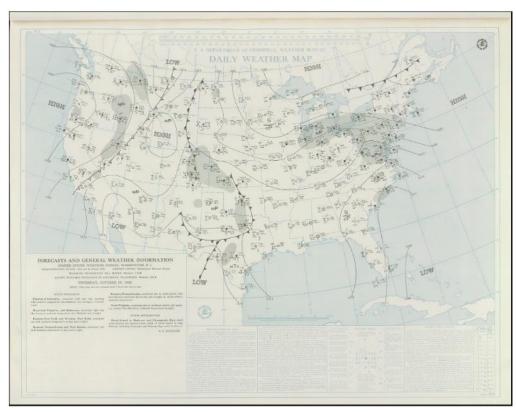


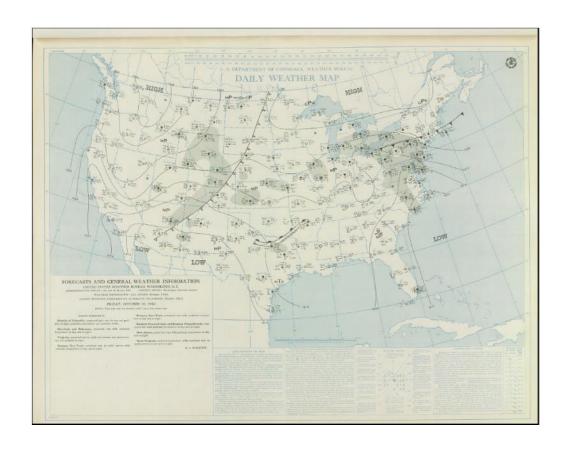


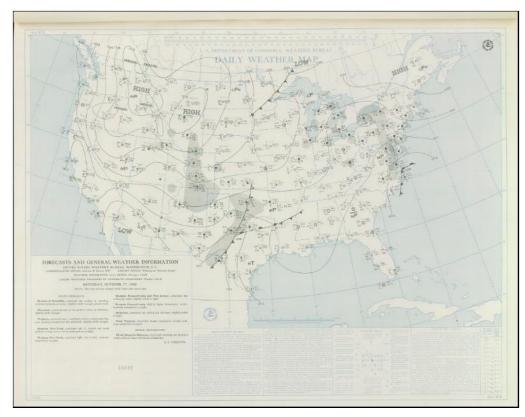


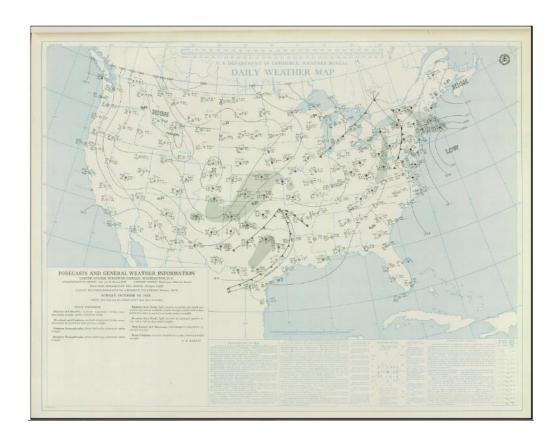


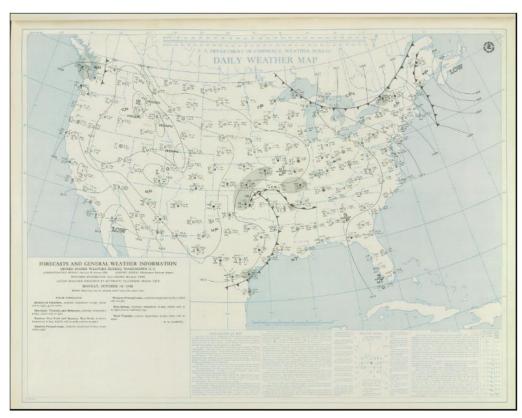


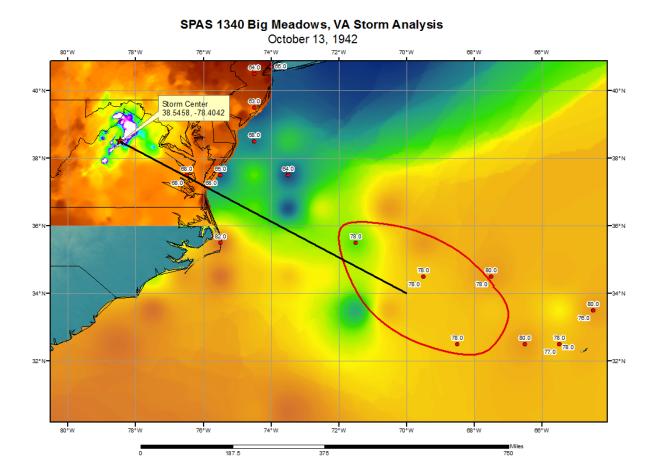












Storm Precipitation Analysis System (SPAS) For Storm #1431 SPAS Analysis

General Storm Location: Warner, Oklahoma (38.5, -98.9, 33.5, -91.7)

Storm Dates: May 7 – May 11, 1943

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 35.4792

Longitude: -95.3292

Max. Grid rainfall amount: 25.24"

Max. Observed rainfall amount: 25.00" (Warner, OK)

Number of Stations: 325

SPAS Version: 10.0

Base Map Used: USACE Isohyetal Map

Spatial resolution: 0.2679

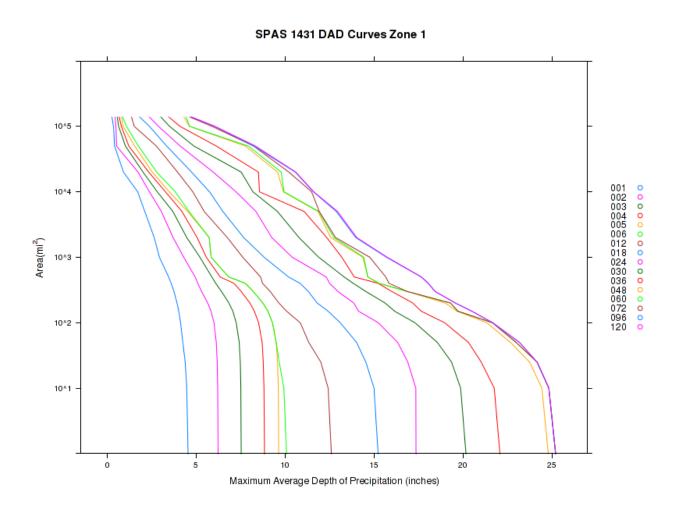
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

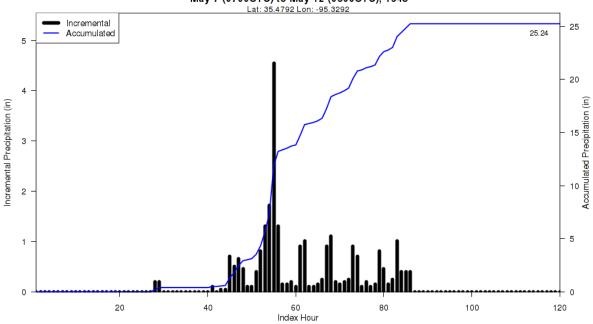
Reliability of Results: In addition to the NCDC stations, twenty-seven supplemental stations along with two supplemental estimated stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE), three hourly stations were digitized based on the mass rainfall curves. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable.

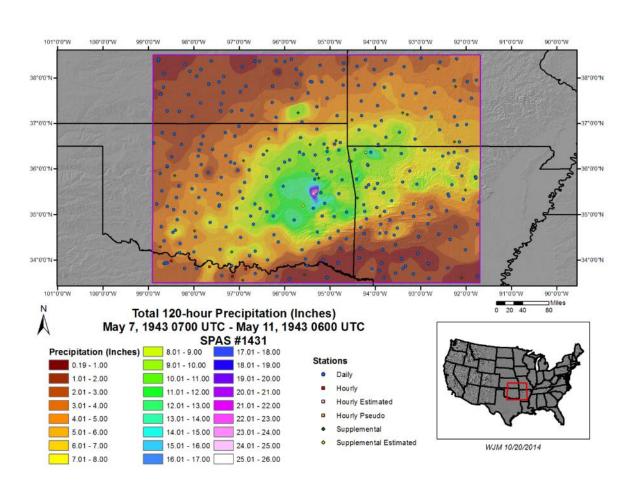
Storm Name:	SPAS 1431 - V	Warner, OK									
Storm Date:	5/7-11/1943					Storm A	djustn	nent for	· Virginia	ì	
AWA Analysis Date:	11/14/2015										
Temporal Transposi	tion Date	24-May									
		Lat	Long				Inflow Dire		SSW @ 290	miles	
Storm Center Locat	ion	35.48 N	95.33 W				rage Elevat		N/A	feet	
Storm Rep Dew Poi		31.61 N	97.23 W				ıter Elevati		600	feet	
Transposition Dew	Point Location						alysis Durat		24	hours	
Basin Location						Effective I	Barrier Hei	ght	N/A	feet	
The store	m nomnocontotivo	dom point is	71.5 F	rrith tot	al mua aimitak	ole water abo	rn coo lornl	of		2.42	inches.
	m representative of place maximum of		77.5 F			ole water abo				3.22	inches.
	ioned maximum	•	0.0		• •	ole water abo				#N/A	inches.
•	ne in-place storm	•	600		ch subtracts			f precipitabl	e water at	71.5 F	
	ne in-place storm		600	whi	ch subtracts			f precipitabl		77.5 F	
The tra	ansposition basin	elevation at	N/A	whi	ch subtracts	x.xx	inches o	f precipitabl	e water at	0.0	
The inflow ba	rier/basin elevati	on height is	N/A	whi	ch subtracts	X,XX	inches o	f precipitabl	e water at	0.0	
	he in-place storn			1.34					Storm representat		
The	transposition/ele			#N/A		-		naximum 24-h	r Td values betwe	een May 5-9,	
	The bar	rier adjustme	ent factor is	#N/A		1943 at KAC	.1.				
	779	. 1 . 2: -:		шът г							
	The to	otal adjustme	ent factor is	#N/A							
01	1 C4 D	P									
Observe	d Storm Depth-A	Ţ		12 11	10 11	24 Hours	26 11	40 11	70 11	06 11	120 H
	1 sq miles	1 Hours 4.5	6 Hours 10.1	12 Hours 12.6	18 Hours 15.2	17.4	36 Hours 22.1	48 Hours 24.8	72 Hours 25.2	96 Hours 25.2	120 Hour 25.2
	10 sq miles		9.9	12.4	15.2	17.4	21.8	24.6	24.8	24.8	24.8
	100 sq miles		9.3	10.9	13.1	15.2	19.0	21.3	21.7	21.7	21.7
	200 sq miles	·	8.8	9.7	11.8	13.9	17.2	19.0	19.3	19.6	19.6
	500 sq miles	 	6.8	8.6	10.2	12.3	13.9	14.7	15.7	17.7	17.7
	1000 sq miles	2.9	5.8	7.6	8.8	10.4	13.2	14.4	14.8	15.7	15.7
	2000 sq miles	2.6	5.7	6.8	7.7	9.3	12.3	12.6	12.8	14.0	14.0
	5000 sq miles	2.1	4.6	5.5	6.5	8.4	11.1	11.9	11.9	12.9	13.0
	10000 sq miles	·	3.8	4.8	5.8	7.2	8.6	9.9	11.5	11.6	11.6
	20000 sq miles	 	2.8	4.0	4.7	6.0	8.5	9.6	10.2	10.6	10.6
(**************************************	50000 sq miles		1.8	2.8	3.3	4.1	6.1	7.8	8.2	8.2	8.3
	100000 sq miles	0.4	1.1	1.5	2.4	2.9	4.1	4.6	5.9	6.0	6.1
				an 1 a 1 1 a 1		0.77					1
	Storm Center Na	me		SPAS 1431		OK.					
Storm Da Storm Ty	. /			5/7-11/194 General Sto							
Storm Lo				35.48 N	95.33 W						
	nter Elevation			600	75.55 11						
	tion Total & Dura	tion (10 sq ı	ni)	25.24 inche	s in 72 hour	S					
		,									
Storm Re	presentative Dew	Point		71.5 F	24						
	presentative Dew	Point Locat	ion	31.61 N	97.23 W		May	June			
	n Dew Point			77.5 F			76.9	78.5			
	Inflow Vector			SSW @ 290)						
In-place I	Maximization Fac	tor		1.34							
	There is a	<u> </u>		24 M	-	-		-			ł
	Transposition (E tion Dew Point I	,		24-May							
	tion Dew Point L										
	tion Adjustment			#N/A	-	-	-	-			
	Basin Elevation	1 40101		N/A	-	-	+	-			
	Elevation in Basin			N/A							
	rrier Height			N/A							ĺ
	djustment Factor			#N/A							
	ustment Factor			#N/A							1

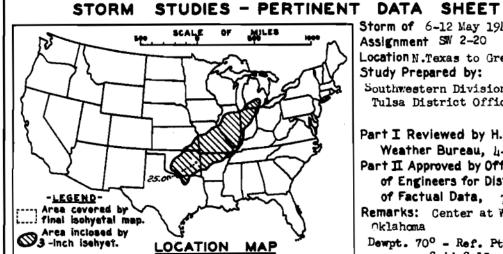
				\$		431 - M							3				
2					IVIAA	IIWOW A	LIXAGE		ration (ho		OIV (IIVCI	ILOJ					
Area (mi ²)	1	2	3	4	5	6	12	18	24	30	36	48	60	72	96	120	Total
0.3	4.54	6.23	7.54	8.84	9.64	10.09	12.62	15.24	17.77	20.19	22.11	24.83	25.24	25.24	25.24	25.24	25.24
1	4.54	6.23	7.53	8.84	9.64	10.08	12.60	15.23	17.36	20.17	22.08	24.80	25.21	25.21	25.21	25.21	25.21
10	4.47	6.21	7.51	8.81	9.62	9.93	12.42	15.00	17.35	19.87	21.76	24.44	24.83	24.83	24.83	24.83	24.83
25	4.38	6.18	7.48	8.77	9.57	9.67	12.01	14.54	16.90	19.36	21.03	23.75	24.17	24.17	24.17	24.17	24.17
50	4.25	6.13	7.42	8.71	9.50	9.50	11.33	14.02	16.33	18.56	20.31	22.67	22.99	22.99	23.18	23.18	23.18
100	4.12	6.00	7.25	8.51	9.29	9.29	10.85	13.10	15.24	17.30	18.97	21.34	21.66	21.66	21.67	21.67	21.67
150	4.02	5.83	7.06	8.27	9.03	9.03	10.08	12.42	14.13	16.16	17.65	19.66	19.71	19.72	20.50	20.50	20.50
200	3.92	5.65	6.84	8.02	8.75	8.75	9.65	11.80	13.86	15.62	17.18	19.00	19.30	19.30	19.57	19.57	19.57
300	3.75	5.30	6.42	7.53	8.21	8.21	9.16	11.31	12.97	14.54	16.00	16.87	16.87	16.87	18.43	18.44	18.44
400	3.59	5.09	6.10	7.12	7.76	7.76	8.73	10.84	12.50	13.83	15.23	15.28	15.28	15.84	18.04	18.06	18.06
500	3.45	4.94	5.88	6.35	6.83	6.83	8.62	10.19	12.31	13.32	13.89	14.65	14.65	15.66	17.65	17.67	17.67
1,000	2.93	4.30	5.21	5.57	5.84	5.84	7.62	8.82	10.40	11.89	13.19	14.37	14.43	14.76	15.70	15.74	15.74
2,000	2.64	3.70	4.47	5.05	5.73	5.73	6.75	7.67	9.25	10.78	12.34	12.56	12.74	12.84	13.97	14.03	14.03
5,000	2.11	3.04	3.69	4.20	4.52	4.60	5.45	6.50	8.36	9.57	11.07	11.85	11.90	11.92	12.88	12.95	12.95
10,000	1.71	2.37	2.81	3.27	3.49	3.82	4.81	5.75	7.24	8.19	8.56	9.90	9.94	11.49	11.59	11.61	11.61
20,000	0.91	1.73	2.01	2.33	2.53	2.78	3.95	4.74	5.96	7.53	8.50	9.58	9.78	10.21	10.57	10.60	10.60
50,000	0.41	0.52	1.02	1.21	1.54	1.75	2.76	3.34	4.10	4.87	6.13	7.77	7.94	8.23	8.24	8.34	8.34
100,000	0.35	0.49	0.64	0.79	0.89	1.08	1.52	2.37	2.88	3.50	4.09	4.62	4.63	5.89	6.04	6.05	6.05
138,970	0.26	0.43	0.56	0.67	0.80	0.86	1.36	1.82	2.37	3.01	3.46	4.31	4.44	4.63	4.73	4.73	4.73



SPAS 1431 Storm Center Mass Curve Zone 1 May 7 (0700UTC) to May 12 (0600UTC), 1943







CORPS OF ENGINEERS

Storm of 6-12 May 1943 Assignment SW 2-20 Location N. Texas to Great Lakes Study Prepared by: Southwestern Division Tulsa District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 4-14-45 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 7-17-4? Remarks: Center at Warner. Oklahoma Dewpt. 70° - Ref. Pt. 225 SSE

Grid G-15

DATA AND COMPUTATIONS COMPILED PART I

Preliminary isohyetal map, in 1 sheet, scale 1:1,000,000	
	er of Sheets)
Form 5001-C (Hourly precip. data)	553
Form 5001-B (24-hour " ")	
Form 5001-D (" " " ")	178
Miscl. precip. records, meteorological data, etc.	80
Form 5002 (Mass rainfail curves)	281

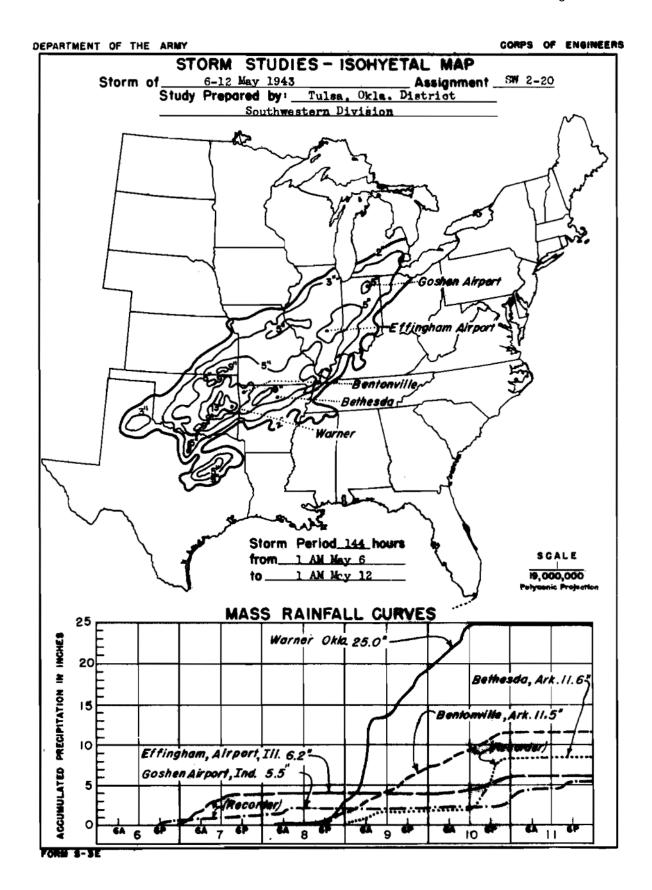
Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets: Form 5-10 /Data from m

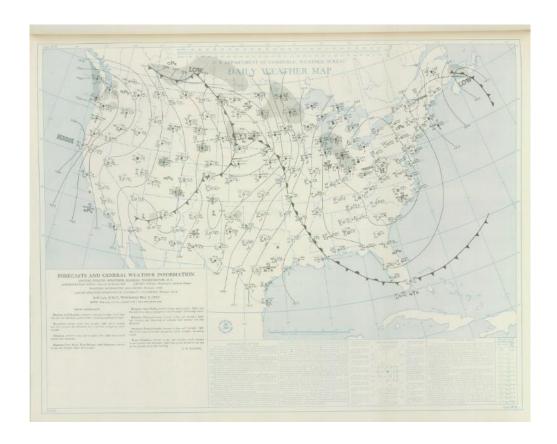
FORM 5-10 (Data from mass raintall curves)	42
Form S-II (Depth-area data from isohyetai map)	12
Form S-12 (Maximum depth-duration data)	12
Maximum duration-depth-area curves	1
Data relating to periods of maximum rainfall	2

MAXIMUM	AVERAGE	DEPTH	OF	RAINFALL	IN	INCHES

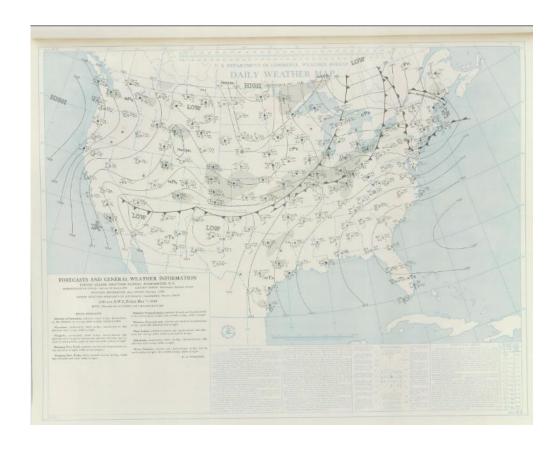
Area in Sq. M	i.		D	uratio	n of	Rainfa	all in	Hours	3		120/
	6	12	18	211	30	36	48	60	72	96	144
Max. Station	10.0	12.5	15.0	17.6	20.0	21.8	24.6	25.0	25.0	25.0	25.0
10	9.9	12.3	14.6	17.2	19.5	21.5	24.4	24.9	24.9	24.9	24.9
100	8.7	10.8	12.4	14.9	17.1	19.3	21.8	22.5	22.5	22.5	22.5
200	7.4	9.5	11.4	13.8	16.0	18.3	20.6	21.3	21.3	21.3	21.3
.500	5.4	7.6	10.0	12.3	14.5	16.7	18.6	19.4	19.4	19.4	19.4
1,000	4.3	6.3	9.0	11.1	13.3	15.4	17.1	18.0	18.0	18.0	18.0
2,000	3.6	5.4	8.0	9.9	12.1	14.0	15.5	16.5	16.5	16.5	16.5
5,000	3.0	4.5	6.8	8.3	10.5	12.1	13.4	14.4	14.4	14.4	14.4
10,000	2.6	3.9	5.8	7.2	9.1	10.4	11.7	12.6	12.6	12.8	12.8
20,000	2.1	3.3	4.9	6.1	7.6	8.7	10.0	10.7	10.8	11.1	11.1
50,000	1.6	2.5	3.7	4.6	5.7	6.5	7.7	8.1	8.3	8.8	8.9
100,000	1.1	1.9	2.7	3.4	4.2	4.9	5.8	6.2	6.4	7.0	7.3
212,000	0.6	1.1	1.7	2.2	2.6	3.0	3.7	4.2	4.4	5.0	5.5

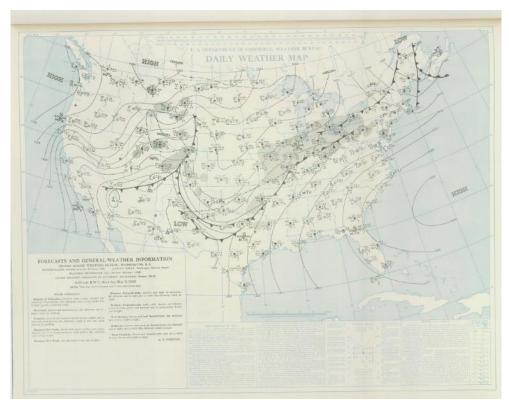
Form S-2



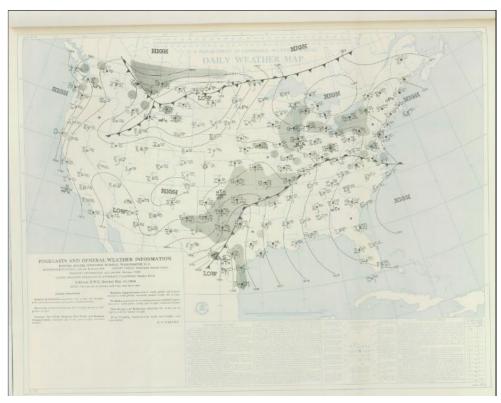


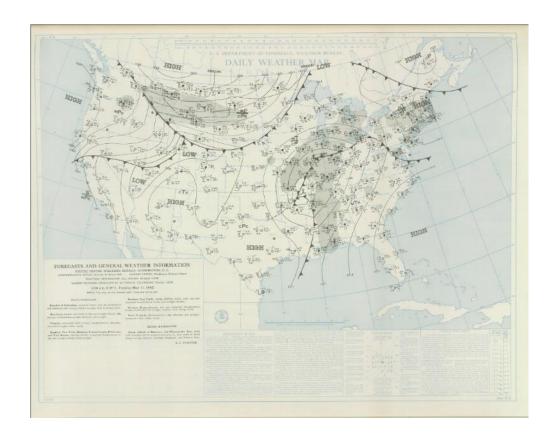




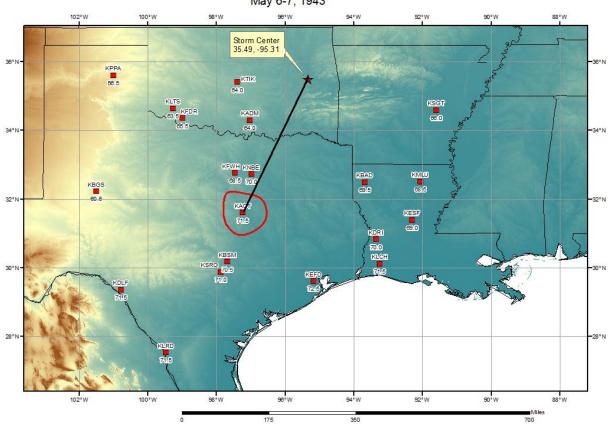


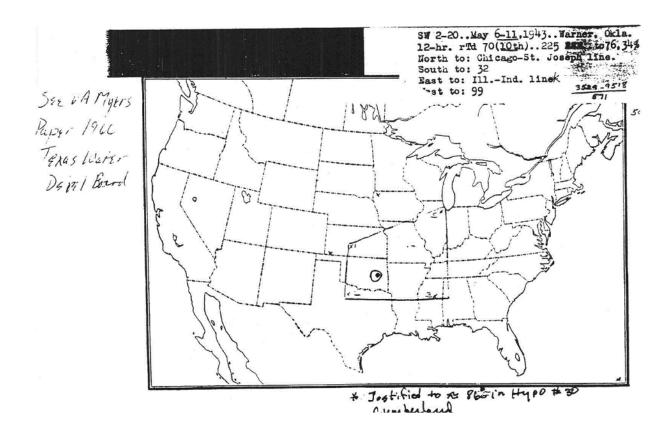






Warner, OK Storm Analysis May 6-7, 1943





Storm Precipitation Analysis System (SPAS) For Storm #1433 SPAS Analysis

General Storm Location: Collinsville, Illinois (40.0, -91.5, 36.9, -87.3)

Storm Dates: August 13 – August 16, 1946

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 38.6708

Longitude: -90.0042

Max. Grid rainfall amount: 19.07"

Max. Observed rainfall amount: 19.07" (Collinsville, IL)

Number of Stations: 166

SPAS Version: 10.0

Base Map Used: Derived basemap based off of SPAS analysis

Spatial resolution: 0.2596

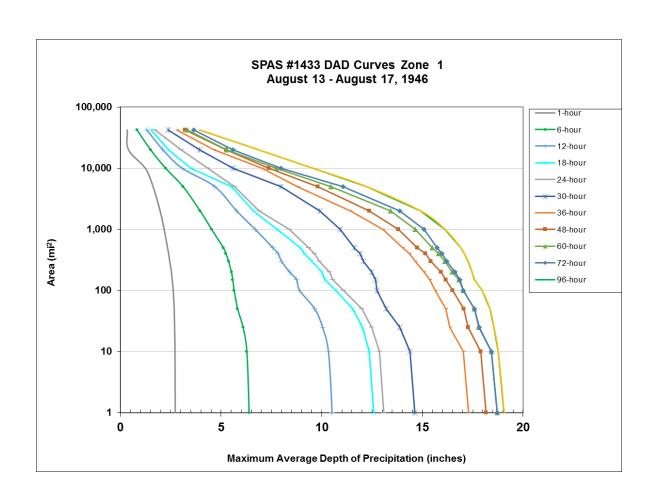
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

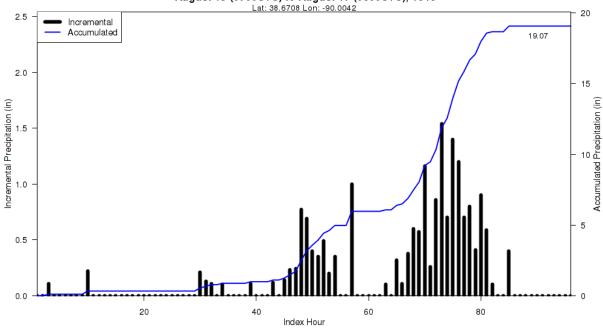
Reliability of Results: In addition to the NCDC stations, twenty-four supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE), three hourly stations were added based on the mass rainfall curves. Three hourly stations were also added from local climatology from NCDC. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable.

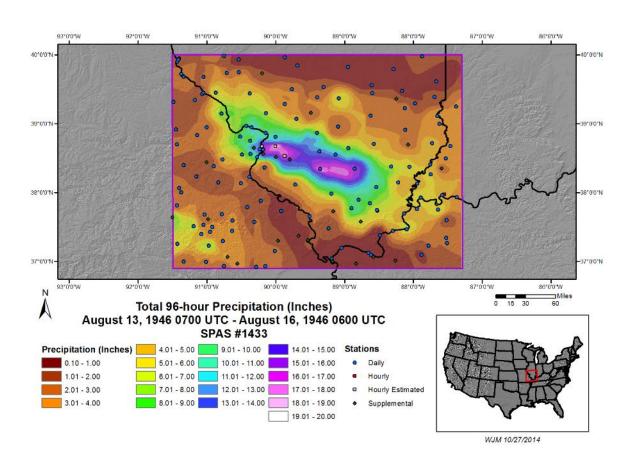
Storm Name:	SPAS 1433 - 0	Collinsville.	IL								
Storm Date:	8/12-17/1946			4	9	Storm A	dinstm	ent for	Virginia	1	
AWA Analysis Date:				ĺ	•		lajastii		v II giiiid	•	
Temporal Transposit		1-Aug									
Temporai Transposit	Ion Date	Lat	Long			Moisture I	nflow Dire	ntion	SSW @ 225	miles	
C4 C4 I4:			90.00 W			1					
Storm Center Location		38.67 N					age Elevati		N/A	feet	
Storm Rep Dew Poin		35.71 N	91.60 W			t	ter Elevatio		600	feet	
Transposition Dew P	oint Location						lysis Durati		24	hours	
Basin Location						Effective B	arrier Hei	ght	N/A	feet	
m .			E (0 E				, ,	c		2.00	. ,
	representative	-	76.0 F			le water abov				2.99	inches.
	olace maximum	•	80.5 F			le water abov				3.68	inches.
The transpositi		-	0.0			le water abov				#N/A	inches.
	in-place storn		600		ich subtracts			f precipitabl		76.0 F	
	in-place storm		600		ich subtracts			f precipitabl		80.5 F	
	sposition basin		N/A		ich subtracts			f precipitable		0.0	
The inflow barr	ier/basin elevat	tion height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitable	e water at	0.0	
					7	N. B.B		GD + G + 46	22		
	ne in-place stor			1.24					 Storm repres n maximum 24-h 		
The	transposition/e			#N/A					n maximum 24-n 14-15, 1946 at K		
	The ba	arrier adjustm	ent factor is	#N/A		KMEM.	a dany 10 valu	co on August	1→ 10, 1740 at K.	ino allu	
		1		45774		-					
	The	total adjustm	ent factor is	#N/A		<u></u>					
Observed	Storm Depth-A										
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hou
	1 sq miles	2.7	6.4	10.5	12.6	13.1	17.3	18.2	18.7	19.1	19.1
	10 sq miles	2.7	6.3	10.3	12.4	12.9	17.0	17.9	18.4	18.8	18.8
	100 sq miles	2.6	5.7	8.9	10.7	11.1	15.6	16.5	17.0	18.0	18.0
	200 sq miles	2.5	5.5	8.4	10.0	10.4	15.1	15.9	16.6	17.5	17.5
	500 sq miles	2.3	5.1	7.6	8.9	9.4	14.0	14.8	15.7	16.9	16.9
	1000 sq miles	2.2	4.5	6.7	7.8	8.4	13.0	13.8	15.1	16.1	16.1
	2000 sq miles	2.0	4.0	5.8	6.6	6.9	11.4	12.4	13.9	14.9	14.9
***************************************	5000 sq miles	1.6	3.1	4.7	5.5	5.7	8.8	9.8	11.1	12.2	12.2
	0000 sq miles	1.2	2.2	3.1	3.5	4.3	7.0	7.4	8.0	9.6	9.6
***************************************	0000 sq miles	0.4	1.5	2.1	2.4	3.0	4.7	5.3	5.6	6.9	6.9
4	2261 sq miles	0.3	0.8	1.3	1.5	1.7	2.8	3.2	3.6	3.9	3.9
α. α	. G . W			GD + G 4 422	G 111 11		1	1	1		
	torm Center Na	ame		SPAS 1433		He, IL					
Storm Date				8/12-17/19	46				-		
Storm Type				Synoptic	00.00.337				+		
Storm Con	er Elevation			38.67 N 600	90.00 W						
	on Total & Dura	ation (10 sc =	ni)	19.07" in 96	hre from CI	Δς 1/33					
Ficcipitatio	m rotal & Duli	011 (10 SQ II	11)	12.07 11190	, 1110111 31	1433					
Storm Pan	resentative Dev	v Point		76.0 F	24						
	resentative Dev		on	35.71 N	91.60 W			July	Aug		
Maximum		v i Omi Local	1011	80.5 F	71.00 W			80.28	80.2		
	nflow Vector			SSW @ 225				00.20	00.2		
	aximization Fac	rtor		1.24	-				-		
III-prace W	azimzation rac			1.47							
Temporal 7	ransposition (I	Date)		1-Aug							
	on Dew Point I			- 1 mg							
	on Maximum E										
	on Adjustment			#N/A							
	sin Elevation	1 40101		N/A							1
	evation in Basin	1		N/A							
riighest El				N/A							
Inflow Ran				. 1/ / 1					_		1
Inflow Barrier Ad	ustment Factor			#N/A							

	\$	Storm 1			•			•			ò	
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES) Duration (hours)											
Area (mi ²)	1	6	12	18	24	30	36	48	60	72	96	Total
0.3	2.72	6.40	10.52	12.60	13.10	14.64	17.32	18.19	18.74	18.74	19.07	19.07
1	2.72	6.39	10.51	12.58	13.08	14.62	17.30	18.17	18.72	18.72	19.05	19.05
10	2.71	6.28	10.33	12.37	12.86	14.38	17.03	17.89	18.43	18.43	18.76	18.76
25	2.69	6.09	10.04	12.03	12.48	13.88	16.35	17.28	17.80	17.81	18.55	18.55
50	2.67	5.82	9.65	11.54	12.00	13.21	16.16	17.04	17.57	17.59	18.35	18.35
100	2.62	5.65	8.90	10.69	11.08	12.75	15.63	16.49	17.02	17.02	17.96	17.96
150	2.57	5.58	8.75	10.17	10.55	12.68	15.37	16.17	16.82	16.86	17.57	17.57
200	2.53	5.51	8.40	10.00	10.38	12.49	15.09	15.92	16.47	16.62	17.47	17.47
300	2.45	5.37	8.00	9.52	9.87	12.07	14.65	15.41	16.12	16.21	17.27	17.27
400	2.39	5.24	7.83	9.13	9.63	11.90	14.36	15.15	15.81	15.97	17.07	17.07
500	2.34	5.11	7.57	8.94	9.35	11.62	14.03	14.75	15.49	15.73	16.90	16.90
1,000	2.17	4.53	6.69	7.79	8.39	10.92	13.03	13.81	14.65	15.07	16.12	16.12
2,000	1.97	3.96	5.77	6.60	6.89	9.90	11.43	12.37	13.41	13.87	14.91	14.91
5,000	1.62	3.11	4.69	5.51	5.67	7.98	8.80	9.80	10.45	11.06	12.23	12.23
10,000	1.23	2.24	3.06	3.49	4.34	5.59	7.03	7.37	7.73	7.98	9.56	9.56
20,000	0.40	1.50	2.11	2.40	3.03	3.94	4.66	5.26	5.29	5.59	6.86	6.86
42,261	0.34	0.82	1.31	1.53	1.72	2.36	2.80	3.22	3.34	3.64	3.94	3.94



SPAS 1433 Storm Center Mass Curve Zone 1 August 13 (0700UTC) to August 17 (0600UTC), 1946





DEPARTMENT OF THE ARMY

CORPS OF ENGINEERS



DATA SHEET

Storm of 12-16 August 1946

Assignment MR 7-2B

Location Mo., Ill., Ind. & Ky.

Study Prepared by: Upper Mississippi Valley

Division

St. Louis District

Part I Reviewed by H. M. Sec. of Weather Bureau, 3/8/49 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 3/20/50 Remarks: Center near Collinaville, Ill. Dewpt. 74° Ref. Pt. 225 S Grid F-12

DATA AND COMPUTATIONS COMPILED

Preliminary isohyetal map, in 1 sheet, scale 1: 1,000,000	
	r of Sheets)
Form 5001-C (Hourly precip. data)	58
Form 5001-B (24-hour " ")	
Form 5001-D (" " " ")	16
Misci. precip. records, meteorological data, etc	15
Form 5002 (Mass rainfall curves)	44
PART II	
Final isohyetal maps, in 1 sheet, scale 1: 1,000,000	

Data and computation sheets:

Form S-IO (Data from mass rainfall curves)

Form S-II (Depth-area data from isohyetal map)

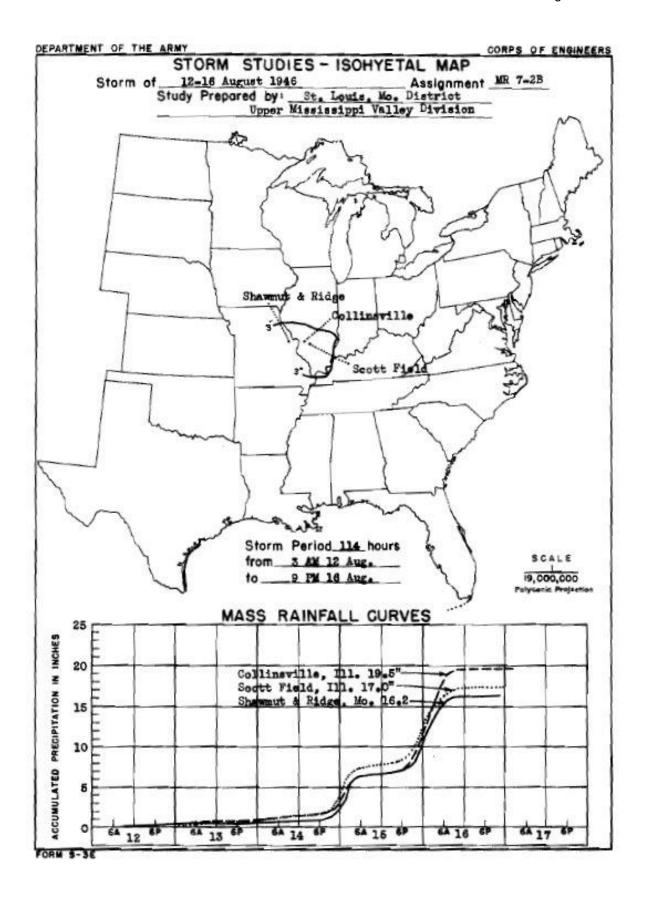
Form S-I2 (Maximum depth-duration data)

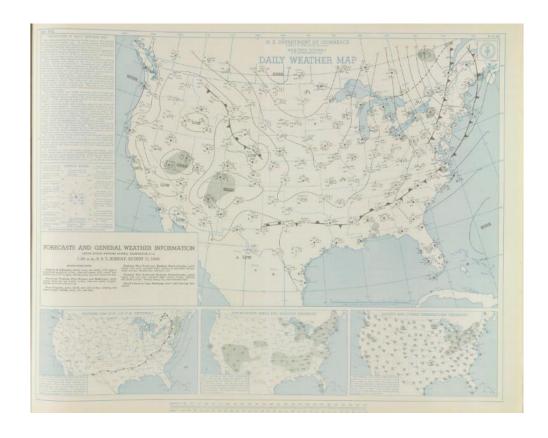
Maximum duration-depth-area curves

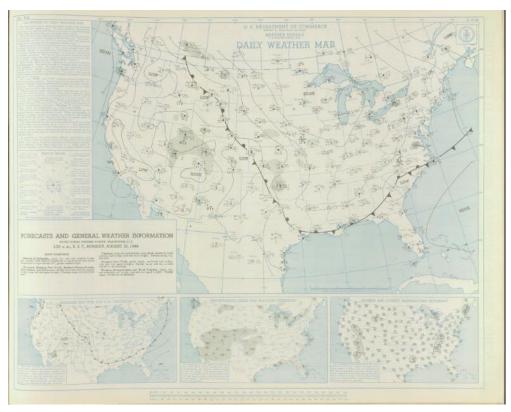
Data relating to periods of maximum rainfall

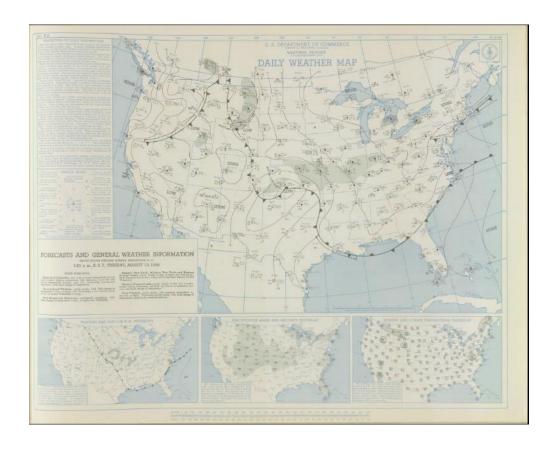
Area in Sq. Mi.		Duration of Rainfall in Hours										
	6	12	18	24	30	36	48	60	72	96	114	
Max. Sta.	6.4	10.2	12.6	12.7	14.1	18.0	18.1	18.6	18.7	19.4	19.	
10	6.0	9.8	12.1	12.1	13.7	17.5	17.6	18.3	18.3	18.9	19.	
100	5.6	8.8	10.9	11.1	13.2	16.6	16.7	17.5	17.6	13.0	18.	
200	5.4	8.3	10.5	10.6	13.0	16.2	16.3	17.2	17.3	17.7	17.	
500	5.2	7.7	9.7	9.9	12.8	15.5	15.6	16.7	16.9	17.1	17.	
1,000	4.9	7.0	8.9	9.0	12.6	14.7	14.8	15.9	16.0	16.3	16.	
2,000	4.3	6.1	7.6	7.8	11.2	13.3	13.4	14.3	14.3	14.6	14.	
5,000	3.3	4.8	5.9	6.0	8.6	10.4	10.6	11.3	11.4	11.6	11.	
10,000	2.4	3.7	4.5	4.6	6.6	8.0	8.2	8.7	8.8	9.0	9.	
20,000	1.5	2.5	3.1	3.2	4.5	5.6	5.8	6.0	6.1	6.3	6.	
20,400	1.5	2.5	3.1	3.2	4.5	5.5	5.7	6.0	6.1	6.3	6.	

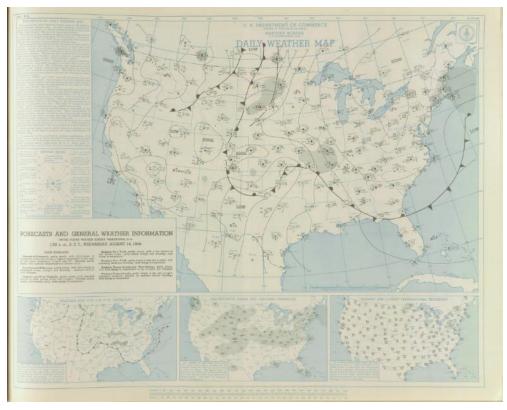
Form 5-2

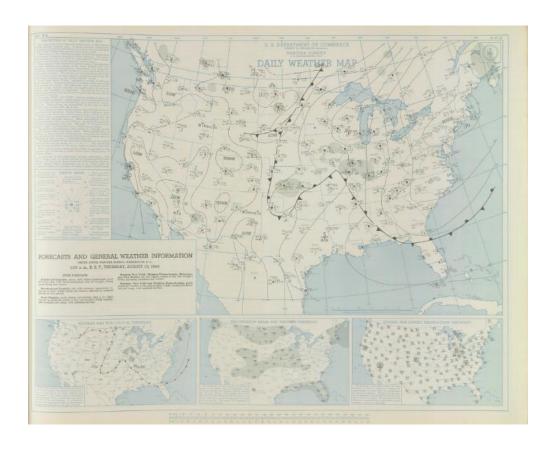


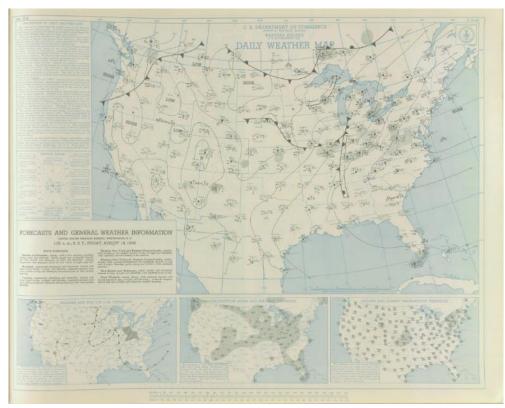


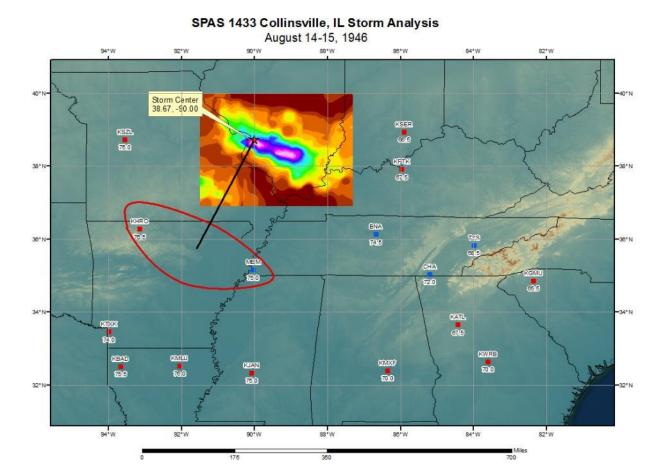


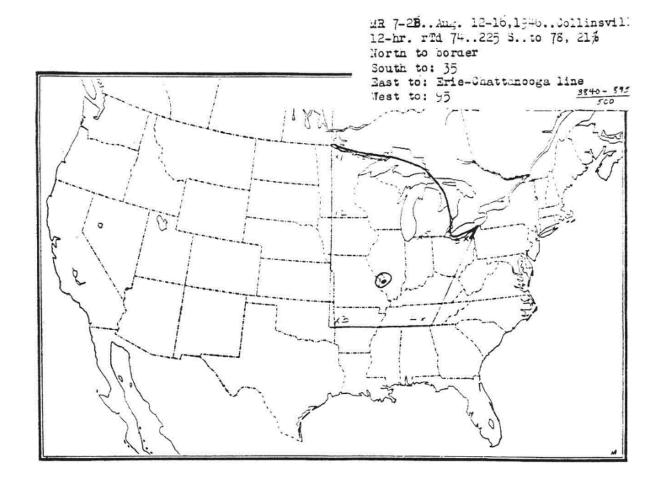












Page 150 of 734

Storm Precipitation Analysis System (SPAS) For Storm #1435 SPAS Analysis

General Storm Location: Lower Mississippi Valley (-94.7, 33.1, -89.5, 28.6)

Storm Dates: May 12 – May 19, 1953

Event: Mid-latitude cyclones with associated cold fronts including one stationary front

DAD Zone 1

Latitude: 31.7875

Longitude: -91.8125

Max. Grid rainfall amount: 25.35"

Max. Observed rainfall amount: 25.35" (Harrisonburg, LA)

Number of Stations: 234

SPAS Version: 9.5

Base Map Used: USGS storm total isohyets

Spatial resolution: 0.2840

Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

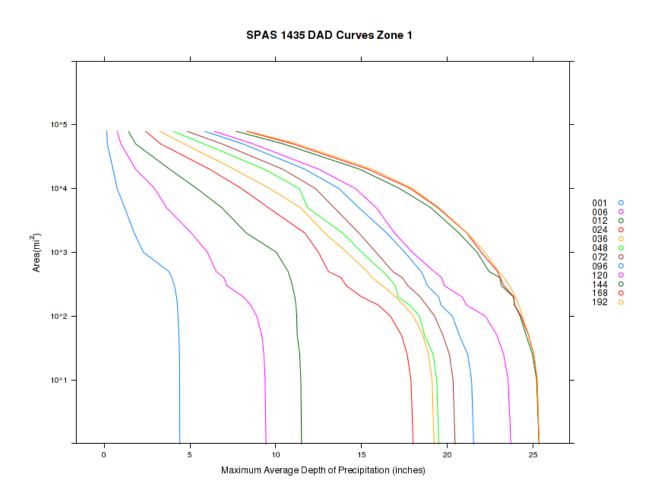
Reliability of Results: Two stations not found in existing NCDC data were digitized from the mass curves in the USACE report. One of them, Melville LA, had a co-located daily station which was used to anchor the hourly estimation. At the storm maximum at Harrisonburg Dam LA, hours 20 to 31 were estimated using the mass curve from the USGS report because the NCDC hourly data had an accumulated amount recorded. A map of isohyets of the storm total developed by the USGS was used as the basemap to improve spatial patterns.

The DAD estimates agree reasonably well with most being within +/- 5%. The larger differences are likely do to the fact that the current SPAS analysis was run with more data than was available to the previous publications. Slight differences in the domain (in particular the extension of the buffer area into the Gulf of Mexico) and overall time period may also contribute.

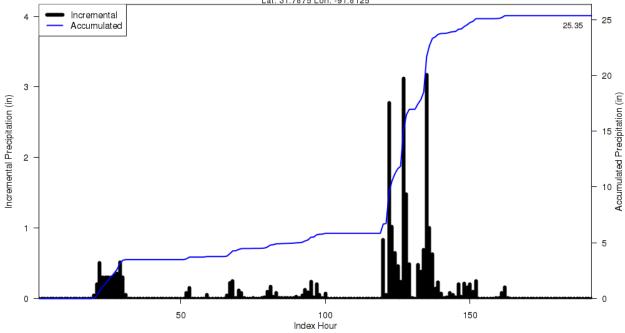
With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed reliable.

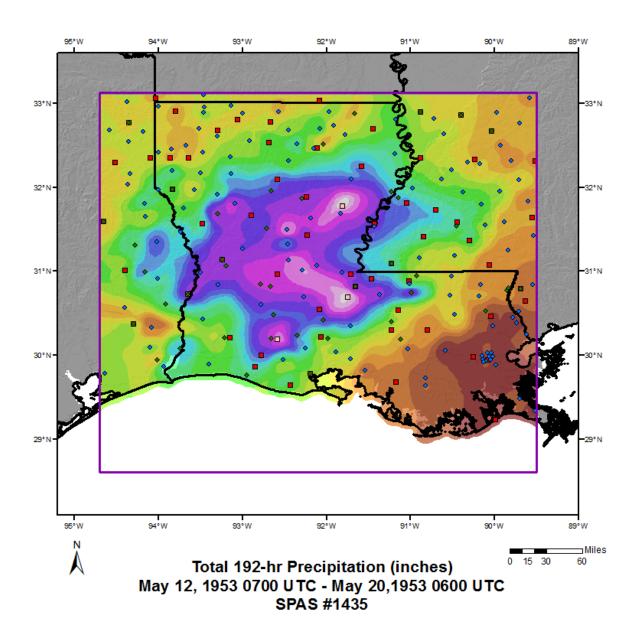
Storm Name:	SPAS 1435	- Harrisonl	burg Dam, LA								
Storm Date:	5/11-19/19				S	Storm A	diustn	nent for	· Virginia	a	
AWA Analysis Date:	11/14/2015	5			~		- a-j a-s v		, 8	-	
Temporal Transposit	ion Date	1-Jun									
		Lat	Lon	Ì		Moisture	Inflow Dire	ection	SSE @ 435	miles	
Storm Center Locati	on	31.79 N	91.82 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep SST Loca		26.00 N	89.00 W				nter Elevati		0	feet	
Transposition SST L		20.0011	02.00 11				alysis Durat		24	hours	
Basin Location	J C C C C C C C C C C C C C C C C C C C						Barrier Hei		N/A	feet	
									'		
The sto	rm represent	ative SST is	80.0 F	with tot	al precipitab	le water abo	ve sea level	of		3.60	inches.
	n-place maxi		83.0 F		al precipitab					4.08	inches.
	itioned maxi		0.0		al precipitab					#N/A	inches.
	-place storm		0	feet whi	ch subtracts	0.00	inches o	f precipitabl	e water at	80.0 F	
The in	-place storm	elevation is	0	feet whi	ch subtracts	0.00	inches o	f precipitabl	e water at	83.0 F	
	osition basin		N/A	feet whi	ch subtracts	x,xx	inches o	f precipitabl	e water at	0.0	
The inflow barrier	/basin elevati	on height is	N/A	feet whi	ch subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
				1		M	1 6 2-	0.1405 ****		1 674075	
			zation factor is						Ehad a storm rep T tative SST value w		
The			basin factor is						SPLIT trajectory da		
	The	barrier adjus	tment factor is	#N/A			in region where	temperature did	l not vary significa	intly over a	
				у дътга		large area.					
	1	he total adjus	tment factor is	#N/A							
	a										
Observed	Storm Dept	h-Area-Dura		12.11	10.11	24 11	26 11	40 11	72.11	061	120 11
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq mile		9.4	11.5	11.5	18.0	19.2	19.5	20.5	21.5	23.7
	10 sq miles		9.4	11.5	11.5	17.9	19.1	19.4	20.3	21.4	23.5
	100 sq miles 200 sq miles	7	8.9 8.1	11.2 11.1	11.2 11.1	16.7 15.0	18.0 17.0	18.4 17.1	19.3 18.4	20.3 19.5	20.9
	500 sq miles	· · · · · · · · · · · · · · · · · · ·	6.5	10.7	10.7	13.1	15.3	16.2	16.8	18.5	19.2
***************************************	000 sq miles	-	6.0	10.7	10.7	12.5	14.1	15.0	15.8	17.5	18.0
	000 sq miles	 	5.1	8.3	8.3	11.7	12.9	13.9	14.9	16.5	16.9
	000 sq miles		3.6	6.9	6.9	9.6	11.5	11.9	13.4	14.9	15.9
	000 sq miles		3.0	5.4	5.4	8.0	9.7	11.4	12.3	13.7	14.6
	000 sq miles		1.8	3.8	3.8	6.2	7.6	9.4	10.4	11.7	12.5
	000 sq miles	·	1.0	1.8	1.8	3.3	4.7	5.8	6.9	8.1	8.7
	1									}	
Storm or S	Storm Center	Name		SPAS 1435	- Harrison	hurg Dam.	LA Zone 1				
Storm Dat		Tturre		5/11-19/19		our g Dunn,	La r zone r				
Storm Typ				Synoptic							
Storm Loc				31.79 N	91.82 W						
Storm Cer	ter Elevation			0							
	on Total & D			25.35" inch	es in 192 ho	urs					
	resentative S			80.0 F	24		May	June			
Storm Rep	resentative S	ST Location		26.00 N	89.00 W		81	84			
Maximum	SST			83.0 F							
	Inflow Vector			SSE @ 435							
In-place M	[aximization]	Factor		1.13							
				ļ							
	Transposition			1-Jun	ļ			ļ			
	ion SST Loca										
	ion Maximur			(1277.1							
	ion Adjustme			#N/A							
	asin Elevation			N/A							
	evation in Ba	sin		N/A							
	rier Height			N/A							
	justment Fac			#N/A					Ļ		
Total Adiu	stment Facto	r		#N/A]

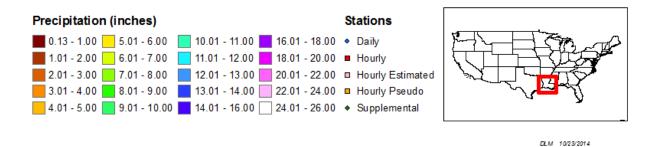
	Storm 1435 - May 12 (0700 UTC) - May 20 (0600 UTC), 1953 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
			WAX	IIWUW AV	EKAGE		ration (hou		JN (INC	169)				
Area (mi ²)	1	6	12	24	36	48	72	96	120	144	168	192	Total	
0.3	4.41	9.43	11.69	18.02	19.24	19.51	20.46	21.54	23.71	25.35	25.35	25.35	25.35	
1	4.41	9.43	11.50	18.01	19.23	19.50	20.45	21.53	23.70	25.34	25.34	25.35	25.35	
10	4.40	9.38	11.46	17.88	19.11	19.38	20.33	21.41	23.54	25.20	25.23	25.24	25.24	
25	4.39	9.31	11.40	17.66	18.90	19.18	20.12	21.19	23.28	24.96	25.04	25.05	25.05	
50	4.36	9.19	11.25	17.33	18.58	18.67	19.74	20.70	22.89	24.59	24.73	24.75	24.75	
100	4.31	8.89	11.22	16.68	18.02	18.38	19.26	20.29	22.21	24.24	24.29	24.37	24.37	
150	4.27	8.53	11.18	15.96	17.45	17.79	18.76	19.62	21.10	23.91	23.91	24.17	24.17	
200	4.22	8.12	11.11	15.01	16.98	17.13	18.42	19.50	20.86	23.85	23.88	23.97	23.97	
300	4.10	7.16	10.97	14.11	16.22	16.96	17.70	18.83	19.82	23.14	23.29	23.62	23.62	
400	3.94	6.98	10.84	13.81	15.61	16.60	17.38	18.65	19.68	23.07	23.07	23.30	23.30	
500	3.77	6.53	10.72	13.07	15.32	16.23	16.82	18.47	19.22	22.43	22.92	22.98	22.98	
1,000	2.29	6.02	10.04	12.49	14.14	15.01	15.84	17.52	17.97	21.73	21.98	22.19	22.19	
2,000	1.76	5.09	8.29	11.70	12.86	13.91	14.85	16.47	16.93	20.68	21.14	21.16	21.16	
5,000	1.20	3.64	6.86	9.58	11.45	11.86	13.41	14.85	15.86	19.04	19.45	19.52	19.52	
10,000	0.76	2.95	5.40	8.00	9.65	11.38	12.31	13.68	14.64	17.22	17.84	17.96	17.96	
20,000	0.52	1.84	3.83	6.16	7.58	9.35	10.42	11.72	12.53	14.91	15.40	15.64	15.64	
50,000	0.19	0.98	1.84	3.30	4.68	5.83	6.88	8.09	8.69	10.45	11.01	11.27	11.27	
78,752	0.15	0.76	1.42	2.42	3.24	4.02	4.84	5.88	6.42	7.70	8.30	8.43	8.43	



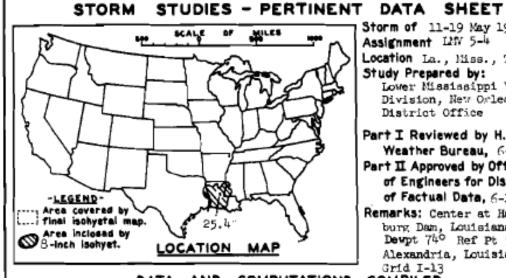








CORPS OF EMGINEERS



Storm of 11-19 May 1953

Assignment LIN 5-4 Location La., Miss., Tex. Study Prepared by:

Lower Mississippi Valley Division, New Orleans District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 6-15-56 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 6-13-61

Remarks: Center at Harrisonburg Dam, Louisiana Dewpt 74° Ref Pt 50 S of Alexandria, Louisiana Grid I-13

DATA AND COMPUTATIONS COMPILED PART I

Preliminary isohyetai map, in 4 sheets, scale 1:2,500,000	
Precipitation data and mass curves: (Numbe	r of Sheets)
Form 5001-C (Hourly precip. data)	48
Form 5001-B (24-hour " ")	43
Form 5001-D (" " " ")	-
Misci, precip. records, meteorological data, etc	-
Form 5002 (Mass rainfall curves)	16

PART II

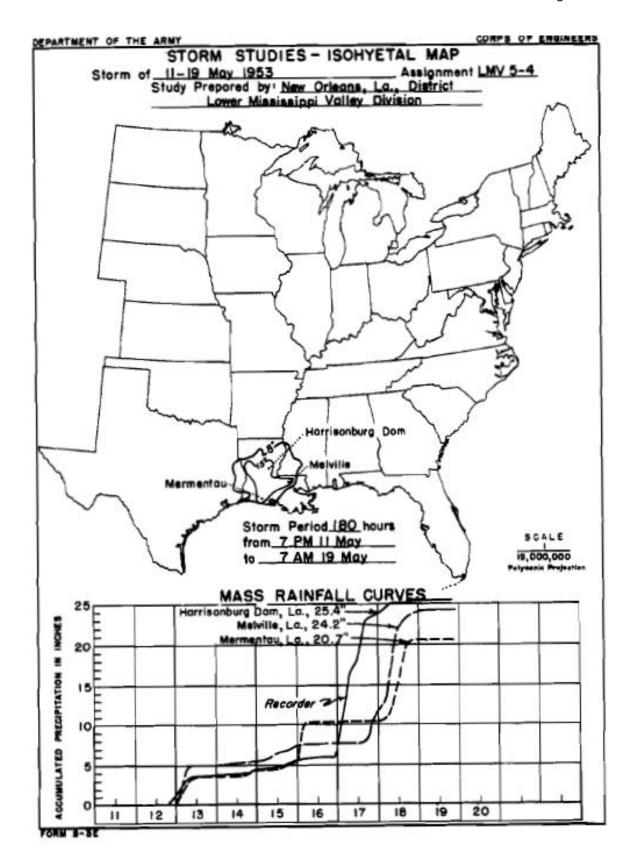
Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets:

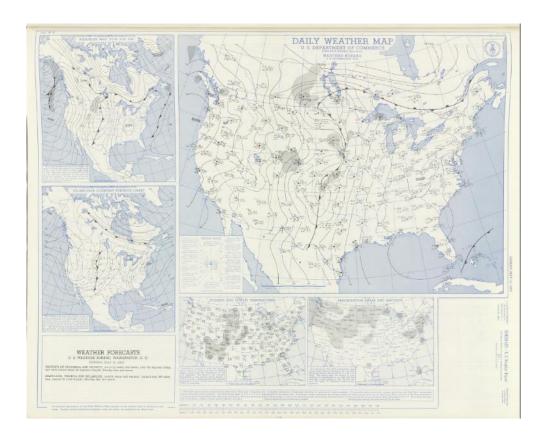
Form S-10 (Data from mass rainfall curves)	10
Form S-II (Depth-area data from isohyetai map)	2
Furm S-12 (Maximum depth-duration data)	18
Maximum duration-depth-area curves	ı
Data relating to periods of maximum rainfall	

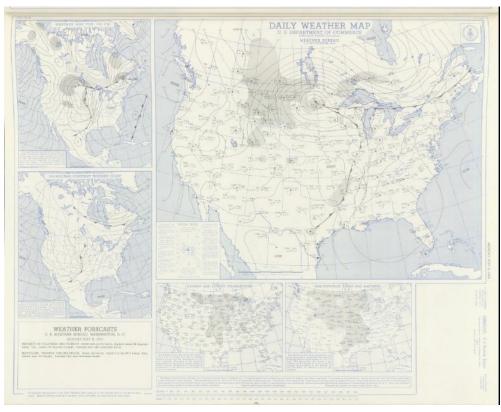
MAXIMUM	AVERAGE	DEPTH	OF	RAINFALL	IN	INCHES

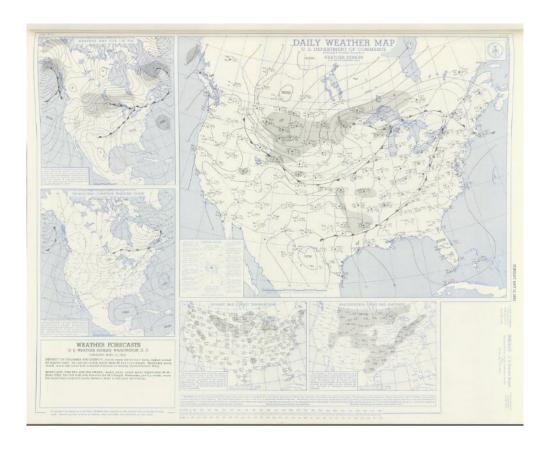
ı	Area	in Sq. Mi.			Di	uratio	n of	Rainfall in Hours					
ľ		_	6	12	18	24	36	48	72	94	120	144	180
		10 100 200 500 1,000 2,000 5,000 10,000 20,000 40,000	98.7765.75	11.7 10.9 10.5 9.6 7.4 4.9 3.6 2.3		17.4 16.0 15.5 14.0 12.3	19.2 18.3 17.7 16.6 15.4 13.9 11.6 9.7 7.7 5.6	19.6 18.7 18.2 17.0 15.8 14.5 12.7 11.1 9.2 6.8	20.4 19.5 19.0 18.0 16.9 15.8 14.0 12.6 10.7 8.1	21.3 19.9 18.9 17.9 16.8 15.2 13.7 12.0 9.3	23.7 22.6 22.1 21.2 20.0 18.7 16.7 15.0 12.9	25.4 24.2 23.6 22.6 21.8 20.9 19.3 17.7 15.5 12.1	25.4 24.2 23.7 22.8 22.0 21.1 19.6 18.0 16.0 12.7

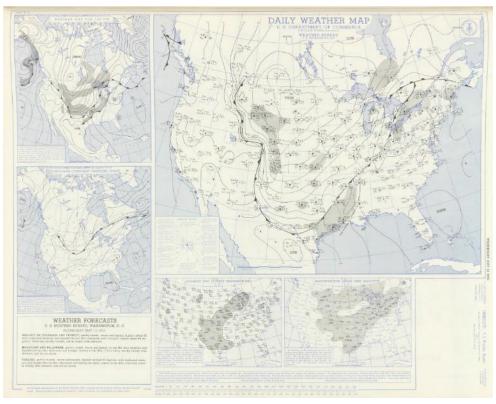
Form 5-2

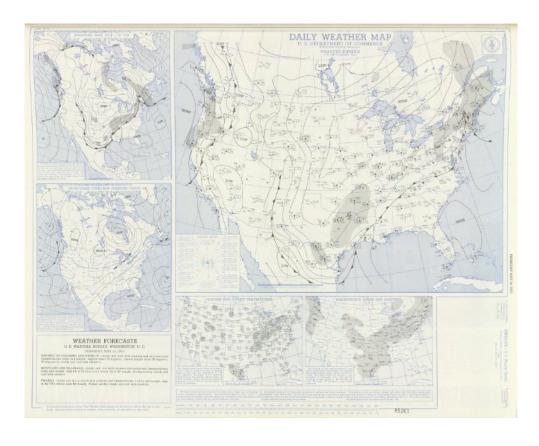


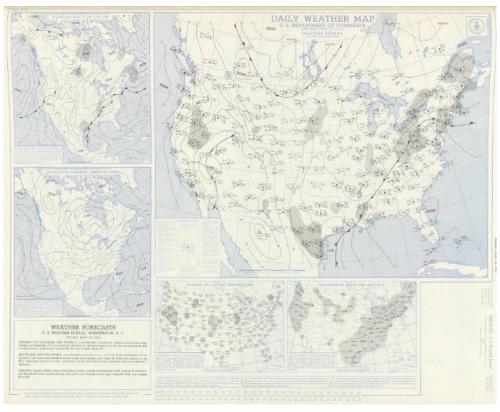


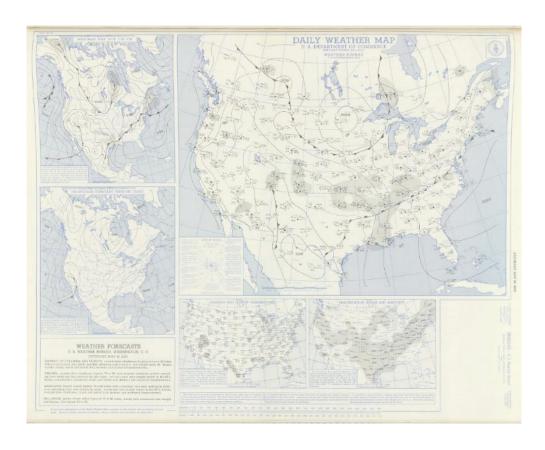


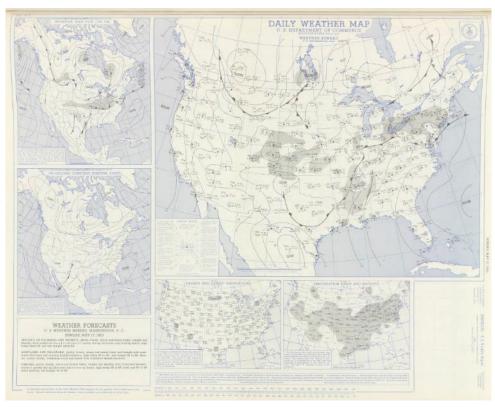


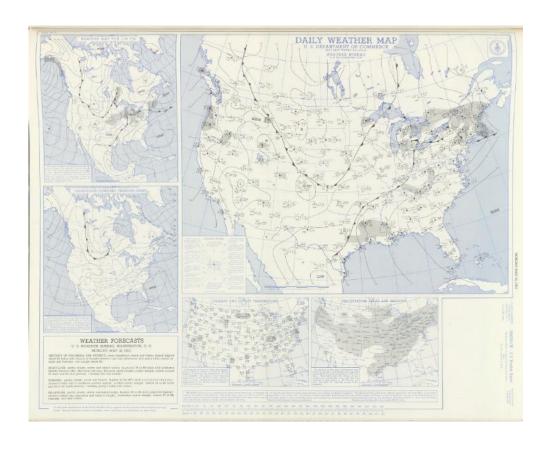


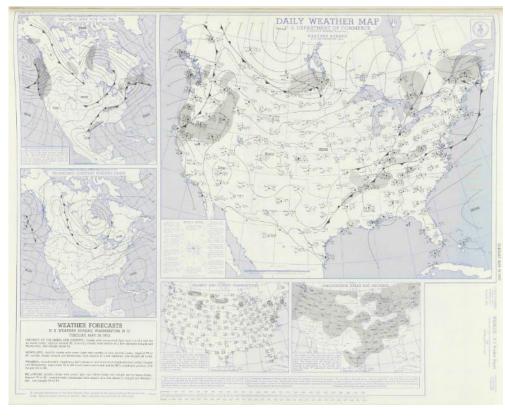




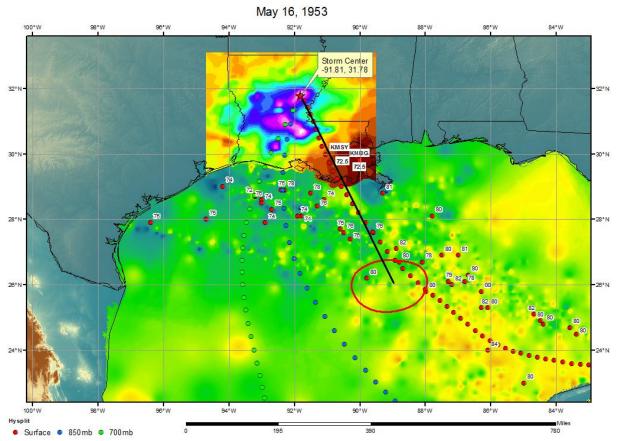








SPAS 1435 Harrisonburg, LA Storm Analysis



Storm Precipitation Analysis System (SPAS) For Storm #1312A SPAS Analysis

General Storm Location: Rosman, NC has the max total of 35.38"

Storm Dates: September 26 - October 3, 1964

Event: Semi-stationary front

DAD Zone 1 - Northwest

Latitude: 37.7375

Longitude: -81.59583

Max. Grid Rainfall Amount: 9.22" at Rollins Branch, WV

DAD Zone 2 - Central

Latitude: 35.14583

Longitude: -82.80416

Max. Grid Rainfall Amount: 17.86"

Number of Stations: 1,365 stations (325 of which are hourly)

SPAS Version: 9.5

Base Map Used: Digitized TVA Isohyetal Map (storm total Sept 28 - Oct 6); expanded using SPAS storm

totals

Spatial resolution: 30 seconds

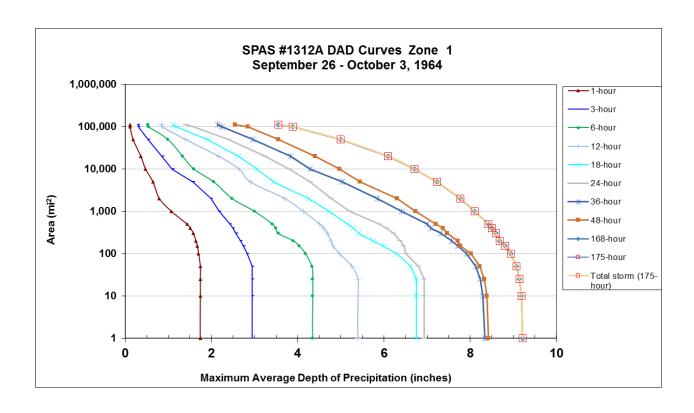
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

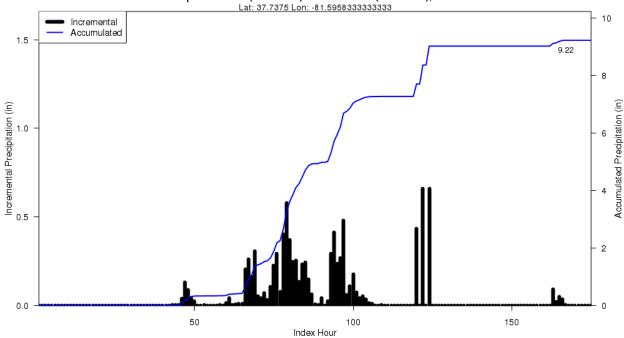
Reliability of Results: In addition to the 314 hourly stations from NCDC used in the whole project area, fourteen additional hourly stations were digitized from the TVA report adding more certainty to the timing of the storm center. The extent and magnitude of the rainfall is moderately reliable given the surprising large number of daily rain gauges available.

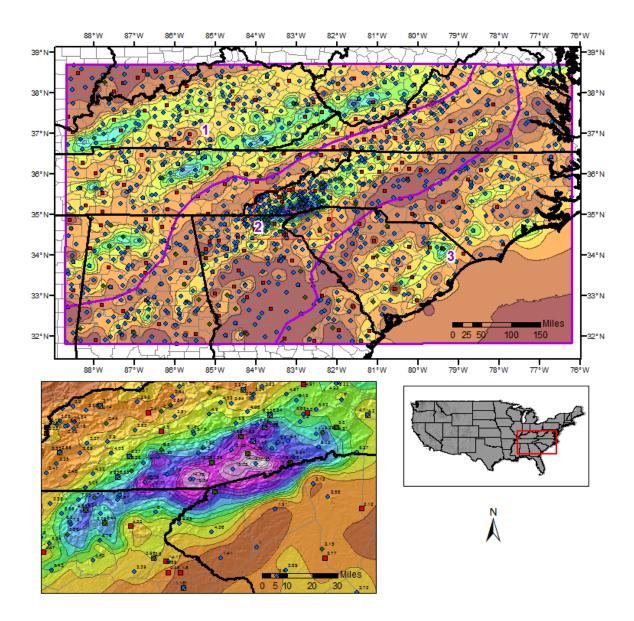
Storm Name:	SPAS 1312 - F	Polline Rro	nch WV								
Storm Date:	9/26-10/3/196		iicii, vv v		S	torm A	dinetr	ent for	Virgini	9	
	Date: 11/14/2015				Ь	101111 11	lujustii	iciit ioi	VII SIII	a	
Temporal Tran	nsposition Date	15-Sep									
	•	Lat	Long			Moisture	Inflow Dire	ection	S @ 490	miles	
Storm Center l	Location	37.74 N	81.60 W			Basin Ave	rage Elevat	ion	N/A	feet	
	w Point Location	30.65 N	82.50 W				nter Elevati		2,100	feet	
_	Dew Point Location	2010211	02120 11				dysis Dura		24	hours	
Basin Location							Barrier Hei		N/A	feet	
		-									
The	storm representative d	lew point is	74.5 F	with tot	al precipital	ole water abo	ve sea level	of		2.79	inches.
T	he in-place maximum d	lew point is	76.5 F	with tot	al precipital	ole water abo	ve sea level	of		3.07	inches.
The trans	spositioned maximum d	lew point is	0.0	with tot	al precipital	ole water abo	ve sea level	of		#N/A	inches.
	The in-place storm	elevation is	2,100	which	ch subtracts	0.50	inches of	precipitable	e water at	74.5 F	
	The in-place storm	elevation is	2,100	which	ch subtracts	0.53	inches of	precipitable	e water at	76.5 F	
	The transposition basin		N/A	which	ch subtracts	x.xx	inches of	precipitable	e water at	0.0	
The inflo	w barrier/basin elevation	on height is	N/A	which	ch subtracts	x.xx	inches of	precipitable	e water at	0.0	
	The in-place storm			1.11		Notes:					
	The transposition/elev			#N/A							
	The barr	ier adjustme	ent factor is	#N/A							
	The to	tal adjustme	ent factor is	#N/A	ļ	<u> </u>				1	
Obs	served Storm Depth-A	·	·		10 ==			10	50	104==	125 ==
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq mile	1.7	4.4	5.4	6.8	6.9	8.3	8.4	8.4	8.4	8.4
	10 sq miles	1.7	4.4	5.4	6.8	6.9	8.3	8.4	8.4	8.4	8.4
	100 sq miles	1.7	4.2	5.0	6.3	6.5	7.9	8.0	8.0	8.0	8.0
	200 sq miles	1.6	3.9	4.8	5.7	6.4	7.6	7.7	7.7	7.7	7.7
	500 sq miles	1.4	3.4	4.5	5.2	5.9	7.0	7.2	7.2	7.2	7.2
	1000 sq miles	1.1	3.0	4.1	4.7	5.2	6.4	6.7	6.7	6.7	6.7
	2000 sq miles	0.8 0.6	2.5	3.7 2.9	4.3 3.4	4.8 4.3	5.9 5.0	6.3 5.4	6.3 5.4	6.3 5.4	6.3 5.4
<u></u>	5000 sq miles 10000 sq miles	0.5	1.6	2.6	3.1	3.8	4.3	5.4	5.0	5.0	5.0
	20000 sq miles	0.3	1.3	2.2	2.6	3.2	3.8	4.4	4.4	4.4	4.4
	50000 sq miles	0.4	1.0	1.4	1.9	2.4	3.0	3.6	3.6	3.6	3.6
	100000 sq miles	0.2	0.5	0.9	1.2	1.6	2.2	2.8	2.8	2.8	2.8
	100000 sq miles	0.1	0.5	0.7	1,2	1.0	2.2	2.0	2.0	2.0	2.0
Stor	rm or Storm Center Na	me		SPAS 1312	- Rolling F	ranch WV					
	rm Date(s)	inc		9/26-10/3/1		rancii, ** *					
	rm Type			Synoptic ev		g an interact	ion with Hu	rricane Hild	a (Oct 4-5)		
	rm Location			37.74 N	81.60 W				, - /		
	rm Center Elevation			2100							
Pred	cipitation Total & Dura	tion		9.22 inches	in 240 hour	'S					
	rm Representative Dew			74.5 F	24						
	rm Representative Dew	Point Loca	tion	30.65 N	82.50 W						
	ximum Dew Point			76.5 F							
	isture Inflow Vector			S @ 490							
In-p	olace Maximization Fac	tor		1.11							
-	1.00			15.0						-	
	nporal Transposition (D	,		15-Sep							
	nsposition Dew Point L										
	nsposition Maximum D			#N/ A						-	
	nsposition Adjustment l	ractor		#N/A	-					-	
	rage Basin Elevation hest Elevation in Basin			N/A N/A							
	ow Barrier Height			N/A N/A							
	rier Adjustment Factor			#N/A							
	al Adjustment Factor			#N/A						-	
1012	aı Aujustincili Factor			π1 V//1						<u> </u>	

	Storm	1312A	- Septe	mber 26	6 (0600	UTC) - (October	3 (1200	UTC),	1964	
		MAX	IMUM A	/ERAGE	DEPTH (OF PREC	IPITATIO	N (INCH	ES)		
A (:2)					Dui	ration (hou	ırs)				
Area (mi²)	1	3	6	12	18	24	36	48	168	175	Total
0.3	1.80	3.04	4.47	5.52	6.93	7.12	8.34	8.44	9.22	9.22	9.22
1	1.74	2.94	4.35	5.40	6.75	6.94	8.34	8.43	9.22	9.22	9.22
10	1.74	2.94	4.35	5.40	6.75	6.94	8.30	8.39	9.19	9.19	9.19
25	1.74	2.94	4.35	5.40	6.75	6.94	8.24	8.33	9.15	9.15	9.15
50	1.74	2.94	4.33	5.26	6.62	6.80	8.13	8.22	9.07	9.07	9.07
100	1.70	2.82	4.18	4.97	6.29	6.51	7.92	8.02	8.94	8.94	8.94
150	1.67	2.74	4.04	4.82	6.00	6.46	7.72	7.78	8.81	8.81	8.81
200	1.64	2.67	3.90	4.77	5.74	6.38	7.57	7.72	8.69	8.69	8.69
300	1.58	2.57	3.55	4.69	5.41	6.22	7.32	7.47	8.60	8.60	8.60
400	1.51	2.49	3.49	4.60	5.29	6.06	7.09	7.37	8.51	8.51	8.51
500	1.43	2.42	3.41	4.51	5.16	5.90	7.01	7.21	8.43	8.43	8.43
1,000	1.07	2.17	3.00	4.13	4.72	5.21	6.41	6.73	8.11	8.11	8.11
2,000	0.79	1.98	2.48	3.70	4.25	4.78	5.85	6.31	7.78	7.78	7.78
5,000	0.64	1.57	2.05	2.90	3.44	4.28	5.03	5.44	7.23	7.23	7.23
10,000	0.47	1.09	1.59	2.64	3.06	3.80	4.29	4.97	6.71	6.71	6.71
20,000	0.36	0.85	1.33	2.17	2.63	3.24	3.84	4.40	6.10	6.10	6.10
50,000	0.18	0.53	0.99	1.40	1.92	2.39	2.96	3.55	5.00	5.00	5.00
100,000	0.11	0.30	0.54	0.85	1.19	1.58	2.24	2.84	3.88	3.88	3.88
113,361	0.11	0.29	0.52	0.84	1.10	1.40	2.14	2.55	3.55	3.55	3.55



SPAS 1312 Storm Center Mass Curve Zone 1 September 26 (0600UTC) to October 3 (1200UTC), 1964 Lat: 37.7375 Lon: -81.5958333333333

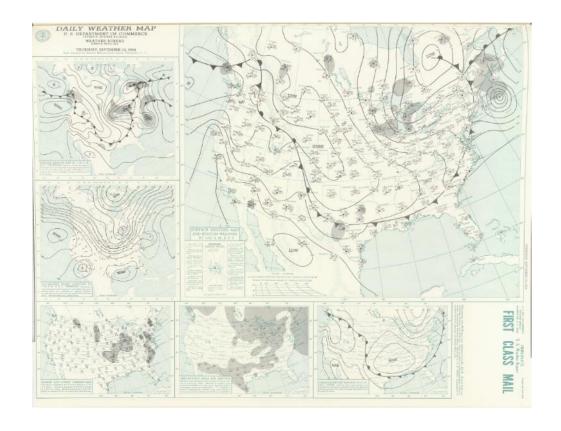


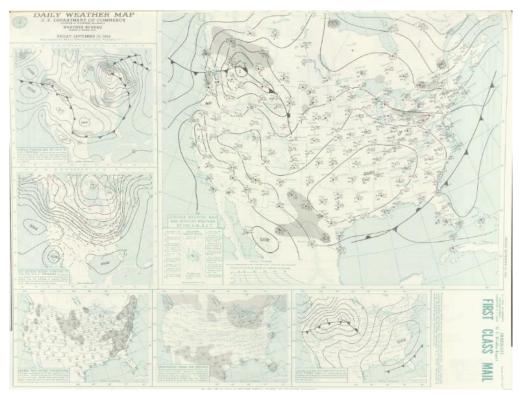


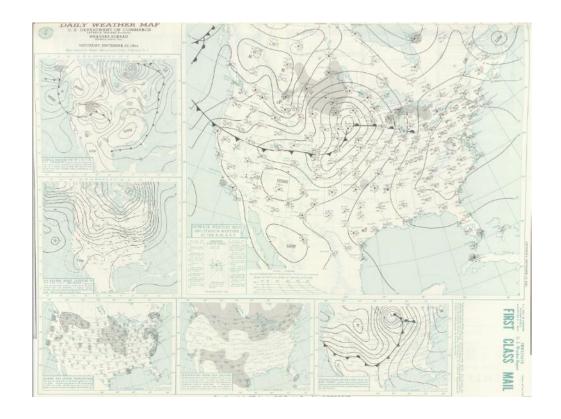
Total 175-hour Precipitation (inches)
September 26, 1964 0600 UTC - October 3, 1964 1200 UTC
SPAS #1312A

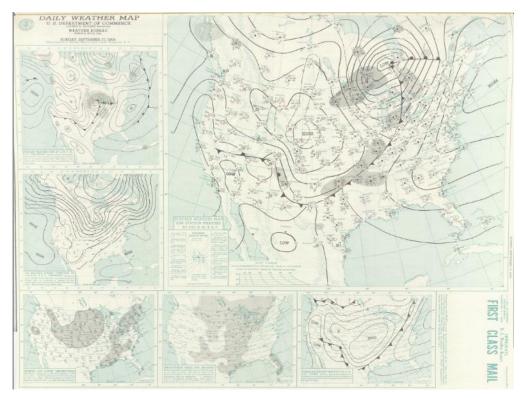


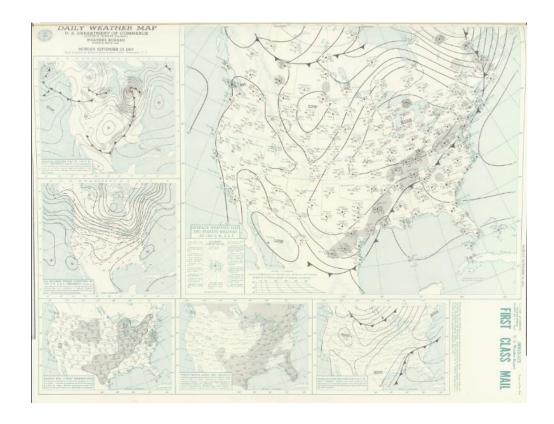
TWP 02/20/2014

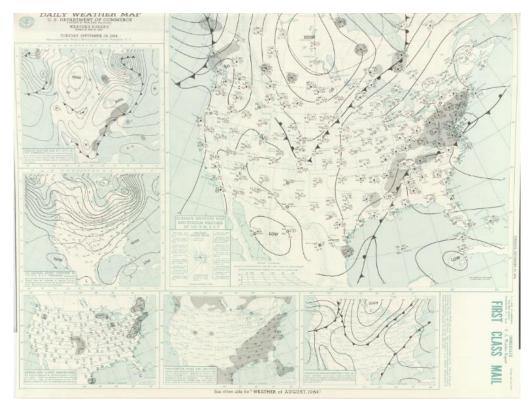


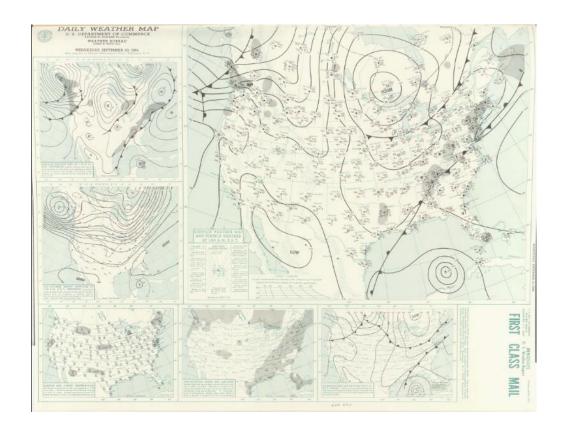


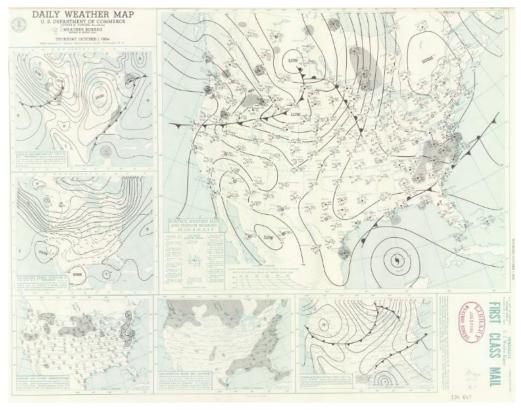


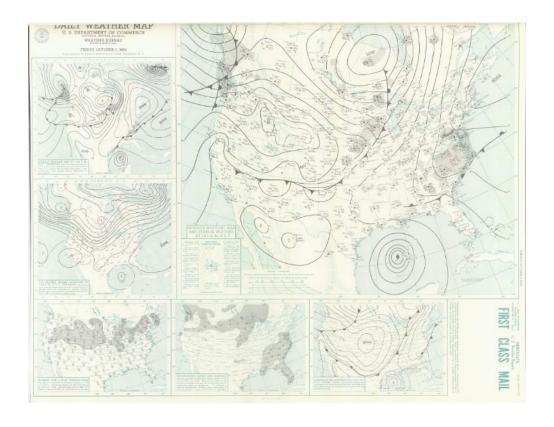


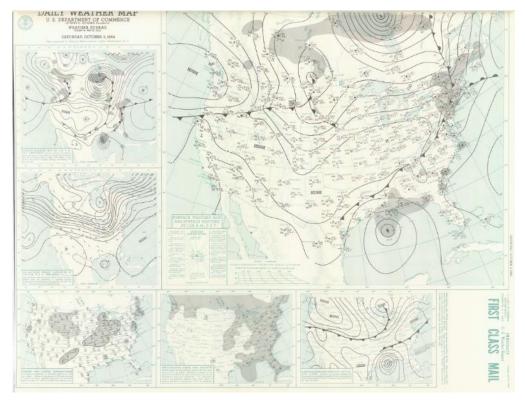




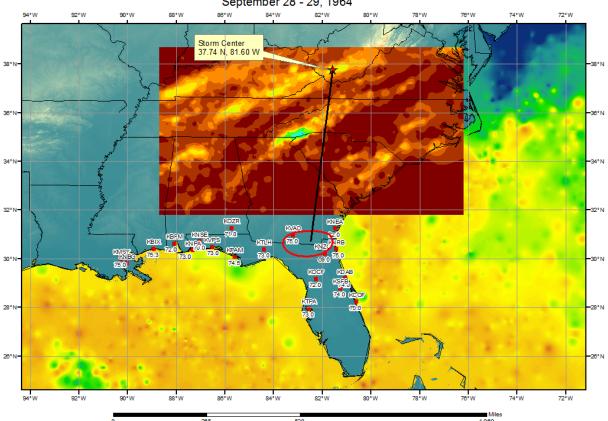








SPAS 1312 Rollins Branch, WV Storm Analysis September 28 - 29, 1964



Storm Precipitation Analysis System (SPAS) For Storm #1312A SPAS Analysis

General Storm Location: Rosman, NC has the max total of 35.38"

Storm Dates: September 26 – October 3, 1964

Event: Semi-stationary front

DAD Zone 1 - Northwest

Latitude: 37.7375

Longitude: -81.59583

Max. Grid Rainfall Amount: 9.22" at Rollins Branch, WV

DAD Zone 2 - Central

Latitude: 35.14583

Longitude: -82.80416

Max. Grid Rainfall Amount: 17.86"

Number of Stations: 1,365 stations (325 of which are hourly)

SPAS Version: 9.5

Base Map Used: Digitized TVA Isohyetal Map (storm total Sept 28 - Oct 6); expanded using SPAS storm

totals

Spatial resolution: 30 seconds

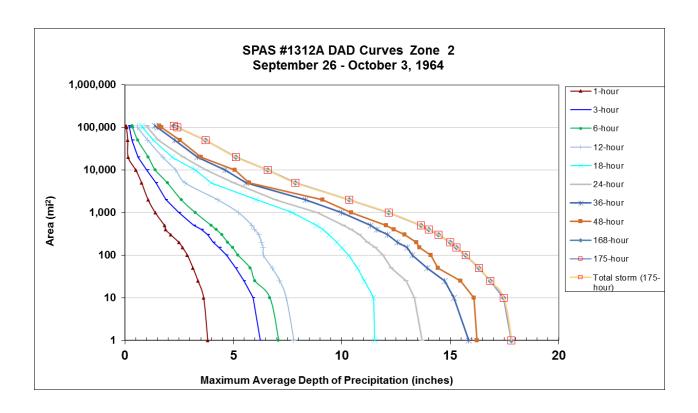
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

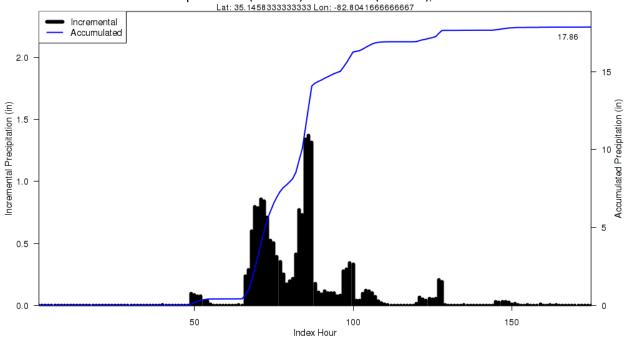
Reliability of Results: In addition to the 314 hourly stations from NCDC used in the whole project area, fourteen additional hourly stations were digitized from the TVA report adding more certainty to the timing of the storm center. The extent and magnitude of the rainfall is moderately reliable given the surprising large number of daily rain gauges available.

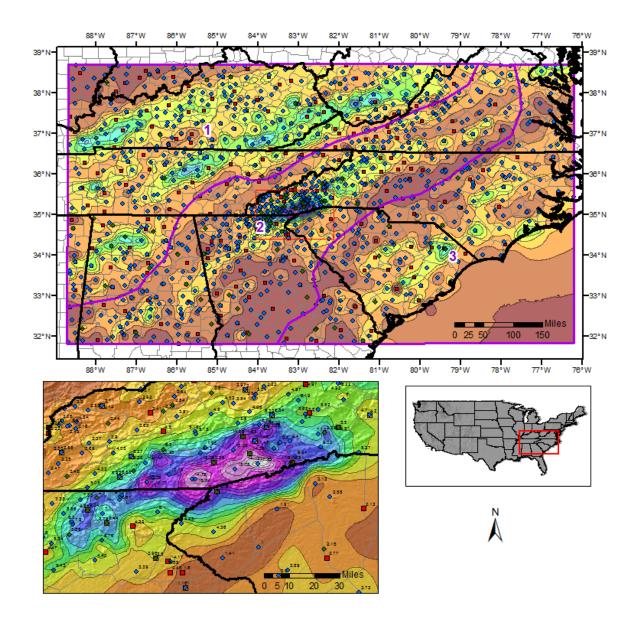
Storm Name:	SPAS 1312 - I	Rosman, NC	Zone 2								
Storm Date:	9/26-10/3/196				S	Storm A	djustn	ent for	· Virgini	a	
AWA Analysis Date:	11/14/2015								8		
Temporal Transpos	tion Date	15-Sep									
		Lat	Long			Moisture	Inflow Dire	ection	S @ 310	miles	
Storm Center Locat	ion	35.14 N	82.80 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep Dew Poi	nt Location	30.65 N	82.50 W			Storm Cer	nter Elevati	on	2,300	feet	
Transposition Dew	Point Location					Storm Ana	alysis Dura	tion	24	hours	
Basin Location						Effective 1	Barrier Hei	ght	N/A	feet	
	n representative o		74.5 F		• •		ove sea level			2.79	inches.
	place maximum o	•	76.5 F		• •		ove sea level			3.07	inches.
•	oned maximum oned oned maximum oned oned oned oned oned oned oned oned	•	2,300		ai precipitat ch subtracts	1	ove sea level	oı precipitabl	o water at	#N/A 74.5 F	inches.
	e in-place storm		2,300		ch subtracts			precipitable precipitable		74.5 F	
	nsposition basin		N/A		ch subtracts			precipitable		0.0	
	rier/basin elevati		N/A		ch subtracts			precipitable		0.0	
								F			
Т	ne in-place storm	maximizati	on factor is	1.10		Notes: Storm	n representativ	e dew point v	alue was based	on maximum	
	ransposition/ele			#N/A					at KVAD, KNI		
		ier adjustme		#N/A		KJAX.					
	The to	tal adjustme	nt factor is	#N/A							
Observed	l Storm Depth-A	Area-Durati	on								
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	3.8	7.1	7.8	11.5	13.7	15.9	16.2	16.2	16.2	16.2
	10 sq miles	4	6.7	7.4	11.5	13.4	15.2	16.1	16.1	16.1	16.1
	100 sq miles	·	5.2	6.4	10.3	11.9	13.3	14.1	14.1	14.1	14.1
	200 sq miles	ţ	4.7	6.3	9.8	11.2	12.6	13.5	13.5	13.5	13.5
	500 sq miles	·	4.0	5.9	8.8	10.1	11.4	12.0	12.0	12.0	12.0
	1000 sq miles	·	3.3 2.6	5.2 4.3	7.7 6.1	8.9 6.9	10.0 8.3	10.5 9.1	10.5 9.1	9.1	10.5 9.1
	2000 sq miles	ļ	2.0	2.8	4.0	5.0	5.6	9.1 5.7	5.7	5.7	5.7
	5000 sq miles 10000 sq miles	<u> </u>	1.4	2.3	3.3	3.8	4.6	5.1	5.1	5.1	5.1
	20000 sq miles	/	1.1	1.8	2.2	2.7	3.3	3.5	3.5	3.5	3.5
	50000 sq miles	<u> </u>	0.6	1.1	1.3	1.6	2.3	2.6	2.6	2.6	2.6
	100000 sq miles	·	0.4	0.6	0.8	1.0	1.5	1.7	1.7	1.7	1.7
Storm or	Storm Center Na	me		SPAS 1312	- Rosman.	NC Zone 2					1
Storm Da				9/26-10/3/1							
Storm Ty	ne e			Synoptic ev	ent includin	g an interact	ion with Hu	rricane Hild	a (Oct 4-5)		
Storm Lo	cation			35.14 N	82.80 W						
Storm Ce	nter Elevation			2300							
Precipitat	ion Total & Dura	tion		17.86 inche	s in 240 hou	urs					
	<u> </u>	<u></u>									
	presentative Dew			74.5 F	24						
	presentative Dew	Point Loca	tion	30.65 N	82.50 W						
	Dew Point			76.5 F		-					
	Inflow Vector Maximization Fac	tor		S @ 310 1.10							
m-prace r	raammzation Fac	101		1.10							
Temporal	Transposition (E	Date)		15-Sep	-		-				
	tion Dew Point I			10 Бер							
	tion Maximum I										
	tion Adjustment			#N/A							
	Basin Elevation			N/A							
	levation in Basin			N/A							
	rrier Height		_	N/A							
	djustment Factor			#N/A							
Barrier A	ajustinent ractor			111 1111							

	Storm	1312A	- Septe	mber 26	6 (0600	UTC) - (Octobe	r 3 (120	UTC),	1964	
		MAX	IMUM A	/ERAGE	DEPTH (OF PREC	IPITATIO	ON (INCH	ES)		
A = = (;2)					Du	ration (hou	ırs)				
Area (mi²)	1	3	6	12	18	24	36	48	168	175	Total
0.3	3.92	6.38	7.23	7.94	11.75	13.94	15.88	16.49	17.86	17.86	17.86
1	3.82	6.24	7.09	7.79	11.52	13.70	15.86	16.24	17.83	17.83	17.83
10	3.63	5.90	6.69	7.44	11.46	13.35	15.16	16.10	17.47	17.47	17.47
25	3.37	5.48	6.00	7.14	11.04	12.97	14.74	15.48	16.84	16.84	16.84
50	3.14	5.11	5.78	6.79	10.72	12.29	13.94	14.44	16.34	16.34	16.34
100	2.88	4.67	5.22	6.39	10.31	11.91	13.26	14.10	15.72	15.72	15.72
150	2.66	4.36	4.97	6.38	10.01	11.55	13.01	13.58	15.30	15.30	15.30
200	2.49	4.07	4.74	6.29	9.77	11.20	12.58	13.45	15.01	15.01	15.01
300	2.12	3.82	4.47	6.18	9.42	10.83	12.11	12.91	14.47	14.47	14.47
400	1.87	3.53	4.21	5.98	9.12	10.44	11.62	12.40	14.02	14.02	14.02
500	1.82	3.17	3.98	5.86	8.82	10.09	11.35	12.04	13.65	13.65	13.65
1,000	1.40	2.49	3.25	5.24	7.71	8.89	9.99	10.45	12.17	12.17	12.17
2,000	1.07	1.88	2.60	4.28	6.05	6.93	8.34	9.12	10.35	10.35	10.35
5,000	0.77	1.43	1.96	2.78	3.99	5.02	5.58	5.73	7.86	7.86	7.86
10,000	0.50	1.02	1.40	2.34	3.27	3.75	4.62	5.06	6.59	6.59	6.59
20,000	0.15	0.61	1.08	1.75	2.19	2.71	3.34	3.51	5.12	5.12	5.12
50,000	0.13	0.33	0.59	1.06	1.32	1.55	2.31	2.55	3.72	3.72	3.72
100,000	0.07	0.20	0.36	0.58	0.82	1.04	1.50	1.68	2.42	2.42	2.42
108,165	0.06	0.18	0.33	0.58	0.78	1.02	1.38	1.59	2.25	2.25	2.25



SPAS 1312 Storm Center Mass Curve Zone 2 September 26 (0600UTC) to October 3 (1200UTC), 1964 Lat: 35.14583333333333 Lon: -82.8041666666667

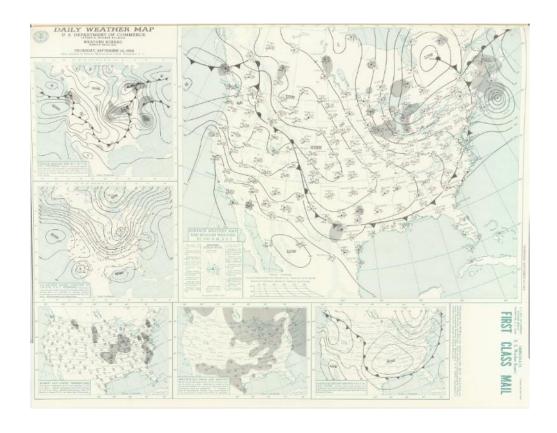


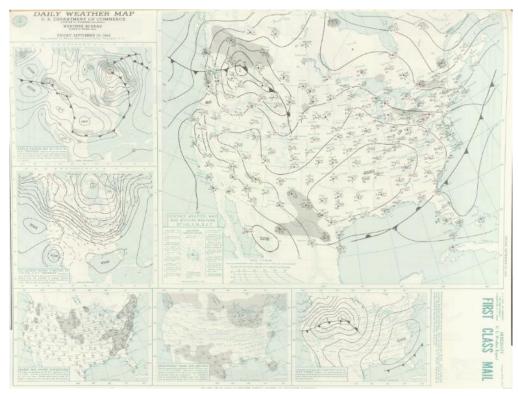


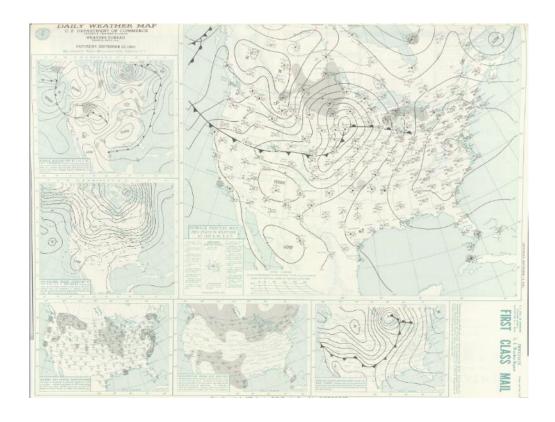
Total 175-hour Precipitation (inches)
September 26, 1964 0600 UTC - October 3, 1964 1200 UTC
SPAS #1312A

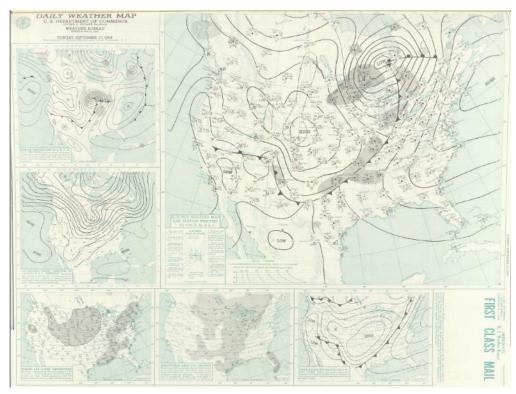


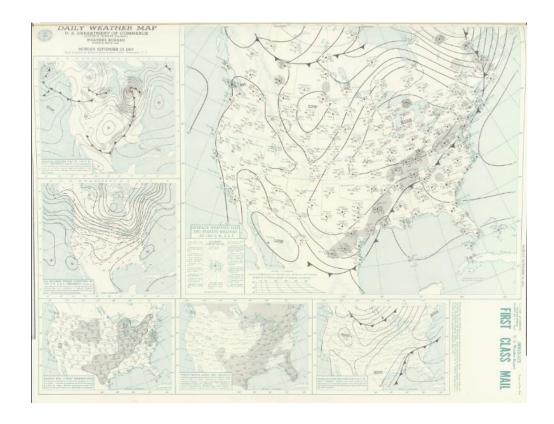
TWP 02/20/2014

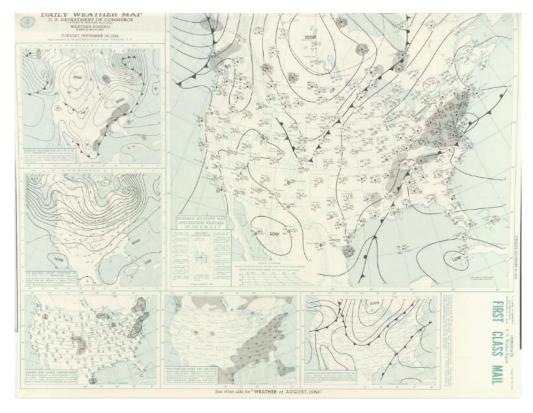


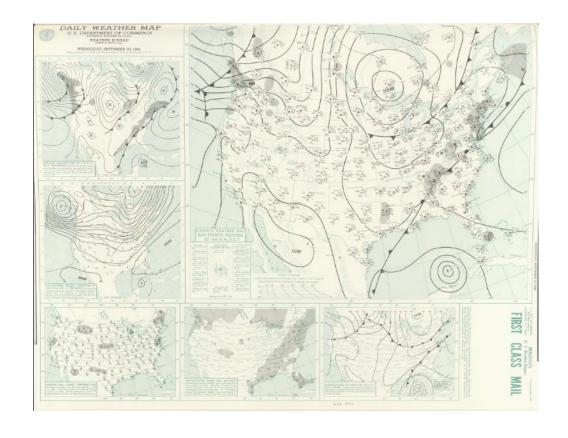


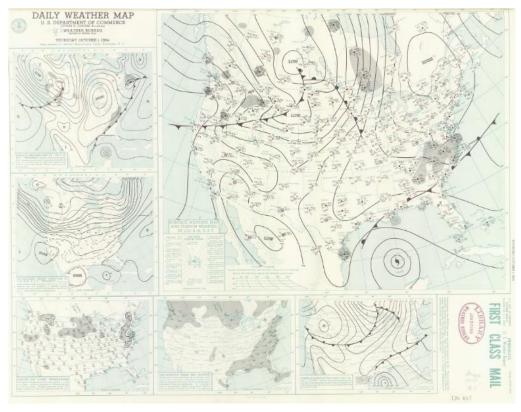


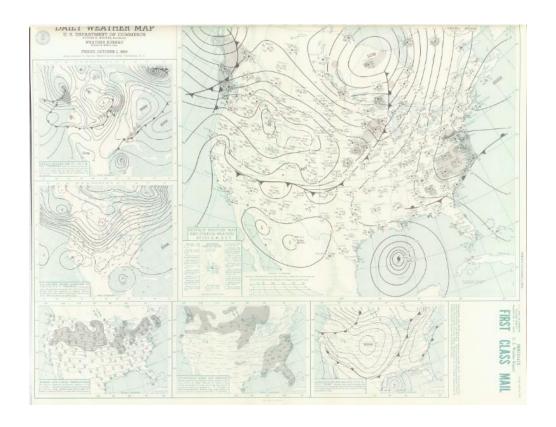


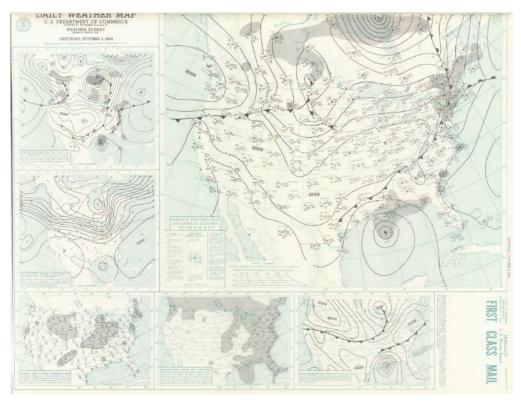




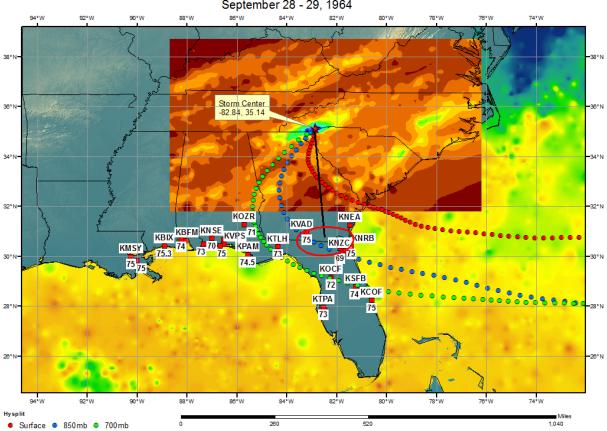








SPAS 1312 Rosman, NC Storm Analysis September 28 - 29, 1964



Storm Precipitation Analysis System (SPAS) For Storm #1183 SPAS-General Analysis

General Storm Location: Edgerton, Missouri

Storm Dates: July 18-20, 1965

Event: Synoptic

DAD Zone 1

Latitude: 40.4125

Longitude: -95.5125

Max. Grid Rainfall Amount: 20.76"

Max. Observed Rainfall Amount: 20.10" at ATCHISON 65N 41W SCT34

Number of Stations: 387 (90 Daily, 41 Hourly, 4 Hourly Estimated, 2 Hourly Estimated Pseudo, 13

Hourly Pseudo, and 237 Supplemental)

SPAS Version: 8.5

Base Map Used: Yes, conus_prism_ppt_in_1971_2000_07

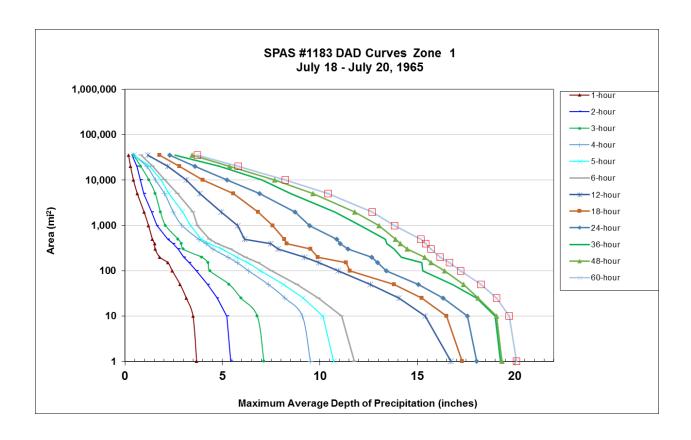
Spatial resolution: 00:00:30 (0.3 sq. miles)

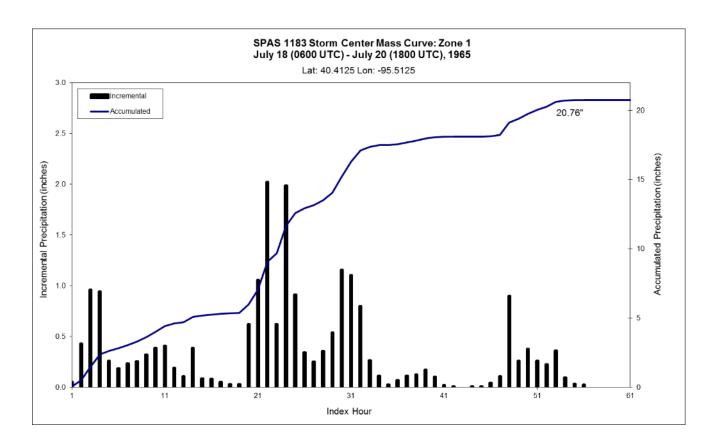
Radar Included: No

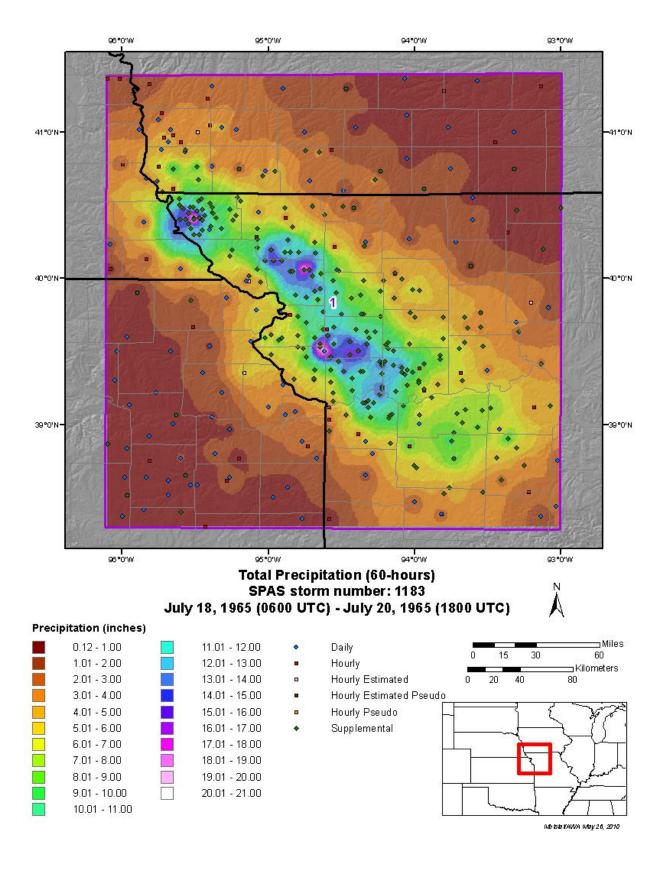
Depth-Area-Duration (DAD) analysis: Yes

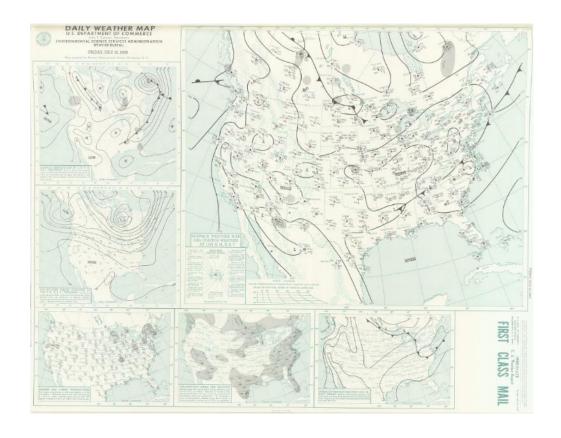
Storm Name:	SPAS 1183 - I	Edganton N	IO Zono 1								
//www.com/com/com/com/com/com/com/com/com/com/	7/18-20/1965		10 Zone 1		C	torm A	diuctm	ant for	Virgin	ia	
AWA Analysis Date:					3	will A	ujusuli	CIII IUI	v II gill	ıa	
Temporal Transpositi		15-Jul									
Temporar Transpositi	on Date	Lat	Long			Moisture	Inflow Dire	ection	SW @ 100	miles	
Storm Center Location	n e	40.41 N	95.51 W				rage Elevat		N/A	feet	
		39.22 N	96.58 W						900	feet	
Storm Rep Dew Point Transposition Dew Po		39.22 N	90.58 W			1	iter Elevati ilysis Dura		24	hours	
Basin Location	mit Location					1	aysis Dura Barrier Hei		N/A	feet	
Dusin Eccution						Effective	Jaillet He	giit	11/11	1001	
The storm r	epresentative o	lew point is	76.0 F	with to	tal precipita	ble water ab	ove sea leve	of .		2.99	inches.
	ace maximum d		80.5 F			ble water ab				3.68	inches.
The transposition		•	0.0			ble water ab				#N/A	inches.
	n-place storm		900		ch subtracts			precipitabl	e water at	76.0 F	
	n-place storm		900	whie	ch subtracts	0.28		precipitabl		80.5 F	
The trans	position basin	elevation at	N/A	whie	ch subtracts	x.xx	inches of	precipitabl	e water at	0.0	
The inflow barrie	er/basin elevation	on height is	N/A	whie	ch subtracts	x.xx	inches of	precipitabl	e water at	0.0	
Th	e in-place stori	m maximiza	tion factor is	1.23					1183. Storm re	•	
The tr	ransposition/el	evation to b	asin factor is	#N/A		average on J	uly 17-18 from	n KTOP, KFI	RI, and KCNK		
	The bar	rrier adjustn	nent factor is	#N/A							
	The t	total adjustn	nent factor is	#N/A							
Observed S	Storm Depth-A	Area-Durat	ion								
000000000000000000000000000000000000000		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	3.7	11.8	16.7	17.3	18.0	19.3	19.4	20.1	20.1	20.1
	10 sq miles	3.5	11.1	15.4	16.5	17.6	19.0	19.1	19.7	19.7	19.7
	100 sq miles	2.4	7.5	11.0	11.5	13.4	15.3	16.4	17.2	17.2	17.2
	200 sq miles	1.8	6.2	9.2	9.9	12.7	14.2	15.4	16.2	16.2	16.2
	500 sq miles	1.4	4.4	6.1	8.2	10.9	13.4	13.9	15.2	15.2	15.2
	1000 sq miles	1.2	3.7	5.8	7.6	9.5	12.1	13.0	13.8	13.8	13.8
	2000 sq miles	1.0	3.5	4.9	6.8	8.7	10.8	11.8	12.7	12.7	12.7
	5000 sq miles	0.6	2.7	3.8	5.6	6.9	8.5	9.7	10.4	10.4	10.4
	0000 sq miles	0.4	2.1	3.2	4.0	5.2	7.0	7.7	8.2	8.2	8.2
	0000 sq miles	0.3	1.4	2.2	2.8	3.6	4.9	5.4	5.8	5.8	5.8
3	5221 sq miles	0.2	0.8	1.2	1.8	2.3	2.6	3.5	3.7	3.7	3.7
											1
	orm Center Na	me				n, MO Zone	1				
Storm Date	` /			7/18-20/19							
Storm Type				General Sto							
Storm Local	tion er Elevation			40.41 N 900	95.51 W	-					
	er Elevation on Total & Dura	ation (10 sa	mi)	7 0 0	as in 60hra	18.59" in 24	hre				
riecipitatio	ni 10tal & Dura	mion (10 sq	11111)	20.70 Inch	o in ounis,	10.J9 III 24	1111.5				
Storm Paper	esentative Dew	/ Point		76.0 F	24						
	esentative Dew		tion	39.22 N	96.58 W						
Maximum I		- om Loca		80.5 F	2 0.00 11						
	flow Vector			SW @ 100							
	ximization Fac	tor		1.23							
Temporal T	ransposition (I	Date)		15-Jul							
	on Dew Point I										
Transposition	on Maximum D	ew Point									
	on Adjustment			#N/A							
	sin Elevation			N/A							
	vation in Basin	1		N/A							
Inflow Barr	ier Height			N/A							
Barrier Adj	ustment Factor			#N/A							
T-4-1 A J	tment Factor			#N/A							

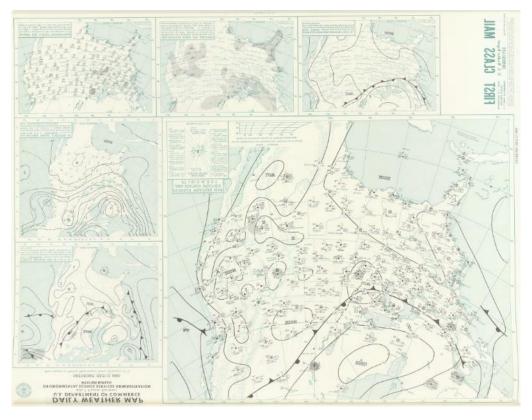
						600 UT							
			WAX	INIUM A	VERAGE	DEPTH (ration (hou		N (INCH	E5)			
Area (mi²)	1	2	3	4	5	6	12	18 18	24	36	48	60	Total
0.3	3.77	5.64	7.34	9.83	10.97	12.06	17.13	17.80	18.59	19.82	19.86	20.76	20.76
1	3.68	5.44	7.13	9.52	10.71	11.77	16.72	17.29	18.04	19.27	19.35	20.08	20.08
10	3.49	5.23	6.79	9.10	10.15	11.11	15.41	16.49	17.56	19.00	19.06	19.71	19.71
25	3.15	4.72	5.96	8.21	9.13	9.93	14.05	15.23	16.32	18.04	18.12	19.06	19.06
50	2.83	4.24	5.35	7.36	8.12	8.83	12.60	13.81	15.05	16.79	17.37	18.27	18.27
100	2.43	3.67	4.36	6.34	6.94	7.52	10.95	11.54	13.41	15.27	16.39	17.22	17.22
150	2.21	3.31	4.26	5.77	6.32	6.84	9.96	11.34	12.96	15.23	15.69	16.66	16.66
200	1.79	3.02	3.94	5.28	5.72	6.18	9.23	9.90	12.66	14.18	15.38	16.18	16.18
300	1.55	2.74	2.99	4.53	5.00	5.41	7.86	9.53	11.45	13.80	14.49	15.71	15.71
400	1.52	2.47	2.90	4.16	4.30	4.74	7.48	8.30	11.04	13.43	14.13	15.44	15.44
500	1.41	2.20	2.73	3.79	3.91	4.35	6.13	8.17	10.88	13.37	13.88	15.17	15.17
1,000	1.21	1.63	2.09	2.93	3.37	3.71	5.79	7.57	9.48	12.08	13.04	13.83	13.83
2,000	0.98	1.37	1.82	2.48	2.95	3.49	4.94	6.83	8.74	10.76	11.80	12.70	12.70
5,000	0.64	0.98	1.56	2.04	2.26	2.69	3.84	5.57	6.92	8.50	9.66	10.42	10.42
10,000	0.44	0.80	1.24	1.57	1.86	2.06	3.16	4.00	5.23	7.03	7.67	8.24	8.24
20,000	0.29	0.61	0.82	1.13	1.29	1.44	2.21	2.81	3.59	4.86	5.36	5.81	5.81
35,221	0.19	0.37	0.45	0.46	0.46	0.83	1.17	1.78	2.29	2.57	3.46	3.72	3.72

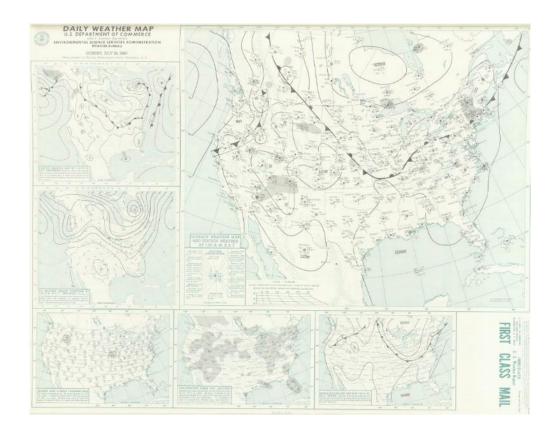


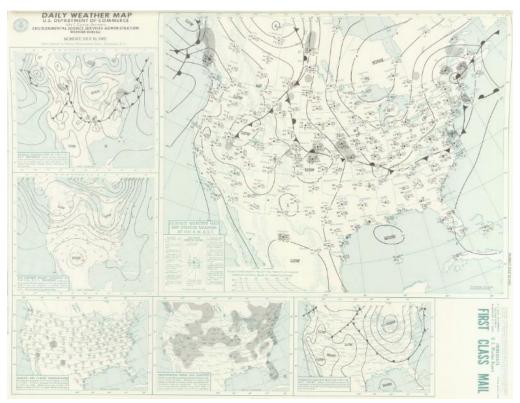


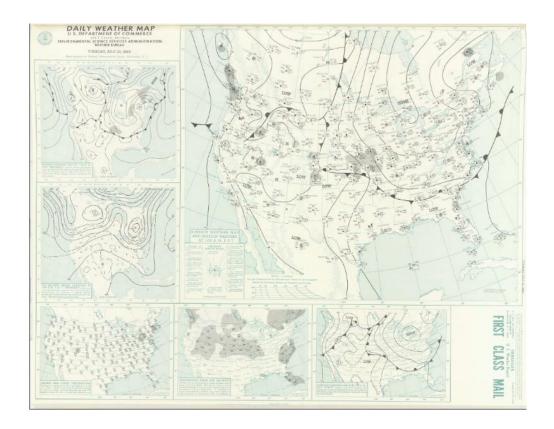




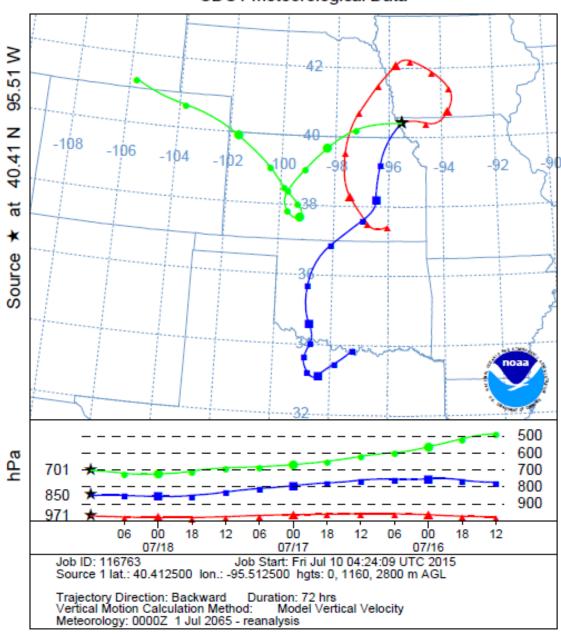


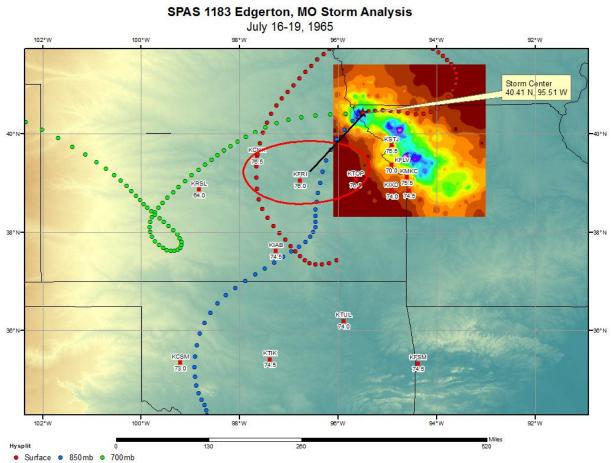






NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 18 Jul 65 CDC1 Meteorological Data





Storm Precipitation Analysis System (SPAS) For Storm #1380 SPAS Analysis

General Storm Location: Tennessee Valley (-88.6, 37.4, 34.0, -79.9)

Storm Dates: August 21 – August 24, 1967

Event: Mesoscale Storms with Embedded Convection (MEC)

DAD Zone 1

Latitude: 34.7958

Longitude: -83.6958

Max. Grid/Radar Rainfall Amount: 18.42"

Max. Observed Rainfall Amount: 18.42"

DAD Zone 2

Latitude: 34.8125

Longitude: -80.8792

Max. Grid/Radar Rainfall Amount: 12.65"

Max. Observed Rainfall Amount: 11.14"

Number of Stations: 490

SPAS Version: 9.5

Base Map Used: Mean annual maximum 48-hour precipitation associated with MECs

Spatial resolution: 0.2690

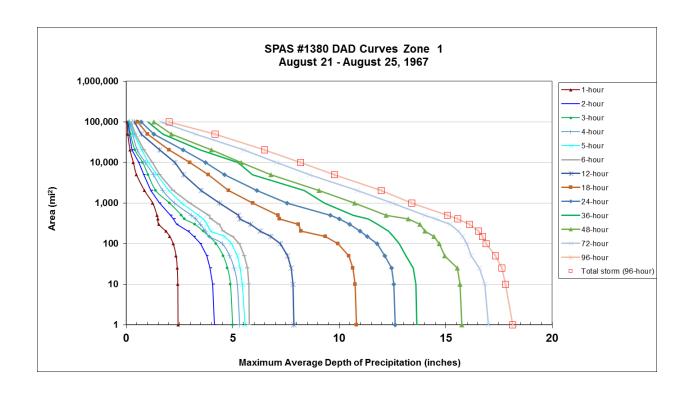
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

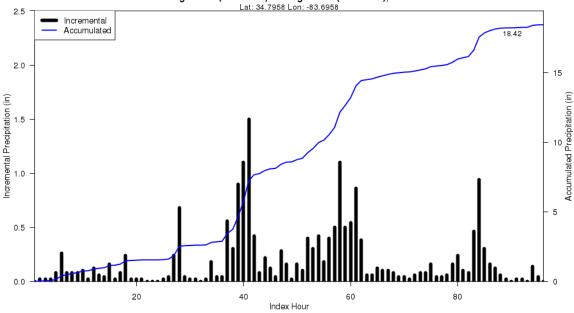
Reliability of results: In addition to the NCDC stations, seventeen supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Due to the orientation and integrity of the station data, no additional stations were digitized. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the various reports, this analysis is deemed quite reliable.

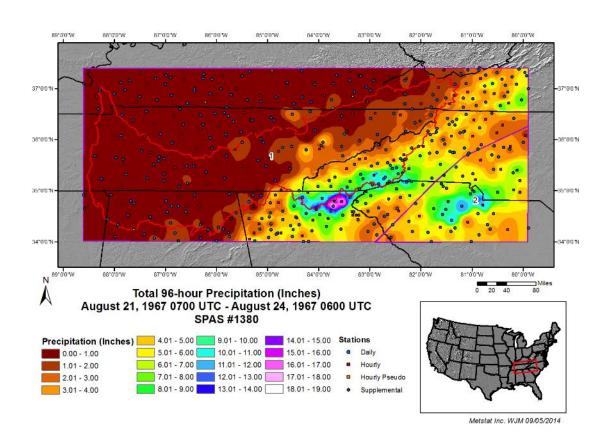
Storm Center Storm Rep D Transposition Basin Location	08/22-24/ s Date: 11/14/201 ansposition Date r Location ew Point Location n Dew Point Location	7-Aug Lat 34.80 N 31.00 N			S	Storm A	Adjustn	nent for	Virgini	a	
AWA Analysi Temporal Tra Storm Center Storm Rep D Transposition Basin Location	s Date: 11/14/201 ansposition Date r Location ew Point Location n Dew Point Location	7-Aug Lat 34.80 N 31.00 N	Lon) (O1 III 7	iujustii		vii giiii	a	
Storm Center Storm Rep D Transposition Basin Location	ansposition Date r Location ew Point Location n Dew Point Location	7-Aug Lat 34.80 N 31.00 N	Lon								
Storm Center Storm Rep D Transposition Basin Location	r Location ew Point Location n Dew Point Locati on	Lat 34.80 N 31.00 N	Lon								
Storm Rep D Transposition Basin Location	ew Point Location n Dew Point Locati on	34.80 N 31.00 N	-			Moistura	Inflow Dire	etion	SSW @ 275	miles	
Storm Rep D Transposition Basin Location	ew Point Location n Dew Point Locati on	31.00 N	83.70 W						N/A	feet	
Transposition Basin Location	n Dew Point Locati on		0 = 00				rage Elevat				
Basin Locatio	on	on	85.00 W				ıter Elevati		3,700	feet	-
Т							dysis Durat		24	hours	-
	he storm representat					Effective I	Barrier Hei	ght	N/A	feet	
	he storm representat										
The tra	•		73.5 F		tal precipital					2.67	inches.
The tra	The in-place maxim	•	79.5 F		tal precipital					3.52	inches.
	nspositioned maxim		0.0		tal precipital				<u> </u>	#N/A	inches.
	The in-place sto				ch subtracts			f precipitabl		73.5 F	
	The in-place sto		3,700		ch subtracts			f precipitabl		79.5 F	
m · .	The transposition ba				ch subtracts			f precipitabl		0.0	
Ine inf	low barrier/basin ele	vation neight is	N/A	reet wni	ch subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
	TI : 1		· · ·	124	1	Notes: Ct-	mammagt'	o dom e-it	ho mes b 1	n mari:	1
		orm maximizati		1.36					alue was based o stations used are		
	The transposition			#N/A			ies on August iM, KOZR an		stations used are	ALOF,	
<u>_</u>	The	barrier adjustm	ent factor is	#N/A		, 151 /	, 110211 011				
		1 1		1/3-7/4							
<u>L</u>	T	ne total adjustm	ent factor is	#N/A		L					<u> </u>
	-										
0	bserved Storm Dep						T	1	,		
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	
	1 sq n		5.8	7.9	10.8	12.6	13.7	15.8	17.0	18.1	18.1
	10 sq m		5.8	7.8	10.7	12.6	13.6	15.7	16.8	17.8	17.8
	100 sq m		5.3	7.2	9.9	11.8	12.8	14.7	16.0	16.9	16.9
	200 sq m	 {	4.6	6.3	8.2	11.0	12.3	14.0	15.6	16.5	16.5
	500 sq m		3.9	5.3	7.1	9.6	10.7	12.2	14.0	15.1	15.1
	1000 sq m		3.0	4.4	6.0	7.6	9.3	10.7	12.5	13.4	13.4
	2000 sq m	······	2.2	3.5	4.8	6.1	8.4	9.1	10.9	12.0	12.0
	5000 sq m		1.6	2.7	3.9	3.7	5.9	6.8	8.6	9.8	9.8
	10000 sq m		1.2 0.8	2.3 1.6	3.0	2.7	5.2 3.5	5.4 4.0	7.1 5.5	8.2 6.5	8.2 6.5
	20000 sq m 50000 sq m		0.6	0.7	1.0	1.3	1.7	2.1	3.3	4.2	4.2
_	30000 sq III	0.1	0.4	0.7	1.0	1.3	1./	2.1	3.3	4.2	4.2
G.	St. C. t	N		CD 4C 1200	D 4 D	G A					
	orm or Storm Cente	r Name			OCT	am, GA					
	orm Date			08/22-24/1		dod Commi	ion	-			
	orm Type orm Location	-		Mesoscale 34.80 N	with Embede 83.70 W	ueu Convect	1011	-	-		-
	orm Location orm Center Elevatio	n		3,700	03.70 W		-	-			-
					es in 96 hou	re	-	-			1
Pr	recipitation Total &	Juration		10.42 INCh	ES 111 70 110U	15					1
C+	orm Representative	Dew Point		73.5 F	24						
	orm Representative		ition	31.00 N	85.00 W		July	Aug			1
	aximum Dew Point	Dew I offit Loca	LI OII	79.5 F	05.00 W		79.49	79.36			1
	oisture Inflow Vector	nr.		SSW @ 27	5		12.77	17.50			1
	-place Maximization	•		1.36			-	-			1
	prace manification	1 40101		1.00			-	-			1
Tz	emporal Transposition	n (Date)		7-Aug							1
	ansposition Dew Po			, -1 sug			-	-			1
	ansposition Maximu						-	-			1
	ansposition Adjustm			#N/A			-	-			1
	verage Basin Elevation			N/A							1
	ighest Elevation in B			N/A							1
	flow Barrier Height	G()111		N/A							1
	arrier Adjustment Fa	rtor		#N/A							1
	otal Adjustment Fact			#N/A							1

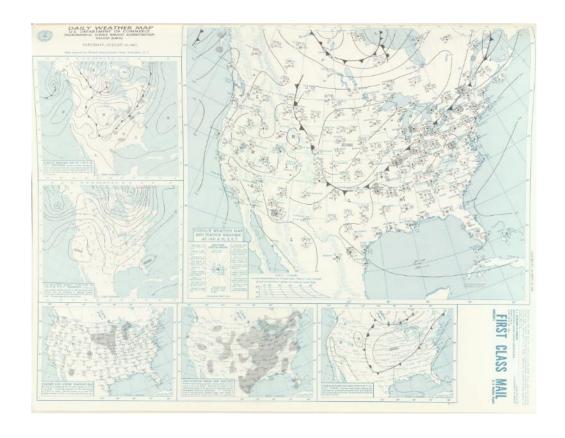
			Storm 1	380 - A	ugust 2	21 (0700	UTC) -	Augus	t 25 (06	00 UTC), 1967			
				MAXIMU	M AVER	AGE DEP	TH OF F	RECIPIT	ATION (I	NCHES)				
Aron (mi²)							Duration	(hours)						
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	96	Total
0.3	2.43	4.15	5.00	5.33	5.58	5.79	7.88	10.81	12.64	13.66	15.76	17.02	18.42	18.42
1	2.43	4.14	4.99	5.32	5.57	5.78	7.87	10.80	12.63	13.65	15.75	17.01	18.14	18.14
10	2.42	4.06	4.89	5.21	5.46	5.75	7.83	10.74	12.57	13.59	15.68	16.84	17.80	17.80
25	2.39	3.93	4.75	5.06	5.34	5.69	7.75	10.64	12.45	13.47	15.55	16.57	17.63	17.63
50	2.34	3.77	4.55	4.85	5.22	5.55	7.57	10.45	12.15	13.13	14.96	16.20	17.34	17.34
100	2.20	3.48	4.22	4.50	4.94	5.32	7.23	9.94	11.78	12.82	14.69	15.99	16.90	16.90
150	2.04	3.17	3.89	3.89	4.61	5.00	6.80	9.34	11.32	12.54	14.45	15.80	16.72	16.72
200	1.86	2.91	3.62	3.73	3.96	4.56	6.28	8.21	10.98	12.31	14.02	15.58	16.53	16.53
300	1.52	2.36	3.21	3.47	3.79	4.37	5.84	8.08	10.50	11.81	13.78	15.21	16.11	16.11
400	1.48	2.22	2.73	3.26	3.63	3.97	5.34	7.20	10.01	11.36	13.23	14.53	15.57	15.57
500	1.44	2.07	2.59	3.05	3.37	3.88	5.26	7.13	9.58	10.66	12.21	14.03	15.07	15.07
1,000	1.24	1.55	2.03	2.26	2.59	2.98	4.38	5.95	7.55	9.30	10.72	12.49	13.41	13.41
2,000	0.86	1.16	1.39	1.72	2.00	2.21	3.52	4.80	6.14	8.36	9.05	10.85	11.98	11.98
5,000	0.48	0.81	1.02	1.27	1.43	1.56	2.70	3.85	4.62	5.93	6.79	8.62	9.77	9.77
10,000	0.33	0.58	0.77	0.89	1.03	1.23	2.29	2.98	3.73	5.24	5.39	7.06	8.18	8.18
20,000	0.18	0.27	0.41	0.52	0.73	0.82	1.57	2.02	2.66	3.48	4.00	5.53	6.50	6.50
50,000	0.07	0.15	0.20	0.30	0.36	0.43	0.70	1.01	1.30	1.71	2.11	3.26	4.17	4.17
99,877	0.05	0.09	0.13	0.15	0.19	0.22	0.39	0.54	0.70	1.02	1.30	1.64	2.02	2.02

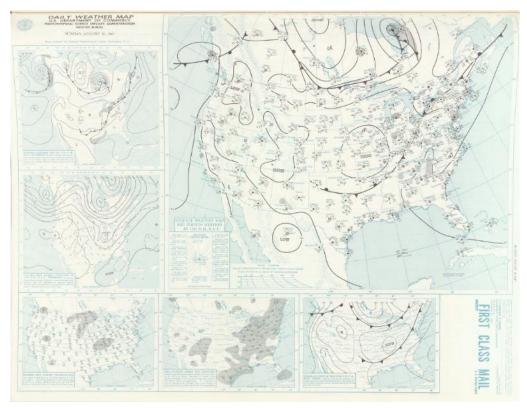


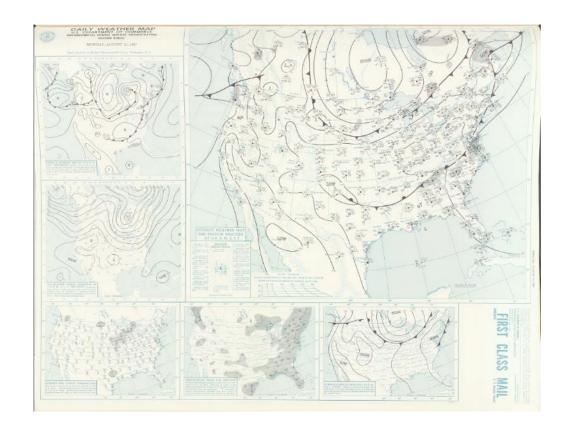
SPAS 1380 Storm Center Mass Curve Zone 1 August 21 (0700UTC) to August 25 (0600UTC), 1967 Lat: 34.7958 Lon: -83.6958

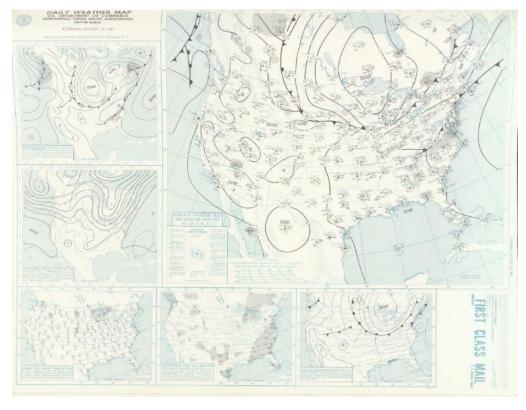


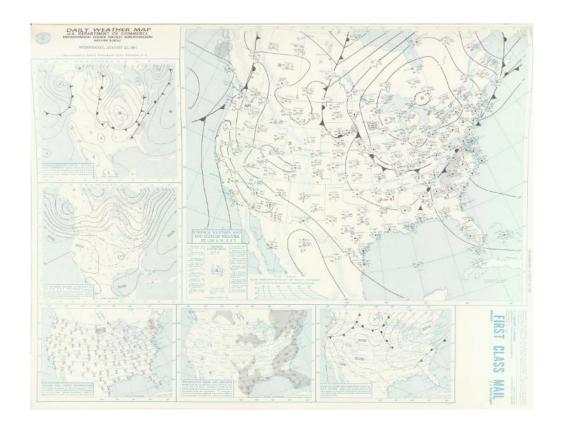


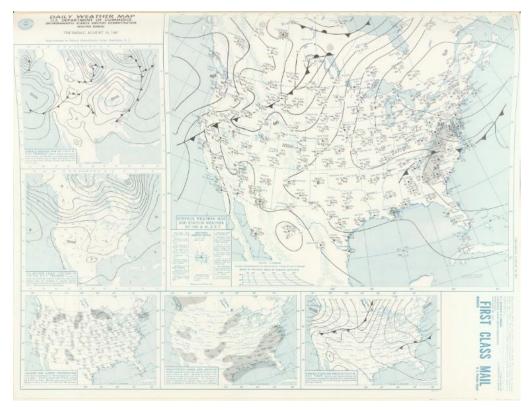




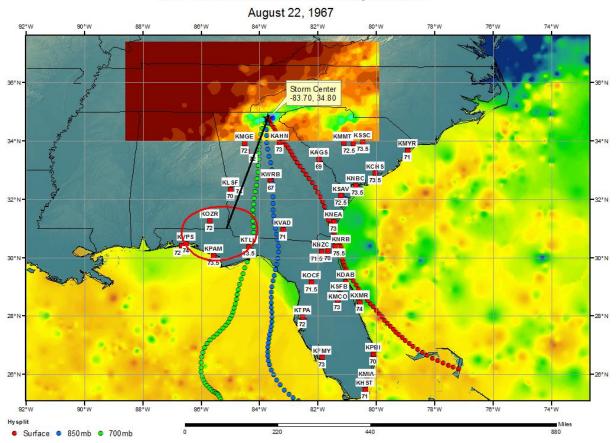








SPAS 1380 Burton, GA Storm Analysis Zone 1



Storm Precipitation Analysis System (SPAS) For Storm #1357 SPAS Analysis

General Storm Location: Tennessee Valley

Storm Dates: March 14 - March 17, 1973

Event: Mid-latitude cyclone (MLC)

DAD Zone 1

Latitude: 34.8375

Longitude: -88.3958

Max. Grid Rainfall Amount: 12.15"

Max. Observed Rainfall Amount: 12.11" at Glens, MS

Number of Stations: 664 (352 Daily, 138 Hourly, 0 Hourly Estimated, 38 Hourly Pseudo, 133

Supplemental, and 3 Supplemental Estimated)

SPAS Version: 9.5

Base Map Used: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2707

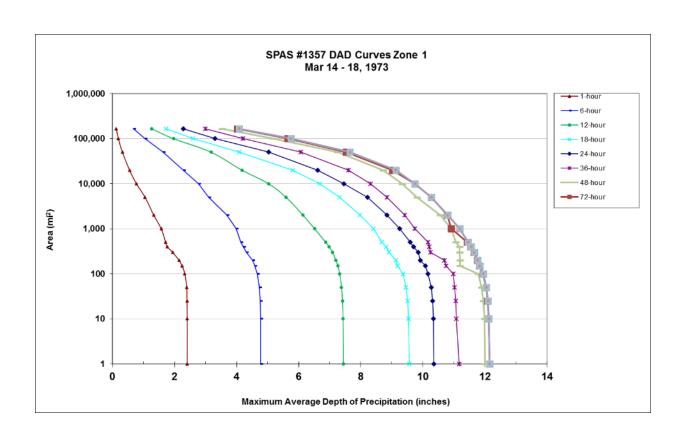
Radar Included: No

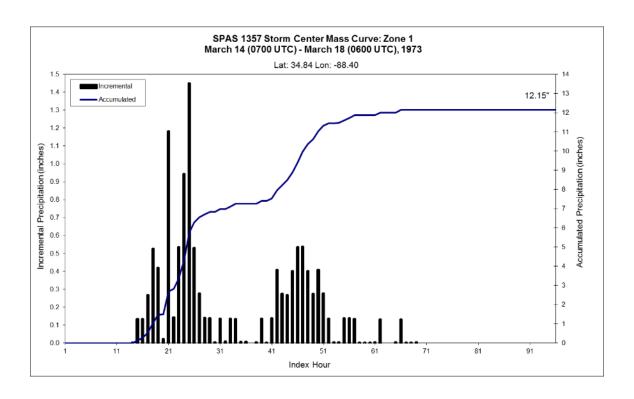
Depth-Area-Duration (DAD) analysis: Yes

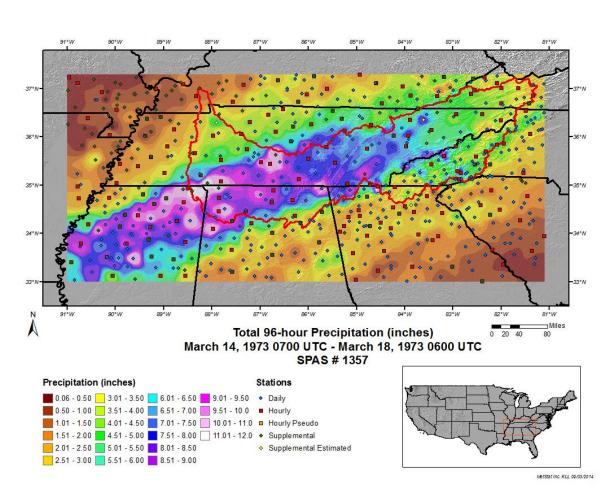
Reliability of results: In addition to the NCDC stations, there were three supplemental stations added to fill in where there was a lack of observations, in order to create a more realistic precipitation pattern. There were also four daily and seven hourly stations digitized and added from the TVA report. The added TVA data helped to enhance the accuracy of the timing of the storm center. Overall, this storm analysis is found to be reliable. Comparing the SPAS analysis to the TVA isohyetal map further validates the consistency of the magnitude and extent of the rainfall.

Storm Name:	SPAS 1357 - Bi	~~~~~	L		a				T70		
Storm Date:	March 14-17, 1	973			S	torm A	ajustm	ent for	Virginia	ì	
AWA Analysis Date:	•					I	I				
Temporal Transposit	ion Date	1-Apr									
		Lat	Lon			Moisture l	nflow Dire	ction	SSW @ 365	miles	
Storm Center Location	on	34.84 N	88.40 W			Basin Aver	age Elevat	ion	N/A	feet	
Storm Rep Dew Poin	t Location	30.00 N	91.00 W			Storm Cen	ter Elevati	on	600	feet	
Transposition Dew P	oint Location						lysis Durat		24	hours	
Basin Location						Effective B	arrier Hei	ght	N/A	feet	
	m representative	-	69.0 F	with tota	l precipitabl	e water abov	e sea level o	of		2.14	inches.
	-place maximum		73.0 F		• •	e water abov				2.60	inches.
	ioned maximum	-	0.0		• •	e water abov				#N/A	inches.
	ne in-place storm		600		ch subtracts			f precipitabl		69.0 F	
	ne in-place storm		600		ch subtracts	0.14		f precipitabl		73.0 F	
	nsposition storm		N/A		ch subtracts	X.XX		f precipitabl		0.0	
Ine mor	isture inflow barr	ier neight is	N/A	reet which	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
	The in-place	maximizati	on factor is	1.22		Notes: Storm	ep Td is the 24h	r average Td fn	om KBPT, KLCH,	KLFT, KBTE	
	•	e transpositi		#N/A					March 14, 1973.		1
,	The elevation/bar			#N/A							
	The to	otal adjustme	ent factor is	#N/A							
Observed	Storm Depth-Ar	,						,			
		6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	72 Hours		
	1 sq mile	4.8	7.4	9.6	10.4	11.2	12.0	12.2	12.2		
	10 sq miles	4.8	7.4	9.5	10.3	11.1	12.0	12.1	12.1		
	100 sq miles	4.7	7.3	9.4	10.2	11.0	11.8	11.9	12.0		
emononomonomonomon	200 sq miles	4.5	7.2	9.1	9.9	10.7	11.2	11.8	11.8		
	500 sq miles	4.1	6.9	8.7	9.6	10.2	11.1	11.4	11.5		
	1000 sq miles	4.0	6.5	8.4	9.3	9.7	10.9	10.9	11.2		
***************************************	2000 sq miles	3.7	6.1	8.0	8.9	9.4	10.6	10.8	10.8		
	5000 sq miles	3.1	5.6 5.0	7.3	8.2	8.8	9.8	10.3	10.3		
***************************************	10000 sq miles	2.8		6.7	7.5	8.3	9.3	9.7	9.8		
	20000 sq miles	2.3 1.6	4.2 3.2	5.8 4.1	6.6 5.0	7.6 6.1	8.7 7.3	9.0 7.5	9.1 7.7		
	50000 sq miles	1.0	3,4	4.1	5.0	0.1	7.3	7.5	7.7		
G, G	. C . N			CD AC 1255	D '11	A T					1
	torm Center Nam	ie		SPAS 1357 -		e, AL					_
Storm Date				March 14-17							
Storm Type Storm Loc				Mid-latitude 34.84 N	88.40 W						
	ation ter Elevation			600	00.4U W						1
	ter Elevation on Total & Durati	on		12.15 Inches	in 06 Hores						1
riecipitati	on rotal & Dufatt	VII		12.13 Inches	111 20 FIOURS						
Storm Ren	resentative Dew I	Point		69.0 F	24						1
	resentative Dew I		on	30.00 N	91.00 W		March	April			
Maximum		JIII LOCALI	/ 	73.0 F	, 1.00 H		71.81	73.98			1
	nflow Vector			SSW @ 365							1
	aximization Facto	or		1.22							
III place IVI											
Temporal 7	Transposition Dat	e		1-Apr							1
	ion Dew Point Lo										1
	ion Maximum De										
	ion Adjustment Fa			#N/A							
	asin Elevation			N/A							
	evation in Basin			N/A							
	rier Height			N/A							
	Adjustment Factor			#N/A							
	stment Factor			#N/A							
10tai 1 taju											_

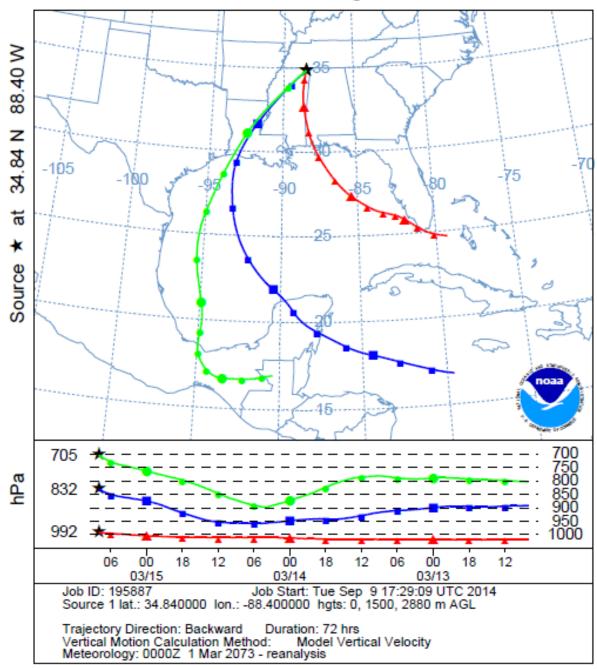
St	orm 13	57 Zon	e 1 - M	ar 14 (0700 U	TC) - N	lar 18 (0600 L	TC), 1	973	
	M	AXIMUN	I AVERA	AGE DEI	PTH OF	PRECIP	OITATIO	(INCH	ES)		
					Dura	ation (hou	ırs)				
areasqmi	1	6	12	18	24	36	48	72	96		Total
0.3	2.41	4.78	7.44	9.56	10.36	11.38	12.01	12.15	12.15		12.15
1	2.41	4.78	7.44	9.56	10.36	11.17	12.01	12.15	12.15		12.15
10	2.41	4.77	7.43	9.54	10.34	11.08	11.99	12.13	12.13		12.13
25	2.40	4.76	7.41	9.51	10.32	11.06	11.95	12.09	12.10		12.10
50	2.39	4.73	7.38	9.46	10.27	11.03	11.90	12.04	12.05		12.05
100	2.33	4.67	7.32	9.36	10.17	10.98	11.79	11.93	11.95		11.95
150	2.24	4.58	7.26	9.19	10.08	10.75	11.20	11.83	11.84		11.84
200	2.14	4.51	7.20	9.13	9.92	10.70	11.20	11.76	11.77		11.77
300	1.94	4.31	7.09	8.91	9.85	10.25	11.19	11.65	11.66		11.66
400	1.76	4.22	6.98	8.82	9.70	10.21	11.19	11.54	11.56		11.56
500	1.71	4.14	6.87	8.68	9.59	10.16	11.07	11.43	11.46		11.46
1,000	1.57	3.99	6.51	8.41	9.25	9.74	10.91	10.91	11.19		11.19
2,000	1.33	3.68	6.14	7.98	8.85	9.41	10.56	10.79	10.80		10.80
5,000	1.05	3.10	5.59	7.32	8.22	8.84	9.81	10.27	10.27		10.27
10,000	0.77	2.77	5.03	6.68	7.45	8.31	9.33	9.74	9.75		9.75
20,000	0.55	2.28	4.17	5.81	6.61	7.60	8.72	9.02	9.13		9.13
50,000	0.32	1.63	3.18	4.08	5.03	6.07	7.25	7.53	7.65		7.65
100,000	0.19	1.05	1.97	2.59	3.30	4.20	5.17	5.64	5.75		5.75
166,120	0.12	0.67	1.26	1.73	2.28	2.99	3.53	4.03	4.08		4.08

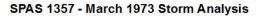


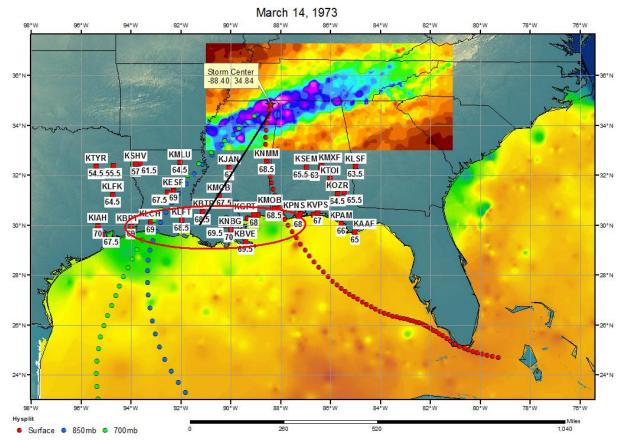




NOAA HYSPLIT MODEL
Backward trajectories ending at 0800 UTC 15 Mar 73
CDC1 Meteorological Data







Storm Precipitation Analysis System (SPAS) For Storm #1533 SPAS Analysis

General Storm Location: Mid Atlantic

Storm Dates: October 31 - November 7, 1985

Event: Remnants of Hurricane Juan becoming an extratropical cyclone

DAD Zone 1

Latitude: 37.8125

Longitude: -79.1625

Max. Grid Rainfall Amount: 22.56"

Max. Observed Rainfall Amount: 19.76" at Montebello 3 NE, VA

Number of Stations: 1050 (696 Daily, 183 Hourly, 0 Hourly Estimated, 62 Hourly Pseudo, 109

Supplemental, and 0 Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: PRISM July (1981-2010) precipitation

Spatial resolution: 0.2606

Radar Included: No

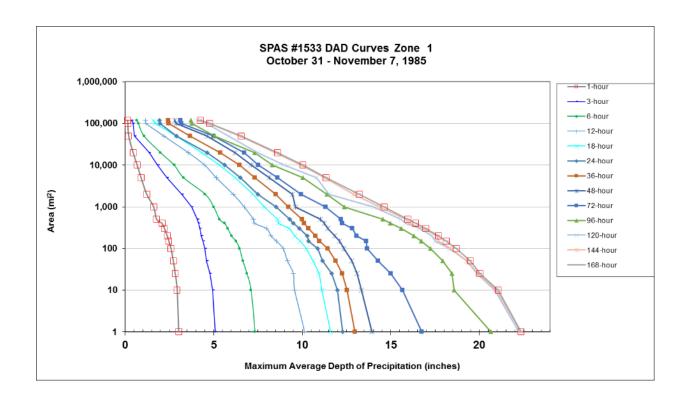
Depth-Area-Duration (DAD) analysis: Yes

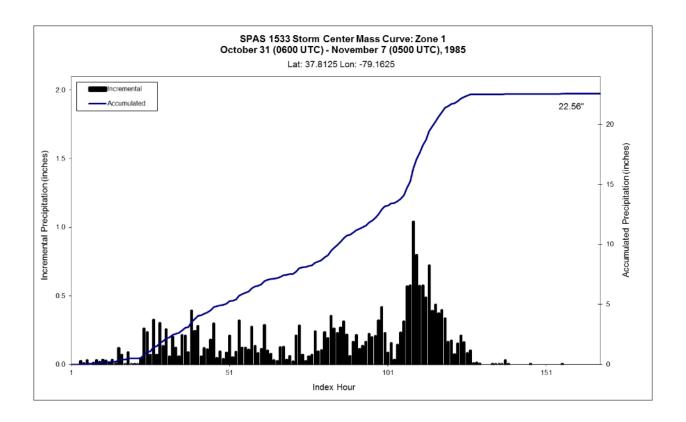
Reliability of results: With the density of stations available for this storm and with how closely the

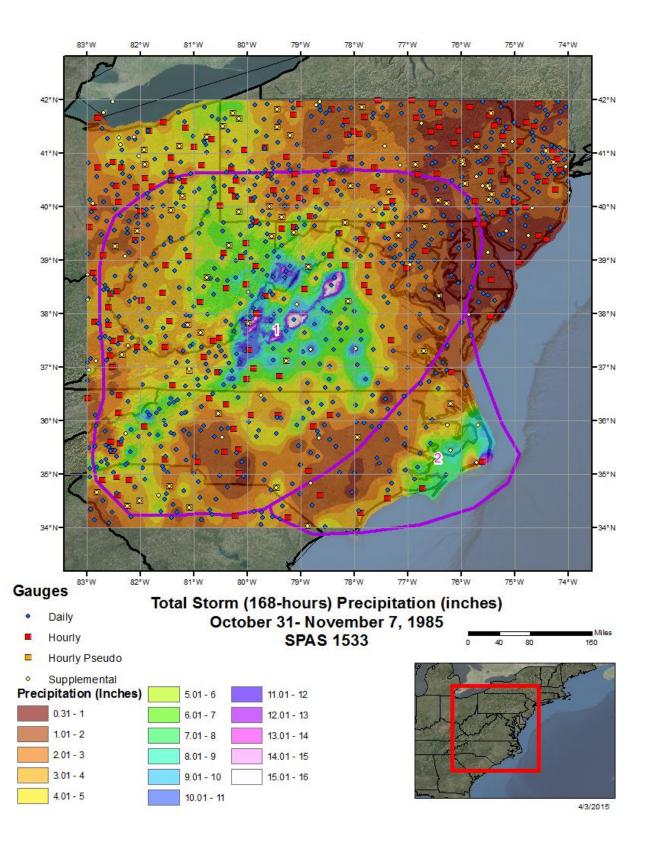
resulting SPAS analysis was to the observations, this analysis is deemed quite reliable.

torm Date: 10/31-11/7/19	785				Storm A	adjustn	ient for	Virginia	a			
WA Analysis Date: 11/14/2015												
emporal Transposition Date	17-Oct							EGE C 205	.,			
	Lat	Long				Inflow Dire		ESE @ 395	miles			
torm Center Location	37.81 N	79.16 W				rage Elevati		N/A	feet			
torm Rep Dew Point Location	35.0 N	73.00 W				ter Elevatio		4,000	feet			
ransposition Dew Point Location						lysis Durati		24	hours			
asin Location					Effective B	Barrier Heig	ght	N/A	feet			
The storm representative		76.5 F				ve sea level			3.07	inches.		
The in-place maximum		78.0 F				ve sea level			3.29	inches.		
The transpositioned maximum	dew point is	0.0	with tot	al precipitab		ve sea level			#N/A	inches.		
The in-place storm		4,000		ch subtracts			f precipitable		76.5 F			
The in-place storm		4,000		ch subtracts	1.00		f precipitable		78.0 F			
The transposition basin		N/A		ch subtracts	X,XX		f precipitable		0.0			
The inflow barrier/basin elevati	ion height is	N/A	whi	ch subtracts	X,XX	inches o	f precipitable	e water at	0.0			
				•								
The in-place stori			1.09					Storm repres				
The transposition/el			#N/A			sed on maximu	ım 24-hr avera	ge SST values o	n November			
The bar	rrier adjustm	ent factor is	#N/A		3, 1985.							
The t	total adjustm	ent factor is	#N/A							<u> </u>		
Observed Storm Depth-A	rea-Duratio	n										
	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours		144 Hours	
1 sq miles	3.0	7.3	10.1	11.6	12.3	13.0	13.9	16.8	20.6	22.2	22.3	22.4
10 sq miles	2.9	7.1	9.6	11.1	12.0	12.5	13.4	15.7	18.6	20.9	21.0	21.1
100 sq miles	2.6	6.5	8.9	10.2	10.9	11.4	12.4	13.7	17.2	18.3	18.4	18.7
200 sq miles	2.4	6.0	8.2	9.6	10.3	10.8	11.8	13.1	16.3	17.3	17.6	17.7
500 sq miles	1.8	5.3	7.2	8.6	9.3	10.0	11.0	12.2	14.6	15.6	15.8	16.0
1000 sq miles	1.6	5.0	6.7	7.9	8.5	9.2	9.6	11.3	12.4	14.0	14.4	14.6
2000 sq miles	1.2	4.5	6.1	7.2	7.5	8.5	9.4	9.9	11.4	11.5	12.9	13.2
5000 sq miles	0.9	3.3	5.1	6.2	6.5	7.3	8.1	8.6	10.0	10.8	11.3	11.4
10000 sq miles	0.7	2.8	4.5	5.3	5.6	6.5	7.1	7.5	8.3	9.0	9.9	10.0
20000 sq miles	0.5	2.0	3.6	4.3	4.6	5.4	6.2	6.7	7.3	7.5	8.5	8.6
50000 sq miles	0.2	1.1	2.2	2.9	2.9	3.7	4.6	5.0	5.1	5.8	6.5	6.6
100000 sq miles	0.2	0.8	1.2	1.7	2.0	2.5	2.9	3.2	3.8	4.6	4.7	4.8
118956 sq miles	0.1	0.7	1.2	1.6	1.9	2.4	2.8	3.1	3.7	4.1	4.2	4.3
Storm or Storm Center Nar	me			- Montebel	lo, VA							
Storm Date(s)			10/31-11/7	7/1985								
Storm Type			Tropical									
Storm Location			37.81 N	79.16 W								
Storm Center Elevation			4,000									
Precipitation Total & Dura	tion (10 sq m	ni)	22.56" in 10	58hrs from S	PAS 1533							
										ļ		
Storm Representative Dew			76.5 F	24						ļ		
Storm Representative Dew	Point Locati	on	35.0 N	73.00 W		Oct	Nov					
Maximum Dew Point			78.0 F			79	75.5					
Moisture Inflow Vector			ESE @ 395									
In-place Maximization Fact	tor		1.09									
										ļ		
Temporal Transposition (D			17-Oct									
Transposition Dew Point L										1		
Transposition Maximum De			· · · · · · · · · · · · · · · · · · ·							4		
Transposition Adjustment I	Factor		#N/A									
Average Basin Elevation			N/A							1		
Highest Elevation in Basin			N/A							1		
Inflow Barrier Height			N/A			-				1		
Barrier Adjustment Factor			#N/A							1		

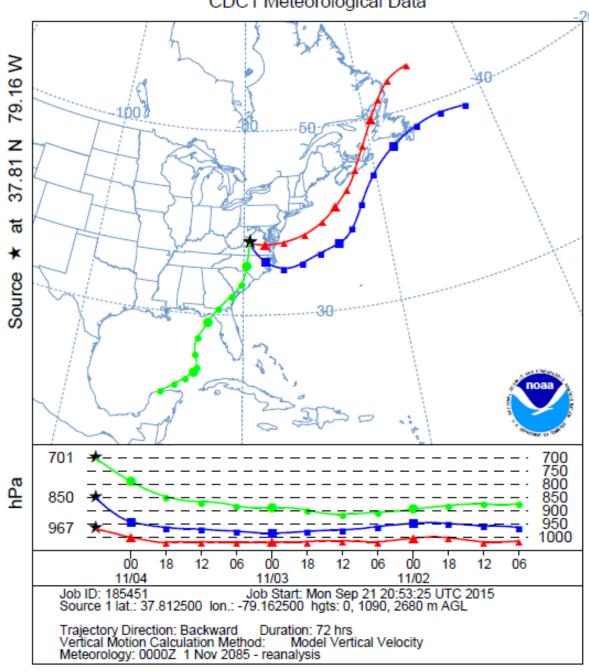
			Storn	n 1533 - (October	31 (0600	UTC) -	Novemb	er 7 (05	00 UTC)	1985			
				MAXI	NUM AVE	RAGE DE	PTH OF P	RECIPITA	ATION (IN	CHES)				
Aug (m;2)							Duration	(hours)						
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	Total
0.3	3.03	5.12	7.35	10.15	11.63	12.33	13.00	14.05	16.90	20.83	22.42	22.55	22.56	22.56
1	3.02	5.10	7.33	10.12	11.60	12.29	12.97	13.93	16.75	20.64	22.22	22.32	22.35	22.35
10	2.94	4.94	7.11	9.57	11.12	11.99	12.53	13.35	15.67	18.58	20.86	20.96	21.06	21.06
25	2.83	4.78	6.88	9.50	10.96	11.66	12.25	13.09	14.99	18.46	19.86	19.90	20.02	20.02
50	2.72	4.60	6.65	9.17	10.62	11.15	11.89	12.79	14.29	17.94	19.30	19.32	19.49	19.49
100	2.59	4.50	6.46	8.92	10.23	10.87	11.43	12.35	13.66	17.23	18.30	18.37	18.70	18.70
150	2.47	4.40	6.26	8.54	9.89	10.35	10.97	12.10	13.62	16.71	17.51	17.69	18.14	18.14
200	2.38	4.31	6.01	8.24	9.58	10.29	10.76	11.83	13.08	16.31	17.31	17.60	17.68	17.68
300	2.22	4.22	5.80	7.99	9.28	9.83	10.35	11.43	12.83	15.59	16.62	16.79	16.97	16.97
400	2.08	4.15	5.62	7.30	8.66	9.50	10.12	11.24	12.26	14.97	15.83	16.03	16.41	16.41
500	1.78	4.08	5.33	7.24	8.62	9.30	9.99	11.03	12.17	14.55	15.55	15.83	15.95	15.95
1,000	1.61	3.75	5.00	6.72	7.85	8.54	9.21	9.62	11.31	12.39	14.03	14.39	14.62	14.62
2,000	1.22	3.20	4.52	6.10	7.20	7.50	8.50	9.44	9.93	11.40	11.51	12.90	13.22	13.22
5,000	0.90	2.35	3.30	5.14	6.21	6.51	7.31	8.14	8.60	10.03	10.79	11.28	11.35	11.35
10,000	0.68	1.84	2.77	4.49	5.33	5.63	6.46	7.13	7.53	8.32	8.98	9.92	10.03	10.03
20,000	0.45	1.36	2.00	3.56	4.32	4.64	5.36	6.22	6.73	7.33	7.49	8.48	8.60	8.60
50,000	0.20	0.53	1.07	2.18	2.87	2.91	3.68	4.62	4.99	5.06	5.83	6.47	6.56	6.56
100,000	0.16	0.44	0.75	1.18	1.68	1.96	2.45	2.88	3.18	3.77	4.58	4.72	4.79	4.79
118,956	0.14	0.37	0.67	1.16	1.60	1.93	2.43	2.81	3.12	3.71	4.06	4.23	4.25	4.25

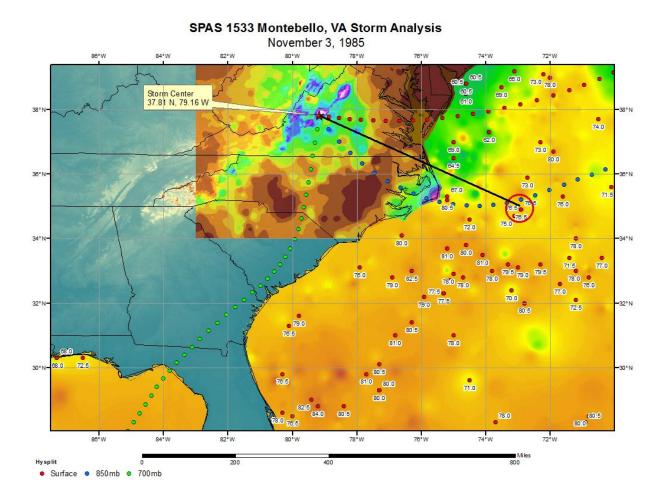






NOAA HYSPLIT MODEL Backward trajectories ending at 0600 UTC 04 Nov 85 CDC1 Meteorological Data





Page 216 of 734

Storm Precipitation Analysis System (SPAS) For Storm #1201 SPAS-NEXRAD Analysis

General Storm Location: New England (Maine, New Hampshire, Vermont, western Massachusetts and adjacent portions of Canada)

Storm Dates: October 7-11, 2005 (10/7/2005 0900 UTC – 10/10/2005 0000 UTC)

Event: Synoptic plus tropical storm (Tammy) remnants

DAD Zone 1

Latitude: 42.7699

Longitude: -72.7500

Max. Grid Rainfall Amount: 15.40"

Max. Observed Rainfall Amount: 15.60 inches at Halifax, VT (all but 0.20" of this fell during the CPP, hence the maximum point rainfall is 15.40"). 12.75 inches was reported at Gunstock Ski Area, VT – although considered "unofficial," this was reported in Storm Data so it was accepted into this analysis.

Number of Stations: 462 (126 Daily, 87 Hourly, 1 Hourly Estimated, 40 Hourly Pseudo, 206 Supplemental, and 2 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM October Precipitation

Spatial resolution: 36 seconds (0.34 sq-mi)

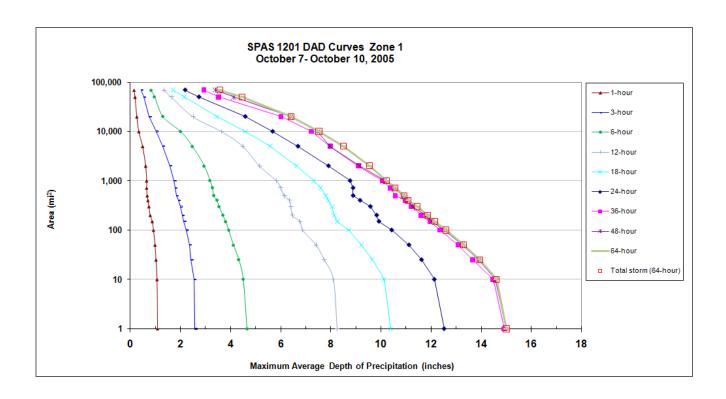
Radar Included: Yes (KGYX, KBW, KCXX, KENX and Canadian radar WVY**)

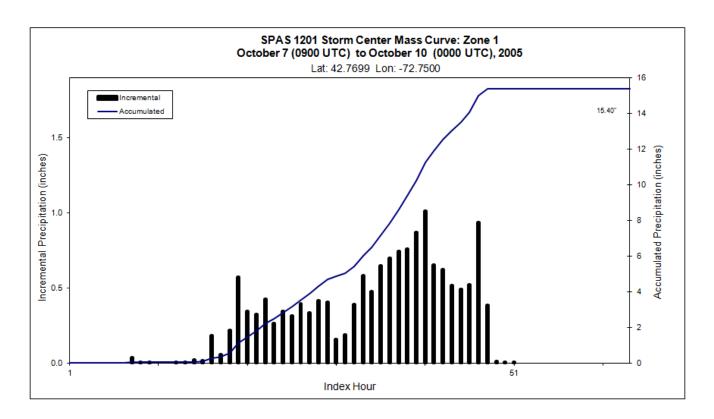
Depth-Area-Duration (DAD) analysis: Yes*

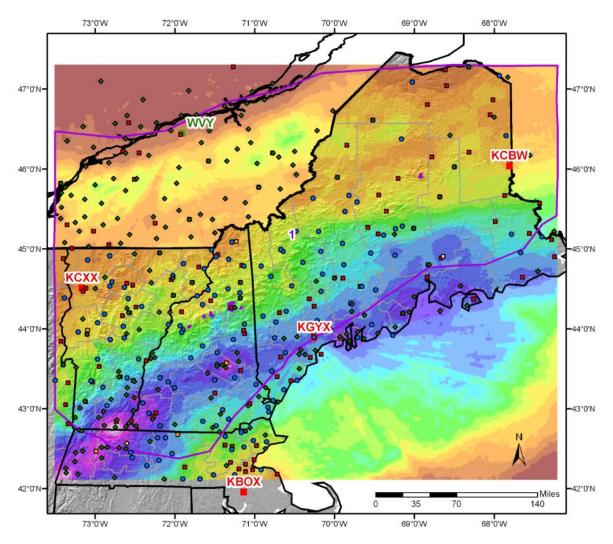
Reliability of results: Given the extensive gauge data and decent radar data, we have a great deal of confidence in the magnitude and spatial distribution of rainfall for this analysis. The only exception to this is across north-central Vermont where a large radar blockage area exsits; fortunately however, relatively light rainfall occurred across this area. **Also, Canadian radar data is only available every 10-minutes, instead of 5-minutes in the U.S., so that forced all of the radar data to a 10-minute time step – although not significant, this too diminished the overall accuracy of this analysis slightly.

Storm Name:	SDAS 1201	l - Halifax,	VT								
Storm Date:	10/7-10/20		<u> </u>		Ç ₁	torm 1	diuctm	ant far	Virgini	0	
AWA Analysis Date:					3	ин А	սյսծա	cht lul	v II giiii	a	
Temporal Transposit		24-Sep									
remporar fransposit	IOH Date	Lat	Long			Moisture	Inflow Dire	ection	SSE @ 808	miles	
Storm Center Locati	on	42.77 N	72.75 W				rage Elevat		N/A	feet	
Storm Rep SST Locat			67.00 W				nter Elevati		1,500	feet	
Transposition SST Local		32.00 N	07.00 W				alysis Dura		24	hours	
Basin Location	cation						Barrier Hei		N/A	feet	-
Busin Edeution						Elicetive	Duiller lie	· 5····	IVA	Teet	
The stor	m representa	ative SST is	80.0 F	with tot	al nrecinital	ole water abo	ove sea level	of		3.60	inches
	-place maxii		81.5 F				ove sea level			3.84	inches
The transposi			0.0				ove sea level			#N/A	inches
	place storm		1,500		ch subtracts			f precipitabl	e water at	80.0 F	Inches
	place storm		1,500		ch subtracts			precipitabl		81.5 F	
	sition basin		N/A	whi	ch subtracts	x,xx		f precipitabl		0.0	
The inflow barrier/l			N/A	whi	ch subtracts	X.XX		f precipitabl		0.0	
The in-	place storm	maximizati	on factor is	1.07					d 8 SST maps alo	ng with	1
	position/ele			#N/A		HYSPLIT bac	kward trajectory	·			
	•	ier adjustme		#N/A		1					
	The to	tal adjustme	ent factor is	#N/A							
Observed	Storm Dept	th-Area-Du	ration								
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	4.50	8.10	10.12	12.13	14.57	14.60	14.60	14.60		
1	00 sq miles	3.92	6.88	8.71	10.43	12.54	12.60	12.60	12.60		
2	00 sq miles	3.69	6.47	8.13	9.83	11.77	11.86	11.86	11.86		
5	00 sq miles	3.32	6.15	7.80	8.89	10.87	10.92	10.92	10.92		
10	00 sq miles	3.18	5.84	7.32	8.77	10.15	10.22	10.22	10.22		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	00 sq miles	2.95	5.16	6.64	7.91	9.16	9.55	9.55	9.55		
50	00 sq miles	2.48	4.50	5.59	6.69	7.98	8.51	8.51	8.51		
	00 sq miles	2.01	3.65	4.59	5.68	7.48	7.52	7.52	7.52		
	00 sq miles	1.30	2.51	3.45	4.59	6.39	6.41	6.41	6.41		
	00 sq miles	0.97	1.65	2.16	2.74	4.13	4.46	4.46	4.46		
691	05 sq miles	0.82	1.36	1.71	2.19	3.40	3.57	3.57	3.57		<u> </u>
	torm Center	Name		SPAS 1201		T					
Storm Date				10/7-10/20	05						4
Storm Type				Synoptic							4
Storm Loc				42.77 N	72.75 W						1
	ter Elevation			1,500		<u> </u>	-				1
Precipitati	on Total & I	Juration		15.4 inches	ın 64 hours	at point					1
C4 D	racantation (	CCT		90 0 E	24		-				1
	resentative S			80.0 F 32.00 N	24 67.00 W		Cant	Oat			1
Maximum	resentative S	ST LOCATION	ш	81.5 F	07.00 W		Sept 82.5	Oct 79.5			1
	nflow Vecto	r		SSE @ 808			82.5	17.3			1
	aximization			1.07							1
ni-piace Wi	u.iiiizati0II	1 40 101		1.07							1
Temporal 7	   Transposition	n Date		24-Sep							1
*	ion SST Loc			2 <b>0</b> p							1
	ion Maximu										1
	ion Adjustme			#N/A							1
	asin Elevatio			N/A							1
	evation in Ba			N/A							1
	rier Height			N/A							1
	justment Fac	ctor		#N/A							1
	stment Facto			#N/A							

Sto	rm 120	1 -Octo	ber 7 (	0900 U	TC) - O	ctober	10 (000	00 UTC	). 2005	
			•		PRECI		•		,,	
					Duration	ı (hours)				
Area (mi²)	1	3	6	12	18	24	36	48	64	Total
0	1.09	2.64	4.74	8.49	10.69	12.88	15.34	15.4	15.4	15.40
1	1.08	2.58	4.65	8.25	10.39	12.52	14.92	15	15	15.00
10	1.06	2.54	4.5	8.1	10.12	12.13	14.47	14.57	14.6	14.60
25	1.02	2.43	4.33	7.74	9.65	11.62	13.66	13.89	13.94	13.94
50	0.98	2.36	4.11	7.41	9.22	11.12	13.08	13.26	13.3	13.30
100	0.92	2.23	3.92	6.88	8.71	10.43	12.36	12.54	12.6	12.60
150	0.87	2.14	3.8	6.77	8.26	9.92	11.95	12.02	12.15	12.15
200	0.79	2.07	3.69	6.47	8.13	9.83	11.61	11.77	11.86	11.86
300	0.74	1.99	3.54	6.41	8.05	9.58	11.22	11.27	11.45	11.45
400	0.7	1.92	3.45	6.35	7.9	9.17	10.97	11.05	11.08	11.08
500	0.67	1.84	3.32	6.15	7.8	8.89	10.57	10.87	10.92	10.92
715	0.65	1.78	3.27	6	7.59	8.89	10.37	10.53	10.56	10.56
1,000	0.65	1.75	3.18	5.84	7.32	8.77	10.06	10.15	10.22	10.22
2,000	0.61	1.58	2.95	5.16	6.64	7.91	9.1	9.16	9.55	9.55
5,000	0.49	1.29	2.48	4.5	5.59	6.69	7.98	7.98	8.51	8.51
10,000	0.34	1.04	2.01	3.65	4.59	5.68	7.23	7.48	7.52	7.52
20,000	0.26	0.76	1.3	2.51	3.45	4.59	6.01	6.39	6.41	6.41
50,000	0.19	0.53	0.97	1.65	2.16	2.74	3.53	4.13	4.46	4.46
69,105	0.15	0.44	0.82	1.36	1.71	2.19	2.94	3.4	3.57	3.57



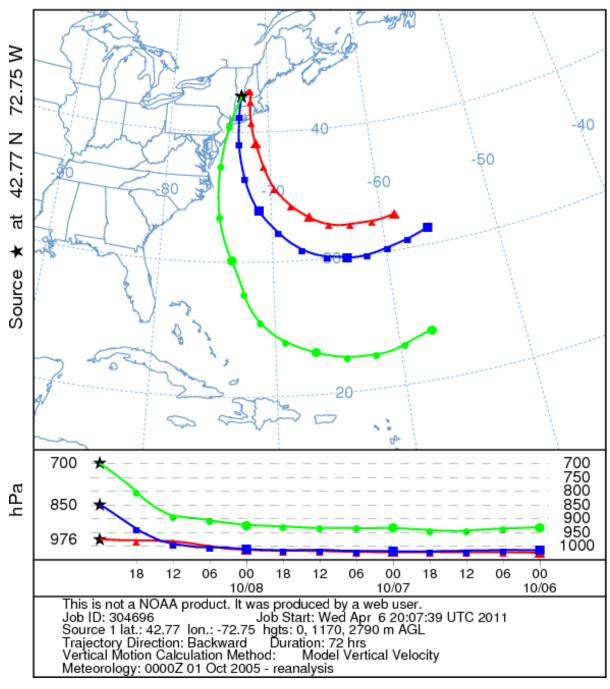




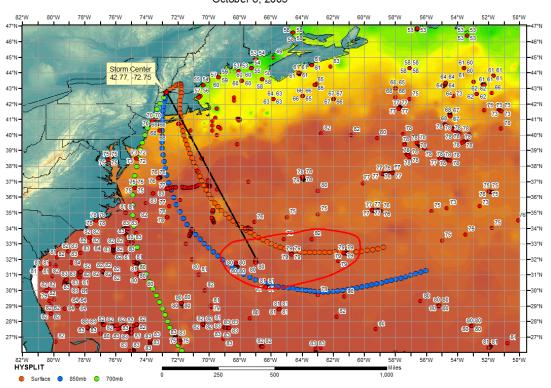
Total 64-hour Precipitation (inches)
October 7-11, 2005
10/7/2005 0900 UTC - 10/10/2005 0000 UTC
SPAS #1201



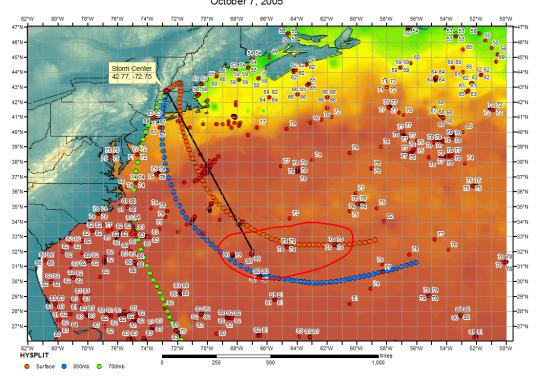
## NOAA HYSPLIT MODEL Backward trajectories ending at 0000 UTC 09 Oct 05 CDC1 Meteorological Data



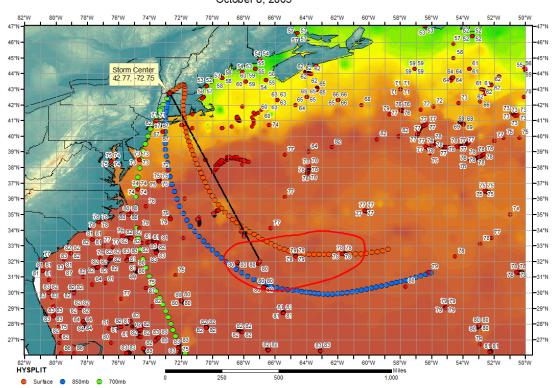
#### SPAS 1201 Sea Surface Tempertures (F) October 6, 2005



#### SPAS 1201 Sea Surface Tempertures (F) October 7, 2005



## SPAS 1201 Sea Surface Tempertures (F) October 8, 2005



## Storm Precipitation Analysis System (SPAS) For Storm #1047 SPAS-NEXRAD Analysis

General Storm Location: Tamaqua, PA

**Storm Dates**: 6/26/2006 0100Z - 6/28/2006 1000Z

**Event**: Thunderstorm

**Latitude**: 41.675

Longitude: -75.375

Max. Grid/Radar Rainfall Amount: 12.26" (Grid/Pixel Point)

Max. Observed Rainfall Amount: 11.79" (11.97" grid cell at Aldenville, ALDP1)

Number of Stations: 491 (99-hourly, 21 hourly estimated, 78-daily 293-supplemental) gauging stations

within the defined search domain.

SPAS Version: 4.0

Base Map Used: No

Spatial resolution: 0.36 mi²

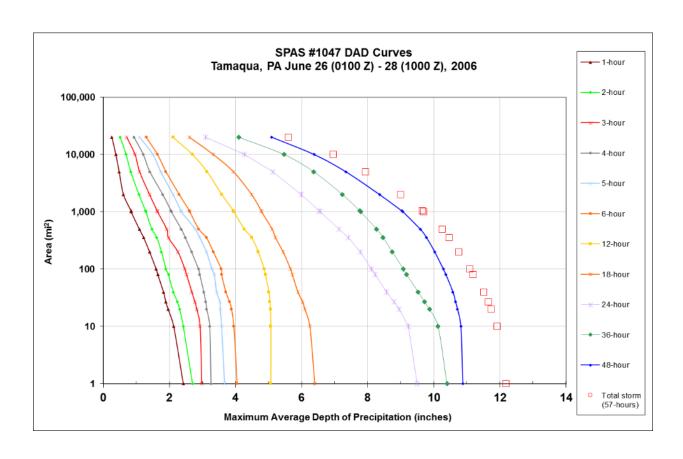
Radar Included: Yes (multiple stations were merged)

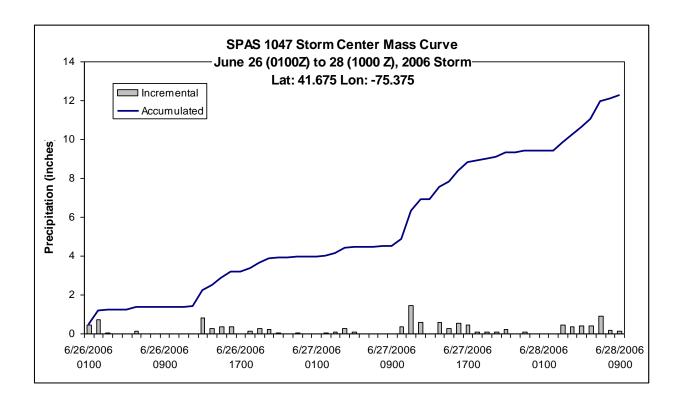
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, 18, 24, 36, 48, & 57 hours

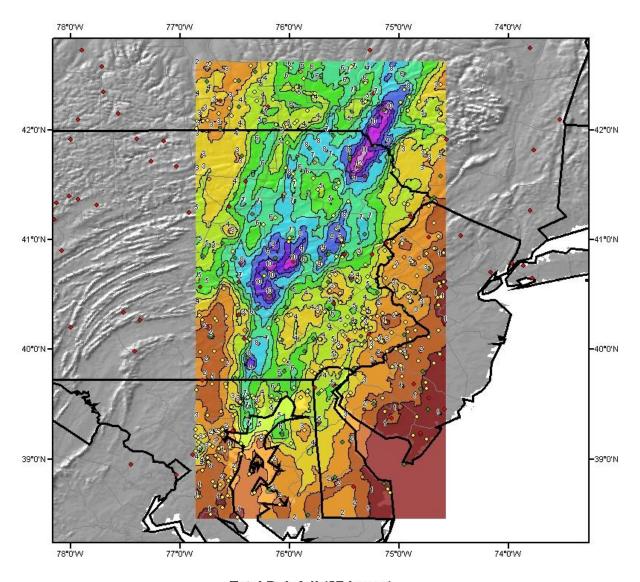
Storm Nan		CDAC 1045 TO	D. t									
Storm Nan Storm Date		SPAS 1047-Ta 6/26-28/2006	ımaqua, PA			C	torm A	diuctm	ant for	Virgini	9	
		11/14/2015				ß	WI III A	aujusun	iciit ioi	viigiiii	а	
Temporal 7			10-Jul									
remporta	- Tunoposi	1011 2 1110	Lat	Lon			Moisture 1	Inflow Dire	ection	SSE @ 115	miles	
Storm Cen	ter Locati	on	41.68 N	75.38 W				rage Elevat		N/A	feet	
Storm Rep			40.10 N	74.70 W				iter Elevati		1,300	feet	
		oint Location	1012011					dysis Durat		24	hours	
Basin Loca								Barrier Hei		N/A	feet	
	The storm	representative of	dew point is	71.0 F	with to	tal precipital	ble water ab	ove sea leve	l of		2.36	inches.
	The in-p	lace maximum o	dew point is	76.0 F	with to	tal precipital	ble water ab	ove sea leve	l of		2.99	inches.
The	•	oned maximum o	•	0.0				ove sea leve			#N/A	inches.
		in-place storm		1,300		ch subtracts			f precipitabl		71.0 F	
		in-place storm		1,300		ch subtracts	0.33		f precipitabl		76.0 F	
The		sposition basin		N/A N/A		ch subtracts			f precipitabl		0.0	
ine i	iniiow darr	ier/basin elevati	on neight is	IN/A	reet wm	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
	m.	e in-place storm	movimiacti	on footon:	1.28	Ī	Notes: DAD v	alues taken from	n SPAS 1047 S	Storm representati	ve dew point	
		ransposition/ele			#N/A		value was bas	ed on average 2	4-hr Td values	for June 26-27, 20	006 at KSMQ,	
	THC t	•	ier adjustme		#N/A					ent storm elevation		
		THE BUIL	ici adjustino	in ractor is	111/12		with the storm		umulation area	over general area	associated	
		The to	otal adjustme	ent factor is	#N/A							
												-
	Observed	Storm Depth-A	rea-Durati	on								
			6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
		10 sq miles	4.0	5.1	6.3	9.2	10.8	11.9	11.9	11.9		
		100 sq miles	3.6	4.9	5.7	8.1	10.3	11.1	11.1	11.1		Ĭ
		200 sq miles	3.3	4.7	5.4	7.8	10.0	10.8	10.8	10.8		
	***************************************	500 sq miles	2.9	4.3	5.1	7.1	9.6	10.3	10.3	10.3		
		1000 sq miles	2.6	4.0	4.8	6.6	9.1	9.7	9.7	9.7		
		2000 sq miles	2.3	3.6	4.5	6.0	8.4	9.0	9.0	9.0		
		5000 sq miles	1.9	3.1	3.9	5.1	7.3	7.9	7.9	7.9	~~~~	
		10000 sq miles	1.6	2.7 2.1	3.3	4.3	6.4	7.0	7.0	7.0		
		20000 sq miles	1.3 0.0	0.0	2.6 0.0	3.1 0.0	5.1 0.0	5.6 4.0	5.6 4.0	5.6 4.0		1
		34760 sq miles	0.0	0.0	0.0	0.0	0.0	4.0	4.0	4.0		_
	Storm or S	torm Center Na	ma		SDAS 1045	/-Tamaqua,	DA					1
	Storm Date		ille		6/26-28/20		IA					1
	Storm Type				General Sto							1
	Storm Loc				41.68 N	75.38 W						1
		ter Elevation			1,300		1250 at sto	rm center p	oint			Ī
		on Total & Dura	tion		12.26 Inche	es; 72 Hrs S		<b>.</b>				
		resentative Dew			71.0 F	24						
		resentative Dew	Point Locat	ion	40.10 N	74.70 W			June	July		<b>.</b>
	Maximum				76.0 F				74	76.5		<del> </del>
		nflow Vector			SSE @ 115	1						-
	In-place M	aximization Fac	tor		1.28							-
	Tomporel 5	Francocition (D	lota)		10 Ivl					-		1
		Transposition (D on Dew Point L			10-Jul					-		1
		on Dew Point L										1
		on Adjustment l			#N/A							1
		asin Elevation	40101		N/A							1
		evation in Basin			N/A							1
	Highest Ele											1
	Highest El- Inflow Bar				N/A							
	Inflow Bar				N/A   #N/A							1

**MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)** 

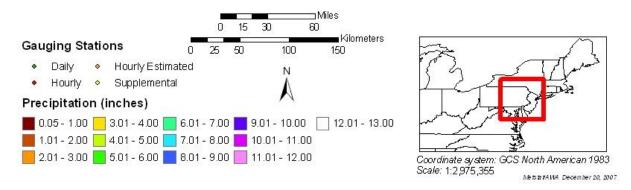
						Duration	(hours)		,			
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	Total
0.36	2.49	2.77	3.06	3.39	3.80	4.15	5.24	6.50	9.58	10.49	10.98	12.26
1	2.42	2.70	2.98	3.26	3.67	4.05	5.07	6.40	9.50	10.40	10.88	12.18
10	2.13	2.42	2.93	3.22	3.58	3.95	5.07	6.25	9.23	10.13	10.82	11.92
20	1.96	2.31	2.83	3.13	3.54	3.88	5.06	6.10	8.95	9.87	10.72	11.73
27	1.89	2.24	2.77	3.10	3.53	3.82	5.04	6.03	8.80	9.72	10.66	11.65
40	1.82	2.12	2.68	3.04	3.43	3.71	5.01	5.89	8.58	9.53	10.58	11.51
80	1.65	1.97	2.52	2.92	3.36	3.58	4.91	5.72	8.23	9.18	10.37	11.19
100	1.60	1.90	2.47	2.88	3.29	3.57	4.87	5.67	8.12	9.08	10.29	11.09
200	1.40	1.76	2.26	2.67	3.12	3.33	4.69	5.44	7.78	8.75	10.03	10.75
356	1.22	1.62	1.97	2.48	2.92	3.12	4.49	5.21	7.42	8.47	9.78	10.46
500	1.09	1.47	1.92	2.36	2.78	2.89	4.27	5.11	7.14	8.27	9.59	10.25
1,000	0.84	1.29	1.64	2.06	2.36	2.62	3.95	4.79	6.56	7.79	9.07	9.69
1,044	0.84	1.28	1.63	2.05	2.35	2.61	3.94	4.78	6.53	7.76	9.03	9.65
2,000	0.61	1.08	1.40	1.80	2.11	2.30	3.59	4.49	5.99	7.24	8.36	8.99
5,000	0.48	0.83	1.10	1.41	1.74	1.90	3.14	3.94	5.14	6.37	7.34	7.93
10,000	0.38	0.69	0.96	1.21	1.50	1.64	2.70	3.33	4.27	5.47	6.38	6.95
20,000	0.26	0.51	0.71	0.93	1.10	1.30	2.11	2.61	3.10	4.10	5.10	5.60
34,760	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.01



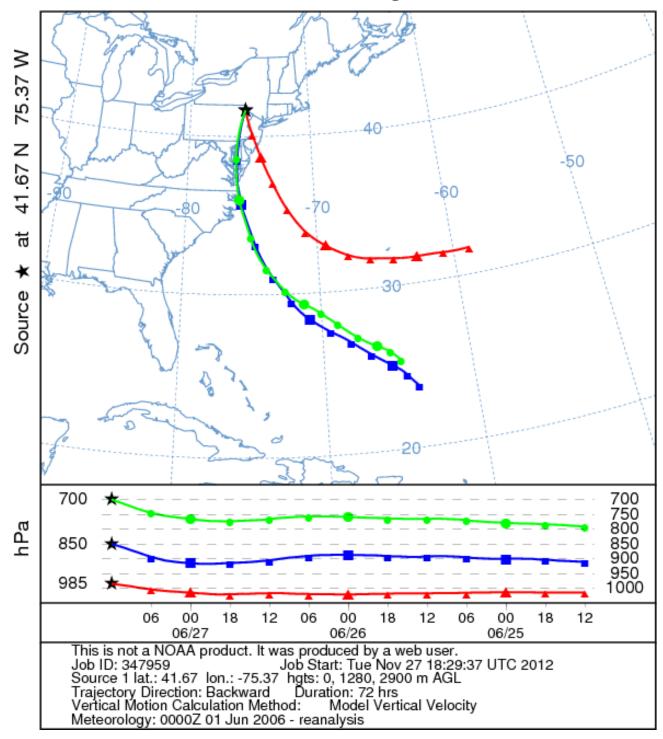




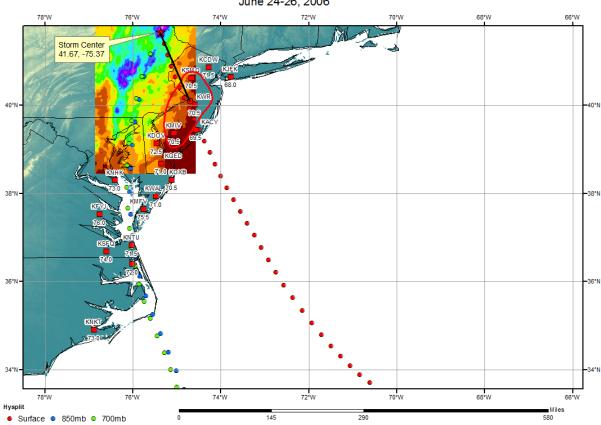
Total Rainfall (57-hours)
Tamaqua, PA 2006 Storm
Storm #1047 June 26 (0100 Z) to 28 (1000 Z), 2006



# NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 27 Jun 06 CDC1 Meteorological Data



#### SPAS 1047 Tamaqua, PA Storm Analysis June 24-26, 2006



## Storm Precipitation Analysis System (SPAS) For Storm #1218 SPAS-NEXRAD Analysis

General Storm Location: Northwestern Georgia and portions of adjacent states

Storm Dates: September 19-22, 2009

**Event**: Thunderstorm

**DAD Zone 1 (southern center)** 

Latitude: 33.87

Longitude: -84.76

Max. Grid Rainfall Amount: 25.37" (full storm period)

Max. Observed Rainfall Amount: 21.03" (24-hr total)

**DAD Zone 2 (northern center)** 

Latitude: 34.77

Longitude: -85.26

Max. Grid Rainfall Amount: 19.61"

Max. Observed Rainfall Amount: 12.44"

Number of Stations: 447 (59 Daily, 48 Hourly, 0 Hourly Estimated, 0 Hourly Estimated Pseudo, 62

Hourly Pseudo, 272 Supplemental, and 6 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: PRISM Mean (1971-2000) September precipitation

**Spatial resolution:** 36 seconds (~ 0.39 mi²)

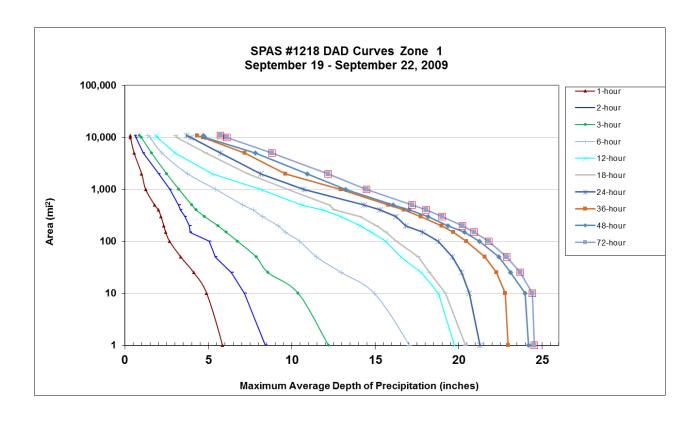
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

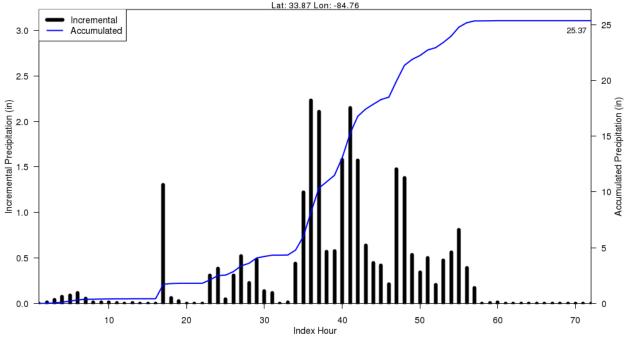
Reliability of results: Given the unblocked, clean and QC'ed radar data coupled with extensive gauge data, we have a very high degree of confidence in the results, particularly in DAD zone 1. We have slightly less confidence in the DAD results for Zone 2 given fewer stations sampled the peak rainfall center.

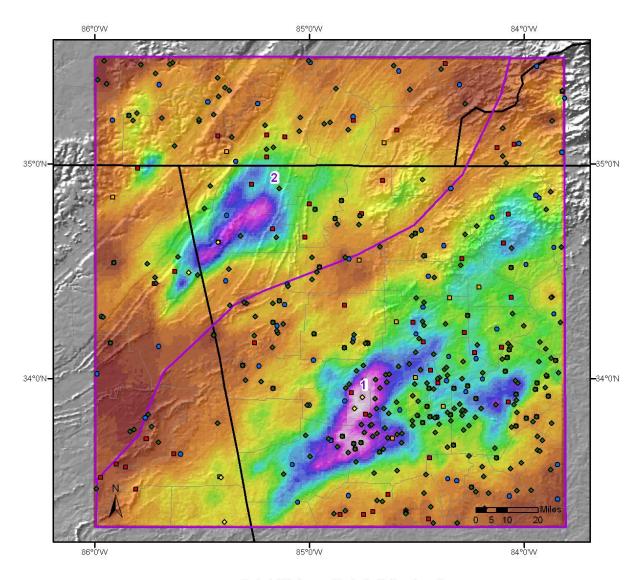
Storm Name:	SPAS 1218 - D	Oouglasville	, GA Zone 1	J							
Storm Date:	9/19-22/2009			,		Storm A	Adjustn	nent for	· Virginia	a	
AWA Analysis Date:	11/14/2015								1	1	1
Temporal Transposit	ion Date	5-Sep									
		Lat	Long				Inflow Dire		SSW @ 225	miles	
Storm Center Location		33.87 N	84.76 W				rage Elevat		N/A	feet	
Storm Rep Dew Poin		30.66 N	85.42 W				nter Elevati		1,000	feet	
Transposition Dew P	oint Location						dysis Durat		24	hours	
Basin Location						Effective I	Barrier Hei	ght	N/A	feet	
The storn	n representative of	dew point is	76.0 F	with tot	al precipital	le water abo	ve sea level	of		2.99	inches.
	place maximum	•	77.5 F				ve sea level			3.22	inches.
	oned maximum	•	0.0				ve sea level			#N/A	inches.
•	e in-place storm	•	1,000		ch subtracts			f precipitabl	e water at	76.0 F	
Th	e in-place storm	elevation is	1,000	whi	ch subtracts	0.28	inches o	f precipitabl	e water at	77.5 F	
The tra	nsposition basin	elevation at	N/A	whi	ch subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
The inflow bar	rier/basin elevati	on height is	N/A	whi	ch subtracts	x,xx	inches o	f precipitabl	e water at	0.0	
					-						
	The in-place st								s based on 24-hr		
Т	he transposition			r					21 along with Hy ted in region who		
	The	barrier adjus	tment factor is	#N/A					gree over a large		
		1 1		UNTLA			of KMAI, KP.		,		
	111	ie totai adjus	tment factor is	#N/A							
Observed	Storm Depth-A	ras-Durstic	m								
Obscived	Storm Beptii-A	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
······································	1 sq miles	5.8	17.0	19.8	20.4	21.3	23.0	24.2	24.5	24.5	24.5
	10 sq miles		15.0	18.8	19.2	20.6	22.8	24.0	24.4	24.4	24.4
······	100 sq miles		10.5	15.6	16.3	18.8	20.5	21.2	21.8	21.8	21.8
	200 sq miles	2.3	9.2	14.1	15.1	16.8	19.0	19.4	20.2	20.2	20.2
	500 sq miles	1.8	7.1	10.6	12.2	14.3	15.8	16.1	17.2	17.2	17.2
	1000 sq miles	<u> </u>	5.5	8.1	9.8	10.7	13.0	13.2	14.5	14.5	14.5
	2000 sq miles	<u> </u>	3.8	5.2	7.4	8.2	9.6	10.9	12.2	12.2	12.2
***************************************	5000 sq miles	0.6	2.2	3.0	4.9	5.7	7.2	7.8	8.8	8.8	8.8
	10000 sq miles	0.3	1.5 1.4	1.9	3.1	3.7	4.7	4.8	6.1 5.7	6.1 5.7	6.1 5.7
	20000 sq miles	0.3	1.4	1.9	3.1	3.7	4.3	4./	5./	5./	5./
Storm or S	torm Center Nar	ne		SPAS 1218	- Douglacy	ille, GA Zo	ne 1				
Storm Date		ne		9/19-22/20		ine, Grizo	1				
Storm Type				Synoptic							
Storm Loc				33.87 N	84.76 W						
Storm Cen	ter Elevation			1000							
Precipitati	on Total & Durat	tion (10 sq n	ni)	25.37 inche	s in 72 hour	s					
	resentative Dew			76.0 F	24			-			
	resentative Dew	Point Locati	on	30.66 N	85.42 W		Aug	Sept			
	Dew Point			77.5 F			79.5	76.5			
	nflow Vector aximization Fact	0.5		SSW @ 225	)	-	-	-	-		
iii-piace M	aniiiizatioii Fact	.01		1.00			-				
Temporal 7	Transposition (Da	ate)		5-Sep							Ī
	ion Dew Point L										
Transposit	ion Maximum D	ew Point									
	ion Adjustment F	actor		#N/A							
	asin Elevation			N/A							
	evation in Basin			N/A							
	rier Height			N/A			ļ				
	justment Factor			#N/A							ļ
Total Adiu	stment Factor			#N/A							

	Storm '	1218 - S	eptemb	er 19 (1	300 UT	C) - Se	otembe	22 (12	00 UTC	, 2009	
		MAX	IMUM A	/ERAGE	DEPTH (	OF PREC	IPITATIO	N (INCH	ES)		
Araa (m;²)					Dui	ration (hou	ırs)				
Area (mi²)	1	2	3	6	12	18	24	36	48	72	Total
0.4	5.94	8.82	12.98	17.36	20.31	21.07	22.82	23.83	24.95	25.37	25.37
1	5.84	8.42	12.20	17.03	19.76	20.42	21.29	22.97	24.19	24.54	24.54
10	4.90	7.17	10.39	14.95	18.79	19.21	20.63	22.80	23.97	24.41	24.41
25	4.13	6.39	8.58	12.98	17.77	18.25	20.18	22.26	23.10	23.69	23.69
50	3.35	5.42	7.87	11.49	16.57	17.60	19.63	21.56	22.41	22.89	22.89
100	2.68	5.05	6.76	10.48	15.63	16.27	18.79	20.48	21.24	21.79	21.79
150	2.44	3.90	6.07	9.62	14.78	15.63	17.85	19.67	20.36	20.93	20.93
200	2.33	3.86	5.57	9.18	14.10	15.09	16.82	18.97	19.35	20.22	20.22
300	2.16	3.58	4.78	8.25	12.92	14.09	16.26	17.73	18.16	19.00	19.00
400	2.01	3.32	4.27	7.70	11.89	12.55	15.29	16.73	17.03	18.04	18.04
500	1.78	3.22	4.01	7.07	10.63	12.24	14.32	15.80	16.07	17.22	17.22
1,000	1.24	2.69	3.24	5.45	8.11	9.77	10.74	12.95	13.24	14.48	14.48
2,000	1.00	2.02	2.50	3.75	5.22	7.40	8.15	9.62	10.93	12.17	12.17
5,000	0.55	1.08	1.60	2.22	2.97	4.87	5.73	7.17	7.81	8.80	8.80
10,000	0.33	0.65	0.98	1.51	1.93	3.10	3.97	4.69	4.79	6.12	6.12
10,922	0.31	0.59	0.87	1.37	1.89	3.06	3.68	4.33	4.71	5.72	5.72



#### SPAS 1218 Storm Center Mass Curve Zone 1 September 19 (1300UTC) to September 22 (1200UTC), 2009 Lat: 33.87 Lon: -84.76

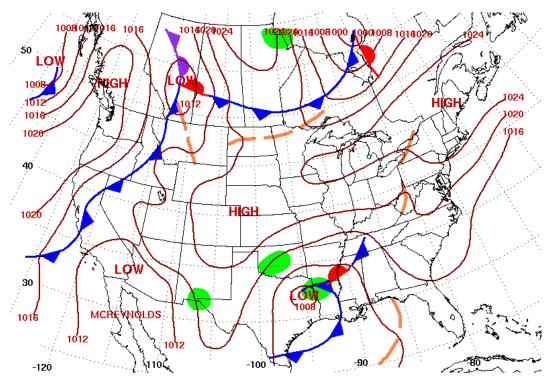




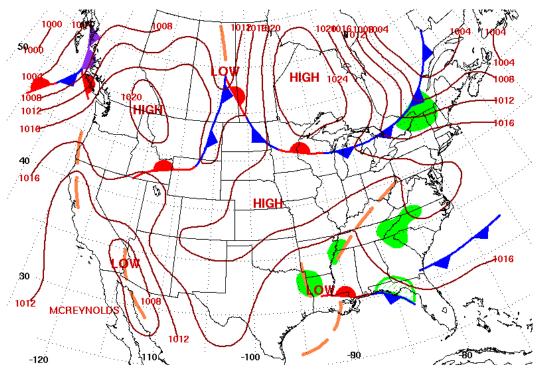
Total 72-hour Rainfall (Inches) 09/19/2009 1300 UTC - 09/22/2009 1300 UTC SPAS #1218



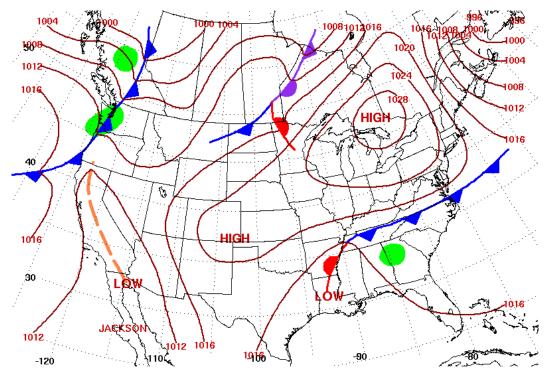




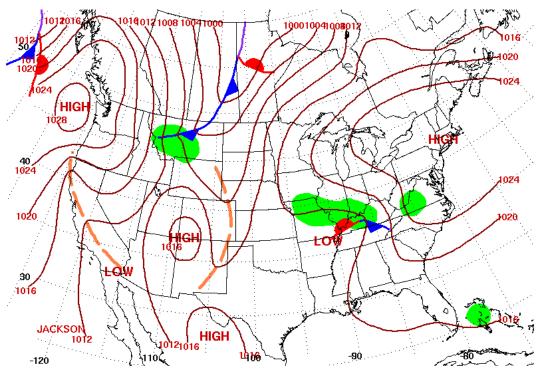
Surface Weather Map at 7:00 A.M. E.S.T.



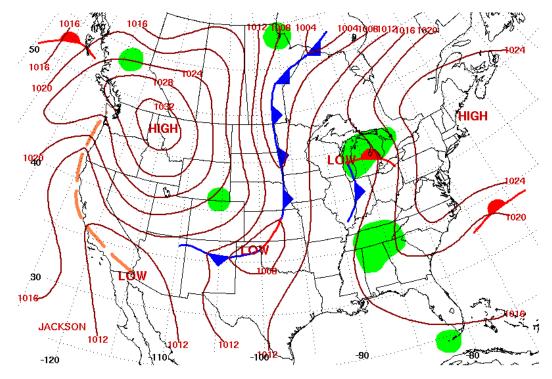
Surface Weather Map at 7:00 A.M. E.S.T.



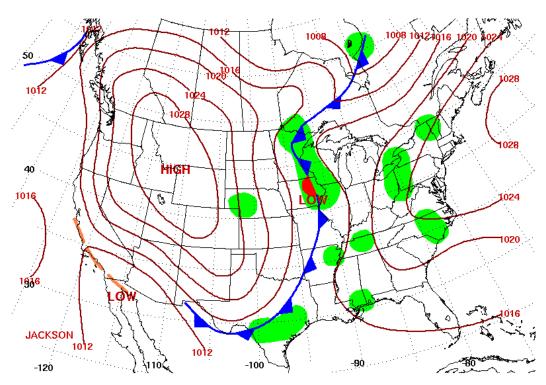
Surface Weather Map at 7:00 A.M. E.S.T.



Surface Weather Map at 7:00 A.M. E.S.T.

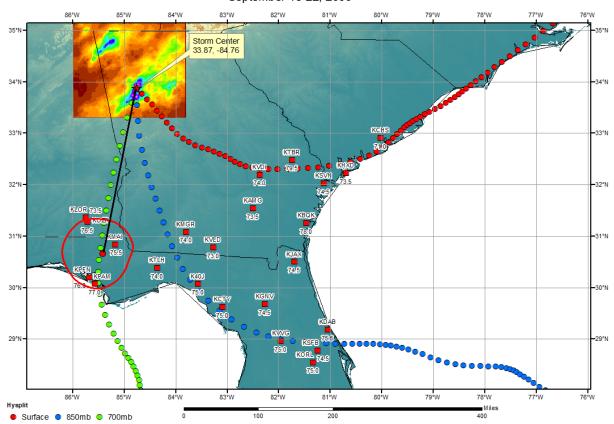


Surface Weather Map at 7:00 A.M. E.S.T.



Surface Weather Map at 7:00 A.M. E.S.T.

SPAS 1218 - Dew Point Temperature (F) September 18-22, 2009



## Storm Precipitation Analysis System (SPAS) For Storm #1208 SPAS-NEXRAD Analysis

General Storm Location: Western and Central Tennessee, Southwestern Kentucky and adjacent

portions of nearby states

Storm Dates: April 30 – May 3, 2010

**Event**: Synoptic

**DAD Zone 1** 

Latitude: 36.06

Longitude: -86.91

Max. Grid Rainfall Amount: 19.71"

Max. Observed Rainfall Amount: 19.70" at WARNER PARK, TN, followed by 19.51" at USGS SR840 Rain gauge No. 4 near Bending Chestnut, TN followed by 19.41" at CoCoRaHS Camden

4.5 NW, TN.

Number of Stations: 753 (120 Daily, 52 Hourly, 46 Hourly Pseudo, 1 Hourly Estimated Pseudo, 5 Hourly

Estimated, 521 Supplemental, and 8 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM May Precipitation

**Spatial resolution:** 36 seconds (0.39 sq-mi)

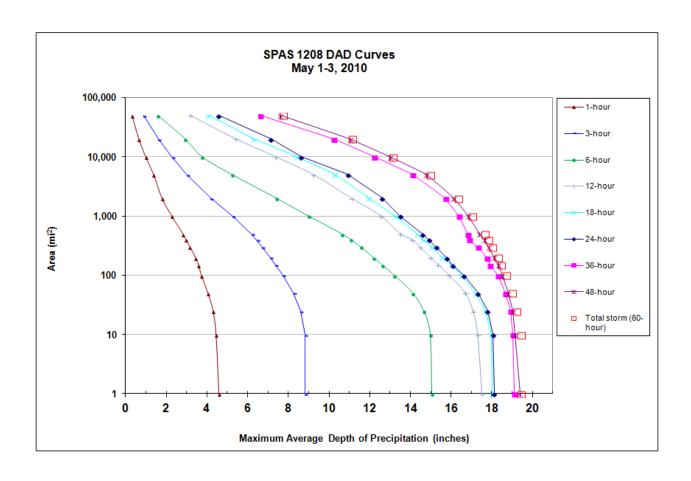
Radar Included: Yes

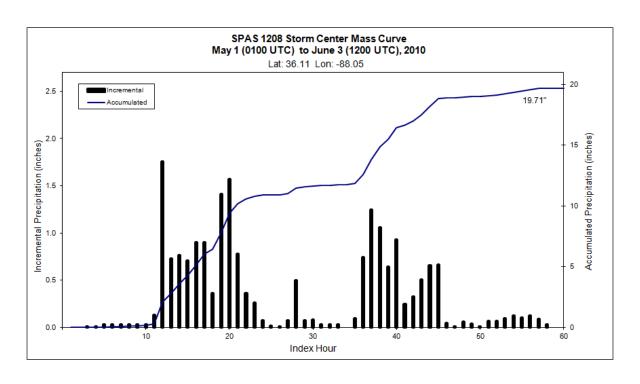
Depth-Area-Duration (DAD) analysis: Yes

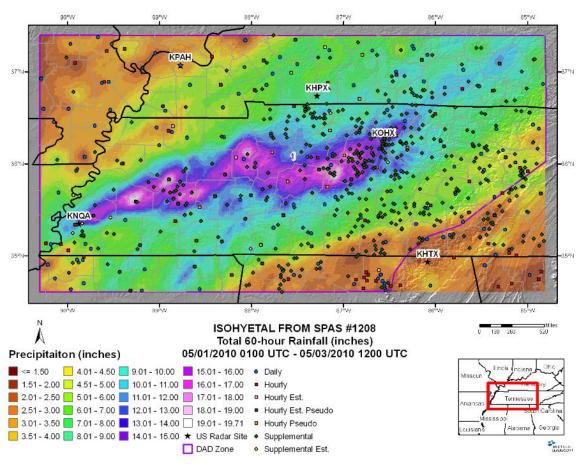
**Degree of confidence in results:** This was a difficult storm to analyze due to the extreme intensities, strong spatial rainfall gradients, large amount of data, relatively low radar reflectivity values across western Tennessee where among the heaviest rains fell. However, given this analysis was based on WDT NEXRAD data and a plethora of gauge data, our confidence in the results is high.

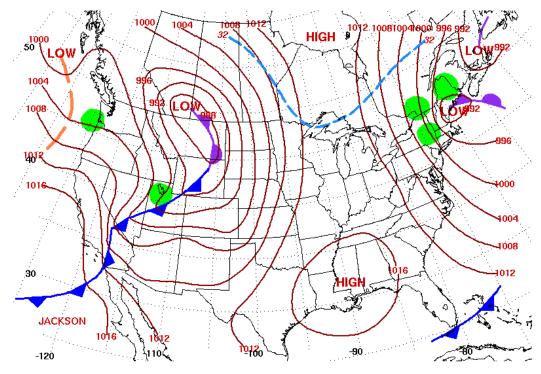
Storm Nam	ie:	SPAS 1208 - V	<b>Varner Par</b>	k, TN								
Storm Date	e <b>:</b>	4/30 -5/3/2010	0			S	torm A	djustm	ent for	· Virgini	a	
AWA Analy	ysis Date:	11/14/2015										
Temporal T	<u> Franspositi</u>	on Date	15-May									
			Lat	Long			Moisture	Inflow Dire	ection	SSW @ 360	miles	
Storm Cent	ter Locatio	n	36.06 N	86.91 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep	Dew Point	Location	31.50 N	90.00 W				ıter Elevati		600	feet	
-		oint Location	0210011	70100 11			t	dysis Dura		12	hours	
Basin Loca		2000000						Barrier Hei		N/A	feet	
							Directi (C)		· <b>5</b> ····	11112		
	The storm	representative of	lew point is	75.0 F	with tot	al precipital	ole water abo	ove sea leve	l of		2.85	inches.
		ace maximum o		76.5 F		al precipital					3.07	inches.
The t	•	ned maximum o	•	0.0		al precipital					#N/A	inches.
	•	in-place storm	•	600		ch subtracts			precipitabl	e water at	75.0 F	
		in-place storm		600	whi	ch subtracts	0.16		precipitabl		76.5 F	
		sposition basin		N/A	whi	ch subtracts	x.xx		precipitabl		0.0	
The i		er/basin elevati		N/A	whi	ch subtracts	x.xx		precipitabl		0.0	
									• •			
	The	in-place storm	maximizatio	on factor is	1.08		Notes: Storm	representativ	e Td value w	as based on 12-	hr surface	1
		ansposition/ele			#N/A			-		ng with Hysplit b		
	1110 111		ier adjustme		#N/A					ion where tempe		
		THE DAIT	aajastiit	140101 13				_		e area. Used ai	n average of	
		The to	tal adjustme	ent factor is	#N/A		KJAN, KMO	CB, KHBG, a	nd KASD.			
		iic to	uajustille	140-101 15	111/11	1						1
	Observed	Storm Depth-A	rag_Durct	on								
	Observed	storiii Deptii- <i>E</i>	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
		1 sq miles	4.6	15.1	17.5	18.0	18.1	19.1	19.4	19.5	19.5	19.5
		10 sq miles	<u> </u>	15.1	17.3	18.0	18.1	19.1	19.4	19.5	19.5	19.5
		100 sq miles	<b></b>	13.2	15.9	16.5	16.6	18.3	18.5	18.7	19.4	18.7
		200 sq miles	4	12.2	15.0	15.6	15.8	17.8	18.1	18.3	18.3	18.3
		500 sq miles	2.8	10.6	13.5	14.3	14.6	16.8	17.4	17.7	17.7	17.7
		1000 sq miles	2.3	9.0	12.6	13.3	13.5	16.4	16.9	17.1	17.1	17.1
		2000 sq miles	филимический и <u>фили</u> мический и по	7.4	11.1	12.0	12.6	15.7	16.1	16.4	16.4	16.4
		5000 sq miles	1.4	5.2	9.2	10.3	10.9	14.1	14.8	15.0	15.0	15.0
		0000 sq miles	<b></b>	3.8	7.4	8.4	8.6	12.2	13.0	13.1	13.1	13.1
		20000 sq miles	0.7	2.9	5.4	6.3	7.2	10.2	11.0	11.2	11.2	11.2
		50000 sq miles	0.3	1.6	3.2	4.1	4.6	6.6	7.6	7.8	7.8	7.8
	-	oooo sq iiiics	0.5	1.0	3.2	7.1	7.0	0.0	7.0	7.0	7.0	7.0
	C4 C4	Ct N-			CD AC 1200	. Wanan 1	Doub TNI	1	1			1
		orm Center Na	me			- Warner I	rark, IIN					
	Storm Date				4/30 -5/3/2	010						1
	Storm Type Storm Loca				Synoptic 36.06 N	86.91 W						1
		er Elevation			600	00.71 W						1
		on Total & Dura	tion (10 sg	mi)		s in 72 hour	·c					
-	i recipitatio	10ta & Dala		)	17./1 HICHE	3 III / 2 IIOUI						1
	Storm Por	esentative Dew	Point		75.0 F	12						
		esentative Dew		tion	31.50 N	90.00 W						
	Maximum I		1 OIIII LOCA	uon	76.5 F	20.00 W						
		flow Vector			SSW @ 360	)						1
		nximization Fac	tor		1.08							
	m-prace Ma	iamizanon Fac	101		1.00							
	Temporal T	ransposition (E	)ate)		15-May							
	-	on Dew Point L			13-1v1ay	-						1
		on Maximum I				-						t
		on Adjustment			#N/A							
		sin Elevation	i actor		N/A							
		vation in Basin			N/A	-						1
	Highart Ela				1 V/ /1							
]					NI/A							
]	Inflow Barr				N/A # <b>N/A</b>							

	Storm 1208 - May 1 (0100 UTC) - May 3 (1200 UTC), 2010														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
					Duration	n (hours)									
Area (mi ² )	1	3	6	12	18	24	36	48	60	Total					
0.4	4.63	8.92	15.31	17.77	18.33	18.39	19.36	19.66	19.71	19.71					
1	4.58	8.82	15.06	17.52	18.03	18.12	19.11	19.38	19.45	19.45					
10	4.44	8.81	14.98	17.31	17.97	18.06	19.04	19.15	19.43	19.43					
25	4.29	8.61	14.66	17.08	17.69	17.8	18.91	19.05	19.24	19.24					
50	4.04	8.25	14.12	16.7	17.2	17.33	18.67	18.82	19.01	19.01					
100	3.72	7.72	13.21	15.9	16.52	16.63	18.31	18.51	18.71	18.71					
150	3.58	7.37	12.62	15.37	16.04	16.07	17.91	18.35	18.48	18.48					
200	3.43	7.12	12.18	14.99	15.57	15.78	17.75	18.11	18.32	18.32					
300	3.16	6.72	11.56	14.47	15.07	15.28	17.33	17.85	18.05	18.05					
400	2.97	6.44	11.07	14.08	14.65	14.91	16.9	17.65	17.85	17.85					
500	2.81	6.19	10.63	13.52	14.34	14.61	16.84	17.4	17.67	17.67					
1,000	2.27	5.26	8.99	12.55	13.27	13.5	16.39	16.86	17.05	17.05					
2,000	1.79	4.19	7.41	11.11	11.96	12.62	15.72	16.14	16.37	16.37					
5,000	1.38	3	5.23	9.24	10.3	10.93	14.12	14.79	15	15.00					
10,000	0.99	2.28	3.76	7.39	8.42	8.64	12.21	13	13.13	13.13					
20,000	0.66	1.6	2.93	5.44	6.33	7.16	10.24	11.04	11.15	11.15					
50,000	0.32	0.88	1.58	3.19	4.08	4.59	6.63	7.63	7.75	7.75					

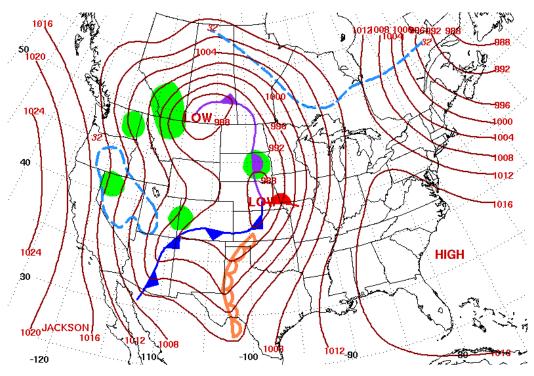




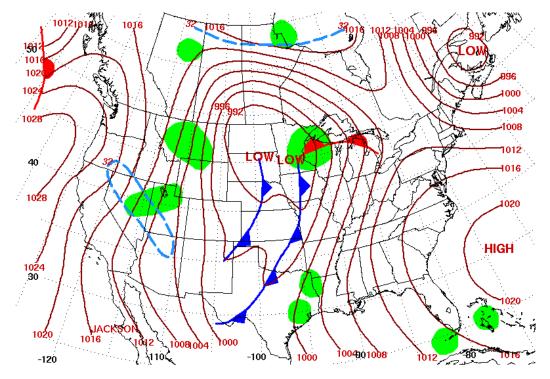




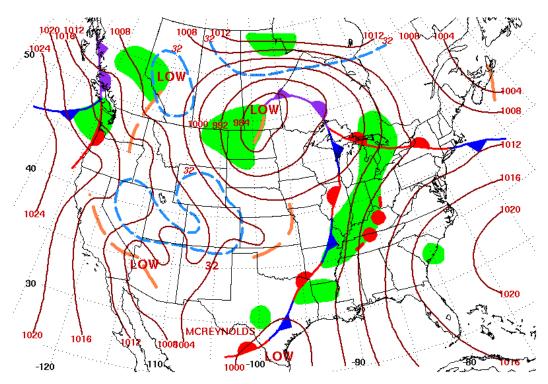
Surface Weather Map at 7:00 A.M. E.S.T.



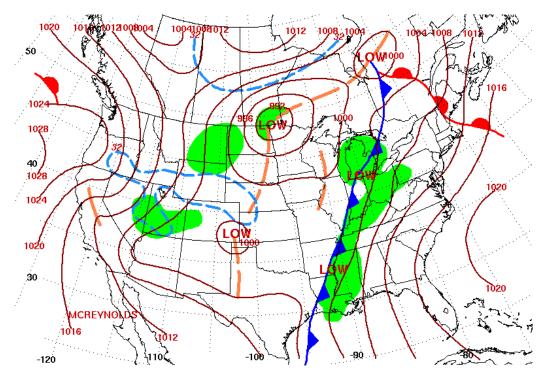
Surface Weather Map at 7:00 A.M. E.S.T.



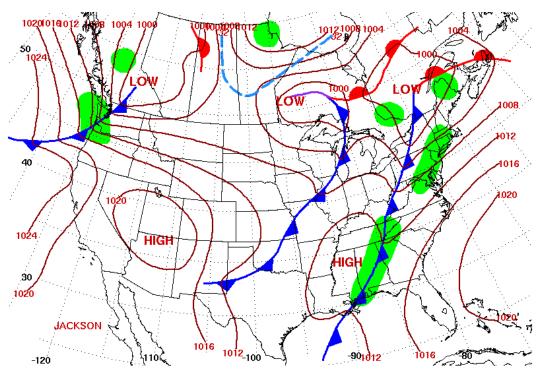
Surface Weather Map at 7:00 A.M. E.S.T.



Surface Weather Map at 7:00 A.M. E.S.T.

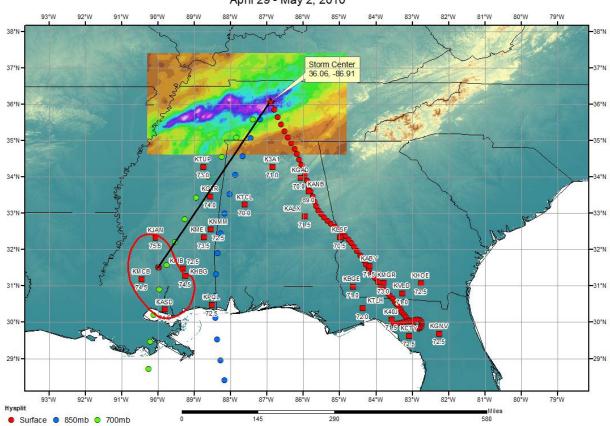


Surface Weather Map at 7:00 A.M. E.S.T.



Surface Weather Map at 7:00 A.M. E.S.T.

## SPAS 1208 - Dew Point Temperature (F) April 29 - May 2, 2010



# Storm Precipitation Analysis System (SPAS) For Storm #1350 SPAS Analysis

General Storm Location: Portsmouth, NC

Storm Dates: September 26 - October 1, 2010

Event: Synoptic

**DAD Zone 1** 

Latitude: 35.175

Longitude: -77.215

Max. Grid Rainfall Amount: 23.44"

Max. Observed Rainfall Amount: 22.54"

Number of Stations: 874 (475 Daily, 294 Hourly, 42 Hourly Pseudo, 55 Supplemental, and 8

Supplemental Estimated)

SPAS Version: 9.5

Basemap: NOAA Stage IV September 26-30, 2010 Precipitation

Spatial resolution: 0.01 (~ 0.40 mi²)

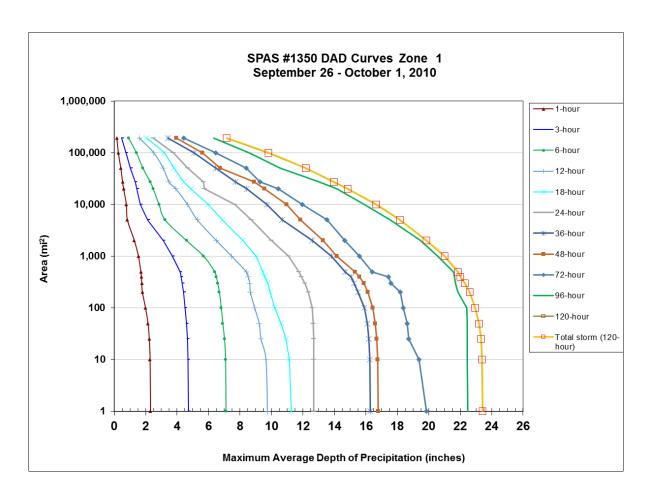
Radar Included: Yes

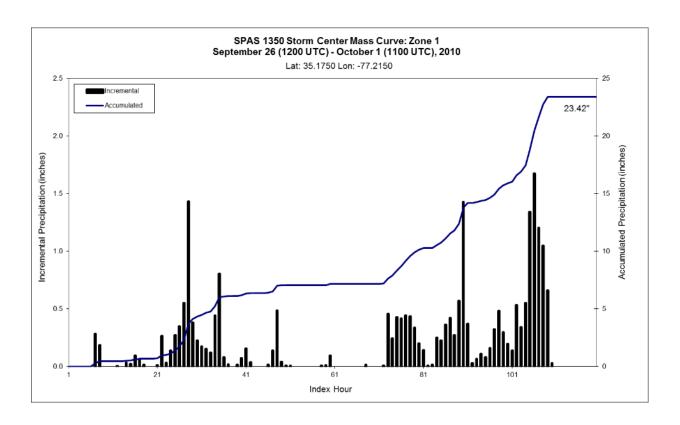
Depth-Area-Duration (DAD) analysis: Yes

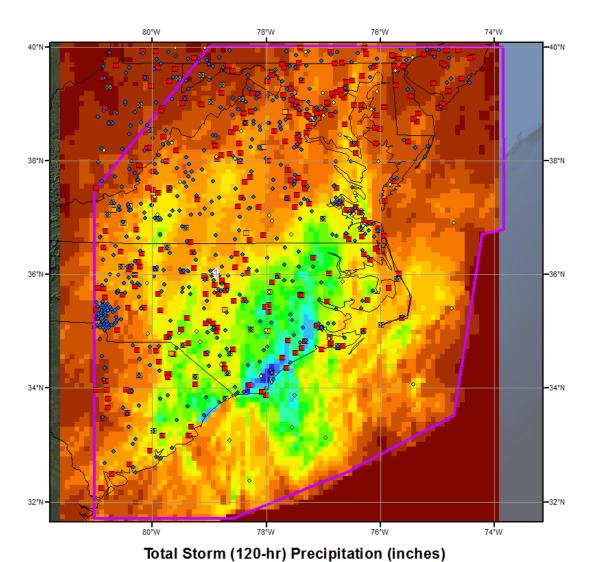
**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly and hourly pseudo stations.

Storm Name	. SDAC 1250	0 - New Bern	NC								
Storm Date:	9/26-10/1/		,110		C	torm A	diustm	ent for	Virginia		
	is Date: 11/14/201				Ь	willi A	ajustin	ciit ioi	v II giilla		
•	ansposition Date	15-Sep									
remporar ii	ansposition Date	Lat	Long	1		Moisture l	Inflow Direc	tion	SE @ 435	miles	
Storm Cente	r I ocation	35.18 N	77.22 W				age Elevati		N/A	feet	
	ST Location	30.00 N	73.00 W				ter Elevatio		0	feet	
	n SST Location	30.00 N	73.00 W				lysis Durati		24	hours	
Basin Locati							Barrier Heig		N/A	feet	
								,	14/24	icct	
	The storm represen	ntative SST is	81.5 F	with tota	l precipitable	water above	sea level of			3.84	inches.
	The in-place may		83.5 F		l precipitable					4.16	inches.
The	transpositioned may	kimum SST is	0.0	with tota	l precipitable	water above	sea level of			#N/A	inches
	The in-place storr	n elevation is	0	wh	ich subtracts	0.00	inches of	f precipitable	e water at	81.5 F	
	The in-place storr	n elevation is	0	wh	ich subtracts	0.00	inches of	f precipitable	e water at	83.5 F	
Т	he transposition basi	n elevation at	N/A	wh	ich subtracts	X.XX	inches of	f precipitable	e water at	0.0	
The inflo	w barrier/basin eleva	tion height is	N/A	wh	ich subtracts	x.xx	inches of	f precipitable	e water at	0.0	
					_						
	The in-place sto			-					0. Storm repres		
	The transposition/e			-		value was ba 2010.	sea on maximu	m 24-hr SST v	values on Septem	iber 28-29,	
	The ba	arrier adjustm	ent factor is	#N/A		2010.					
	The	total adjustme	ant factor :	#N/A							
	THE	totai aujustiii	ent factor is	#1 <b>\</b> /A							<u> </u>
0	bserved Storm Dep	th Aron Dure	ntion								
	bserved Storiii Dep	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	7.1	9.7	11.1	12.7	16.8	19.4	22.5	23.4		1
	100 sq miles	ļ	8.9	10.2	12.6	16.4	18.4	22.4	22.9		
	200 sq miles	<del>-</del>	8.7	9.9	12.3	16.1	18.2	21.8	22.6		1
	500 sq miles	·	8.4	9.4	11.8	15.3	16.4	21.6	21.8		
	1000 sq miles	5.7	7.5	9.0	11.1	14.2	15.6	20.6	21.0		
	2000 sq miles	4.6	6.5	8.2	10.0	13.3	14.7	19.5	19.9		
	5000 sq miles	3.2	5.3	6.9	8.7	11.8	13.5	17.5	18.2		
	10000 sq miles	2.9	4.7	6.0	7.7	11.0	12.0	15.9	16.7		ļ
	20000 sq miles	·	3.9	4.9	5.7	9.6	10.4	14.2	14.8		
	50000 sq miles	1 1	3.1	3.8	4.7	6.7	8.4	10.6	12.2		
	100000 sq miles	·	2.5	3.2	3.8	5.6	6.5	8.6	9.8		<b>.</b>
	193233 sq miles	0.9	1.6	2.1	2.5	4.0	4.4	6.3	7.1		J
0.	g. g .	3.7		GD 4 G 4 2 5 0	N D	NG	1				-
	orm or Storm Center orm Date(s)	r Name		9/26-10/1/2	- New Bern,	NC					-
	orm Type			Synoptic	010						
	orm Location			35.18 N	77.22 W						1
	orm Center Elevation	n		0	77.22 11						t
	recipitation Total & I		q mi)	-	0 hrs from SP	AS 1350					i i
					1						Ī
	orm Representative S			81.5 F	24						
	orm Representative S	SST Location		30.00 N	73.00 W		Sept				
	laximum SST			83.5 F			83.2				ļ
	loisture Inflow Vecto			SE @ 435							<u> </u>
In	-place Maximization	Factor		1.08							ļ
	1.77	(D : )		15.0	-						1
	emporal Transpositio			15-Sep	-						<del> </del>
	ansposition SST Loc										<del> </del>
	ansposition Adjustm			#NI/A							1
	ansposition Adjustm verage Basin Elevation			#N/A N/A							1
	verage Basin Elevation ighest Elevation in B			N/A N/A							1
П	flow Barrier Height	us/111		N/A							1
In				14/11							1
	arrier Adjustment Fac	ctor		#N/A							

	S	torm 13					•			C), 2010	)			
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)  Duration (hours)													
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	Total		
0	2.31	4.71	7.12	9.75	11.27	13.14	16.29	16.79	19.87	22.94	23.44	23.44		
1	2.31	4.71	7.11	9.74	11.26	12.68	16.29	16.79	19.84	22.47	23.43	23.43		
10	2.28	4.69	7.08	9.65	11.13	12.68	16.25	16.76	19.38	22.46	23.39	23.39		
25	2.23	4.65	7.01	9.33	10.92	12.68	16.20	16.70	18.74	22.45	23.32	23.32		
50	2.15	4.59	6.91	9.22	10.62	12.67	16.10	16.61	18.62	22.44	23.19	23.19		
100	1.99	4.50	6.81	8.93	10.20	12.59	15.91	16.44	18.39	22.41	22.94	22.94		
200	1.79	4.41	6.69	8.66	9.91	12.33	15.50	16.13	18.20	21.84	22.59	22.59		
300	1.75	4.33	6.58	8.62	9.75	12.12	15.25	15.87	17.60	21.71	22.30	22.30		
400	1.72	4.25	6.49	8.51	9.58	11.91	15.07	15.59	17.43	21.65	22.02	22.02		
500	1.69	4.18	6.39	8.39	9.44	11.75	14.68	15.32	16.42	21.58	21.84	21.84		
1000	1.54	3.70	5.69	7.47	9.01	11.08	13.81	14.16	15.61	20.56	21.00	21.00		
2000	1.28	3.12	4.60	6.50	8.19	9.99	12.59	13.27	14.66	19.49	19.86	19.86		
5000	0.84	2.14	3.24	5.29	6.87	8.72	10.69	11.84	13.53	17.54	18.16	18.16		
10000	0.77	1.66	2.85	4.66	5.96	7.68	9.72	10.97	11.98	15.91	16.67	16.67		
20000	0.60	1.45	2.48	3.92	4.89	5.73	8.42	9.57	10.42	14.15	14.83	14.83		
27000	0.53	1.34	2.30	3.49	4.44	5.69	7.71	8.90	9.28	13.04	13.96	13.96		
50000	0.42	1.04	1.83	3.12	3.81	4.69	6.46	6.74	8.41	10.55	12.17	12.17		
100000	0.26	0.74	1.41	2.51	3.18	3.76	5.08	5.60	6.46	8.60	9.82	9.82		
193233	0.17	0.48	0.91	1.60	2.05	2.49	3.42	3.95	4.44	6.32	7.14	7.14		

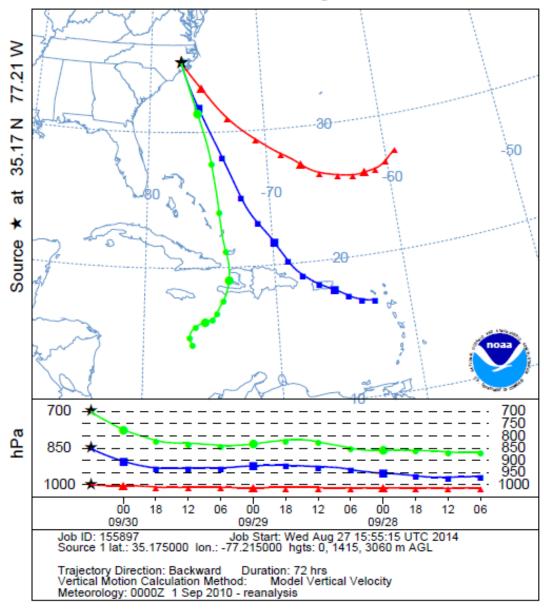


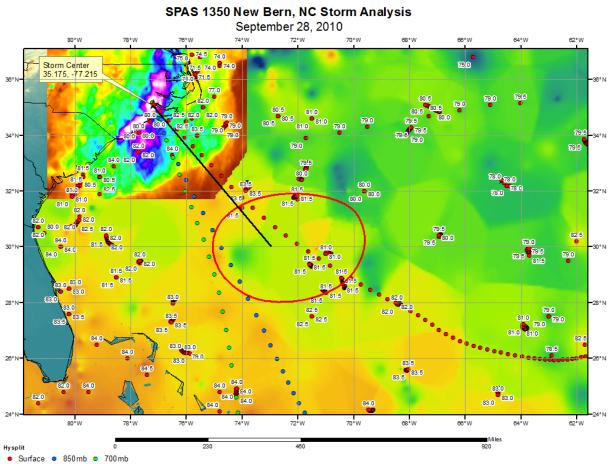




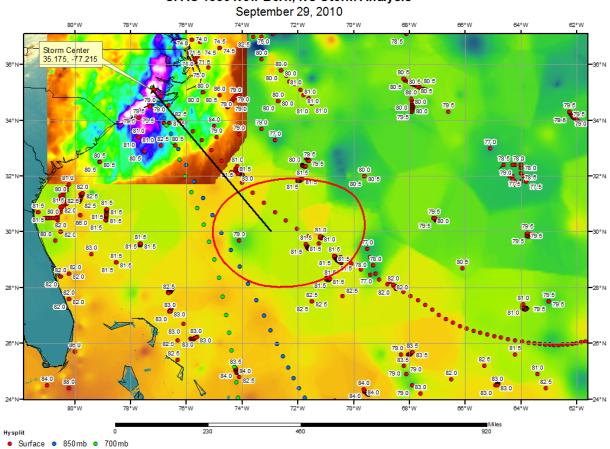
09/26/2010 1200 UTC - 10/01/2010 1100 UTC Gauges SPAS-NEXRAD #1350 D HP 100 200 S • SE 220 110 Precipitation (inches) ■ 0.37 - 1.00 5.01 - 6.00 10.01 - 11.00 15.01 - 16.00 20.01 - 21.00 1.01 - 2.00 6.01 - 7.00 11.01 - 12.00 16.01 - 17.00 21.01 - 22.00 **2**.01 - 3.00 **7**.01 - 8.00 **1**2.01 - 13.00 **1**17.01 - 18.00 **2**2.01 - 23.00 **3**.01 - 4.00 **8**.01 - 9.00 **1**3.01 - 14.00 **1**18.01 - 19.00 **2**3.01 - 24.00 4.01 - 5.00 9.01 - 10.00 14.01 - 15.00 19.01 - 20.00 5/9/2014

NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 30 Sep 10
CDC1 Meteorological Data





## SPAS 1350 New Bern, NC Storm Analysis



# **Local Storms**

# Storm Precipitation Analysis System (SPAS) For Storm #1489 SPAS Analysis

General Storm Location: Jewell, MD

Storm Dates: July 25-30, 1897

**Event:** Local Convective

**DAD Zone 1** 

Latitude: 38.729

Longitude: -76.571

Max. Grid Rainfall Amount: 15.88"

Max. Observed Rainfall Amount: 14.70"

Number of Stations: 312

SPAS Version: 10.0

Base Map Used: Conus_prism_ppt_in_1981_2010_07

Spatial resolution: 30 seconds

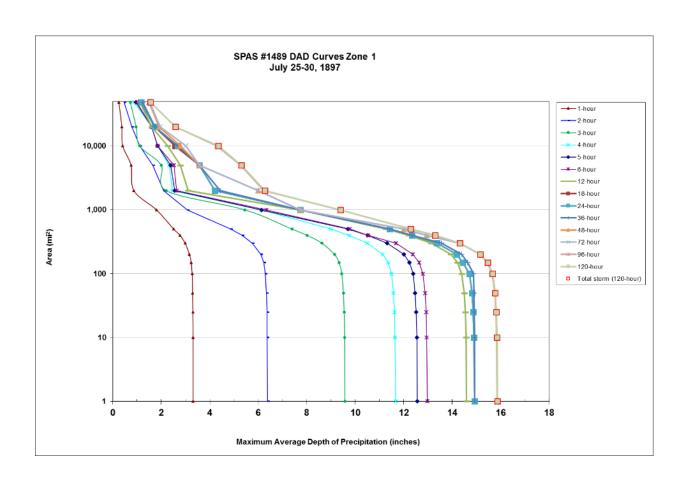
Radar Included: No

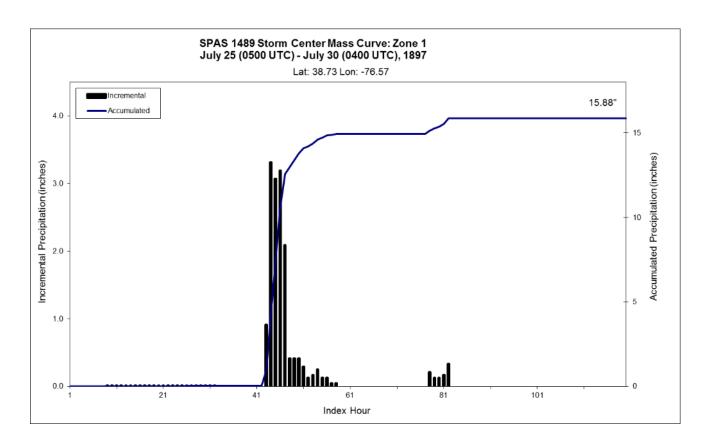
Depth-Area-Duration (DAD) analysis: Yes

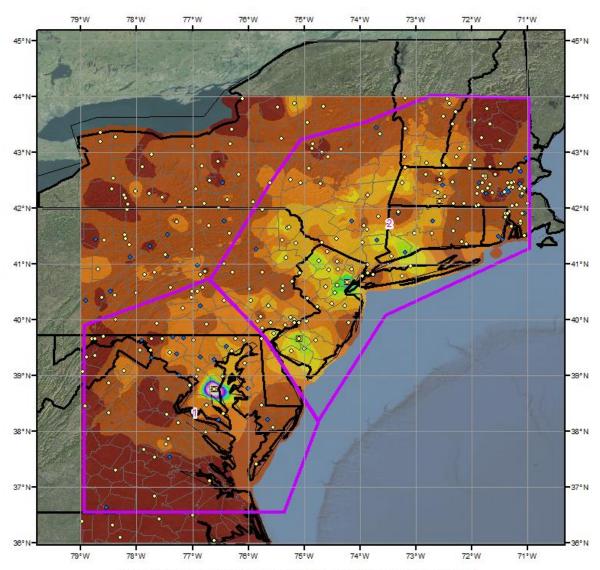
Reliability of Results: This storm is originally USACE NA 1-7a and 1-7b. This analysis was based on hourly pseudo data, daily data and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap and we have a high degree of confidence with the timing based on the location of the four hourly pseudo stations (see below). One hourly USACE mass curve captured the largest storm center at Jewell, MD allowing high confidence in the spatiotemporal isohyetal pattern of this critical location. Many daily stations lacked timing, so they had to be converted into supplemental stations. Due to the four hourly pseudo stations being consistent in timing, there isn't much issue with having to turn so many daily stations into supplemental stations.

Storm Name	e:	SPAS 1489	- Jewell, M	D Zone 1									1
Storm Date:		7/25-29/18				S	torm A	djustm	ent for	Virgini	a		
AWA Analys	sis Date:	11/14/2015	5										
Temporal To	ranspositi	on Date	10-Aug										
			Lat	Long			Moisture I	nflow Dire	ction	E @ 175	miles		
Storm Cente	er Locatio	n	38.73 N	76.57 W			Basin Aver	age Elevati	ion	N/A	feet		
Storm Rep S	SST Locati	on	38.00 N	73.50 W			Storm Cen	ter Elevati	on	200	feet		
Transpositio	on SST Lo	cation					Storm Ana	lysis Durat	ion	12	hours		
Basin Locat	ion						Effective B	arrier Hei	ght	N/A	feet		]
		•	tative SST is	71.5 F		tal precipitab					2.42	inches.	
			imum SST is	79.0 F		tal precipitab					3.44	inches.	
Th			imum SST is	0.0		tal precipitab		1			#N/A	inches.	
			n elevation is	200		ich subtracts			f precipitable		71.5 F		
			n elevation is	200		ich subtracts	0.06		f precipitable		79.0 F		
			n elevation at tion height is	N/A N/A		ich subtracts ich subtracts	X.XX X.XX		f precipitable f precipitable		0.0		
THE HILL	OW Daillei/	basiii eie vai	non neight is	IV/A	ieet wii	icii subtracts	X.XX	inches 0	i precipitable	e water at	0.0		
	The in	n-nlace stor	m maximizat	ion factor is	1.43		Notes: Storm	representative	SST value wa	is based on SS	T values for	1	
		•	levation to ba		#N/A				ed in region wh				
	inc train	•	rrier adjustm				-		ge area and wa				
		1110 00	arrer aajasan	one ruotor is			center.						
		The	total adjustm	ent factor is	#N/A								
					•		•						
Observed St	orm Dept	h-Area-Du	ration										
***************************************		1 Hours	2 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hou
1	sq miles	3.3	6.4	9.6	13.0	14.6	14.9	14.9	14.9	15.9	15.9	15.9	15.9
10	) sq miles	3.3	6.4	9.6	13.0	14.6	14.9	14.9	14.9	15.8	15.9	15.9	15.9
**********************	) sq miles	3.3	6.3	9.4	12.8	14.4	14.7	14.7	14.9	15.6	15.7	15.7	15.7
	) sq miles	3.2	6.1	9.1	12.4	13.9	14.2	14.2	14.4	15.2	15.2	15.2	15.2
	) sq miles	2.5	4.9	7.4	9.8	11.3	11.4	11.4	11.4	12.0	12.0	12.3	12.3
	) sq miles	1.8	3.1	5.5	6.3	7.7	7.7	7.7	7.7	7.7	7.7	9.4	9.4
	) sq miles	0.9	2.1	2.2	2.6	3.1	4.2	4.2	4.4	6.0	6.0	6.2	6.3
	) sq miles	0.8	1.6	2.0	2.5 1.9	2.3	3.6	3.6 2.7	3.6	3.6	3.6	5.3	5.3 4.4
	) sq miles ) sq miles	0.4	1.1 0.8	1.1 1.0	1.6	1.6	2.6 1.7	1.7	2.7 1.7	1.9	2.0	2.6	2.6
20000	o sq mnes	0.4	0.0	1.0	1.0	1.0	1.7	1.7	1.7	1.7	2.0	2.0	2.0
S	torm or Ste	orm Center	Name.		SPAS 1489	9 - Jewell, M	ID Zone 1						
	torm Date				7/25-29/18							1	
	torm Type				Convective							Ī	
S	torm Loca	tion			38.73 N	76.57 W						ĺ	
S	torm Cente	er Elevation	ı		200								
P	recipitatio	n Total & D	Ouration		14.6 inches	s in 12 hours							
		esentative S			71.5 F	12							
			STLocation		38.00 N	73.50 W		July	Aug				
	Maximum S				79.0 F			78	79			1	
		flow Vector			E@ 175							ł	
11	n-prace Ma	ximization	i actoi		1.43								
Т	emporal Ti	ansposition	ı (Date)		10-Aug								
		n SST Loca											
		n Maximur											
		n Adjustme			#N/A								
		in Elevatio			N/A								
H	lighest Ele	vation in Ba	nsin		N/A								
	nflow Barri				N/A								
В	Barrier Adjı	stment Fac			#N/A								
		ment Facto			#N/A								

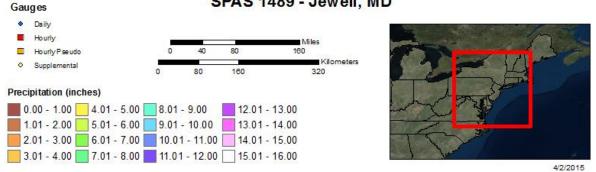
	Storm 1489 Zone 1 - Jul. 25 (0500 UTC) - Jul. 30 (0400 UTC), 1897														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
							Dur	ation (ho	urs)						
areasqmi	1	2	3	4	5	6	12	18	24	36	48	72	96	120	Tota
0.3	3.31	6.38	9.57	11.66	12.56	12.97	14.59	14.92	14.92	15.12	15.85	15.87	15.88	15.88	15.88
1	3.31	6.38	9.57	11.66	12.56	12.97	14.59	14.92	14.92	14.93	15.85	15.87	15.87	15.87	15.87
10	3.31	6.37	9.56	11.64	12.54	12.95	14.57	14.90	14.90	14.92	15.83	15.85	15.85	15.85	15.8
25	3.30	6.36	9.54	11.62	12.52	12.92	14.54	14.87	14.87	14.91	15.80	15.82	15.82	15.82	15.82
50	3.29	6.34	9.51	11.58	12.47	12.88	14.49	14.81	14.81	14.90	15.75	15.77	15.77	15.77	15.77
100	3.27	6.29	9.44	11.50	12.39	12.79	14.39	14.71	14.71	14.88	15.64	15.66	15.66	15.66	15.66
150	3.23	6.22	9.33	11.36	12.24	12.63	14.22	14.44	14.44	14.64	15.45	15.47	15.47	15.47	15.47
200	3.16	6.10	9.14	11.13	12.00	12.38	13.94	14.19	14.19	14.39	15.15	15.16	15.16	15.16	15.16
300	2.98	5.75	8.63	10.50	11.32	11.68	13.15	13.37	13.37	13.56	14.29	14.29	14.31	14.31	14.31
400	2.77	5.34	8.01	9.75	10.51	10.53	12.21	12.35	12.35	12.35	12.95	12.96	13.29	13.30	13.30
500	2.51	4.86	7.39	9.00	9.70	9.77	11.27	11.42	11.42	11.42	12.01	12.02	12.28	12.28	12.28
1,000	1.80	3.08	5.45	6.13	6.13	6.34	7.73	7.73	7.73	7.73	7.73	7.73	9.38	9.39	9.39
2,000	0.87	2.09	2.20	2.46	2.55	2.63	3.10	4.21	4.21	4.43	5.99	6.00	6.23	6.27	6.27
5,000	0.75	1.64	2.00	2.32	2.38	2.53	2.79	3.57	3.57	3.57	3.57	3.57	5.28	5.30	5.30
10,000	0.41	1.11	1.11	1.85	1.85	1.85	2.27	2.57	2.67	2.68	2.79	3.02	4.29	4.36	4.36
20,000	0.37	0.78	0.96	1.60	1.60	1.60	1.60	1.72	1.72	1.74	1.91	1.96	2.58	2.59	2.59
48,380	0.25	0.47	0.72	0.88	0.95	0.98	1.12	1.15	1.17	1.24	1.50	1.53	1.56	1.56	1.56





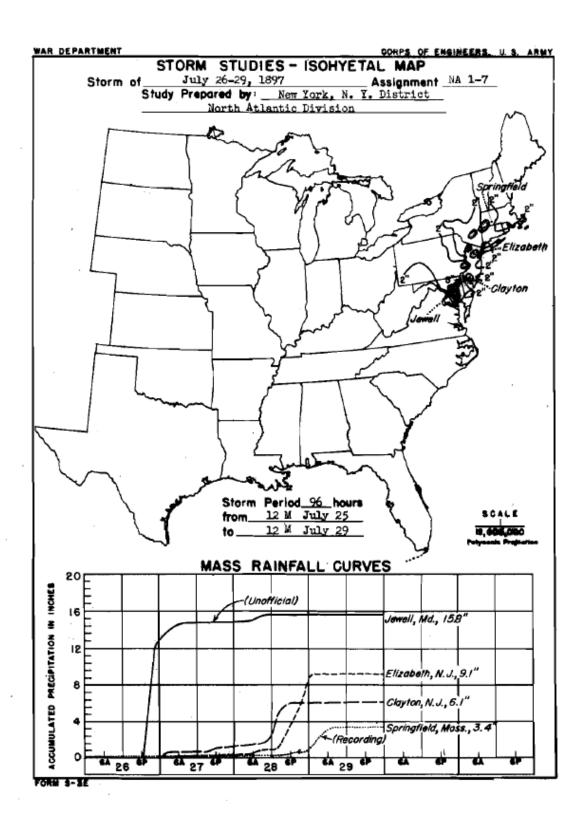


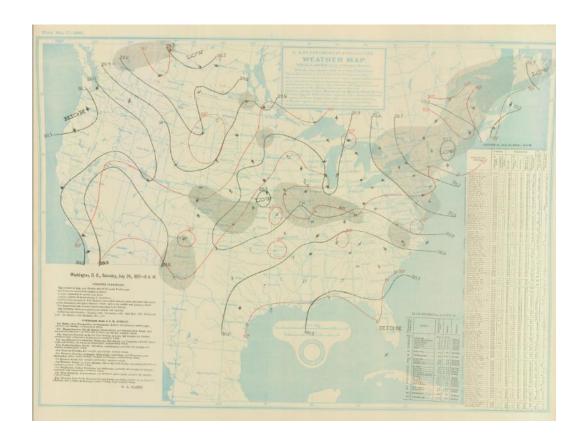
Total Storm (120-hours) Precipitation (inches) July 25 - 29, 1897 SPAS 1489 - Jewell, MD

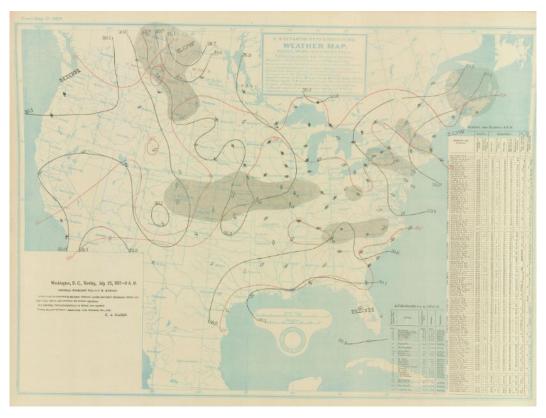


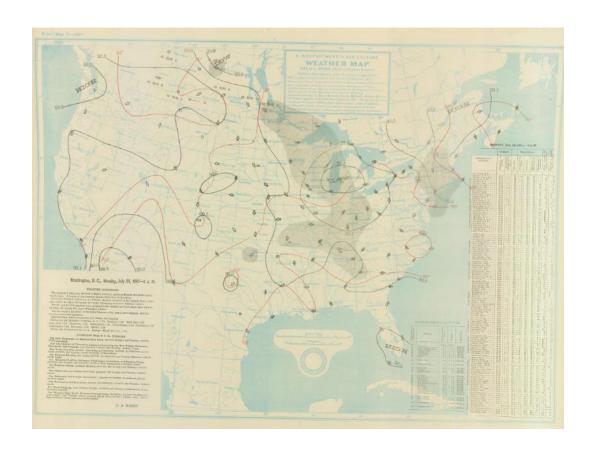
### CORPS OF ENGINEERS, U.S. ARMY WAR DEPARTMENT STUDIES - PERTINENT DATA SHEET STORM Storm of 26-29 July 1897 Assignment NA 1-7 Location Northeast U. S. Study Prepared by: North Atlantic Division New York District Office Part I Reviewed by H. M. Sec. of Weather Bureau, 3/1/40 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 12/27/46 -LEGEND -.... Area covered by final isohyetal map. Remarks: TOTAL STORM Centers at Area inclosed by 2-inch isohyet. Jewell, Md., Elizabeth and LOCATION MAP Clayton, N. J. DATA AND COMPUTATIONS COMPILED PART I Preliminary isohyetal map, in 1 sheet, scale 1:2,500,000 (Number of Sheets) Precipitation data and mass curves: Form 5001-C (Hourly precip. data)_____ 13 Form 5001-B (24-hour " 74 Form 5001-D (" " " " )-----Misc), precip. records, meteorological data, etc._____ Form 5002 (Mass reinfall curves)______ PART I Final isohyetai maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets: Form S-10 (Data from mass rainfall curves)_____ Form S-II (Depth-area data from isohyetai map)_____ Form S-12 (Maximum depth-duration data)_____ Maximum duration-depth-area curves_____ Data relating to periods of maximum rainfall ..... MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES Duration of Rainfall in Hours Area in Sq. Mi. 36 48 24 30 60 72 . 18 13.0 14.5 14.7 10 14.7 14.7 14.7 15.8 15.8 15.8 15.8 100 10.5 11.9 11.9 11.9 11.9 12.8 12.8 12.8 12.8 200 9.4 10.5 10.6 10.6 10.6 10.6 11.5 11.5 11.5 11.5 7.5 9.2 7.0 500 8.3 8.5 8.5 8.5 8.5 9.2 9.2 9.2 5.5 3.7 1,000 6.0 6.2 6.2 6.2 6,2 7.0 7.0 7.0 5.2 3.8 2,000 4.2 4.5 4.6 4.7 4.7 5.2 5.2 5.2 5,000 3.3 2.3 3.1 3.3 3.4 3.7 3.9 4.0 4.1 2.6 2.8 2.9 2.9 10,000 1.5 3.3 3.5 3.6 3.7 3.8 20,000 1.1 2.1 2.4 2.5 3.2 2.6 3.0 3.5 3,6 3.6 0.9 32,000 1.7 1.9 2.0 2.8 3.4 3.4

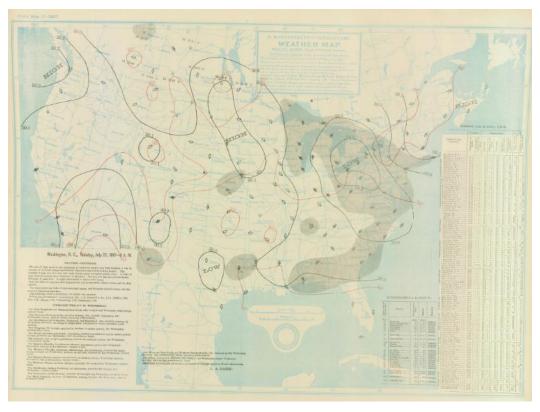
Form 5-2

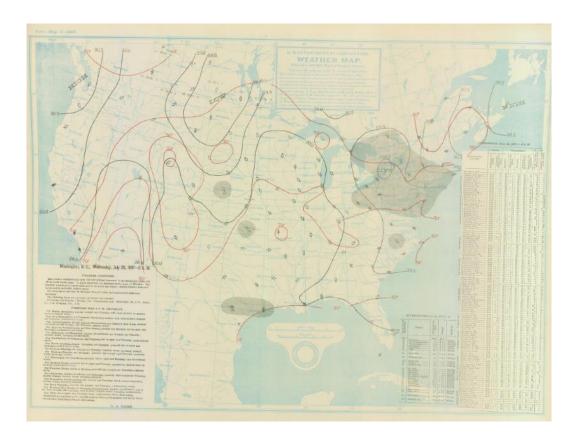


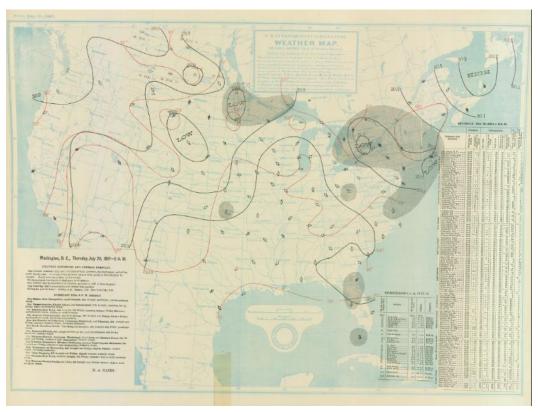




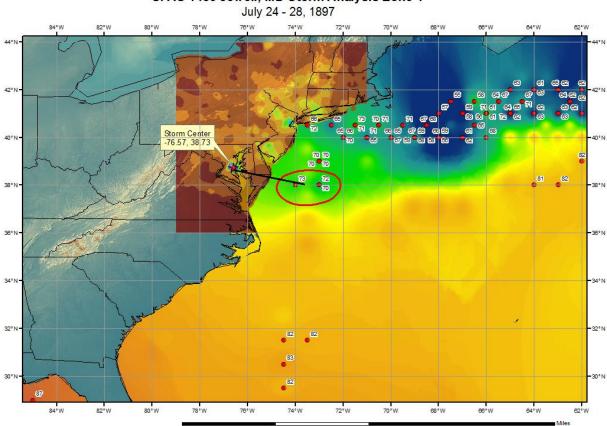


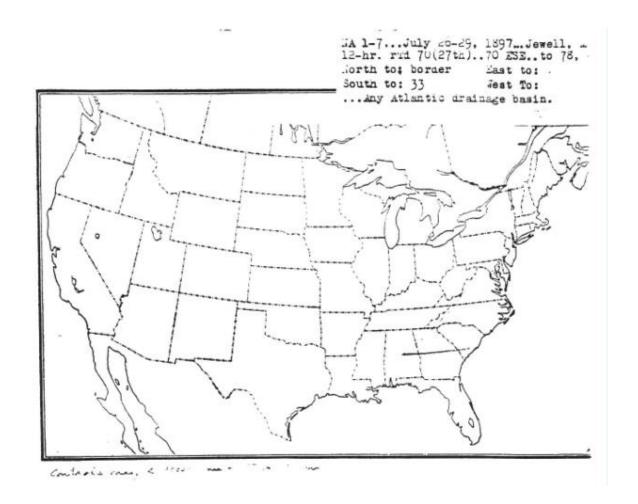






### SPAS 1489 Jewell, MD Storm Analysis Zone 1





# Storm Precipitation Analysis System (SPAS) For Storm #1426 SPAS-NEXRAD Analysis

General Storm Location: Cooper, MI

Storm Dates: September 1 - September 2, 1914

**Event**: Extreme Precipitation Event

**DAD Zone 1** 

Latitude: 42.3708

**Longitude**: -85.5875

Max. Grid Rainfall Amount: 13.39"

Max. Observed Rainfall Amount: 12.80"

Number of Stations: 30

SPAS Version: 10.0

Base Map Used: Continental United States 2 year 6 hour (conus 0002yr06h)

Spatial resolution: 0.2451

Radar Included: No

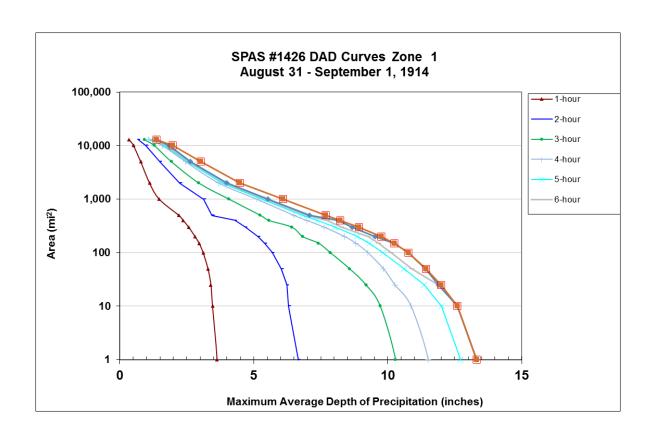
Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: In addition to the NCDC stations, three hourly stations were digitized from the U.S. Army Corp of Engineers (USACE) Storm Study Pertinent Data Sheet (included below). These stations only provided precipitation timing for the time period beginning on August 31, 1914 at 6pm EST and ending at 6pm the following day. Due to the lack of hourly information, a 25-hour Core Precipitation Period (CPP) was established for this time period. While precipitation did fall outside of the CPP, results are unreliable due to the lack of data. The resulting DAD values are slightly less than those determined by the initial USACE report. Major adjustments were completed in order to simulate USACE results, however the original analysis likely over generalized the storm area and this analysis likely provides a more accurate depiction of the event.

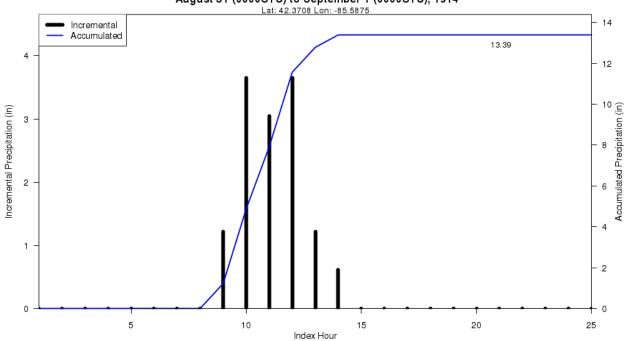
Storm Name:	SPAS 1426 - 0	Cooper, MI									
Storm Date:	8/31-9/1/1914				9	Storm A	diustm	ent for	Virginia	1	
AWA Analysis Date:						) (OI III 1	Lujustiii		v II SIIII	•	
Temporal Transposi	tion Date	15-Aug									
		Lat	Long			Moisture l	Inflow Direc	tion	SW @ 250	miles	
Storm Center Locat	ion	42.37 N	85.59 W			Basin Avei	rage Elevati	on	N/A	feet	
Storm Rep Dew Poi	-	40.25 N	89.50 W				ter Elevatio		800	feet	
Transposition Dew			07120 11				lysis Durati		6	hours	
Basin Location	orne Eccurion						Barrier Heig		N/A	feet	
The stor	m representative	dew point is	75.0 F	with tota	al precipitabl	e water abov	e sea level o	f		2.85	inches.
The ir	-place maximum	dew point is	80.5 F	with tota	al precipitabl	e water abov	e sea level o	f		3.68	inches.
The transposi	tioned maximum	dew point is	0.0	with tota	al precipitabl	e water abov	e sea level o			#N/A	inches.
	he in-place storn		800		ich subtracts			f precipitable		75.0 F	
	he in-place storn		800		ich subtracts			f precipitable		80.5 F	
	ansposition basis		N/A		ich subtracts			f precipitable		0.0	
The inflow ba	rrier/basin eleva	tion height is	N/A	wh	ich subtracts	X,XX	inches o	f precipitable	e water at	0.0	
				1.00		N. DAD	1 .1 .	GD 4 G 140		: m.1	
	The in-place stor			1.30					<ol><li>Storm representations</li><li>2hr persisting to</li></ol>		-
Th	e transposition/e							•	anr persisting to isting dew point		
	The ba	arrier adjustm	ent ractor is	#N/A		in Figure 332.		.c. ram pers	cang acw poilit	can be round	
	т	total adjustm	ant factor :-	#N/A		J 2.32.					
	ine	iotai aujustiii	ent ractor 18	#1¶/A	I						
Observer	l Storm Depth-A	Aran-Duratio	n								
Observed	i Storiii Deptii-A	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
	1 sq miles		13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3
	10 sq miles		12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6	12.6
	100 sq miles		10.1	10.8	10.8	10.8	10.8	10.8	10.8	10.8	10.8
	200 sq miles	<u> </u>	9.3	9.5	9.5	9.8	9.8	9.8	9.8	9.8	9.8
,	500 sq miles		7.0	7.1	7.1	7.7	7.7	7.7	7.7	7.7	7.7
	1000 sq miles		5.4	5.5	5.5	6.1	6.1	6.1	6.1	6.1	6.1
×	2000 sq miles		3.9	4.0	4.0	4.5	4.5	4.5	4.5	4.5	4.5
	5000 sq miles	<u> </u>	2.6	2.6	2.6	3.0	3.0	3.0	3.0	3.0	3.0
	10000 sq miles	0.5	1.7	1.8	1.8	2.0	2.0	2.0	2.0	2.0	2.0
	12,928 sq miles	0.4	1.2	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4
Storm or	Storm Center Na	me		SPAS 1426	- Cooper, N	II					
Storm Da	te(s)			8/31-9/1/19	14						
Storm Ty				Synoptic							
Storm Lo				42.37 N	85.59 W						
	nter Elevation			800							
Precipitat	ion Total & Dura	ation (10 sq m	i)	13.39" in 24	hrs from SP	AS 1426					
~ -	1	70.1		7505							
	presentative Dev			75.0 F	6			A			1
	presentative Dew Dew Point	v Point Locati	on	40.25 N	89.50 W			Aug			
				80.5 F				80.5			1
	Inflow Vector  Maximization Fac	etor		SW @ 250 1.30							
	raammzauom Fac	101		1.00	-	-	-			-	
III-place is				15-Aug							1
•	Transposition (T	Date)									1
Temporal	Transposition (I tion Dew Point I			13-7 tug							
Temporal Transposi	tion Dew Point I	ocation		13-7 kig							
Temporal Transposi Transposi	tion Dew Point I tion Maximum D	Location Dew Point									
Temporal Transposi Transposi Transposi	tion Dew Point I tion Maximum D tion Adjustment	Location Dew Point		#N/A							
Temporal Transposi Transposi Transposi Average F	tion Dew Point I tion Maximum D	Location Dew Point Factor									
Temporal Transposi Transposi Transposi Average E Highest E	tion Dew Point I tion Maximum D tion Adjustment Basin Elevation	Location Dew Point Factor		#N/A N/A							
Temporal Transposi Transposi Transposi Average E Highest E Inflow Ba	tion Dew Point I tion Maximum D tion Adjustment Basin Elevation levation in Basin	Location Dew Point Factor		#N/A N/A N/A							

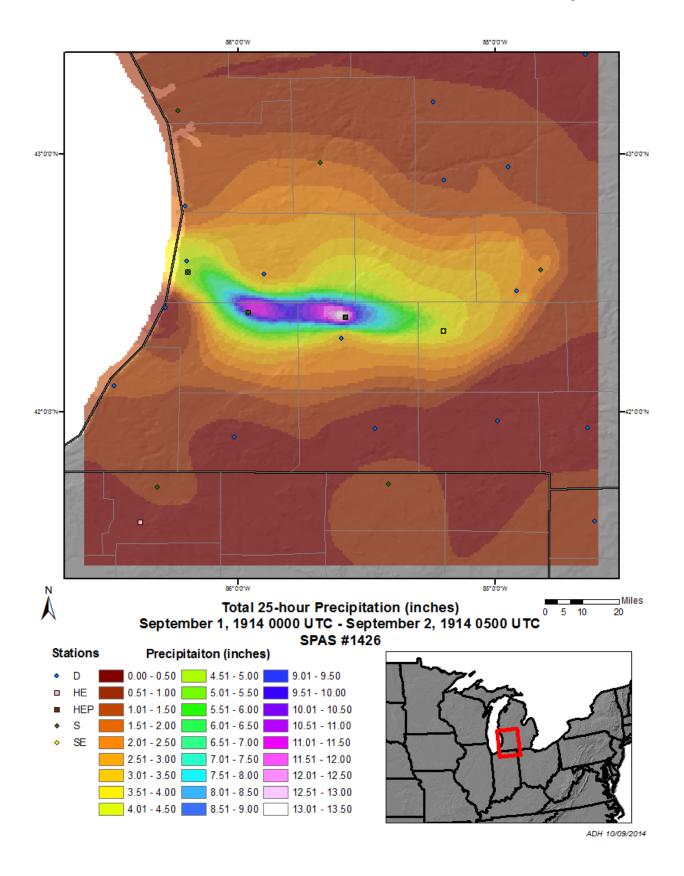
Storm 1426 - September 1 (0100 UTC) - September 2 (0100 UTC), 1914
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

		iiiiOiii At			ration (hou		, , , , , , , , , , , , , , , , , , , ,	,	
Area (mi ² )	1	2	3	4	5	6	12	24	Total
0.2	3.65	6.70	10.35	11.56	12.78	13.39	13.39	13.39	13.39
1	3.63	6.66	10.29	11.51	12.72	13.32	13.32	13.32	13.32
10	3.46	6.30	9.72	10.87	12.01	12.60	12.60	12.60	12.60
25	3.40	6.23	9.19	10.27	11.36	11.89	11.89	11.99	11.99
50	3.29	6.03	8.58	9.84	10.60	10.91	11.42	11.43	11.43
100	3.11	5.69	7.86	9.26	9.81	10.13	10.77	10.78	10.78
150	2.96	5.41	7.42	8.81	9.31	9.67	10.25	10.25	10.25
200	2.81	5.15	6.83	8.39	8.85	9.28	9.53	9.77	9.77
300	2.57	4.68	6.42	7.63	8.03	8.29	8.68	8.92	8.92
400	2.37	4.29	5.57	6.98	7.36	7.74	8.14	8.22	8.22
500	2.20	3.44	5.24	6.49	6.83	6.98	7.08	7.69	7.69
1,000	1.47	3.13	4.08	5.11	5.33	5.44	5.53	6.10	6.10
2,000	1.11	2.24	2.95	3.69	3.83	3.93	4.00	4.48	4.48
5,000	0.78	1.49	1.93	2.46	2.55	2.60	2.63	3.02	3.02
10,000	0.51	0.98	1.29	1.59	1.68	1.74	1.83	1.97	1.97
12,928	0.35	0.68	0.92	1.09	1.18	1.24	1.37	1.37	1.37



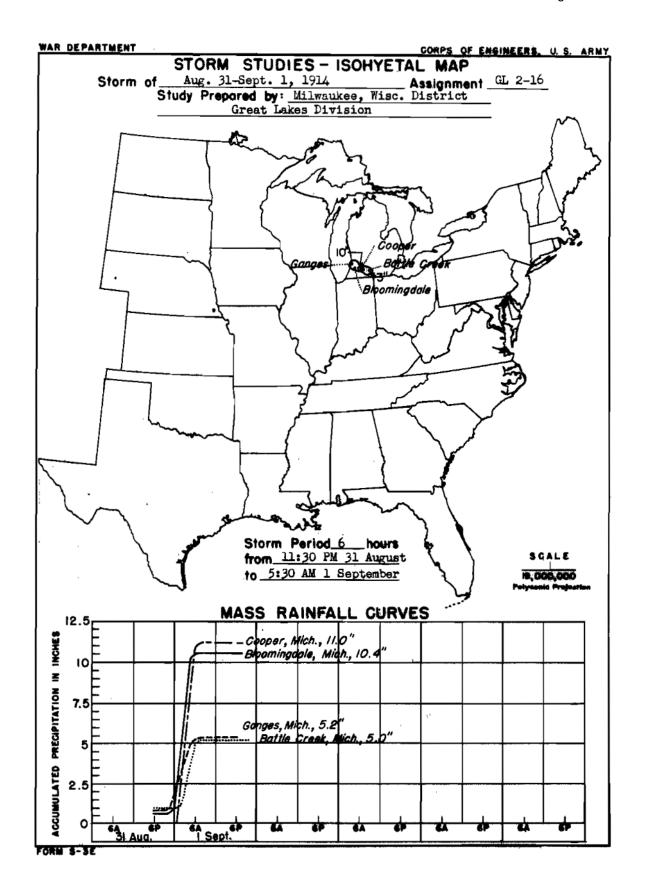
### SPAS 1426 Storm Center Mass Curve Zone 1 August 31 (0000UTC) to September 1 (0000UTC), 1914 Lat: 42.3708 Lon: -85.5875

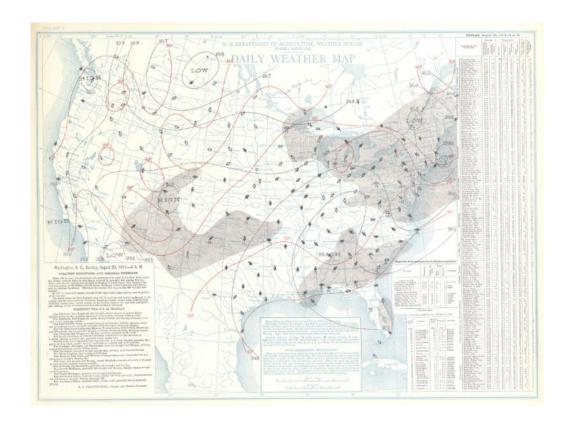


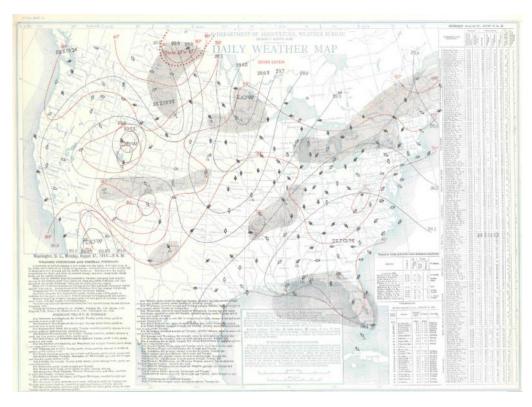


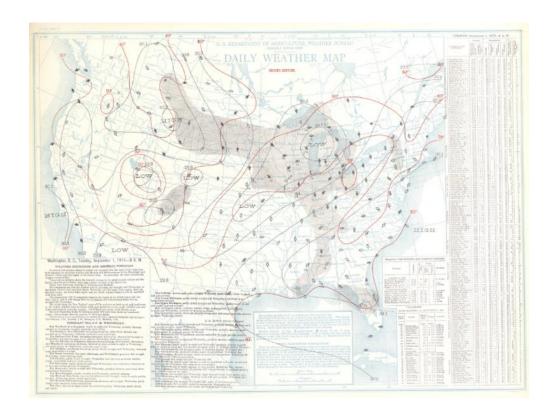
### CORPS OF ENGINEERS, U.S. ARMY WAR DEPARTMENT STUDIES - PERTINENT DATA STORM Storm of 31 Aug.-1 Sept. 1914 GL 2-16 Assignment Michigan Location Study Prepared by: Great Lakes Division Milwaukee District Office and Hydrometeorological Section of Part I Reviewed by H. M. Sec. of Weather Bureau, 10/26/39 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 10/26/46 -LEGEND-Area covered by final isohyetai map. Remarks: Centers near Area inclosed by 3-inch isohyet. Cooper and Bloomingdale, LOCATION MAP Mich. # Extrapolated AND COMPUTATIONS COMPILED PART I 1:2,500,000 Preliminary Isohyetal map, in 1 sheet, scale Precipitation data and mass curves: (Number of Sheets) Form 5001-C (Hourly precip. data)_____ Form 5001-B (24-hour " " )_____ * )______ Form 5001-D ( " Miscl. precip. records, meteorological data, etc._____ Form 5002 (Mass rainfall curves)______ PART II Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets: Form 5-10 (Data from mass rainfall curves)_____ Form S-II (Depth-area data from isohyetal map)_____ Furm S-12 (Maximum depth-duration data)_____ Maximum duration-depth-area curves_____ Data relating to periods of maximum rainfall_____ MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES Duration of Rainfall in Hours Area in Sq. Mi. 6 10 12.6 12.0 50 100 11.3 200 10.0 500 7.6 800 6.3 1,000 5.7 1,200 5.2

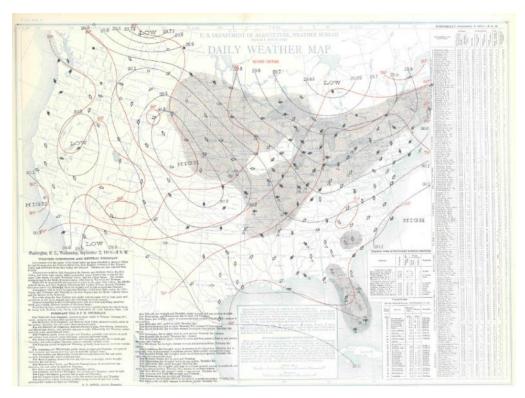
Form 5-2

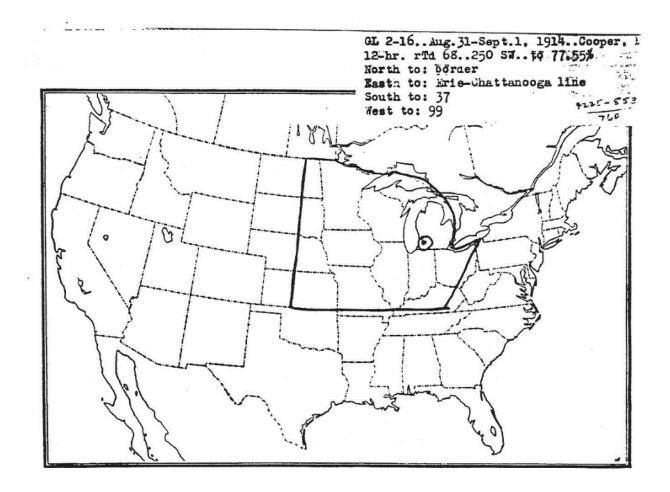












# Storm Precipitation Analysis System (SPAS) Storm # 1343 SPAS Analysis

General Storm Location: Eastern Tennessee

Storm Dates: June 12, 1924 0600 UTC - June 13, 1924 0600 UTC

Event: Extreme "Cloud Burst"

**DAD Zone 1** 

Latitude: 36.30416

Longitude: -82.0625

Max. Grid Rainfall Amount: 16.14"

Max. Observed Rainfall Amount: 14.98"

Number of Stations: 205

SPAS Version: 9.5

**Basemap:** Mean June Precipitation

Spatial resolution: 30 seconds

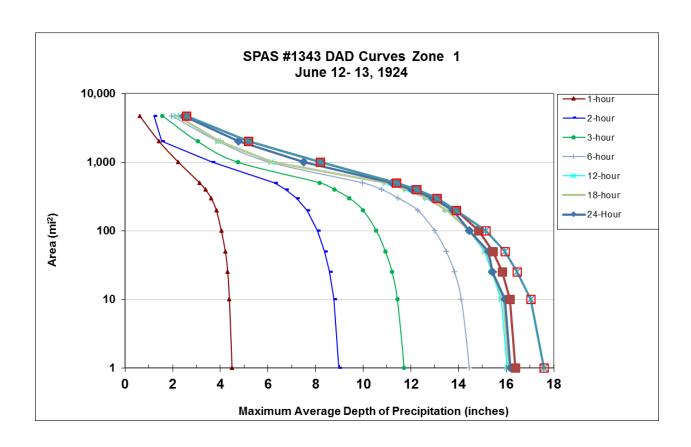
Radar Included: No

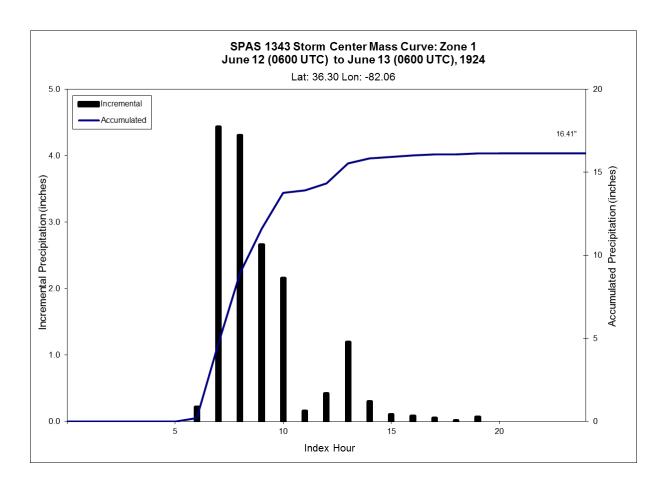
Depth-Area-Duration (DAD) analysis: Yes

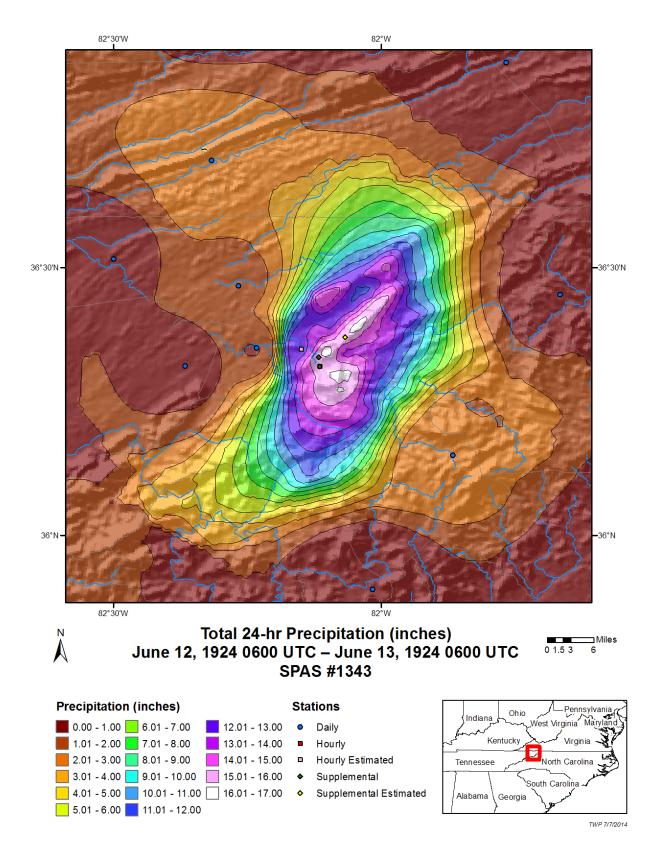
Reliability of results: We have a moderate degree of confidence in this analysis. A decent write-up in the Monthly Weather Review (MWR) provided some important details for quantifying the timing and magnitude of rainfall of this event – which was described as "one of the most terrific rainstorms ever recorded in eastern Tennessee." In fact, the MWR report provided enough information to support the creation of 2 pseudo hourly stations near the storm center; although the exact 1-hour time steps of rainfall are uncertain, the 3 to 8-hour accumulations are reliable given the details provided in the MWR report. The individual hourly rainfall was distributed using the temporal distributions provided in NOAA Atlas 14 Volume 2. The basemap initially drove the storm center value up to 17.62", which we felt to be too high. We constrained the storm total to be 16.14" (1.16" more than highest observed) to account for the local orographic enhancement that likely caused slightly higher rainfalls northeast of the observed maximums. This analysis is only reliable in/near the storm center – the lack of hourly data outside of this are too limited to accurately time the daily precipitation data.

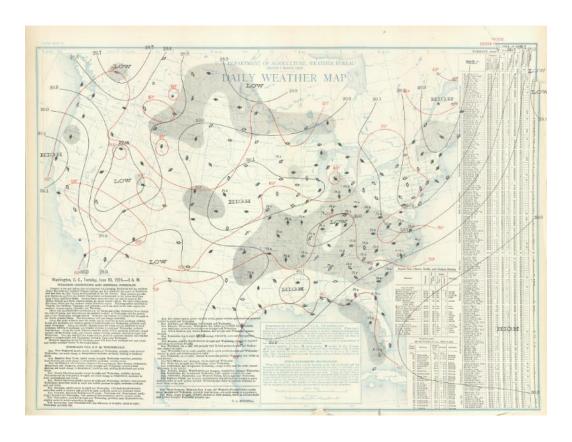
Storm Name:	SPAS 1343	Johnson City	y, TN								
Storm Date:	6/12-13/1924				S	torm A	djustm	ent for	Virginia	a	
AWA Analysis Date:	11/14/2015				~	•••	a-j a-s v		, 8	-	
Temporal Transposit	ion Date	15-Jul									
		Lat	Long			Moisture I	nflow Direc	ction	SW @520	miles	
Storm Center Locati	on	36.30 N	82.06 W				age Elevati		N/A	feet	
Storm Rep Dew Poin		30.70 N	88.10 W				ter Elevatio		3,200	feet	
Transposition Dew P		30.7011	00.10 11			Storm Ana			6	hours	
Basin Location	om Location						arrier Heig		N/A	feet	
							,	,	11112		
The storn	n representative	dew point is	76.0 F	with tota	al precipitabl	e water abov	e sea level o	f		2.99	inches.
	place maximum	•	81.5 F			e water abov				3.84	inches.
	ioned maximum	•	0.0			e water abov				#N/A	inches.
Th	e in-place storn	n elevation is	3,200	whi	ich subtracts	0.77	inches o	f precipitable	e water at	76.0 F	
Th	e in-place storn	n elevation is	3,200	whi	ich subtracts	0.91	inches o	f precipitable	e water at	81.5 F	
The tra	nsposition basii	n elevation at	N/A	whi	ich subtracts	X.XX	inches o	f precipitable	e water at	0.0	
The inflow bar	rier/basin elevat	ion height is	N/A	whi	ich subtracts	X.XX	inches o	f precipitable	e water at	0.0	
Г	he in-place stor	m maximizat	ion factor is	1.32		Notes: Storm	rep Td from l	Mobile, AL, W	B93855. 76°F	Td at	
The	transposition/e	levation to ba	sin factor is	#N/A		consectuive 1	2 hr periods at	times frame v	vhen airflow w	as moving	
	The ba	rrier adjustm	ent factor is	#N/A		over the area.					
	The	total adjustm	ent factor is	#N/A							
		•			•	•					
Observed	Storm Depth-A	Area-Duratio	n								
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	4.5	14.5	16.1	16.1	16.2	16.2	16.4	17.6	17.6	17.6
	10 sq miles	4.4	14.1	15.8	15.9	16.0	16.0	16.2	17.0	17.0	17.0
	100 sq miles	4.0	13.0	14.4	14.5	14.5	14.5	14.8	15.1	15.1	15.1
	200 sq miles	3.8	12.3	13.5	13.5	13.8	13.8	13.9	13.9	13.9	13.9
	500 sq miles	3.1	10.0	11.0	11.0	11.2	11.2	11.4	11.4	11.4	11.4
	1000 sq miles	2.2	6.1	6.2	6.2	7.5	7.5	8.2	8.2	8.2	8.2
	2000 sq miles	1.4	4.5	4.5	4.5	4.8	4.8	5.2	5.2	5.2	5.2
	4726 sq miles	0.6	2.0	2.2	2.2	2.5	2.5	2.6	2.6	2.6	2.6
Storm or S	Storm Center Na	me		SPAS 1343	- Johnson C	ity, TN					
Storm Date	e(s)			6/12-13/192	24						
Storm Typ	e			Mesoscale							
Storm Loc	ation			36.30 N	82.06 W						
Storm Cen	ter Elevation			3,200							
Precipitati	on Total & Dura	ation		16.14 Inches	s in 25-hours						
	resentative Dev			76.0 F	6						
	resentative Dev	Point Locati		30.70 N	88.10 W			June	July		
	Dew Point			81.5 F				79.198	81.67		
	nflow Vector			SW @520							
In-place M	laximization Fac	tor		1.32							
	Transposition (I			15-Jul							
	ion Dew Point I										
	ion Maximum D			UNTLA							
	ion Adjustment	ractor		#N/A							
	asin Elevation			N/A							
	evation in Basin	1		N/A							
	rier Height			N/A							
	justment Factor			#N/A							
Total Adju	stment Factor			#N/A							

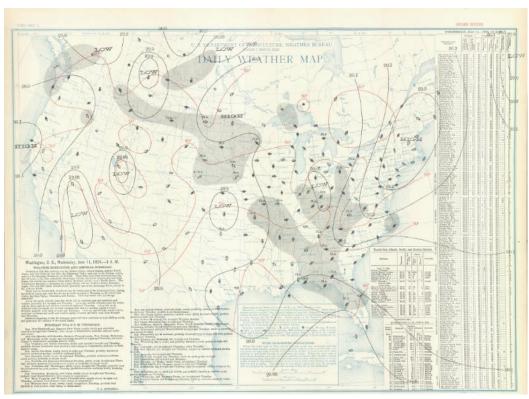
	Storr	n 1343 -	June 1	2 (0600	UTC) -	June 1	3 (0600	UTC), 1	924					
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
		Duration (hours)												
Area (mi²)	1	2	3	6	12	18	24	48	72	Total				
0.3	4.53	8.99	11.74	14.48	16.07	16.14	16.20	16.41	17.63	17.63				
1	4.49	8.97	11.71	14.45	16.05	16.12	16.19	16.39	17.58	17.58				
10	4.38	8.76	11.43	14.12	15.80	15.89	15.96	16.15	17.04	17.04				
25	4.31	8.59	11.21	13.83	15.40	15.41	15.41	15.83	16.45	16.45				
50	4.21	8.37	10.93	13.48	15.10	15.18	15.26	15.45	15.94	15.94				
100	4.04	8.08	10.55	13.00	14.44	14.45	14.45	14.84	15.14	15.14				
200	3.83	7.65	9.99	12.28	13.51	13.51	13.76	13.91	13.91	13.91				
300	3.61	7.20	9.41	11.46	12.67	12.69	12.92	13.09	13.09	13.09				
400	3.37	6.74	8.79	10.77	11.80	11.84	12.03	12.24	12.24	12.24				
500	3.13	6.27	8.18	9.97	10.95	10.98	11.20	11.39	11.39	11.39				
1,000	2.24	3.65	4.73	6.06	6.15	6.20	7.50	8.19	8.19	8.19				
2,000	1.43	1.54	3.05	3.92	3.92	3.96	4.77	5.18	5.18	5.18				
4,726	0.61	1.21	1.57	1.95	2.15	2.21	2.46	2.58	2.58	2.58				

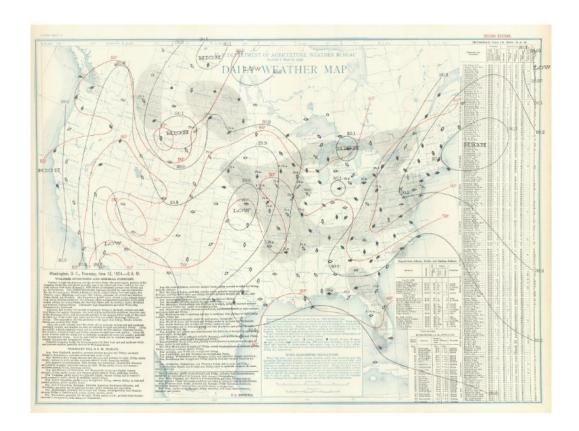


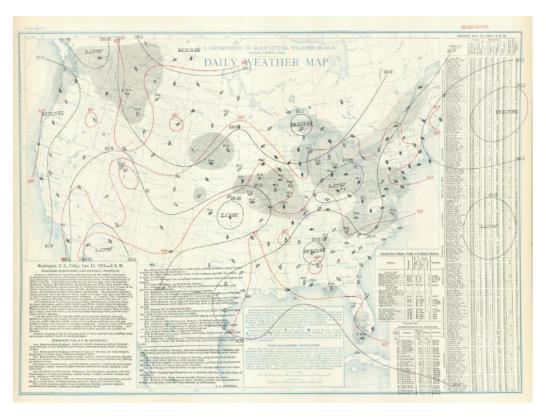




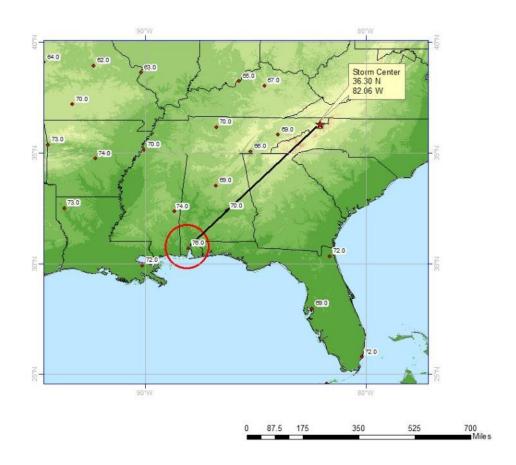








**SPAS 1343** June 12-13, 1924



# Storm Precipitation Analysis System (SPAS) Storm # 1427 SPAS Analysis

General Storm Location: Boyden, IA

**Storm Dates**: September 17 – September 18, 1926

**Event**: Extreme Precipitation Event

**DAD Zone 1** 

Latitude: 43.1958

Longitude: -95.9958

Max. Grid Rainfall Amount: 24.22"

Max. Observed Rainfall Amount: 24.01"

Number of Stations: 159

SPAS Version: 10.0

Basemap: Manually digitized contours

Spatial resolution: 0.242

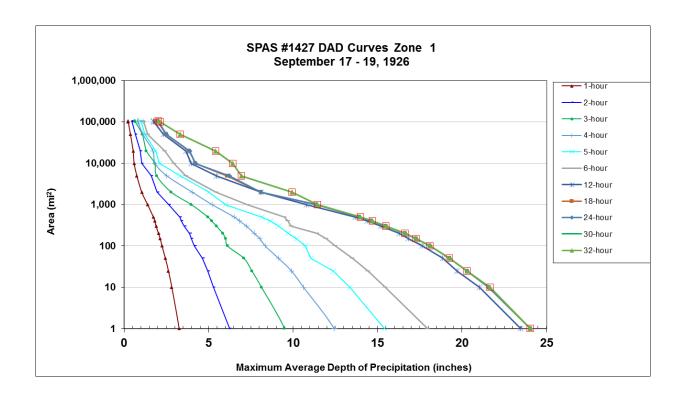
Radar Included: No

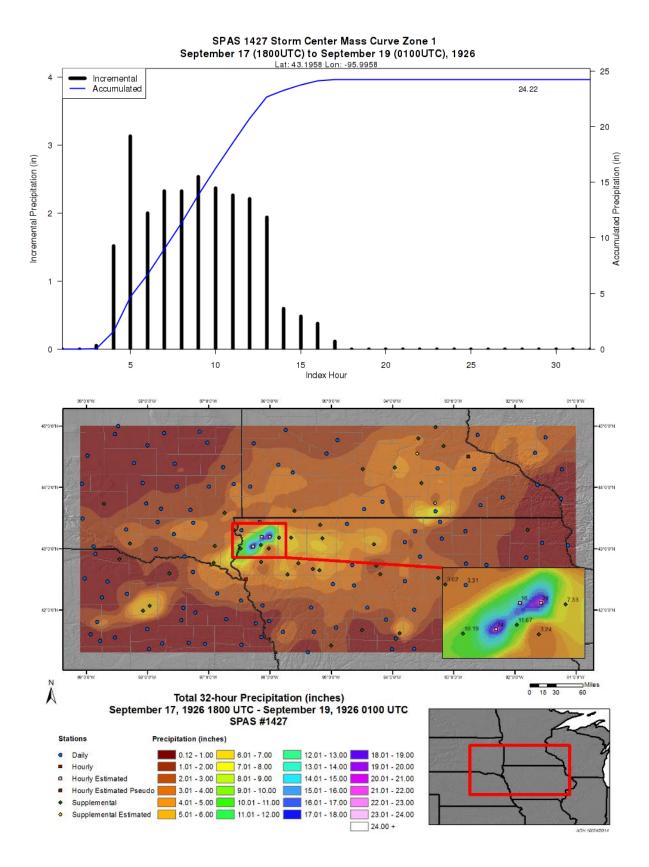
Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: In addition to the NCDC stations, four hourly stations were digitized from the U.S. Army Corp of Engineers (USACE) Storm Study Pertinent Data Sheet (included below). These stations only provided precipitation timing for the time period beginning on September 17 around 12:00 CST to 18:00 CST on September 18. Data mining also produced an additional supplemental station at Foss Field/Sioux Falls Regional Airport, SD. Due to the lack of hourly information, a 32-hour Core Precipitation Period (CPP) was established for this time period. While precipitation did fall outside of the CPP, results are unreliable due to the lack of data. In addition to the three digitized hourly stations, an additional estimated hourly station with 2.40 inches of accumulated precipitation over the CPP was created in order to represent later timing as the frontal passage moved eastward. The resulting DAD values are about equal to those of the previous analysis. There are slight deviations, both high and low, which are likely due to the original analysis over generalizing the storm area. For this reason, the current analysis is considered more reliable and represents a more accurate depiction of the event.

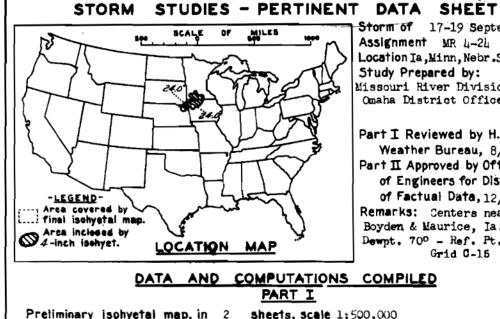
Storm Nan	ODAC 1427 I	Povdor IA									
Storm Nan Storm Date		soyaen, IA				14 a mm A	dingto	ont for	Vincini	•	
	ysis Date: 11/14/2015				2	otorin A	vajustii	ient for	Virgini	a	
		2.5									
Temporal	Transposition Date	3-Sep				3.5.1. 3	. a. D.		GGTT C 200	.,	
a. a		Lat	Long				nflow Dire		SSW @ 390	miles	
	ter Location	43.20 N	96.00 W				age Elevati	-	N/A	feet	
_	Dew Point Location	38.00 N	99.00 W				ter Elevati		1,400	feet	
	ion Dew Point Location						lysis Durat		12	hours	
Basin Loca	ation					Effective B	arrier Hei	ght	N/A	feet	
	The storm representative	•	76.5 F		tal precipitab					3.07	inches.
	The in-place maximum	-	78.0 F		tal precipital					3.29	inches.
The	e transpositioned maximum	•	0.0		tal precipital					#N/A	inches.
	The in-place storr		1,400		ich subtracts	0.37		f precipitabl		76.5 F	
	The in-place storr		1,400		ich subtracts	0.38		f precipitabl		78.0 F	
	The transposition basi		N/A		ich subtracts	X.XX		f precipitabl		0.0	
The	e inflow barrier/basin eleva	ition height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
					1			CD 1 C 1 I			
	The in-place stor			1.08					<ol> <li>Storm repre</li> <li>S 93016 and V</li> </ol>		
	The transposition/e			#N/A					n the synoptic n		
	The ba	arrier adjustm	ent factor is	#N/A		pattern.	ocudono are aj	ppropriate give	ii the synoptic ii	ic teoroigoe itri	
	<b>T</b>			/ // // /							
	The	total adjustm	ent factor is	#N/A							<b>.</b>
	Observed Storm Depth-A	·	1		T		T	T			T
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles		17.9	23.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	10 sq miles	<u>-</u>	15.5	21.0	21.6	21.6	21.7	21.7	21.7	21.7	21.7
	100 sq miles	<del>\</del>	12.5	17.6	18.1	18.1	18.1	18.1	18.1	18.1	18.1
	200 sq miles	<del>-</del> {	11.4	16.3	16.6	16.6	16.6	16.6	16.6	16.6	16.6
	500 sq miles	·	9.5	13.7	13.9	13.9	14.0	14.0	14.0	14.0	14.0
	1000 sq miles	<u>-</u>	7.3	10.8	11.4	11.4	11.4	11.4	11.4	11.4	11.4
	2000 sq miles	<del></del>	5.4 3.7	8.1	8.1	8.1	9.9 6.9	9.9 6.9	9.9	9.9	9.9
	5000 sq miles	<del></del>	3.0	5.5	6.1 4.2	6.2 4.2	6.4	6.4	6.9	6.9 6.4	6.9
	10000 sq miles 20000 sq miles	·	2.4	4.0 3.7	3.9	3.9	5.4	5.4	5.4	5.4	6.4 5.4
	50000 sq miles	· <del></del>	1.4	2.3	2.5	2.5	3.3	3.3	3.3	3.3	3.3
	100000 sq miles	<del>\</del>	1.2	1.8	2.0	2.0	2.1	2.1	2.1	2.1	2.1
	100000 sq fillies	0.2	1.2	1.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1
	C4 C4 C4 N-			CD AC 1422	7 DJ 1						
	Storm or Storm Center Na Storm Date(s)	me		9/17/1926	7 - Boyden, I	A					
	` '			MCC							
	Storm Type Storm Location			43.20 N	96.00 W						
	Storm Center Elevation			1.400	20.00 W						
	Precipitation Total & Dura	ntion		,	es from SPA	S 1427 DAE	)				
	i recipitation fotal & Dula			27.22 HICH	o nom or A	, 172/ DAL		-			
	Storm Representative Dew	Point		76.5 F	12						
	Storm Representative Dew		on.	38.00 N	99.00 W			Aug	Sep		
	Maximum Dew Point	Jun Locali		78.0 F	22.00 11			80.35	75.94		
	Moisture Inflow Vector			SSW @ 39	0			30.00			
	In-place Maximization Fac	tor		1.08							
	r I IIII	<u> </u>									
	Temporal Transposition (D	Date)		3-Sep							
	Transposition Dew Point L										
	Transposition Maximum D										
	Transposition Adjustment			#N/A							
	Average Basin Elevation			N/A							
				N/A							
	Highest Elevation in Basin	l									
	Highest Elevation in Basin Inflow Barrier Height			N/A							

	Sto	rm 1427	7 - Sept	ember 1	7 (1800	UTC) -	Septen	nber 19	(0100 U	TC), 19	26				
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Auga (m:2)		Duration (hours)													
Area (mi²)	1	2	3	4	5	6	12	18	24	30	32	Total			
0.2	3.42	6.47	9.84	12.89	15.99	18.61	23.68	24.22	24.22	24.22	24.22	24.22			
1	3.25	6.24	9.49	12.42	15.41	17.94	23.48	24.03	24.03	24.03	24.03	24.03			
10	2.82	5.28	8.13	10.62	13.36	15.45	21.02	21.57	21.57	21.66	21.66	21.66			
25	2.62	4.95	7.56	9.90	12.36	14.43	19.71	20.31	20.31	20.31	20.31	20.31			
50	2.44	4.64	7.09	9.14	11.06	13.51	18.85	19.26	19.26	19.26	19.26	19.26			
100	2.24	4.16	6.12	8.35	10.72	12.50	17.64	18.09	18.09	18.09	18.09	18.09			
150	2.13	3.97	6.01	8.03	10.22	11.96	16.83	17.26	17.26	17.26	17.26	17.26			
200	2.03	3.88	5.84	7.71	9.72	11.41	16.27	16.61	16.61	16.61	16.61	16.61			
300	1.89	3.57	5.47	7.24	9.15	9.89	15.19	15.50	15.50	15.50	15.50	15.50			
400	1.81	3.38	5.18	6.84	8.66	9.69	14.37	14.64	14.65	14.68	14.68	14.68			
500	1.73	3.30	4.96	6.52	8.16	9.50	13.68	13.89	13.90	13.98	13.98	13.98			
1,000	1.39	2.64	3.98	5.21	6.01	7.27	10.78	11.37	11.37	11.43	11.43	11.43			
2,000	1.04	1.95	2.79	4.03	5.01	5.43	8.09	8.09	8.09	9.93	9.93	9.93			
5,000	0.75	1.59	1.92	2.52	3.31	3.66	5.47	6.08	6.23	6.93	6.93	6.93			
10,000	0.59	1.03	1.81	1.83	2.09	2.96	3.96	4.21	4.21	6.43	6.43	6.43			
20,000	0.53	0.94	1.32	1.70	1.87	2.42	3.66	3.86	3.88	5.42	5.42	5.42			
50,000	0.37	0.67	1.07	1.11	1.24	1.39	2.33	2.50	2.50	3.33	3.33	3.33			
100,000	0.24	0.47	0.66	0.83	1.01	1.16	1.77	1.98	2.04	2.12	2.12	2.12			
104,550	0.23	0.45	0.64	0.81	0.97	1.12	1.74	1.97	2.01	2.01	2.01	2.01			





CORPS OF ENGINEERS



Storm of 17-19 September 1926 Assignment MR 4-24 Location Ia, Minn, Nebr.S.D. & Wisc Study Prepared by:

Missouri River Division Omaha District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 8/5/47 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 12/25/47 Remarks: Centers near

Boyden & Maurice, Ia. Dewpt. 700 - Ref. Pt. 175 SSE Grid C-15

## DATA AND COMPUTATIONS COMPILED

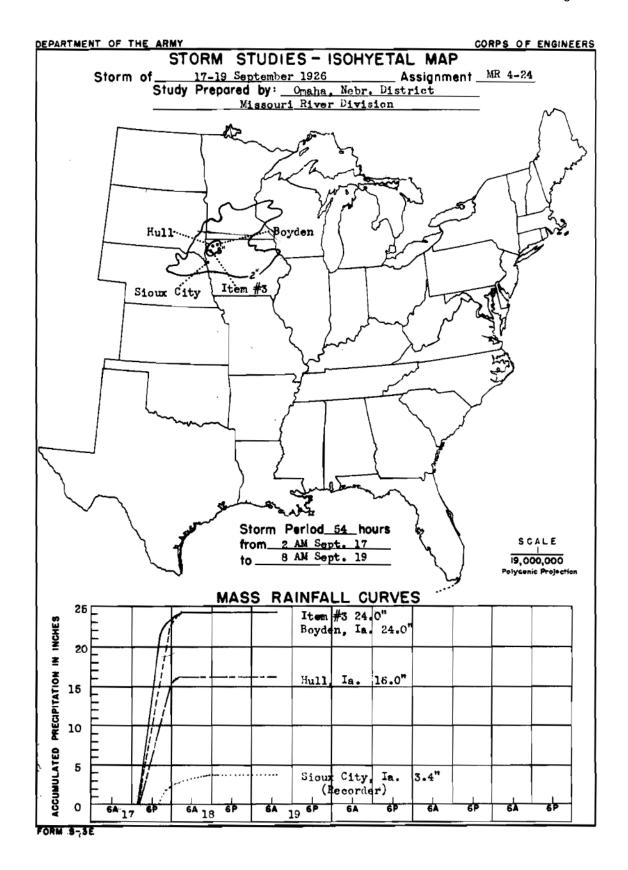
Preliminary Isonyetal map, in 2 Sheets, Scale 1:590,000	,
Precipitation data and mass curves: (Number	of Sheets)
Form 5001-C (Hourly precip. date)	8
Form 5001-B (24-hour " " )	-
Form 5001-D (" " " )	11 .
Miscl. precip. records, meteorological data, etc	29
Form 5002 (Mass rainfail curves)	27
PART II	
Final isohyetal maps, in 1 sheet, scale 1:1.000.000	,

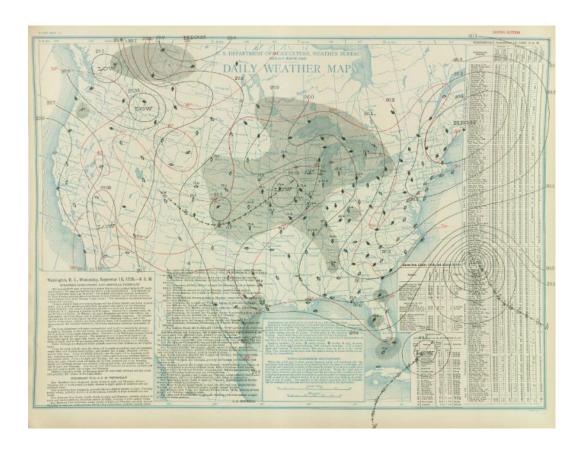
Final Isonyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets: Form S-10 (Data from mass rainfall curves)_____ Form S-II (Depth-area data from isohyetai map)______ Furm S-12 (Maximum depth-duration data)_____

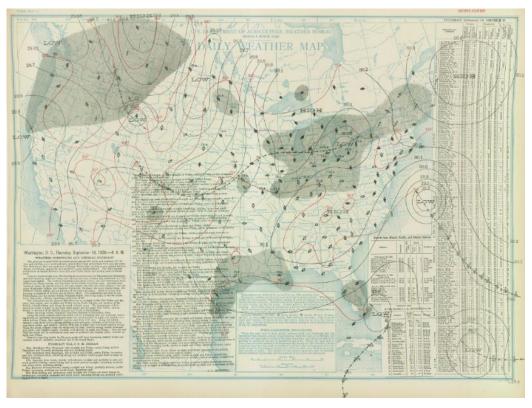
Maximum duration-depth-area curves_____ Data relating to periods of maximum rainfall.... MAYIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

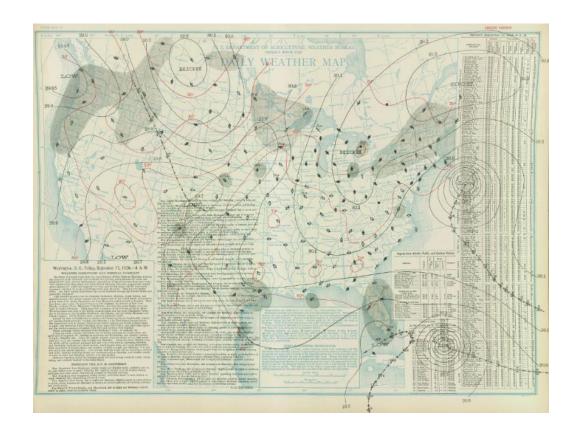
MAAIM	<u> </u>	A F LY	OE.	DEPI	<u> </u>	<u>RA</u> II	ALVE	<u> 1N</u>	INC	763	
Area in Sq. Mi.			D	uration	of	Rainfa	ill in	Hours			
	6	12	18	1 24	30	36	48	54			
Max.Station	18.4	23.8	24.0	24.0	24.0	24.0	24.0	24.0			
10	15.1	20.7	21.7	21.7	21.7	21.7	21.7	21.7			
100	12.8	17.1	17.8	17.8	17.8	17.8	17.8	17.8			
200	11.7	15.8	16.6	16.6	16.6	10.6	16.6	16.6			
500	9.4	12.6	13.3	13.3	13.3	13.3	13.3	13.3			
1,000	7.5	10.1	10.4	10.6	10.6		10.6	10.6			
2,000	5.9	8.0	8.2	8.6	8.6	8.6	8.6	8.6			
5,000	4.1	6.3	6.4	6.6	6.5	6.6	6.6	6.6			
10,000	3.0	5.2	5.4	5.5	5.6	5.6	5.6	5.6			
20,000	2.1	4.1	4.3	4.4	4.6	14.8	4.9	4.9			
50,000	1.4	2.7	2.9	3.0	3.2	3.6	3.8	3.8			
63,000	1.2	2.4	2.6	2.7	2.9	3.3	3.5	3.5			

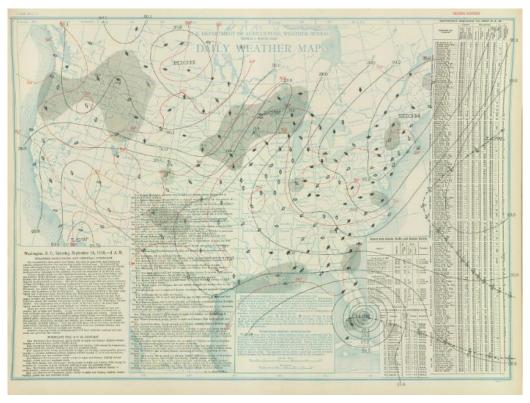
Form 5-2



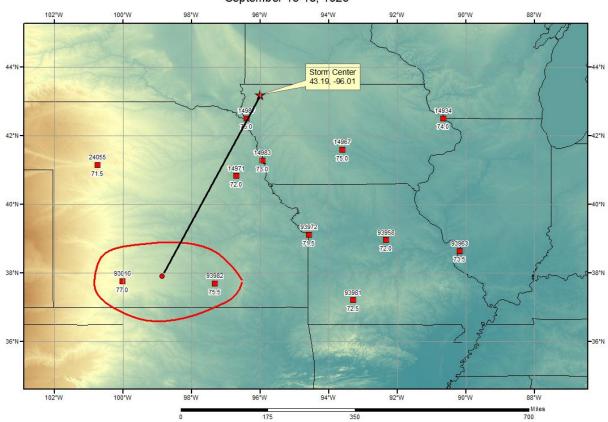


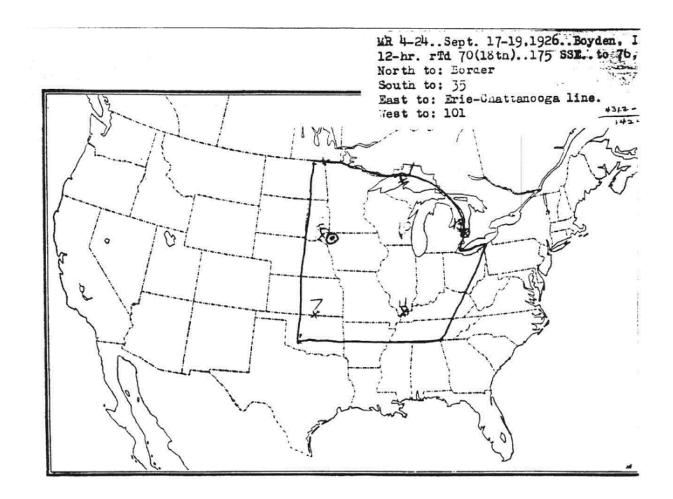






#### Boyden, IA Storm Analysis September 15-18, 1926





### Storm Precipitation Analysis System (SPAS) For Storm #1344 SPAS Analysis

General Storm Location: Simpson, KY

Storm Dates: July 3-7, 1939

Event: Simpson, KY HMR 52 Tale 21, HMR 45 Table 2-2, HMR 2

**DAD Zone 1** 

Latitude: 38.1042

**Longitude**: -83.2958

Max. Grid Rainfall Amount: 20.82"

Max. Observed Rainfall Amount: 20.50"

Number of Stations: 276 (137 Daily, 3 Hourly Estimated, 1 Hourly Estimated Pseudo, and 135

Supplemental)

SPAS Version: 9.5

Basemap: USGS total storm isohyetal

**Spatial resolution:** 00:00:30 (~ 0.30 mi²)

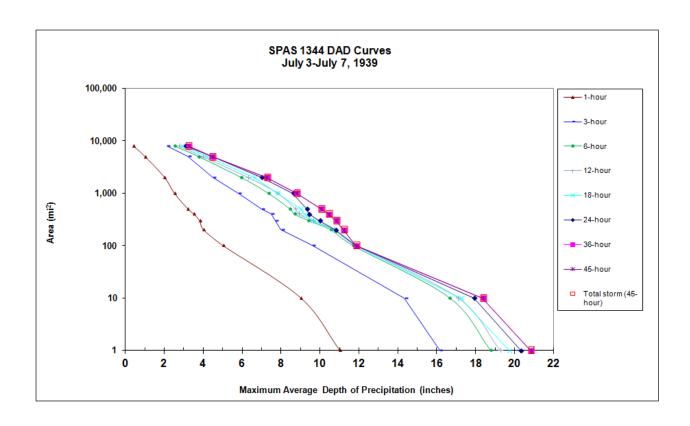
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

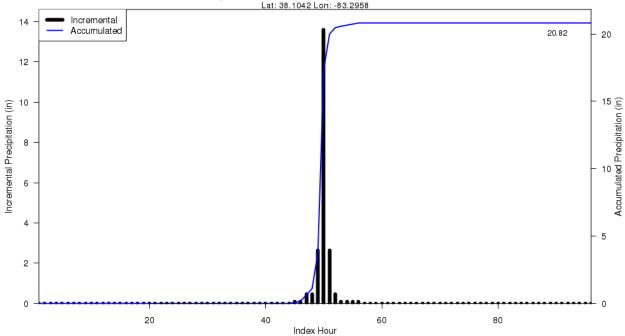
**Reliability of results:** This analysis was based on hourly data, hourly pseudo data HMR reports and supplemental information), daily data, and supplemental station data (USGS report). We have a decent degree of confidence in the station based storm total results, the spatial pattern is dependent on basemap, and the timing is based on hourly and hourly pseudo stations.

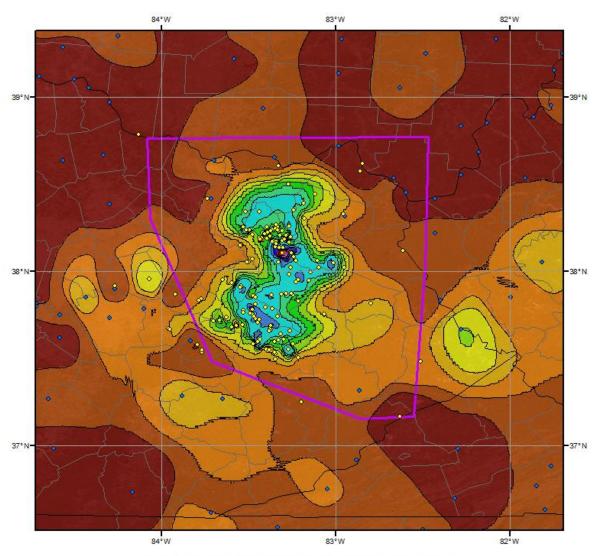
G: 27	an La La La										
Storm Name:	SPAS 1344 - 5	Simpson, KY				14 A	124	4 C	<b>T</b> 7::.		
Storm Date: AWA Analysis Date:	7/3-7/1939 11/14/2015					otorm A	ajustm	ent ior	Virginia		
	*	10 T I							1		
Temporal Transposit	ion Date	18-Jul	T			M-: T	D:	4	NNW @ 125	!1	
		Lat	Long				nflow Direc		NNW @ 125	miles	
Storm Center Locati		38.10 N	83.30 W				age Elevati		N/A	feet	
Storm Rep Dew Poin		39.83 N	84.03 W				ter Elevatio		1,100	feet	
Transposition Dew P	oint Location						lysis Durati		6	hours	
Basin Location						Effective B	arrier Heig	ght	N/A	feet	
	n representative	•	75.5 F		• •	water above				2.92	inches.
	place maximum	•	78.5 F		•	water above				3.37	inches.
•	ioned maximum	•	0.0		ch subtracts	water above				#N/A	inches.
	e in-place storn		1,100		ch subtracts	0.28		f precipitable		75.5 F 78.5 F	
	e in-place storn		1,100 N/A					f precipitable		0.0	
	insposition basii		N/A		ch subtracts	X.XX		f precipitable		0.0	
The inflow bar	rier/basin elevat	non neight is	N/A	WIII	ch subtracts	X.XX	inches o	f precipitable	e water at	0.0	
	The in al		on foot	1.17		Notes: DAD	values taken f	om SDAC 124	14. Storm represe	antative dov	
	The in-place stor			1.16 #N/A					d values on July		
Ine	transposition/e			#N/A #N/A		*			here synoptic met		
	The ba	rrier adjustm	ent ractor is	#IN/A				ture originating			
	The	total adjustme	ant factor is	#N/A							
	THE	totai aujustiii	ent factor is	#11/21							
01 1	Ct D (I	n n .:									
Observed	Storm Depth-A	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	11.0	20.3	20.8	20.8	20.8	20.8	20.8	20.8	20.8	20.8
	10 sq miles	9.0	17.9	18.4	18.4	18.4	18.4	18.4	18.4	18.4	18.4
	100 sq miles	5.0	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8	11.8
	200 sq miles	4.0	10.8	11.2	11.3	11.3	11.0	11.3	11.3	11.0	11.3
***************************************	500 sq miles	3.2	9.3	10.1	10.1	10.1	10.1	10.1	10.1	10.1	10.1
***************************************	1000 sq miles	2.5	8.6	8.8	8.8	8.8	8.8	8.8	8.8	8.8	8.8
	2000 sq miles	2.0	7.0	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
	5000 sq miles	1.0	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
	7975 sq miles	0.4	3.1	3.2	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	77.0 04	911									
Storm or S	Storm Center Na	ime		SPAS 1344 -	Simpson I	v					
Storm Dat		inc		7/3-7/1939	Simpson, i						
Storm Typ				MCC/Thunde	rstorms				1		
Storm Loc				38.10 N	83.30 W						
	ter Elevation			1,100							Ī
	on Total & Dura	ation		20.82 Inches	12-hours						Ī
Storm Rep	oresentative Dev	Point		75.5 F	6						
Storm Rep	resentative Dev	Point Locati	on	39.83 N	84.03 W			July	Aug		
Maximum	Dew Point			78.5 F				78.6637	78.9548		
Moisture 1	inflow Vector			NNW @ 125							
In-place M	laximization Fac	tor		1.16							
	Transposition (I			18-Jul							
	ion Dew Point I										
	ion Maximum D										
	ion Adjustment	Factor		#N/A							l
	asin Elevation			N/A							
	evation in Basin			N/A							
	rier Height			N/A							
	justment Factor			#N/A					Ļ		ļ
Total Adju	stment Factor			#N/A							I

Sto	orm 134 MAXIMU				) - July PRECIF	•		•						
		Duration (hours)												
Area (mi ² )	1	2	3	4	5	6	12	Total	Total					
0.3	13.61	16.25	18.89	19.37	19.84	20.31	20.82	20.82	20.82					
1	11.00	16.15	18.77	19.25	19.72	20.31	20.82	20.82	20.82					
10	9.00	14.34	16.67	17.09	17.23	17.93	18.36	18.36	18.36					
100	5.00	9.60	11.70	11.84	11.84	11.84	11.84	11.84	11.84					
200	4.00	8.00	10.56	10.74	10.74	10.78	11.20	11.20	11.20					
300	3.80	7.70	9.41	9.64	9.64	9.97	10.82	10.82	10.82					
400	3.50	7.50	8.69	8.92	9.19	9.42	10.43	10.43	10.43					
500	3.20	7.00	8.46	8.74	9.00	9.33	10.05	10.05	10.05					
1,000	2.50	5.80	7.34	7.81	7.81	8.60	8.78	8.78	8.78					
2,000	2.00	4.50	5.95	6.30	6.63	7.00	7.25	7.25	7.25					
5,000	1.00	3.21	3.76	3.97	4.18	4.43	4.44	4.44	4.44					
7,975	0.40	2.13	2.53	2.74	2.92	3.10	3.23	3.23	3.23					

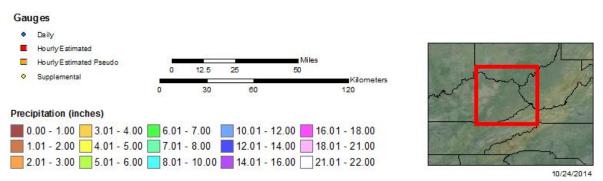


#### SPAS 1344 Storm Center Mass Curve Zone 1 July 3 (0600UTC) to July 7 (0500UTC), 1939 Lat: 38.1042 Lon: -83.2958





Total Storm (96-hr) Precipitation (inches) 07/03/1939 0600 UTC - 07/07/1939 0500 UTC SPAS #1344





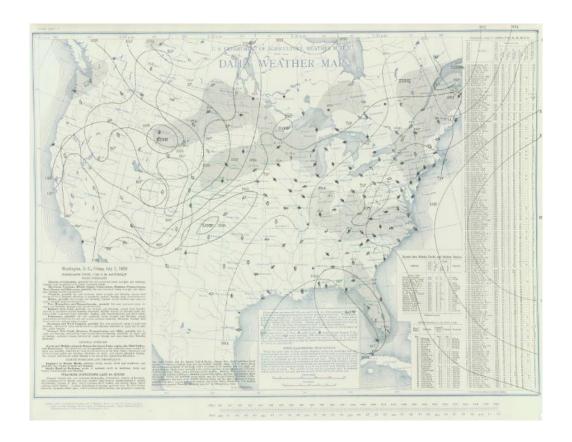


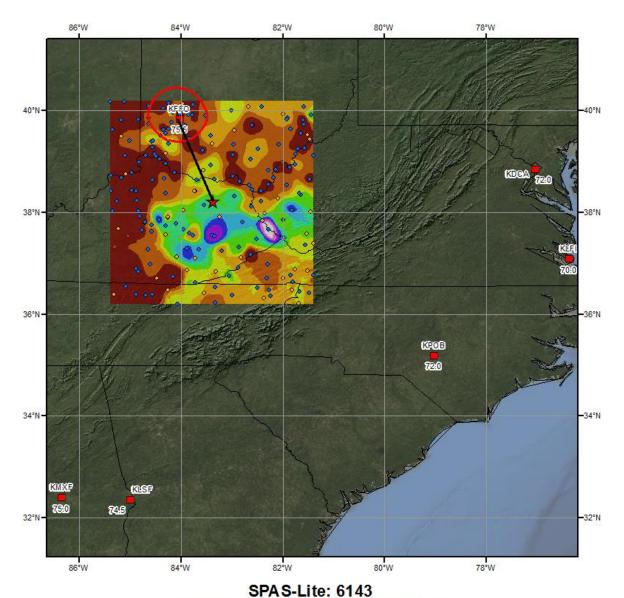








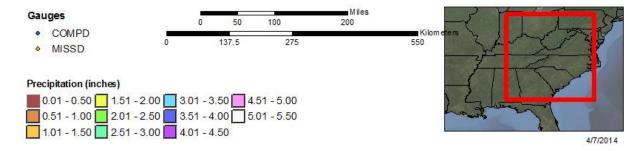




Lat/Lon box: 40.2 -85.4 36.2 -81.4

Begin date: 07/3/1939 for hourly stations, 7/4/1939 for daily

End date: 07/06/1939



### Storm Precipitation Analysis System (SPAS) For Storm #1534 SPAS Analysis

General Storm Location: Ewan, NJ (USACE NA 2-4), re-run SPAS 1023

Storm Dates: August 31 - September 2, 1940

Event: Hurricane

**DAD Zone 1** 

**Latitude**: 39.6875 **Longitude**: -75.1807

Max. Grid Rainfall Amount: 24.30"

Max. Observed Rainfall Amount: 24.00"

Number of Stations: 58 (2 Daily, 27 Hourly, 1 Hourly Pseudo, and 28 Supplemental)

SPAS Version: 10.0

Basemap: Blended PRISM September 1940 Ppt with SPAS Ppt

**Spatial resolution:** 0:00:30 second (~ 0.3 mi²)

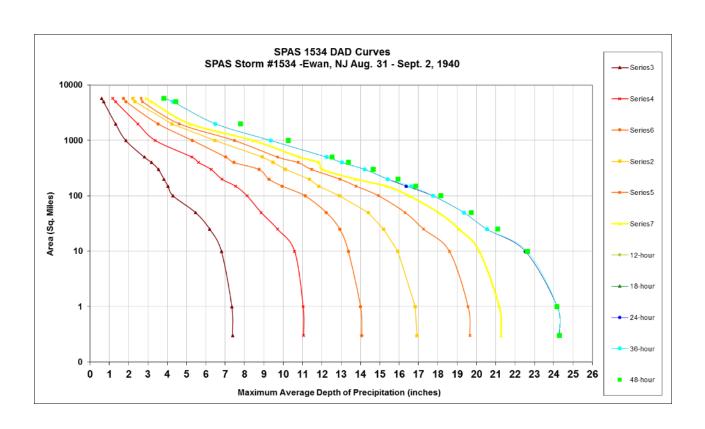
Radar Included: No

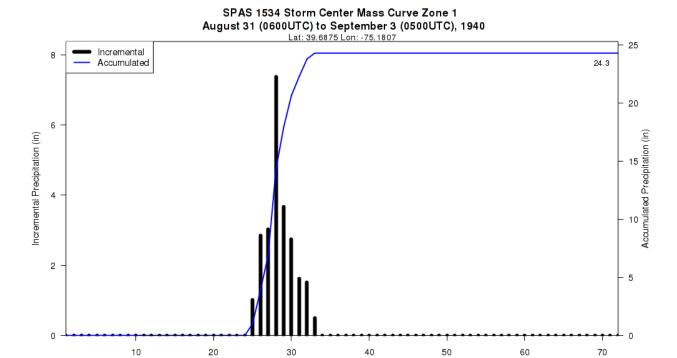
Depth-Area-Duration (DAD) analysis: Yes

**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and bucket survey data. Twenty-seven hourly station, from the USACE NA 2-4 report, were digitized and used in the analysis. Data from SPAS 1023 were used in the analysis, additional data extraction was also completed. We have a good degree of confidence in the station based storm total results, the spatial pattern is dependent on the station data and the basemap, the timing is based on hourly and hourly pseudo stations.

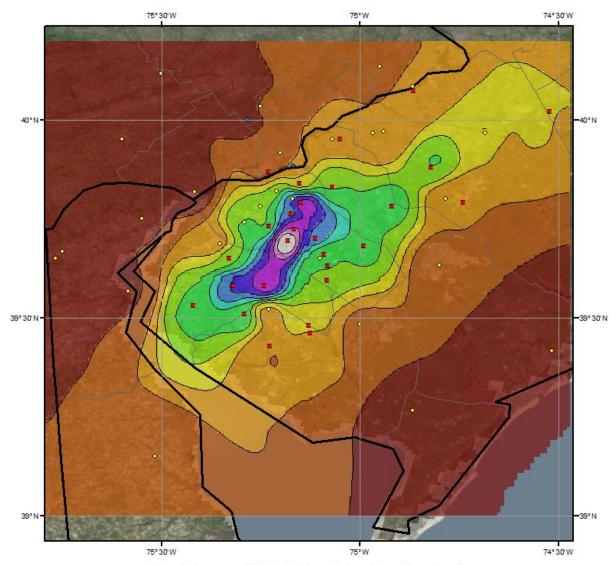
Storm Name:	SPAS 1534-E	wan, N.I									
Storm Date:	9/1/1940	2W 4415, 1 10			S	Storm A	Adinstr	nent for	Virginia		
	Date: 11/14/2015					7011111	lajasti		v ii giiiiu		
emporal Tra	nsposition Date	15-Aug									
		Lat	Long			Moisture 1	Inflow Dire	ection	SSE @ 175	miles	
torm Center	Location	39.70 N	75.19 W			Basin Ave	rage Elevat	tion	N/A	feet	
Storm Rep SS	TLocation	37.27 N	74.47 W			Storm Cer	nter Elevati	ion	100	feet	
ransposition	SST Location					Storm Ana	lysis Dura	tion	6	hours	
asin Locatio	n					Effective I	Barrier He	ight	N/A	feet	
								_			
	The storm represent		76.0 F		l precipitable					2.99	inches
ть	The in-place maxis the transpositioned maxis		80.0 F 0.0		l precipitable I precipitable					3.60 #N/A	inches
111	The in-place storm		100		ich subtracts		1	of precipitable	e water at	76.0 F	menes
	The in-place storm		100		ich subtracts	0.03		of precipitable		80.0 F	
-	The transposition basin		N/A		ich subtracts	X.XX		of precipitable		0.0	
	ow barrier/basin elevati		N/A		ich subtracts	X.XX		of precipitable		0.0	
	The in-place storn			1.21		Notes: Us	ed SST for A	August 30, 19	940.	· · · · · · · · · · · · · · · · · · ·	
	The transposition/ele			#N/A							
	The barr	rier adjustm	ent factor is	#N/A							
	779 .	atal adit	ant fact	#NT/A							
	The to	otal adjustme	ent factor is	#N/A							-
Ob	served Storm Depth-	Aras_Durst	ion								
0.0	served Storm Depth-	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	9 Hours	12 Hours	24 Hours	
00000000	1 sq mile	7.3*	11.3*	14.2*	16.7*	19.4*	21*	24*	24*	24*	
	2 sq miles	6.9	10.3	13.3	16.0	18.6	20.2	23.1	23.1	23.1	
	10 sq miles	6.5	9.7	12.5	15.1	17.7	19.2	21.9	22.0	22.0	
	100 sq miles	4.4	6.9	9.4	11.7	13.9	15.2	17.3	17.6	17.6	
	200 sq miles	3.4	5.7	7.9	9.8	11.7	12.9	14.8	15.1	15.1	
	500 sq miles	2.5	4.3	6.0	7.5	9.0	10.1	11.8	12.2	12.2	
	1000 sq miles	1.8	3.2	4.7	6.0	7.1	8.1	9.8	10.2	10.2	
	5000 sq miles	-	-	-	-	-	<u> </u>	-	-	-	
	10000 sq miles	-	-	-	-	-	-	-	-	-	
	20000 sq miles	-		for an IJCACI		1 (Ei	- E 10) :		AC 1022	-	
	*Designates p	•			E storm studi	es sneet (Fig	gure E.18) 1	nstead of SP.	AS 1023.		
	All other DAL	values 1101	II 31 A3 102.	anarysis.							
Sto	orm or Storm Center Na	ame		SPAS 1534-	Ewan, NJ						
Sto	orm Date(s)			9/1/1940							
	orm Type			Unnamed Hu							
	orm Location			39.70 N	75.19 W						-
	orm Center Elevation			100	10.1 ***	CENT 2:					-
Pre	ecipitation Total & Dura	ation		24.0 inches	12 hours USA	CE NA 2-4	-	-			
Sto	orm Representative SST			76.0 F	6		-				1
	orm Representative SST			37.27 N	74.47 W			Aug			1
	ximum SST			80.0 F				80.5			
Mo	oisture Inflow Vector			SSE @ 175							
In-	place Maximization Fac	ctor		1.21							
	mporal Transposition D			15-Aug							
	insposition SST Location										1
	insposition Maximum S			HATLA							-
	insposition Adjustment	Factor		#N/A				-			-
	erage Basin Elevation	1		N/A	-		-	-			
IH19	ghest Elevation in Basir	1		N/A N/A							
				11/71				1			
Inf	low Barrier Height rrier Adjustment Factor			#N/A							

			Storm 1	534 - Ewa	an, NJ Aı	ıg 31 - S	ept 2, 19	40			
		N/A	VIRALIRA AV		DTU OF F		TION (INC	IEC)			
		IVIA	AIIVIOIVI AV	ERAGE DI	PTH OF P	ration (hou		163)			
Area in Sq. Mi.	1	2	3	4	5	6	12	18	24	36	48
0.3	7.4	11.1	14.1	16.9	19.7	21.3	24.3	24.3	24.3	24.3	24.3
1.0	7.3	11.0	14.0	16.8	19.6	21.2	24.2	24.2	24.2	24.2	24.2
10.0	6.8	10.6	13.4	15.9	18.6	20.2	22.5	22.5	22.5	22.6	22.6
25.0	6.2	9.7	12.9	15.2	17.3	19.1	20.5	20.5	20.5	20.5	21.1
50.0	5.5	8.9	12.2	14.4	16.3	18.0	19.3	19.3	19.3	19.3	19.7
100.0	4.3	8.1	11.1	12.9	14.9	16.5	17.8	17.8	17.8	17.8	18.2
150.0	4.0	7.5	10.0	11.8	13.8	15.3	16.4	16.4	16.4	16.6	16.9
200.0	3.8	6.8	9.3	11.4	12.9	13.8	15.4	15.4	15.4	15.4	15.9
300.0	3.5	6.3	8.7	10.1	11.5	12.0	14.2	14.2	14.2	14.2	14.7
400.0	3.2	5.6	7.4	9.5	10.8	11.9	13.0	13.0	13.0	13.0	13.4
500.0	2.8	5.3	7.0	8.9	9.7	10.9	12.3	12.3	12.3	12.3	12.5
1000.0	1.9	3.4	5.3	6.5	7.5	8.4	9.3	9.3	9.3	9.3	10.3
2000.0	1.3	2.5	3.5	4.2	4.6	5.2	6.5	6.5	6.5	6.5	7.8
5000.0	0.7	1.3	1.9	2.3	2.7	3.2	4.3	4.3	4.3	4.3	4.4
5785.0	0.6	1.2	1.7	2.2	2.6	2.9	3.8	3.8	3.8	3.8	3.8

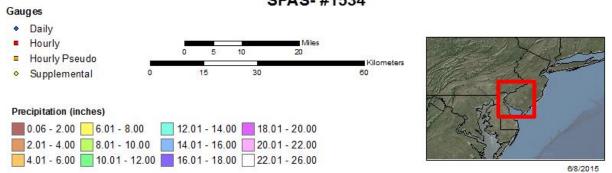


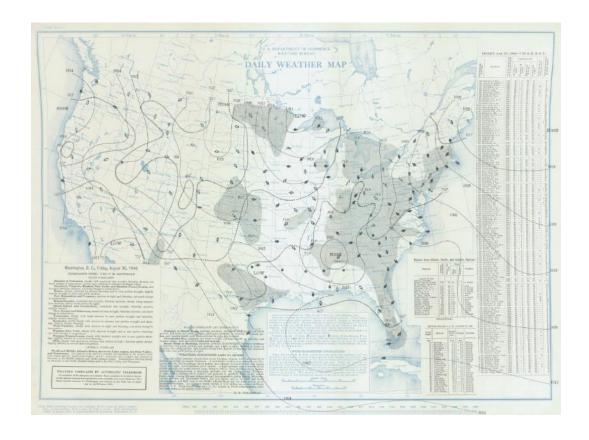


Index Hour



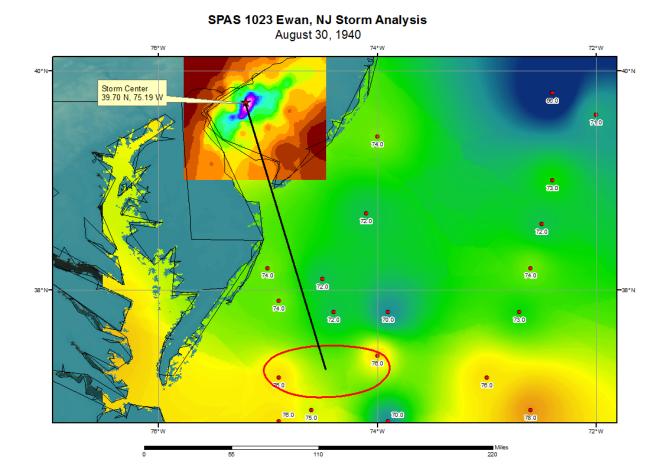
Total Storm (72-hr) Precipitation (inches) 08/31/1940 0600 UTC - 09/03/1940 0500 UTC SPAS- #1534

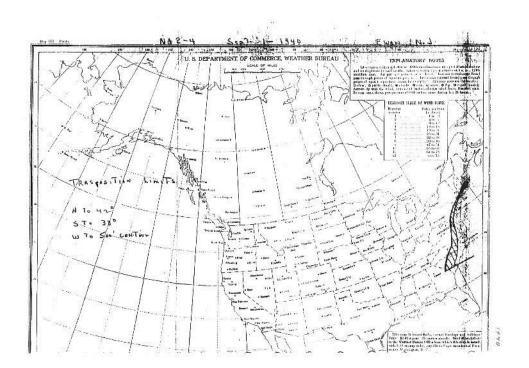












# Storm Precipitation Analysis System (SPAS) For Storm #1429 SPAS Analysis

General Storm Location: Hallett, OK

Storm Dates: September 2 – September 5 1940

Event: CORPS of Engineers, US Army Assignment S W 2 – 18

**DAD Zone 1** 

Latitude: 38.4292

**Longitude**: -95.8125

Max. Grid Rainfall Amount: 7.27"

Max. Observed Rainfall Amount: 7.25"

**DAD Zone 2** 

Latitude: 36.2458

**Longitude**: -96.6125

Max. Grid Rainfall Amount: 24.00"

Max. Observed Rainfall Amount: 24.00"

Number of Stations: 186

SPAS Version: 10.0

Basemap: Manually digitized contours

Spatial resolution: 0.2642

Radar Included: No

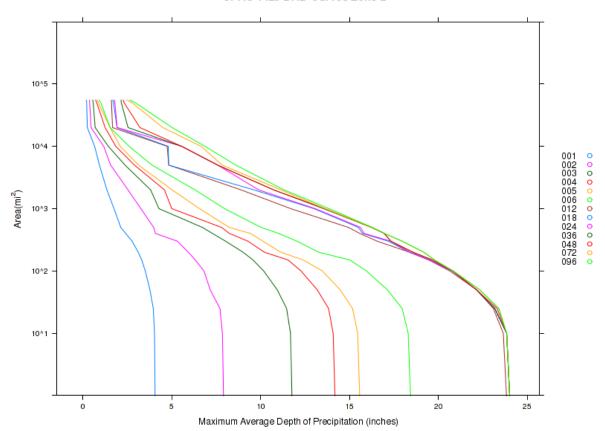
Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: All seven of the hourly stations were digitized from either the Army CORPS of Engineers' pertinent data report or from a NCDC local climatology report of the storm. This provided very high accuracy of the hourly data, which is essential in the timing of the daily and supplemental stations. Of the 43 supplemental stations, 30 were formatted as daily stations. These stations were in the supplemental file due to there being more data on either end of the storm duration as defined for this analysis. For example, if the daily station took measurements in the morning, then there may have been more precipitation reported for the remainder of the storm that was actually part of the following day's observation. Alternatively, if a station had an observation time in the evening then there could have been data not used from the day before that was valid for the period of the storm and could be added to the analysis. With all of the data being thoroughly inspected, the DAD and precipitation pattern following closely to the Army CORPS of Engineers report, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

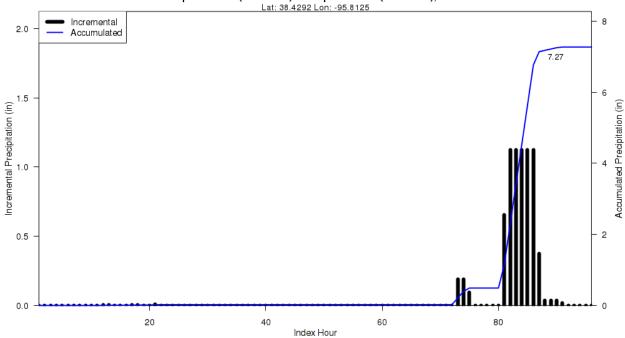
Storm Name:	SPAS 1429 -	Hallett, OK 7	Zone 2								
Storm Date:	9/2-4/1940		-0110 2		S	torm A	diustm	ent for	Virgini	a	
AWA Analysis l	Date: 11/14/2015				~				, B		
Temporal Tran	sposition Date	17-Aug									
		Lat	Long			Moisture 1	Inflow Dire	ction	SE @ 300	miles	
Storm Center I	Location	36.25 N	96.61 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep Dew	v Point Location	32.90 N	93.15 W			Storm Cer	nter Elevati	on	900	feet	
	Dew Point Location						alysis Durat		12	hours	
Basin Location	l					Effective I	Barrier Hei	ght	N/A	feet	
Th		n dorrinointia	77.5 F	with total	al precipitabl	a rrintan ahar	rn coo lornl	- f		3.22	inches.
	ne storm representativ The in-place maximur	•			al precipitabl					3.60	inches.
	nspositioned maximum	•			al precipitabl					#N/A	inches.
THE tru	The in-place stor	•			ch subtracts		1	f precipitabl	e water at	77.5 F	menes.
	The in-place stor				ch subtracts	0.27		f precipitabl		80.0 F	
	The transposition bas				ch subtracts	x.xx		f precipitabl		0.0	
	low barrier/basin elev			whi	ch subtracts	x.xx	inches o	f precipitabl	e water at	0.0	
					1	r					
	The in-place sto			1.12					129. Reanalyze gion. Used KE		
	The transposition/e			#N/A		1 0	-	,	gion. Used Kr age storm rep'		
	The b	arrier adjustm	ent factor is	#N/A					ptic meteorolog		
	The	total adjustm	ent factor is	#N/A			-			•	
	Ine	iotai aujustiii	ent ractor IS	#1 <b>\</b> / F <b>\</b>		<u> </u>					
Obs	erved Storm Depth-	Area-Duratio	n								
Jus	22 rea storm Beptii-	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	4.1	18.4	23.8	24.0	24.0	24.0	24.0	24.0	24.0	24.0
	10 sq miles	4.0	18.3	23.6	23.8	23.8	23.8	23.8	23.8	23.8	23.8
	100 sq miles	3.5	15.9	20.6	20.8	20.8	20.8	20.8	20.8	20.8	20.8
	200 sq miles	3.1	13.3	18.4	18.4	18.4	18.5	18.6	19.2	19.2	19.2
	500 sq miles	2.1	10.0	14.9	15.5	15.6	16.2	16.2	16.2	16.3	16.3
	1000 sq miles	1.7	8.0	11.7	13.0	13.1	13.5	13.6	13.6	13.8	13.8
	2000 sq miles	1.3	6.3	8.9	9.6	9.9	10.7	10.7	11.1	11.3	11.3
	5000 sq miles	0.9	3.9	4.8	4.8	7.6	7.6	7.6	7.8	8.6	8.6
	10000 sq miles	0.7	2.6	4.7	4.8	5.6	5.6	5.6	6.6	6.9	6.9
	20000 sq miles 50000 sq miles	0.2	1.5 1.0	1.7 1.6	1.9	1.9 1.8	2.5	3.2 2.3	4.5 2.8	5.0 2.9	5.0 2.9
	30000 sq iiiies	0.2	1.0	1.0	1./	1.0	2.2	2.3	2.0	2.9	2.9
Stor	m or Storm Center Na	ame		SPAS 1429	- Hallett, O	K Zone 2					1
Stor	m Date(s)			9/2-4/1940							
Stor	m Type			MCC							
	m Location			36.25 N	96.61 W						
	m Center Elevation			900							
Prec	cipitation Total & Dura	ation (10 sq m	i)	24.00 inche	s in 12 hours						
Stor	m Representative Dev	y Point		77.5 F	12						
	m Representative Dev		on	32.90 N	93.15 W		Aug				
	imum Dew Point	Om Locati		80.0 F	20.10 11		79.5				
	sture Inflow Vector			SE @ 300							Í
	lace Maximization Fac	ctor		1.12							
	idee mattimization i de							ļ			
In-pl											
In-pl	poral Transposition (I			17-Aug							
In-pl Tem Tran	poral Transposition (I	Location		17-Aug							
In-pl Tem Tran Tran	aporal Transposition (I asposition Dew Point I asposition Maximum I	Location Dew Point									
In-pl Tem Tran Tran Tran	poral Transposition (I sposition Dew Point I sposition Maximum I sposition Adjustment	Location Dew Point		#N/A							
In-pl Tem Tran Tran Tran Aver	poral Transposition (I asposition Dew Point I asposition Maximum I asposition Adjustment rage Basin Elevation	Location Dew Point Factor		# <b>N/A</b> N/A							
In-pl Tem Tran Tran Tran Aver	aporal Transposition (I asposition Dew Point I asposition Maximum I asposition Adjustment rage Basin Elevation nest Elevation in Basin	Location Dew Point Factor		#N/A N/A N/A							
In-pl Tem Tran Tran Tran Aver High	poral Transposition (I asposition Dew Point I asposition Maximum I asposition Adjustment rage Basin Elevation	Location Dew Point Factor		# <b>N/A</b> N/A							

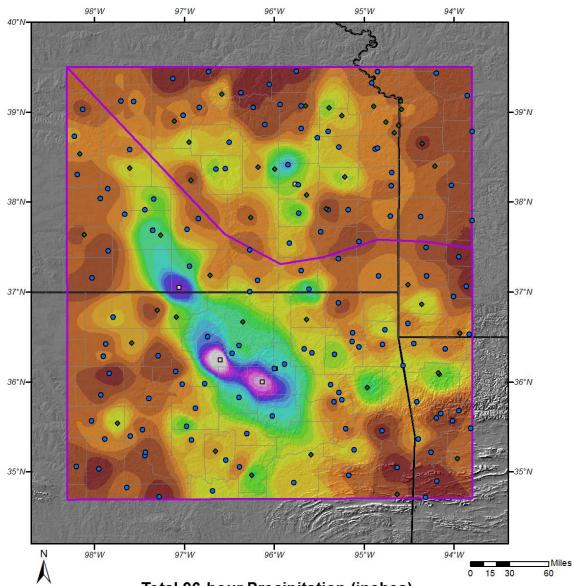
		Sto	rm 142	9 - Sept	tember	2 (0700	UTC)	- Septe	mber 6	(0600 l	JTC), 19	940				
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
Area (mi²)		Duration (hours)														
Alea (IIII )	1	2	3	4	5	6	12	18	24	36	48	72	96	Total		
0.3	4.05	7.90	11.75	14.17	15.56	18.42	23.82	24.00	24.00	24.00	24.00	24.00	24.00	24.00		
1	4.05	7.90	11.75	14.17	15.56	18.42	23.82	24.00	24.00	24.00	24.00	24.00	24.00	24.00		
10	4.02	7.84	11.67	14.07	15.45	18.29	23.64	23.83	23.83	23.83	23.83	23.83	23.83	23.83		
25	3.95	7.70	11.45	13.81	15.16	17.95	23.08	23.16	23.16	23.16	23.29	23.39	23.39	23.39		
50	3.76	7.15	10.92	13.17	14.46	17.12	22.13	22.13	22.13	22.13	22.13	22.31	22.31	22.31		
100	3.50	6.80	10.16	12.26	13.46	15.94	20.63	20.76	20.77	20.80	20.80	20.82	20.82	20.82		
150	3.30	6.31	9.56	11.53	12.39	15.01	19.45	19.49	19.49	19.65	19.65	19.77	19.77	19.77		
200	3.10	5.92	9.00	10.20	11.12	13.25	18.36	18.36	18.36	18.54	18.57	19.16	19.17	19.17		
300	2.76	5.31	8.02	9.28	10.12	12.04	16.55	17.17	17.32	17.32	17.32	17.95	17.96	17.96		
400	2.40	4.07	7.28	8.23	9.42	11.01	15.57	15.72	15.81	16.94	16.94	16.95	16.96	16.96		
500	2.12	3.97	6.71	7.79	8.22	10.01	14.93	15.49	15.61	16.22	16.23	16.24	16.27	16.27		
1,000	1.74	3.25	4.27	4.99	6.55	7.96	11.68	12.99	13.06	13.53	13.61	13.61	13.84	13.84		
2,000	1.34	2.53	3.80	4.58	5.01	6.30	8.89	9.61	9.88	10.72	10.72	11.13	11.31	11.31		
5,000	0.92	1.55	2.36	2.89	3.12	3.88	4.82	4.82	7.57	7.57	7.57	7.83	8.59	8.59		
10,000	0.65	1.16	1.42	1.84	2.09	2.59	4.73	4.79	5.55	5.55	5.55	6.64	6.86	6.86		
20,000	0.24	0.45	0.68	1.24	1.52	1.52	1.66	1.91	1.92	2.53	3.20	4.49	5.01	5.01		
50,000	0.20	0.37	0.57	0.77	0.86	1.00	1.60	1.71	1.79	2.15	2.31	2.76	2.94	2.94		
55,417	0.19	0.36	0.54	0.70	0.80	0.90	1.59	1.67	1.76	2.14	2.25	2.46	2.64	2.64		



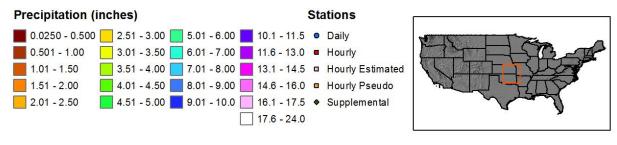


## SPAS 1429 Storm Center Mass Curve Zone 1 September 2 (0700UTC) to September 6 (0600UTC), 1940 Lat: 38.4292 Lon: -95.8125





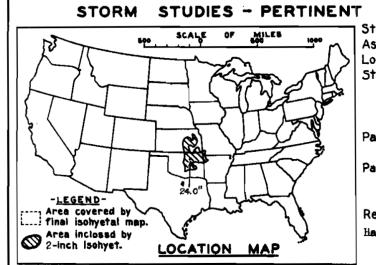
Total 96-hour Precipitation (inches)
September 2, 1940 0700 UTC - September 6,1940 0600 UTC
SPAS #1429



KLL 10/10/2014

#### WAR DEPARTMENT

### CORPS OF ENGINEERS, U.S. ARMY



TOATA SHEET

Storm of September 2 - 6, 1940

Assignment S W 2 - 18

Location Okla. Kans. Mo. & Ark.

Study Prepared by:

Southwestern Division Tulsa District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 8/18/41 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 3/25/43 Remarks: Centers at; Hallett, Okla. and Lebo, Kans.

## DATA AND COMPUTATIONS COMPILED PART I

Preliminary isohyetal map, in 2 sheet, scale	1:1,000,000
Precipitation data and mass curves:	(Number of Sheets)
Form 5001-C (Hourly precip. data)	38
Form 5001-B (24-hour " " )	
Form 5001-D (" " " ")	23
Miscl. precip. records, meteorological data, etc	<b>1</b>
Form 5002 (Mass rainfall curves)	49

#### PART II

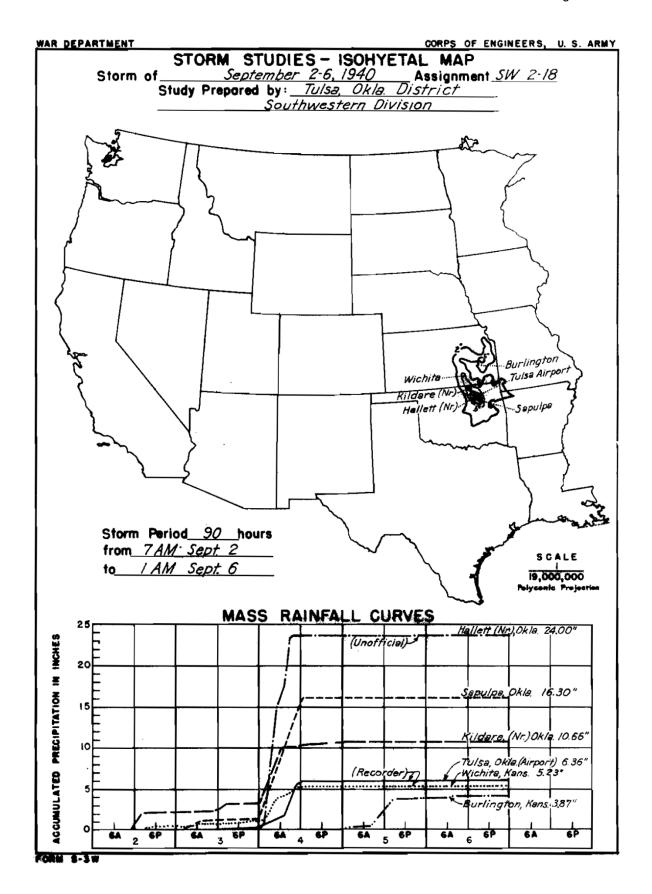
Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets:

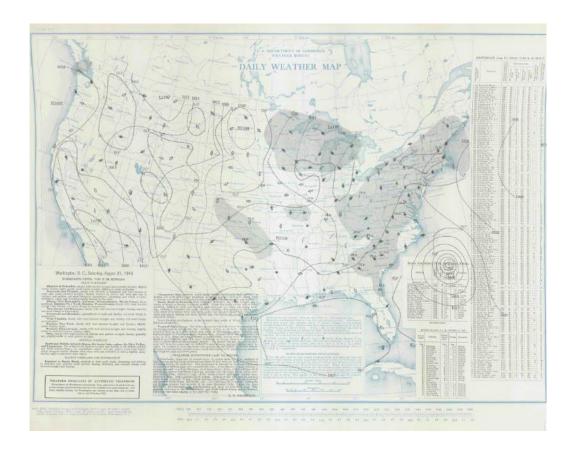
Form S-10 (Data from mass rainfall curves)	9
Form S-II (Depth-area data from isohyetai map)	
Form S-12 (Maximum depth-duration data)	
Maximum duration-depth-area curves	
Data relating to periods of maximum rainfall.	
MAXIMIM AVERAGE DEPTH OF PAINTALL IN INC	

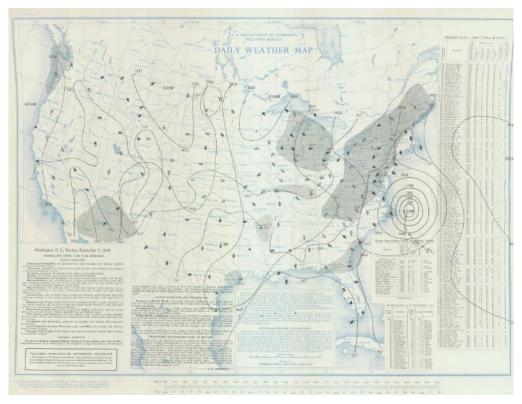
MAXIMUM	AVERAGE	DEPTH	OF	RAINFALL	IN	INCHES

Area in Sq. Mi.			D	<u>uratio</u>	n of	Rainfa	nfall in Hours					
	6	12	18	24	30	<b>3</b> 6	48	54	90			
Max. Station	18.9	ومياد	24.0	24.0	24.0	24.0	24.0	24.0	24.0			
10	18.4	23.4	23.6	23.6	23.6	23.6	23.6	23.6	23.6			
100	24.7	19.2	19.4	19.6	19.7	19.8	19.8	19.8	19.8			
200	12.5	17.6	17.8	18.0	18.1	18.2	18.3	18.3	18,3			
500	9.7	15.4	15.6	15.7	15.8	16.1	16.2	16.2	16.2			
1,000	7.9	13.3	13.4	13.6	13.7	14.0	14.1	14.1	14.1			
2,000	6.2	10.3	10.5	10.7	<b>10.</b> 9	11.1	11.3	11.3	11.3			
5,000	4.3	7.3	7.4	7.5	7.7	7.8	7.9	8.0	8.0			
10,000	3.0	5.3	5•4	5•5	5.6	5•7	5.8	5•9	5.9	]		
15,000	2.4	4.4	4.5	4.7	4.7	4.8	4.9	5.1	5.1			
20,000	2.0	3.9	4.1	4.2	4.3	4.4	4.5	4.6	4.6			
	1		l									
								i		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	Secre	

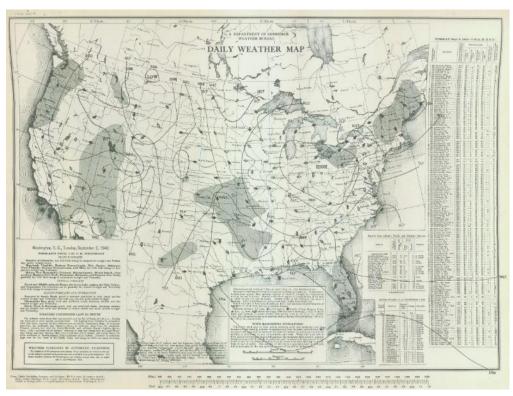
Form 5-2





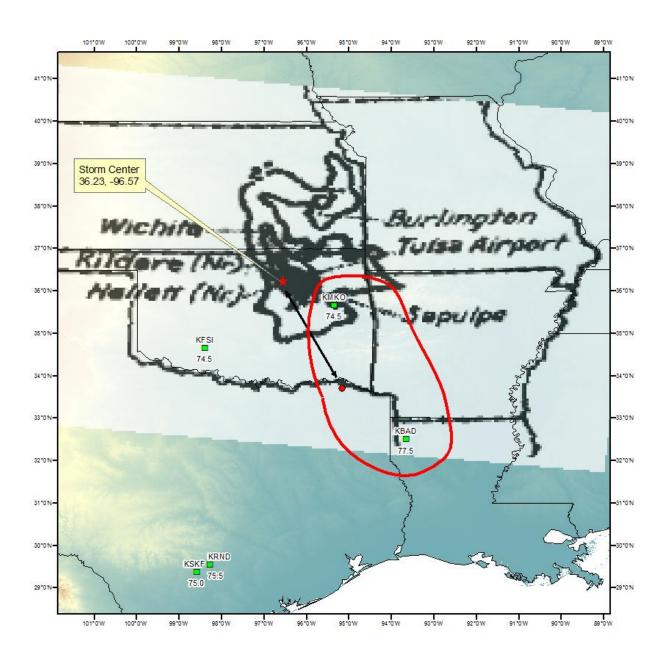






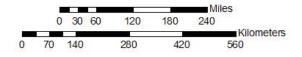




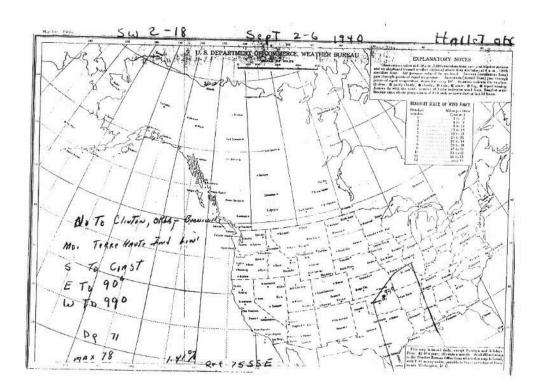


### **Surface Stations**

Surface Observations



SW2-18 Storm Analysis USACE SW2-18 Hallett, OK 9/2-4/1940



## Storm Precipitation Analysis System (SPAS) For Storm #1345 SPAS Analysis

General Storm Location: Smethport, PA

**Storm Dates**: July 16-20, 1942

**Event**: Convective

**DAD Zone 1** 

Latitude: 41.8271

Longitude: -78.2771

Max. Grid Rainfall Amount: 34.91

Max. Observed Rainfall Amount: 34.50"

Number of Stations: 400 (44 Daily, 25 Hourly, 3 Hourly Pseudo, and 328 Supplemental)

SPAS Version: 9.5

Basemap: USGS total storm isohyetal blended with PRISM July normal grid

**Spatial resolution:** 00:00:15 (~ 0.30 mi²)

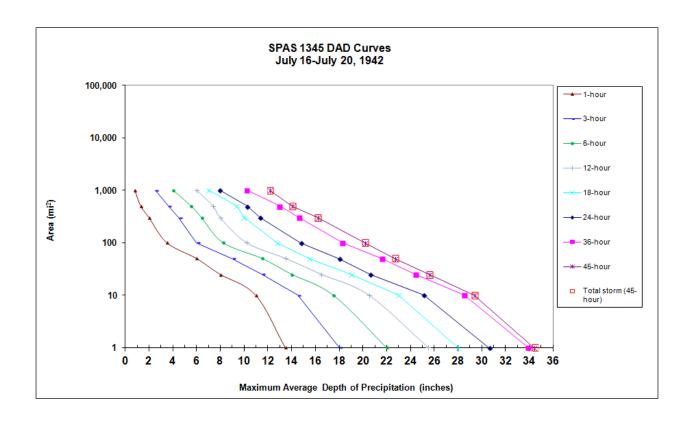
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

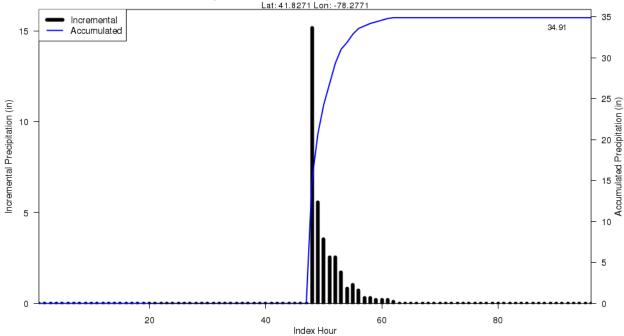
**Reliability of results:** This analysis was based on hourly data, hourly pseudo data (derived from storm study mass curves), daily data, and supplemental station data (USGS report). We have a decent degree of confidence in the station based storm total results, the spatial pattern is dependent on basemap, and the timing is based on hourly and hourly pseudo stations (HMR 56).

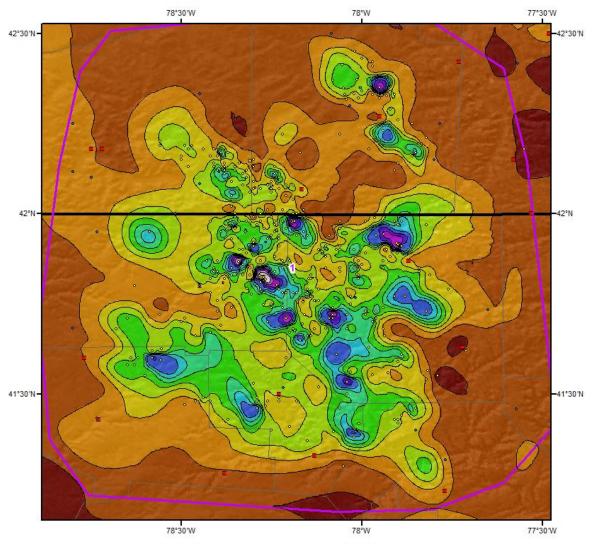
Storm Name:	SPAS 1345 -	Smothnort 1	ΡΔ								
Storm Date:	7/16-20/1942		r A.			Storm	diuctn	nont for	· Virginia		
AWA Analysis Date:						Storin A	aujusui	ient ioi	virgillia		
•	•	15 7 1									
Temporal Transposit	ion Date	15-Jul					a n	.,	********	.,	
		Lat	Long				nflow Direc		WNW @ 235	miles	
Storm Center Locati		41.83 N	78.28 W				age Elevati		N/A	feet	
Storm Rep Dew Poir	t Location	42.60 N	82.83 W			Storm Cen	ter Elevatio	on	1,800	feet	
Transposition Dew F	oint Location					Storm Ana	lysis Durati	ion	6	hours	
Basin Location						Effective B	arrier Heig	ght	N/A	feet	
The storn	n representative	dew point is	77.5 F	with tot	al precipitabl	e water abov	e sea level o	of		3.22	inches.
The in-	place maximum	dew point is	78.0 F	with tot	al precipitabl	e water abov	e sea level o	of		3.29	inches.
The transpositi	oned maximum	dew point is	0.0	with tot	al precipitabl	e water abov	e sea level o	of		#N/A	inches.
Th	e in-place storn	n elevation is	1,800	whi	ich subtracts	0.48	inches o	f precipitabl	e water at	77.5 F	
Th	e in-place storn	n elevation is	1,800	whi	ich subtracts	0.48	inches o	f precipitabl	e water at	78.0 F	
The tra	nsposition basir	n elevation at	N/A	whi	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
The inflow bar	rier/basin elevat	tion height is	N/A	whi	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
Г	he in-place stor	m maximizati	ion factor is	1.03		Notes: NWS	storm rep 12-l	hr dew point v	vas 74, with a clim	atological	1
	transposition/e			#N/A		max of 76. U	dpated analys	is used KMTO	with a 12hr ave a	ıt 77.5.	
	-	rrier adjustm		#N/A							
	The	total adjustm	ent factor is	#N/A							
		total adjustiii	one ructor is	,,,,,,,							
Observed	Storm Depth-	Anna Dunati									
Observed	Storm Depth-	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hou
	1 sq miles	15.0	30.6	33.9	34.4	34.4	34.4	34.4	34.4	34.4	34.4
			25.1	28.5	29.4	29.4	29.4	29.4	29.4	29.4	29.4
······································	10 sq miles	12.5			·		·		<i>-</i>		
	100 sq miles	7.7	14.8	18.3	20.1	20.2	20.2	20.2	20.2	20.2	20.2
	200 sq miles	6.4	11.9	16.3	17.3	17.4	17.4	17.4	17.4	17.4	17.4
	500 sq miles	4.9	10.2	13.0	14.0	14.3	14.4	14.4	14.4	14.4	14.4
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	1000 sq miles	3.9	8.0	10.2	12.2	12.3	12.3	12.6	12.6	12.6	12.6
(m	2000 sq miles	1.2	6.6	8.6	9.7	9.8	9.8	9.9	9.9	9.9	9.9
	5000 sq miles	1.1	3.6	5.4	6.3	6.4	6.5	6.6	6.6	6.6	6.6
	6173 sq miles	1.1	3.4	4.5	5.3	5.5	5.7	5.9	5.9	5.9	5.9
	torm Center Na	ame			- Smethpor	t, PA					
Storm Dat	e(s)			7/16-20/19	42						
Storm Typ				MCC							1
Storm Loc				41.83 N	78.28 W						1
Storm Cer	ter Elevation			1,800							
Precipitati	on Total & Dur	ation		34.91 Inche	s 18-hours						<u> </u>
Storm Rep	resentative Dev	w Point		77.5 F	6						
Storm Rep	resentative Dev	w Point Locat	ion	42.60 N	82.83 W						
Maximum	Dew Point			78.0 F							
Moisture	nflow Vector			WNW @ 23	35						
In-place N	laximization Fac	ctor		1.03							
Temporal	Transposition (I	Date)		15-Jul							
Transposit	ion Dew Point I	Location									
	ion Maximum I										Ī
	ion Adjustment			#N/A					1		1
Transposit				N/A							1
											1
Average B		1		N/A							
Average B Highest E	evation in Basir	1		N/A N/A							1
Average B Highest E Inflow Bar				N/A N/A #N/A							

Stor	Storm 1345 - July 16 (0600 UTC) - July 20 (0500 UTC), 1942  MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
	Duration (hours)															
Area (mi²)	1	1 2 3 4 5 6 12 18 24														
1	13.50	18.00	22.00	25.50	28.00	30.62	33.91	34.41	34.41							
10	11.00	14.50	17.50	20.50	23.00	25.10	28.52	29.35	29.35							
25	8.00	11.50	14.00	16.50	19.00	20.61	24.43	25.58	25.58							
50	6.00	9.00	11.50	13.50	15.50	17.99	21.63	22.69	22.69							
100	3.50	6.00	8.20	10.20	12.80	14.76	18.31	20.14	20.14							
300	2.00	4.50	6.40	8.00	10.00	11.33	14.64	16.18	16.18							
500	1.30	3.60	5.50	7.40	9.36	10.23	12.99	14.01	14.01							
1,000	0.80	2.50	4.00	6.00	7.00	7.95	10.24	12.15	12.15							

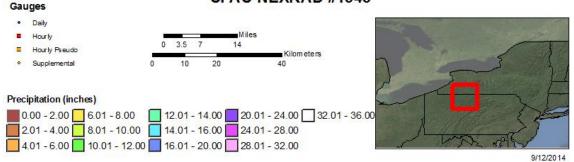


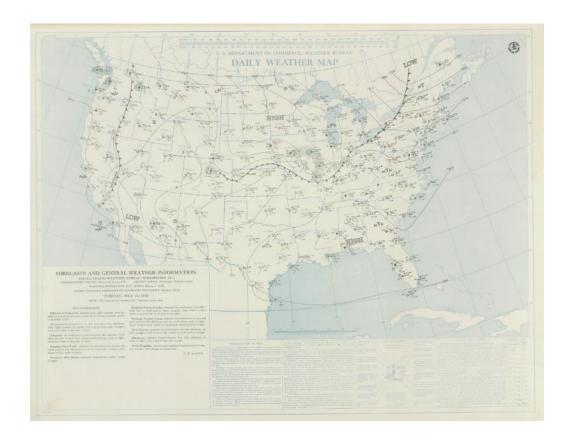


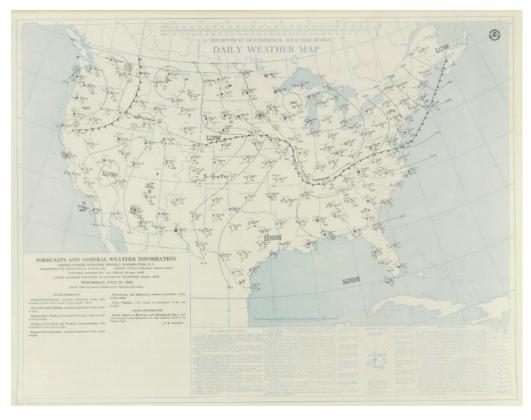


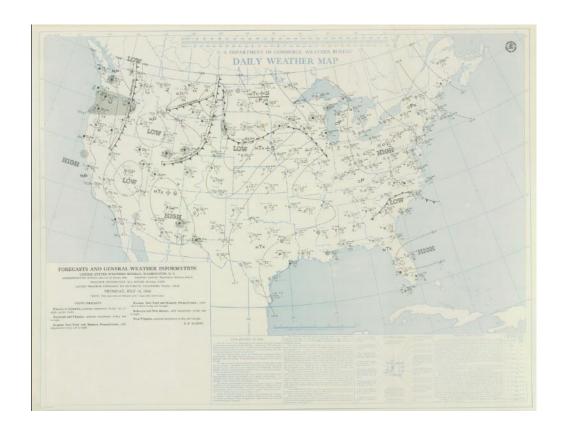


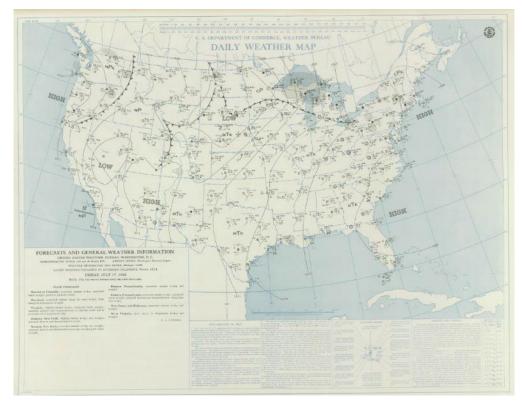
Total Storm (96-hr) Precipitation (inches) 07/16/1942 0600 UTC - 07/20/1942 0500 UTC SPAS-NEXRAD #1345

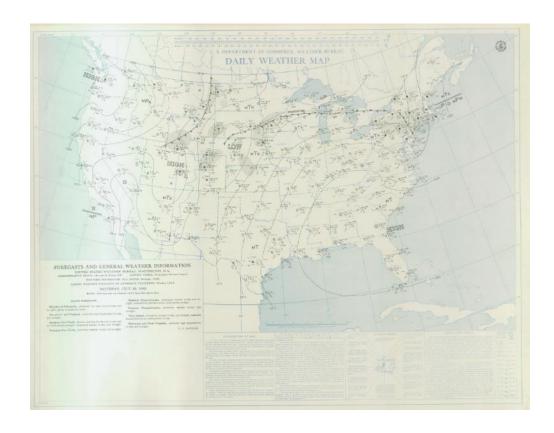


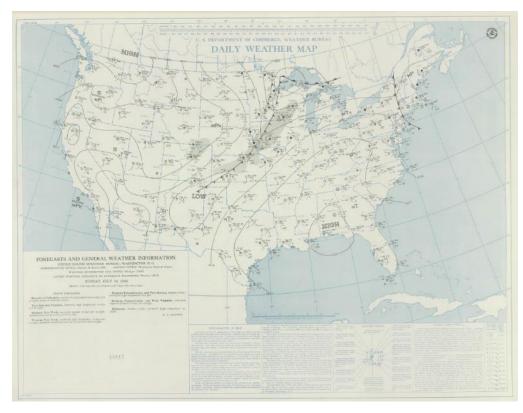


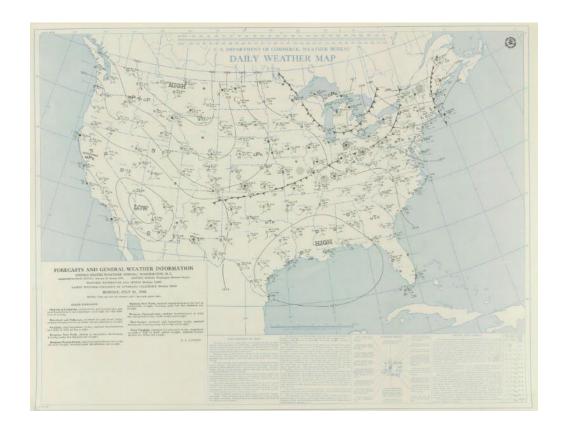




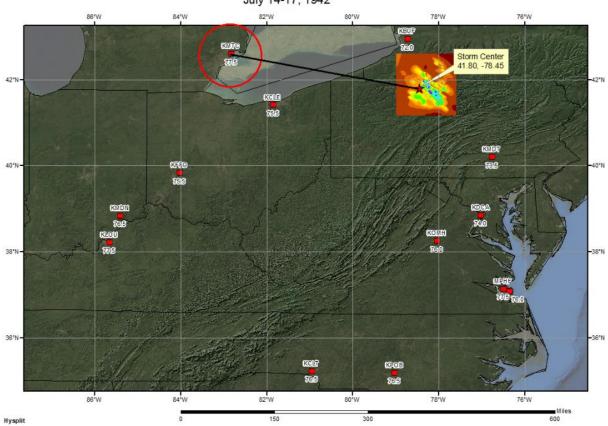


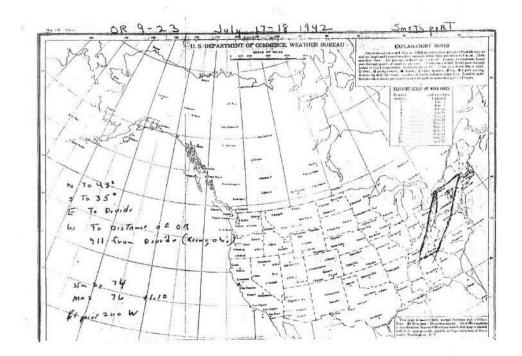






## Smethport, PA Storm Analysis July 14-17, 1942





# Storm Precipitation Analysis System (SPAS) For Storm #1340 SPAS Analysis

**General Storm Location**: Big Meadows, VA (USACE SA 1-28a)

Storm Dates: October 12-17, 1942

**Event**: Flash Flood Event

**DAD Zone 1** 

Latitude: 38.5458

**Longitude**: -78.4042

Max. Grid Rainfall Amount: 19.77"

Max. Observed Rainfall Amount: 18.92"

Number of Stations: 587 (423 Daily, 2 Hourly, 3 Hourly Pseudo, and 159 Supplemental)

SPAS Version: 9.5

Basemap: PRISM October 1942 Precipitation

**Spatial resolution:** 00:00:30 (~ 0.30 mi²)

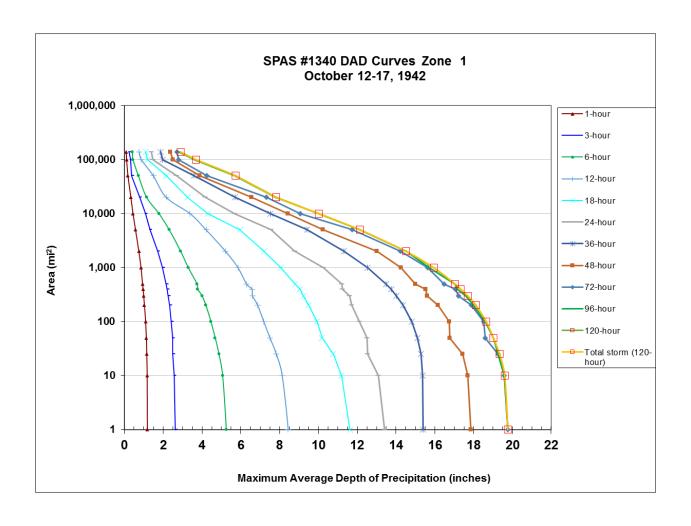
Radar Included: No

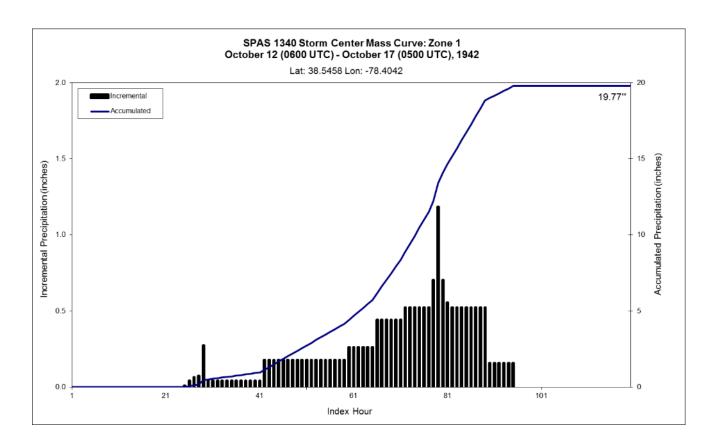
Depth-Area-Duration (DAD) analysis: Yes

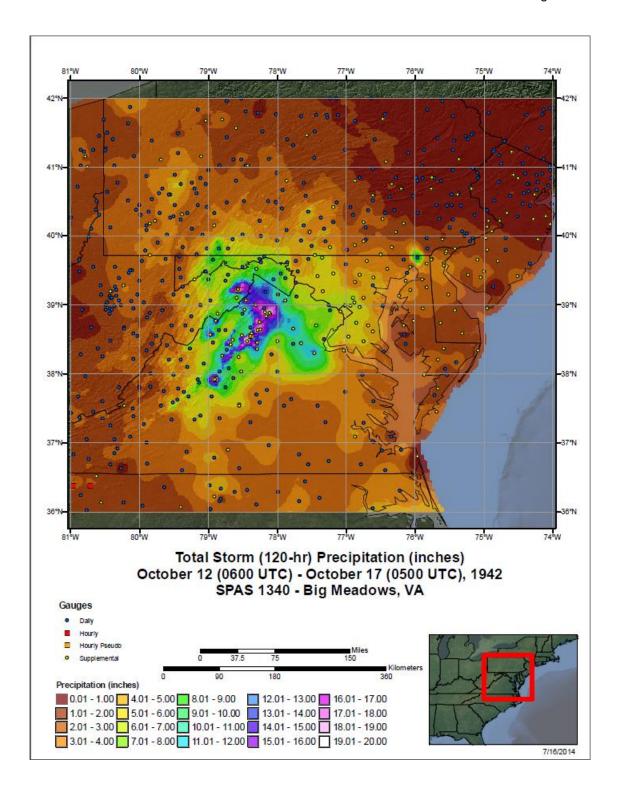
**Reliability of results:** This analysis was based on digitized hourly data from the USACE SA 1-28a mass curves, daily data, and supplemental station data. We have a good degree of confidence in the station based storm total results, the spatial pattern is dependent on the basemap, and the timing is based on hourly stations.

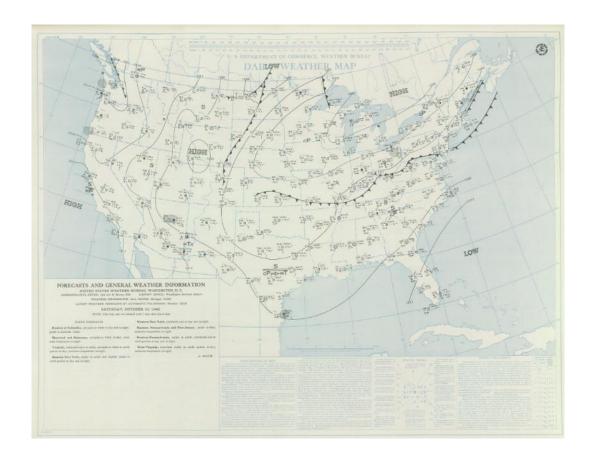
Storm Nan	ne: SPAS 1340 - B	ig Meadows	, VA											
Storm Dat			, , , , ,	Storm Adjustment for Virginia										
AWA Anal	ysis Date: 11/14/2015						ajastii		, 11 g11110					
[emporal	Transposition Date	1-Oct												
		Lat	Long			Moisture l	Inflow Dire	ction	ESE @ 835	miles				
Storm Cen	ter Location	38.55 N	78.40 W			Basin Aver	rage Elevati	on	N/A	feet				
Storm Rep	SST Location	34.00 N	70.00 W			Storm Cen	ter Elevati	on	3,300	feet				
	ion SST Location					Storm Ana	lysis Durat	ion	24	hours				
Basin Loca	ation					Effective B	Barrier Hei	ght	N/A	feet				
	The storm represer		78.0 F		l precipitable					3.29	inches			
	The in-place max		81.0 F		l precipitable					3.76	inches			
	The transpositioned max		0.0		l precipitable	0.84			a resotan at	#N/A 78.0 F	inches			
	The in-place storn The in-place storn		3,300 3,300		ich subtracts ich subtracts	0.93		f precipitabl f precipitabl		81.0 F				
	The transposition basis		N/A		ich subtracts	0.93 X.XX		f precipitabl		0.0				
Th	e inflow barrier/basin eleva		N/A		ich subtracts			f precipitabl		0.0				
111	e minow barrier/basm ereva	tion neight is	11/71	WII	icii subti acts	Α•ΛΛ	menes 0	i precipitati	c water at	0.0				
	The in-place stor	m maximizati	on factor is	1.16	1	Notes: DAD	values taken f	rom SPAS 134	40. Storm represe	entative SST	1			
	The transposition/e			#N/A					values on Octobe					
		arrier adjustm		#N/A										
		, , , , , , , , , , , , , , , , , , ,												
	The	total adjustme	ent factor is	#N/A										
	Observed Storm Depth-A	rea-Duratio	1		~,~~~~	·····	.,	·	.,					
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours					
	10 sq miles		8.1	11.2	13.1	17.7	19.6	19.6	19.6					
	100 sq miles	4.5	7.2	9.9	12.1	16.8	18.5	18.6	18.6		00			
	200 sq miles	4.2	6.9	9.5	11.7	16.2	17.9	18.0	18.1					
	500 sq miles	3.7	6.3	8.8	11.2	15.0	16.5	17.0	17.0		1			
	1000 sq miles	3.3	5.9	8.1	10.3	14.3	15.6	15.7	15.9		1			
	2000 sq miles	2.9	5.2	7.2	8.8	13.0	14.2	14.5	14.5		1			
	5000 sq miles	2.3	4.2	6.0	7.6	10.2	11.7	12.1	12.1		-			
	10000 sq miles	1.8 1.1	2.2	4.3	5.7	8.4 6.6	9.1 7.3	10.0	10.0 7.8		-			
	20000 sq miles	0.7	1.5	3.3	2.7	3.9	4.3	7.8 5.7	5.7		1			
	50000 sq miles 100000 sq miles	0.7	0.9	1.2	1.5	2.5	2.8	3.6	3.7					
	138434 sq miles	0.4	0.8	1.1	1.4	2.4	2.7	2.8	2.9		1			
	130+3+ sq mines	0.4	0.0	1.1	1.4	2.4	2.7	2.0	2.5		-			
	Storm or Storm Center Na	me		SPAS 1340 -	Big Meado	ws, VA					1			
	Storm Date(s)			10/11-18/19										
	Storm Type			Flash Flood I										
	Storm Location			38.55 N	78.40 W									
	Storm Center Elevation			3,300										
	Precipitation Total & Dura	tion (10 sq mi	)	19.77" in 120	hrs from SF	PAS 1340								
					1						4			
	Storm Representative SST			78.0 F	24		C	0-4			<del> </del>			
	Storm Representative SST	Location		34.00 N	70.00 W		Sep	Oct			1			
	Maximum SST			81.0 F			81.8	79			1			
	Moisture Inflow Vector In-place Maximization Fact	lor.		ESE @ 835 1.16			-	-			1			
	ni-piace iviaximization fact	101		1.10			-	-			1			
	Temporal Transposition (D	ate)		1-Oct							1			
	Transposition SST Location			- 000							1			
	Transposition Maximum SS										1			
	Transposition Adjustment I			#N/A			1				i			
	Average Basin Elevation			N/A							1			
	Highest Elevation in Basin			N/A			1				1			
	Inflow Barrier Height			N/A							1			
	Barrier Adjustment Factor			#N/A							1			
	Total Adjustment Factor			#N/A							1			

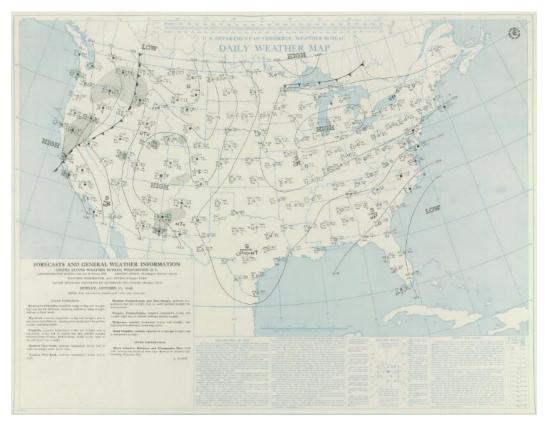
	;	Storm 1	340 - O	ctober 1	2 (0600	UTC) -	Octobe	er 17 (0	500 UTC	C), 1942					
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Auga (m:2)						Duration	(hours)								
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	Total			
0.3	1.18	2.64	5.27	8.48	11.68	13.42	15.74	17.87	19.77	19.77	19.77	19.77			
1	1.18	2.63	5.25	8.44	11.63	13.40	15.40	17.86	19.76	19.76	19.76	19.76			
10	1.17	2.56	5.06	8.13	11.19	13.08	15.36	17.70	19.57	19.57	19.60	19.60			
25	1.15	2.49	4.87	7.83	10.77	12.53	15.30	17.44	19.26	19.26	19.33	19.33			
50	1.13	2.48	4.68	7.50	10.18	12.52	15.11	16.78	18.59	19.01	19.02	19.02			
100	1.09	2.42	4.46	7.18	9.92	12.11	14.81	16.75	18.53	18.60	18.64	18.64			
200	1.03	2.33	4.20	6.87	9.49	11.71	14.37	16.17	17.89	17.98	18.11	18.11			
300	0.99	2.26	4.00	6.60	9.22	11.62	14.02	15.61	17.23	17.60	17.69	17.69			
400	0.96	2.20	3.78	6.57	9.05	11.25	13.74	15.52	17.06	17.17	17.34	17.34			
500	0.93	2.15	3.74	6.29	8.80	11.20	13.48	15.00	16.48	17.04	17.04	17.04			
1,000	0.85	1.96	3.29	5.85	8.05	10.27	12.53	14.25	15.62	15.72	15.94	15.94			
2,000	0.74	1.71	2.90	5.21	7.20	8.78	11.31	13.00	14.22	14.51	14.51	14.51			
5,000	0.57	1.32	2.31	4.21	5.96	7.57	9.41	10.24	11.74	12.12	12.13	12.13			
10,000	0.44	1.07	1.78	3.38	4.30	5.67	7.53	8.42	9.07	10.01	10.03	10.03			
20,000	0.33	0.79	1.14	2.15	3.26	4.18	5.71	6.55	7.32	7.77	7.83	7.83			
50,000	0.18	0.37	0.72	1.49	2.18	2.69	3.59	3.87	4.25	5.67	5.73	5.73			
100,000	0.11	0.31	0.44	0.87	1.20	1.46	1.97	2.50	2.78	3.60	3.68	3.68			
138,434	0.09	0.23	0.42	0.76	1.09	1.39	1.86	2.38	2.7	2.82	2.89	2.89			

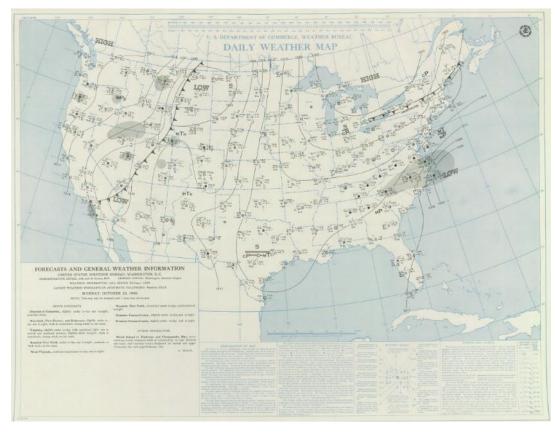


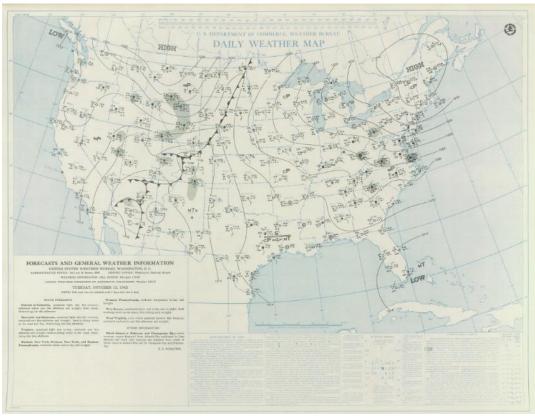


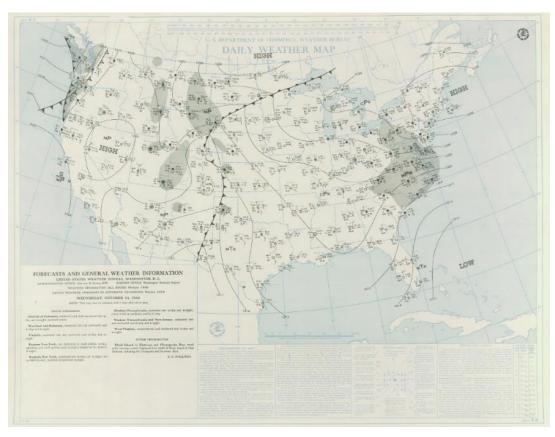


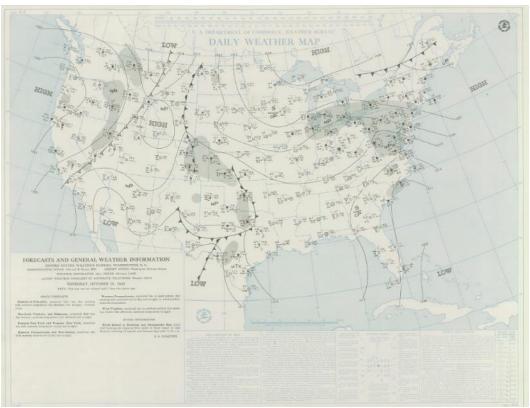


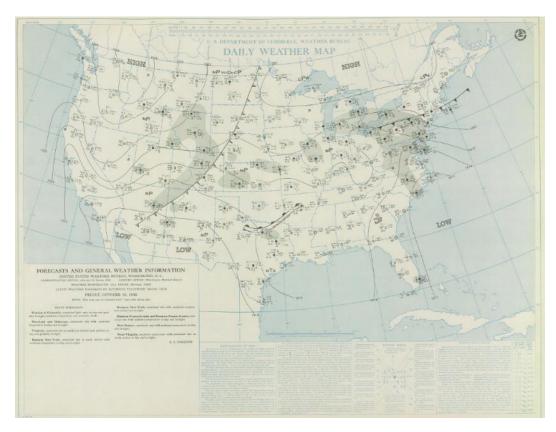


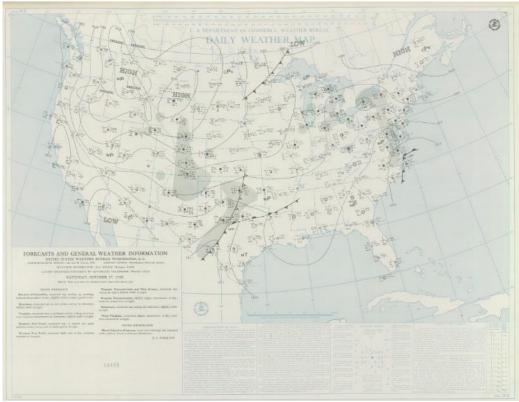


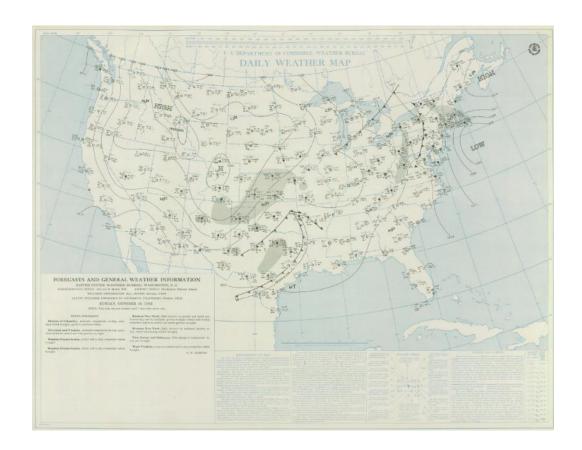












## SPAS 1340 Big Meadows, VA Storm Analysis October 13, 1942 80°W 78°W 70°W 68°W Storm Center 38.5458, -78.4042 63.0 38°N-38°N 78.0 78.0 78.0 34°N-80.0 76.0 80:0 32°N

72°W

68°W

# Storm Precipitation Analysis System (SPAS) For Storm #1432 SPAS Analysis

General Storm Location: Mounds, Oklahoma

**Storm Dates**: May 15 – May 20, 1943

**Event**: Extreme Precipitation Event

**DAD Zone 1** 

Latitude: 35.8458

**Longitude**: -96.0708

Max. Grid Rainfall Amount: 19.27"

Max. Observed Rainfall Amount: 19.23"

Number of Stations: 415

SPAS Version: 10.0

**Basemap:** Continental United States 2 year 6 hour (conus_0002yr06h)

Spatial resolution: 0.2624

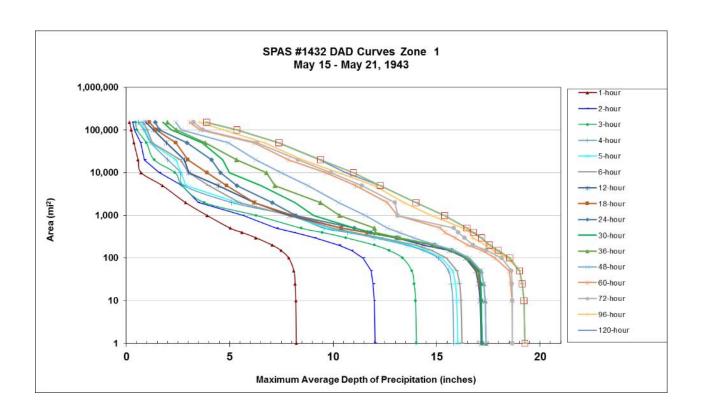
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

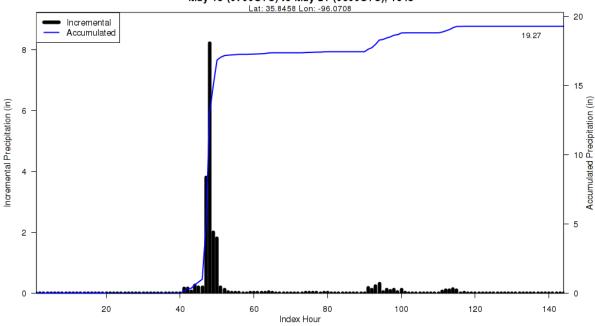
Reliability of results: In addition to the NCDC stations, seventeen supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE), five hourly stations were digitized based on the mass rainfall curves. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable.

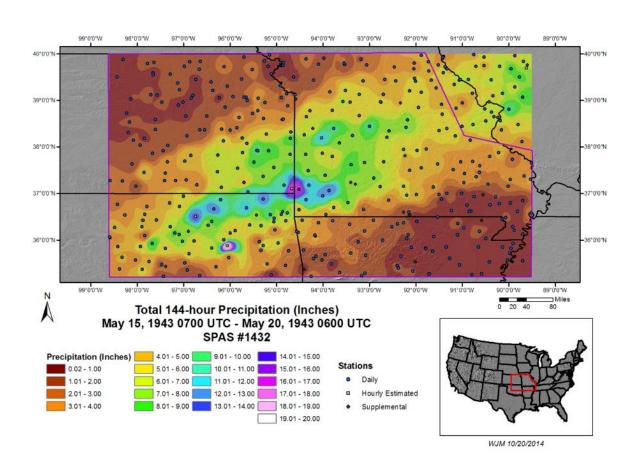
Storm Name:	SPAS 1432 - I		K								
Storm Date:	5/15-20/1943			,	S	Storm A	Adjustn	nent for	r Virgini	a	
AWA Analysis Date:		1.7									
Temporal Transposit	ion Date	1-Jun Lat	Long			Moisture	Inflow Dire	ection	SSW @ 150	miles	
Storm Center Locati	on	35.85 N	96.07 W			1	rage Eleva		N/A	feet	
Storm Rep Dew Poin		33.84 N	96.98 W			T .	nter Elevat		800	feet	
Transposition Dew P			70.70 11			1	alysis Dura		6	hours	
Basin Location							Barrier He		N/A	feet	
	representative of	•	73.0 F		tal precipita tal precipita					2.60	inches.
The transpositio	ace maximum o	•	78.5 F 0.0		tal precipita					3.37 #N/A	inches.
	in-place storm		800		ich subtracts			f precipitabl	e water at	73.0 F	menes.
	in-place storm		800		ich subtracts			f precipitabl		78.5 F	
The trans	sposition basin	elevation at	N/A	whi	ich subtracts	x.xx		f precipitabl		0.0	
The inflow barri	er/basin elevatio	on height is	N/A	whi	ich subtracts	x.xx	inches o	f precipitabl	e water at	0.0	
				1	-	W		c ap. a	1.100 0	T.1	
The	in-place storm	maximizati	on factor is	1.30					1432. Storm repons. KADM, KI		
Ine tr	ansposition/ele	vation to bas ier adjustme				-			e storm rep Td.	, and	
	THE DALL	ioi aujustille	in ractor IS	π1 <b>V/1</b>					-		
	The to	tal adjustme	ent factor is	#N/A		<u></u>					
Observed	Storm Depth-A			,		······	·	·····	·		·
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	·}······	48 Hours	72 Hours		120 Hou
***************************************	1 sq miles 10 sq miles	8.2	16.2 16.2	17.2 17.1	17.2 17.1	17.2 17.2	17.4 17.4	17.4 17.4	18.7 18.7	19.3 19.2	19.3
· · · · · · · · · · · · · · · · · · ·	10 sq miles 100 sq miles	7.9	15.5	16.4	16.4	16.4	16.5	16.6	18.2	18.4	18.5
	200 sq miles	7.1	14.0	14.4	14.8	14.9	15.0	15.0	16.8	17.4	17.6
	500 sq miles	5.0	10.0	10.4	10.4	11.0	12.0	12.6	15.8	16.3	16.5
	1000 sq miles	3.9	7.9	7.9	8.1	8.2	10.3	11.6	13.1	14.8	15.4
	2000 sq miles	2.9	5.5	6.2	6.2	7.1	9.4	10.3	13.0	13.4	14.0
	5000 sq miles	1.7	4.0	4.5	4.9	5.4	7.2	8.8	11.4	12.0	12.3
***************************************	0000 sq miles	0.7	3.0	3.0	3.9	4.6	6.8	7.5	9.9	10.3	10.6
	20000 sq miles 30000 sq miles	0.6 0.4	2.6 1.3	2.8 1.9	3.0	4.1 2.9	5.3 3.8	6.3 5.0	8.3 6.3	8.5 6.7	9.4 7.4
	00000 sq miles	0.2	1.0	1.3	1.5	1.6	2.4	2.7	3.7	4.7	5.3
<u> </u>	•				1						
	torm Center Na	me			2 - Mounds,	OK					
Storm Date				5/15-20/19	943						
Storm Type				MCC	96.07 W						1
Storm Con	ter Elevation			35.85 N 800	96.07 W						
	on Total & Dura	ation (10 sq	mi)		es in 96 hou	rs					
		(2004	/								
Storm Rep	resentative Dev	v Point		73.0 F	6						
	resentative Dev	v Point Loca	tion	33.84 N	96.98 W		May	June			<b>!</b>
Maximum				78.5 F	0		77	79			
	nflow Vector aximization Fac	etor		SSW @ 15 1.30	U	-	1	-			
iii-piace M	aammzauon Fac	101		1.00	+	-		-	-		1
Temporal 7	Transposition (I	Date)		1-Jun							1
	on Dew Point I										
Transposit	on Maximum D	Dew Point									
	on Adjustment	Factor		#N/A							
	sin Elevation			N/A	-						
	evation in Basin	1		N/A	-						1
	rier Height			N/A							1
	ustment Factor			#N/A							

	Storm 1432 - May 15 (0700 UTC) - May 21 (0600 UTC), 1943  MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
	Duration (hours)																	
Area (mi ² )	1	2	3	4	5	6	12	18	24	30	36	48	60	72	96	120	144	Total
0.3	8.21	12.02	14.02	15.82	16.02	16.23	17.15	17.24	17.34	17.35	17.39	17.43	18.79	18.94	19.27	19.27	19.27	19.27
1	8.21	12.02	14.02	15.82	16.02	16.23	17.15	17.19	17.20	17.20	17.39	17.39	18.66	18.66	19.26	19.26	19.26	19.26
10	8.19	11.98	13.98	15.78	15.98	16.18	17.10	17.14	17.16	17.16	17.35	17.35	18.63	18.65	19.22	19.22	19.22	19.22
25	8.16	11.92	13.91	15.70	15.90	16.11	17.03	17.08	17.12	17.12	17.27	17.27	18.58	18.64	19.13	19.14	19.14	19.14
50	8.10	11.83	13.80	15.57	15.77	15.99	16.90	16.98	17.06	17.06	17.15	17.15	18.50	18.61	19.00	19.00	19.00	19.00
100	7.85	11.45	13.36	15.07	15.26	15.47	16.39	16.43	16.43	16.48	16.51	16.59	17.82	18.15	18.42	18.52	18.53	18.53
150	7.48	10.90	12.71	14.35	14.53	14.76	15.62	15.68	15.71	15.71	15.78	15.85	17.19	17.41	17.73	17.92	17.96	17.96
200	7.06	10.28	12.00	13.54	13.71	13.95	14.35	14.83	14.89	14.89	14.96	15.00	16.48	16.76	17.36	17.56	17.57	17.57
300	6.26	9.10	10.61	11.98	12.13	12.32	13.08	13.08	13.08	13.08	13.22	13.89	15.90	16.35	16.75	17.15	17.18	17.18
400	5.58	8.10	9.46	10.67	10.81	11.00	11.65	11.65	11.83	11.83	12.04	13.20	15.41	16.04	16.65	16.74	16.78	16.78
500	5.03	7.26	8.46	9.56	9.67	9.95	10.40	10.40	11.02	11.02	11.99	12.63	15.18	15.84	16.27	16.45	16.45	16.45
1,000	3.90	5.64	6.27	7.89	7.89	7.89	7.89	8.06	8.20	9.05	10.31	11.57	13.11	13.11	14.75	15.37	15.37	15.37
2,000	2.86	3.48	3.77	5.10	5.34	5.48	6.20	6.20	7.05	8.15	9.39	10.27	12.63	12.99	13.42	13.99	13.99	13.99
5,000	1.74	2.69	2.69	2.77	2.88	4.00	4.45	4.86	5.35	6.51	7.19	8.77	11.09	11.40	11.99	12.27	12.27	12.27
10,000	0.72	1.59	2.36	2.61	2.64	3.02	3.02	3.91	4.56	4.99	6.78	7.49	9.64	9.89	10.26	10.62	10.98	10.98
20,000	0.57	0.88	1.35	2.01	2.40	2.61	2.80	2.98	4.11	4.67	5.33	6.26	7.84	8.30	8.49	9.35	9.38	9.38
50,000	0.37	0.70	0.97	1.19	1.19	1.26	1.94	2.40	2.94	3.66	3.82	4.95	6.17	6.33	6.68	7.35	7.38	7.38
100,000	0.24	0.41	0.52	0.85	0.92	1.02	1.31	1.45	1.60	2.18	2.42	2.65	3.56	3.70	4.68	5.32	5.36	5.36
151,933	0.16	0.31	0.46	0.58	0.70	0.79	0.95	1.13	1.41	1.77	1.99	2.39	3.06	3.26	3.53	3.83	3.88	3.88

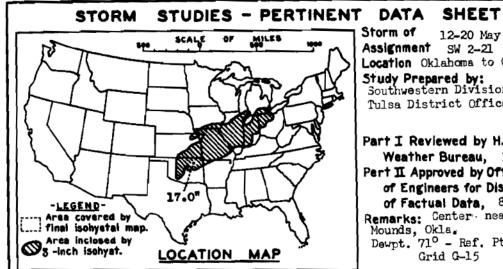


#### SPAS 1432 Storm Center Mass Curve Zone 1 May 15 (0700UTC) to May 21 (0600UTC), 1943





CORPS OF ENGINEERS



Storm of 12-20 May 1943 Assignment SW 2-21 Location Oklahoma to Great Lake: Study Prepared by: Southwestern Division

Tulsa District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 10/9/46 Pert II Approved by Office, Chief of Engineers for Distribution of Factual Data, 8/15/49 Remarks: Center near Mounds, Okla. Dewpt. 71° - Ref. Pt. 60 ESE

1

Grid G-15

DATA AND COMPUTATIONS COMPILED PART I

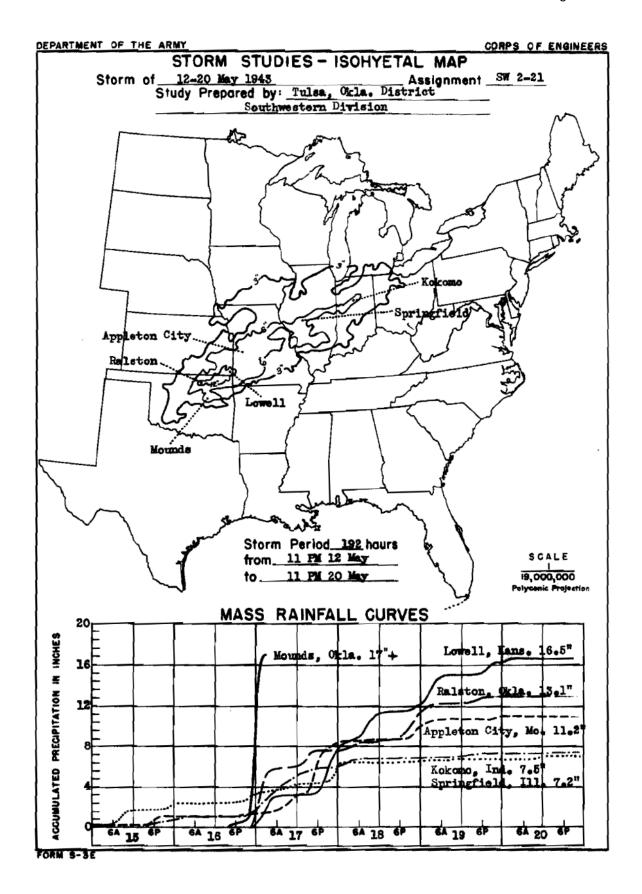
1801 -	
Preliminary isohyetal map, in 1 sheet, scale 1: 1,000,000	
	Number of Sheets)
Form 5001-C (Hourly precip. data)	531
Form 5001-B (24-hour " " )	
Form 5001-D (" " " )	
Misci, precip. records, meteorological data, etc	10
Form 5002 (Mass rainfall curves)	251
PART II	
Final isohyetal maps, in 1 sheet, scale 1: 1,000,000	
Data and computation sheets:	
Form S-10 (Data from mass rainfall curves)	42
Form S-II (Depth-area data from isohyetal map)	
Form S-12 (Maximum depth-duration data)	

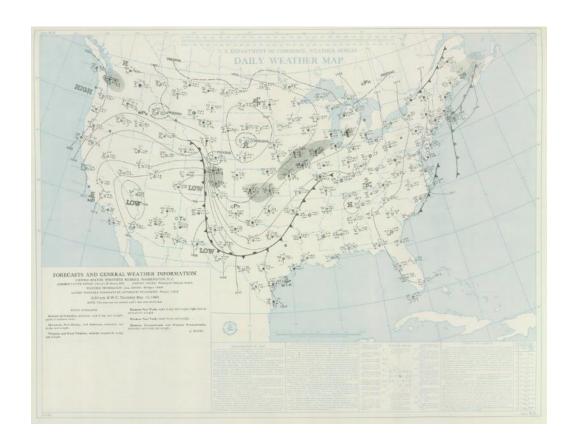
Data relating to periods of maximum rainfall ______ MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

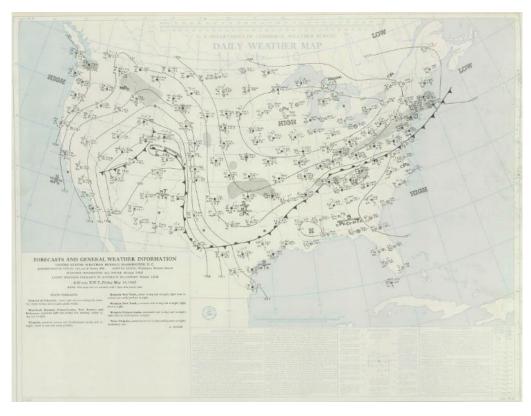
Maximum duration-depth-area curves_____

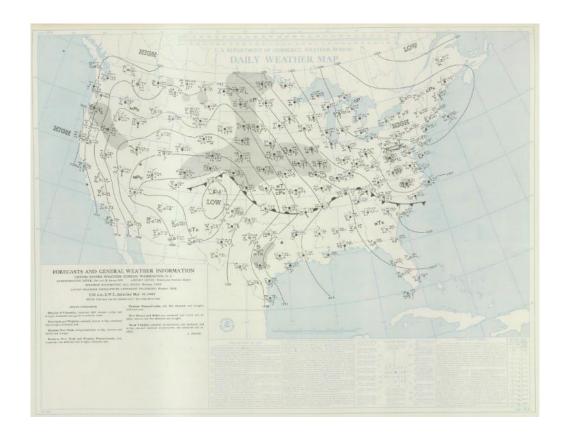
Area	in Sq. Mi.			D	uratio	n of	Rainf	all in	Hours	3		144/
L		6	12	18	21,	36	48	60	72	96	120	192
Max.	Station	16.2	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
	10	15.9	16.7	16.7	16.7	16.7	16.7	16.7	16.7	16.8	16.9	16.9
ł	100	14.2	14.8	14.9	14.9	14.9	14.9	15.0	15.4	15.6	15.9	15.9
1	200	13.0	13.5	13.9	13.9	13.9	13.9	13.9	14.4	15.0	15.5	15.5
1	500	9.2	10.6	11.1	11.1	11.5	12.0	13.7	14.4	14.6	14.9	14.9
1 .	1,000	6.2	7.9	8.4	8.5	10.0	10.8	13,2	13.8	14.1	14.9	14.9
1	2,000	4.0	5.3	6.3	6.6	9.2	10.0	12.6	13.2	13.5	13.7	13.7
1	5,000	3.0	3.6	4.9	5.4	8.3	8.9	11.5	12.1	12.4	12.5	12.6
1	10,000	2,6	3.1	4.2	4.8	7.3	8.0	1.0.2	10.7	11.0	11.3	11.4
ì	20,000	2.1	2.6	3.5	4.2	6.2	6.9	8.6	9.1	9.4	9.8	10.1
1	50,000	1.6	2.0	2.6	3.4	4.6	5.3	6.6	7.0	7.4	7.8	8.2
1	100,000	1.1	1.5	2.0	2.6	3.5	4.3	5.0	5.4	5.8	6.4	6.8
	200,000	0.7	.1.0	.1.3	1.7	2.3	2.7	3.5	3.8	4.3	4.9	5.2

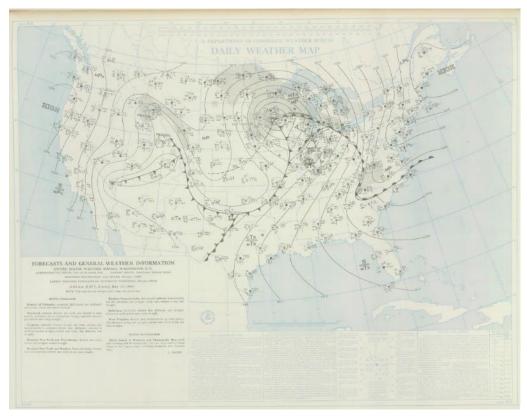
Form 5-2

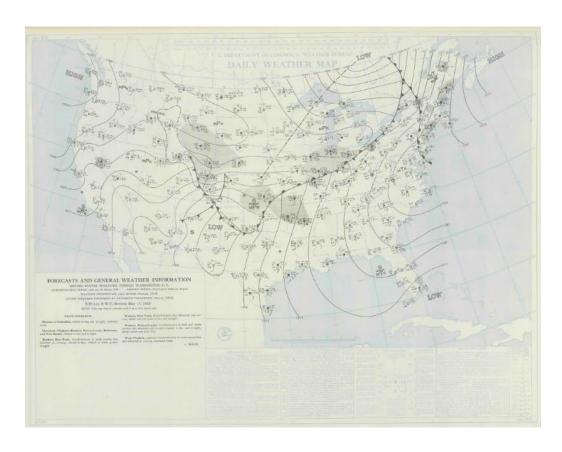


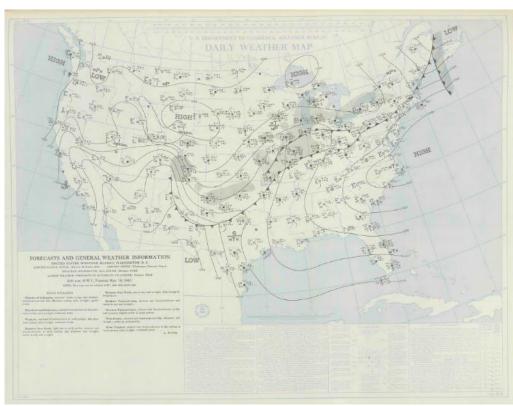


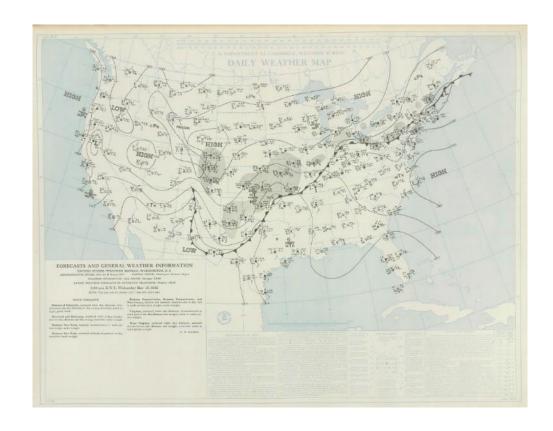


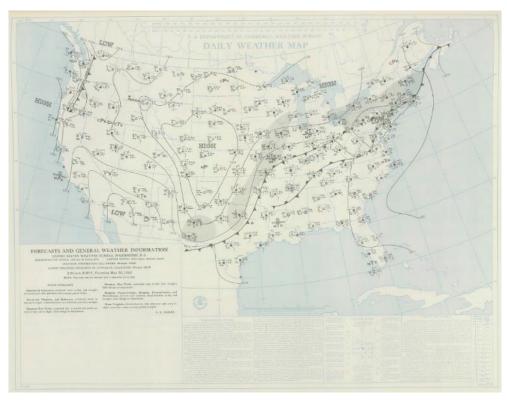


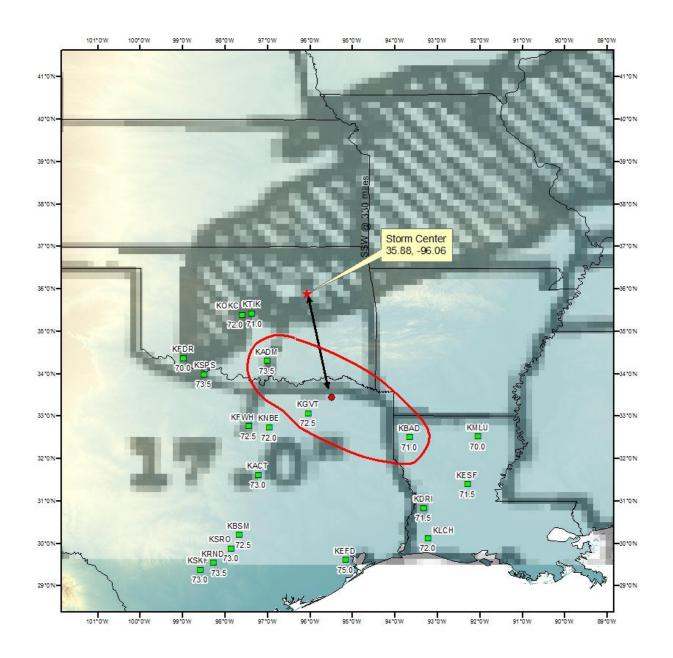






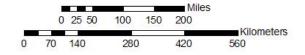






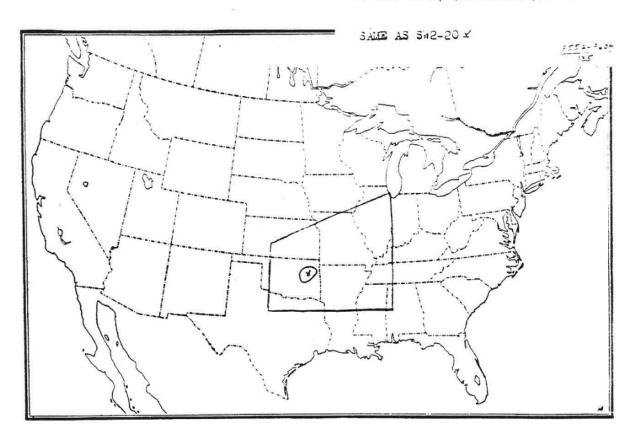
#### **Surface Stations**

Surface Observations



SW2-21 Storm Analysis USACE SW2-21 Mounds, OK 5/15-20/1943

5d 2-21. May 13-20,1943. Lounas, Oct 12-hr. rfd 71(16th)...to 76, 285...00



# Storm Precipitation Analysis System (SPAS) For Storm #1536 SPAS Analysis

General Storm Location: West Virginia

Storm Dates: August 4 - August 5, 1943

Event: USACE_OR_3_30

**DAD Zone 1** 

Latitude: 38.8958

Longitude: -80.7708

Max. Grid Rainfall Amount: 15.04"

Max. Observed Rainfall Amount: 15.00"

Number of Stations: 148

SPAS Version: 10.0

Basemap: Isohyetal basemap from USGS Notable Local Floods report

Spatial resolution: 0.2564

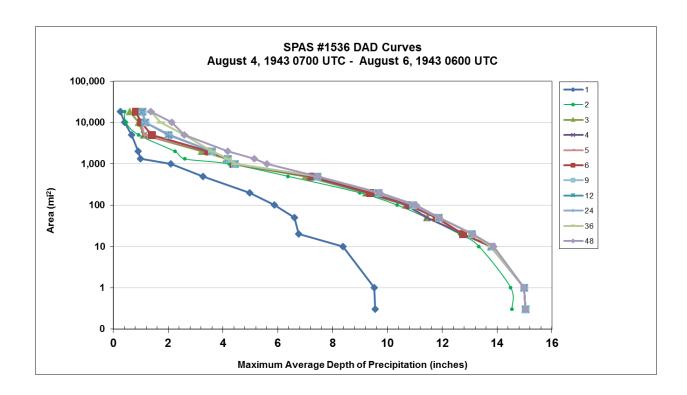
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

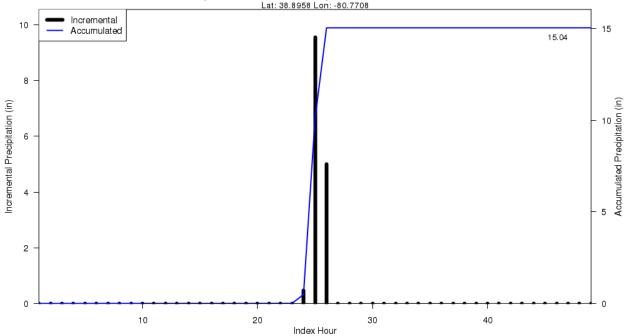
Reliability of results: Three of the 44 supplemental stations were converted from the daily type due to questionable observation times. The remaining 41 supplemental stations were digitized from the USGS Notable Floods report. While there were additional supplemental stations added from the USGS report, they were subsequently removed from the analysis due to inconsistencies with the isohyetal map from said report. This isohyetal map was also digitized and used as the basemap for this storm in order to fully represent this previous analysis. Ten of the eleven hourly stations were digitized from the USGS report along with data from the USACE report OR 3-30. With the amount of data pulled from these trusted sources, and the consistency of the results of this analysis against those previously published, this analysis is considered to be reliable.

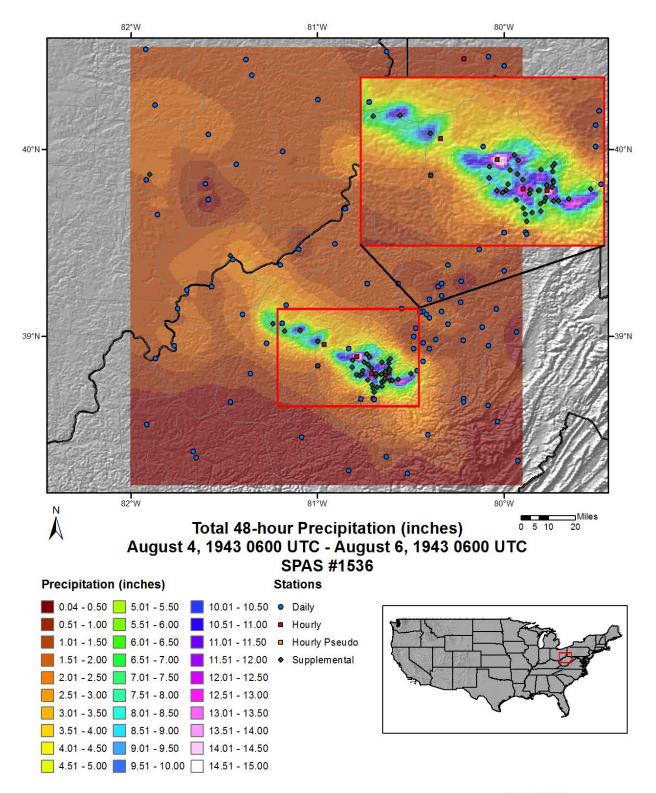
C4 N	CDAC 1526 C	1	17								
Storm Name: Storm Date:	SPAS 1536-G 8/2-4/1943	ienville, w	V			Storm /	\ dinata	aant fa	, Vincini	_	
AWA Analysis Date:					,	Storin F	aujusui	ilent 101	r Virginia	d	
	•	15.4							1		
Temporal Transposit	ion Date	15-Aug	-			34 14 3	G D'	4.	WANTE 155	-1	
		Lat	Long				Inflow Dire		WNW@155	miles	
Storm Center Locati	on	38.90 N	80.77 W				rage Elevati		N/A	feet	
Storm Rep Dew Poin		39.70 N	83.50 W			Storm Cen	ter Elevati	on	1,100	feet	
Transposition Dew P	oint Location						lysis Durat		6	hours	
Basin Location						Effective B	Barrier Hei	ght	N/A	feet	
	representative	-	74.0 F		-	ble water abo				2.73	inches.
	olace maximum	-	79.0 F			ble water abo				3.44	inches.
	oned maximum	•	0.0		• •	ble water abo				#N/A	inches.
The	in-place storm	elevation is	1,100	feet whi	ch subtracts	0.27	inches of	f precipitabl	e water at	74.0 F	
	e in-place storm		1,100		ch subtracts			f precipitabl		79.0 F	
	nsposition basin		N/A	feet whi	ch subtracts	X,XX	inches of	f precipitabl	e water at	0.0	
The inflow barr	rier/basin elevati	on height is	N/A	feet whi	ch subtracts	X.XX	inches of	fprecipitabl	e water at	0.0	
	ne in-place storn			1.27			•		0 with Storm Rep		
The	ransposition/ele			#N/A				-	itive Td was base		
	The bar	rier adjustme	ent factor is	#N/A		average Td o	n Aug 1-2, 19	43 from KFFC	), KLCK and KII	∠N.	
	The to	otal adjustme	ent factor is	#N/A							<u> </u>
Observed	Storm Depth-A	rea-Durati	on								
		1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	9 Hours	12 Hours	24 Hours	
	1 sq miles	9.5	14.5	15.0	15.0	15.0	15.0	15.0	15.0	15.0	
	10 sq miles	8.4	13.3	13.8	13.8	13.8	13.8	13.8	13.8	13.8	
	100 sq miles	5.9	10.4	10.7	10.7	10.7	10.8	10.9	10.9	11.0	
	200 sq miles	5.0	9.0	9.2	9.3	9.4	9.4	9.7	9.7	9.7	
	500 sq miles	3.3	6.4	7.0	7.2	7.3	7.3	7.5	7.5	7.5	
	1000 sq miles	2.1	4.2	4.4	4.4	4.4	4.4	4.4	4.4	4.5	
	2000 sq miles	0.9	2.3	3.2	3.4	3.5	3.5	3.6	3.6	3.6	
	5000 sq miles	0.7	0.9	1.1	1.1	1.1	1.4	2.0	2.1	2.6	
	10000 sq miles	0.4	0.5	0.9	1.0	1.0	1.0	1.2	1.2	1.7	
		•		•	•	•	•	*		•	
Storm or S	torm Center Na	me		SPAS 1536	6-Glenville	. WV					
Storm Date				8/2-4/1943							
Storm Typ					- Local Thu	nderstorms					1
Storm Loc				38.90 N	80.77 W						1
	ter Elevation			1100							1
	on Total & Dura	tion			es 3 to 6 hou	ırs					1
1 recipitati	I I I CAM CO Dalla			-D.O.I Melk							1
Storm Ren	resentative Dew	Point		74.0 F	6						1
	resentative Dew		ion	39.70 N	83.50 W						1
	Dew Point	2004		79.0 F							1
	nflow Vector			WNW@15	5						1
	aximization Fac	tor		1.27							1
III place W	a			·							1
Temporal '	Transposition Da	nte		15-Aug							1
	ion Dew Point L			-05							1
	ion Maximum D										1
	ion Adjustment l			0.00							1
	asin Elevation	actor		N/A	-						1
	evation in Basin			N/A	-						1
	rier Height										1
	justment Factor			N/A					-		1
	,			0.00	-				-		1
10tai Adju	stment Factor			1.27							J

	Storm	1536 -	Augus	st 4 (07	700 UT	C) - A	ugust	6 (0600	) UTC)	, 1943		
						Duration	(hours)					
areasqmi	1	2	3	4	5	6	9	12	24	36	48	TOTAL
0.3	9.56	14.55	15.03	15.03	15.03	15.03	15.04	15.04	15.04	15.04	15.04	15.04
1	9.53	14.5	14.98	14.98	14.98	14.98	14.99	14.99	14.99	14.99	14.99	14.99
10	8.38	13.34	13.78	13.78	13.79	13.79	13.8	13.8	13.8	13.88	13.88	13.88
20	6.76	12.63	12.75	12.75	12.75	12.75	13.08	13.08	13.08	13.12	13.13	13.13
50	6.61	11.41	11.44	11.44	11.76	11.78	11.87	11.87	11.87	11.88	11.91	11.91
100	5.88	10.36	10.66	10.7	10.74	10.78	10.94	10.94	11.03	11.03	11.04	11.04
200	4.97	8.99	9.22	9.29	9.36	9.37	9.68	9.68	9.69	9.73	9.73	9.73
500	3.28	6.37	7	7.18	7.25	7.26	7.45	7.46	7.46	7.46	7.49	7.49
1000	2.1	4.23	4.35	4.38	4.39	4.39	4.43	4.43	4.49	5.61	5.68	5.68
1320	1	2.61	4.13	4.17	4.17	4.17	4.17	4.17	4.17	5.15	5.43	5.43
2000	0.91	2.25	3.23	3.4	3.47	3.48	3.59	3.59	3.59	4.17	4.92	4.92
5000	0.67	0.93	1.12	1.13	1.13	1.4	2.02	2.06	2.59	2.59	2.65	2.65
10000	0.41	0.46	0.93	1.01	1.01	1.01	1.16	1.16	1.73	2.13	2.13	2.13
18226	0.26	0.42	0.61	0.82	0.83	0.83	1.07	1.08	1.37	1.37	1.37	1.37



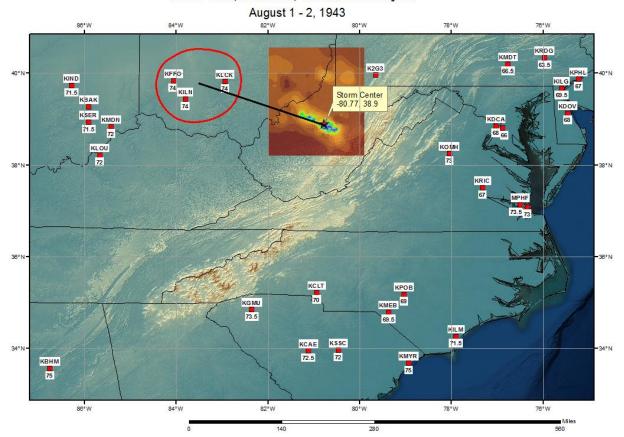






KLL 07/15/2015

#### SPAS 1536, Glenville, WV Storm Analysis



## Storm Precipitation Analysis System (SPAS) For Storm #1434 SPAS Analysis

General Storm Location: Holt, Missouri

**Storm Dates**: June 18 – June 23, 1947

Event: CORPS of Engineers, US Army Assignment MR 8 – 20

**DAD Zone 1** 

Latitude: 39.4542

**Longitude**: -94.3292

Max. Grid Rainfall Amount: 17.62"

Max. Observed Rainfall Amount: 17.62"

Number of Stations: 162

SPAS Version: 10.0

Basemap: Manually digitized contours using Army CORPS of Engineers isohyetal map.

Spatial resolution: 0.2548

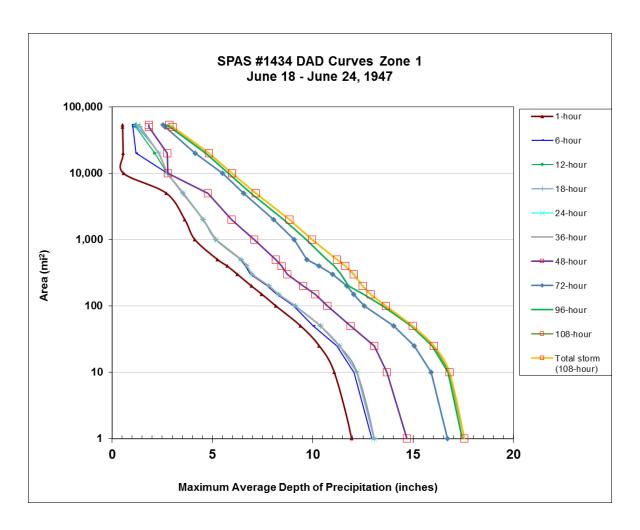
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

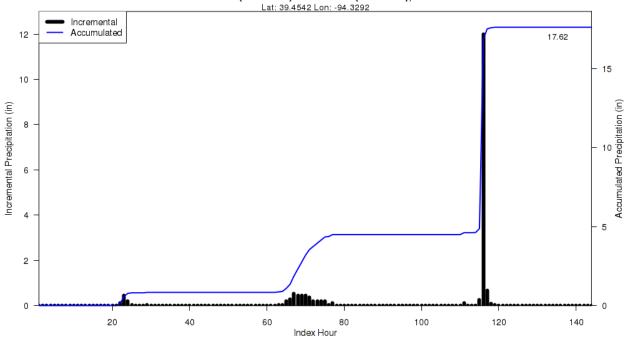
Reliability of results: Ten of the eleven hourly stations used in this analysis were manually digitized from either the Army CORPS of Engineers' pertinent data report or from local climatological data. The last hourly station was estimated from the spas precipitation grid due to daily and supplemental stations nearby needing more accurate timing. This provided very high accuracy of the hourly data, which is essential in the timing of the daily and supplemental stations. Of the 28 supplemental stations, 8 were formatted as daily stations. These stations were in the supplemental file due to there being more data on either end of the storm duration as defined for this analysis. For example, if the daily station took measurements in the morning, then there may have been more precipitation reported for the remainder of the storm that was actually part of the following day's observation. Alternatively, if a station had an observation time in the evening then there could have been data not used from the day before that was valid for the period of the storm and could be added to the analysis. An additional 8 stations found in the CORPS report were added to the supplemental file as well. With all of the data being thoroughly inspected, the DAD and precipitation pattern following closely to the Army CORPS of Engineers report, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

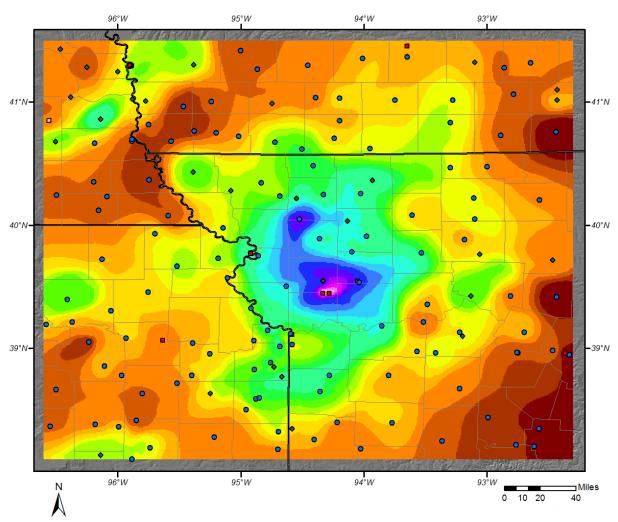
Storm Name:	SPAS 1434 - I	Holt, MO									
Storm Date:	6/18-22/1947				9	Storm A	Adiustm	ent for	Virginia	ı	
AWA Analysis Date	e: 11/14/2015								· 8		
Temporal Transpo	sition Date	5-Jul									
		Lat	Long			Moisture l	Inflow Dire	ction	SSW @ 230	miles	
Storm Center Loca	ation	39.45 N	94.33 W			Basin Aver	rage Elevati	on	N/A	feet	
Storm Rep Dew Po	int Location	36.18 N	95.25 W			Storm Cer	nter Elevatio	on	1,000	feet	
Transposition Dew	Point Location					Storm Ana	lysis Durat	ion	6	hours	
Basin Location						Effective F	Barrier Hei	ght	N/A	feet	
	orm representative	-	79.0 F		tal precipitabl					3.44	inches.
	in-place maximum	•	81.5 F		tal precipitabl					3.84	inches.
	sitioned maximum	•	0.0		tal precipitabl				<u> </u>	#N/A	inches.
	The in-place storn		1,000		nich subtracts			f precipitabl		79.0 F 81.5 F	
	The in-place storn transposition basis		1,000 N/A		nich subtracts nich subtracts			f precipitabl f precipitabl		0.0	
	oarrier/basin elevat		N/A		ich subtracts			f precipitabl		0.0	
THE HITTOW C	Sarrier/ Sasin ere vai	tion neight is	11/71	WI	nen suotracts	Анда	menes o	т ргестриал	c water at	0.0	
	The in-place stor	m maximizati	on factor is	1.12	1	Notes: DAD	values taken f	rom USACE I	MR 8-20, 1sqmi a	mount taken	
Т	he transposition/e			-					n the overall stor		
	•	rrier adjustm		-					ximum 6-hr Td v	alues	
						between June	e 22-23, 1947 a	t KHRO and	KTUL.		
	The	total adjustm	ent factor is	#N/A							
Observe	ed Storm Depth-A	Area-Duratio	n								
000000000000000000000000000000000000000	***************************************	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	11.9	12.9	13.1	13.1	13.1	13.1	14.7	16.7	17.4	17.5
	10 sq miles	11.1	12.0	12.2	12.2	12.2	12.2	13.7	15.9	16.7	16.8
(mannennamennamennamennamennamennamennam	100 sq miles	8.2	9.0	9.1	9.1	9.1	9.1	10.7	12.6	13.5	13.6
	200 sq miles	6.9	7.7	7.8	7.8	7.8	7.8	9.5	11.7	11.8	12.5
	500 sq miles	5.3 4.1	6.4 5.2	6.4	5.2	6.4 5.2	6.5 5.2	8.2 7.1	9.7	10.7 9.7	11.2
	1000 sq miles 2000 sq miles	3.6	5.2 4.5	5.2 4.5	4.5	4.5	4.5	6.0	9.1 8.1	9.7 8.6	8.8
	5000 sq miles	2.7	3.5	3.6	3.6	3.6	3.6	4.8	6.6	6.9	7.2
	10000 sq miles	0.6	2.8	2.8	2.8	2.8	2.8	2.8	5.5	5.8	6.0
· · · · · · · · · · · · · · · · · · ·	20000 sq miles	0.6	2.0	2.1	2.3	2.3	2.3	2.8	4.1	4.7	4.8
·	50000 sq miles	0.5	1.0	1.2	1.3	1.4	1.4	1.8	2.6	2.9	3.0
				*	*	•		*			
Storm of	r Storm Center Na	me		SPAS 1434	- Holt, MO						
Storm D	ate(s)			6/18-22/19	47						
Storm T	ype			MCC							
Storm L				39.45 N	94.33 W						
	enter Elevation			1,000							
Precipit	ation Total & Dura	ation		17.62 Inche	es 6-hours US	SACE MR 8-	-20				
Storm D	annacantativa Day	Doint		79.0 F	6				-		
	epresentative Dew epresentative Dew		on	79.0 F 36.18 N	95.25 W		June	July			
	m Dew Point	. I OIII LOCALI	011	81.5 F	75.25 **		79.546	82.354			
	e Inflow Vector			SSW @ 230	0		, , , , , , , , , , , , , , , , , , , ,	J2.JJ7			
	Maximization Fac	tor		1.12							
,											
Tempora	al Transposition (E	Date)		5-Jul							
	sition Dew Point L										
	sition Maximum D										
	sition Adjustment	Factor		#N/A							
	Basin Elevation			N/A							
	Elevation in Basin			N/A	-		-				
	arrier Height			N/A							-
	Adjustment Factor			#N/A							-
Total Ad	justment Factor			#N/A					<u> </u>		l

	Storm 1434 - June 18 (0700 UTC) - June 24 (0600 UTC), 1947														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Auga (mai2)					Dui	ration (hou	ırs)								
Area (mi²)	1	6	12	18	24	36	48	72	96	108	Total				
0.3	12.00	13.01	13.13	13.13	13.13	13.13	14.77	16.79	17.52	17.62	17.62				
1	11.93	12.94	13.06	13.06	13.06	13.06	14.69	16.70	17.44	17.54	17.54				
10	11.07	12.04	12.20	12.20	12.20	12.20	13.70	15.90	16.74	16.81	16.81				
25	10.32	11.20	11.33	11.33	11.33	11.33	13.07	15.06	15.96	16.03	16.03				
50	9.39	10.01	10.38	10.38	10.38	10.38	11.88	14.03	14.89	14.97	14.97				
100	8.16	9.04	9.14	9.14	9.14	9.14	10.73	12.57	13.49	13.64	13.64				
150	7.46	8.20	8.30	8.30	8.30	8.30	10.12	12.04	12.55	12.87	12.87				
200	6.94	7.73	7.82	7.82	7.82	7.82	9.51	11.69	11.78	12.48	12.48				
300	6.24	6.89	6.97	6.97	6.97	6.97	8.74	11.00	11.42	12.05	12.05				
400	5.73	6.66	6.70	6.72	6.72	6.72	8.45	10.30	11.06	11.62	11.62				
500	5.25	6.40	6.40	6.43	6.43	6.45	8.16	9.71	10.70	11.20	11.20				
1,000	4.12	5.16	5.16	5.16	5.16	5.16	7.07	9.07	9.68	9.96	9.96				
2,000	3.62	4.54	4.54	4.54	4.54	4.54	5.95	8.06	8.55	8.83	8.83				
5,000	2.70	3.49	3.55	3.55	3.55	3.55	4.77	6.56	6.93	7.17	7.17				
10,000	0.56	2.75	2.75	2.75	2.75	2.75	2.77	5.51	5.80	5.97	5.97				
20,000	0.55	1.18	2.12	2.32	2.33	2.33	2.75	4.13	4.66	4.82	4.82				
50,000	0.52	1.03	1.18	1.25	1.35	1.40	1.84	2.64	2.89	3.02	3.02				
53,668	0.52	1.01	1.17	1.22	1.27	1.32	1.83	2.55	2.73	2.85	2.85				

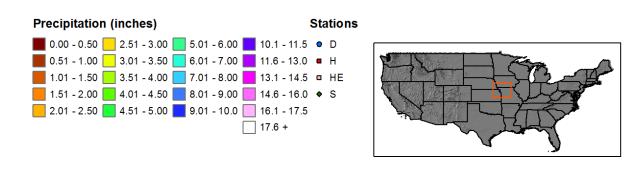


#### SPAS 1434 Storm Center Mass Curve Zone 1 June 18 (0700UTC) to June 24 (0600UTC), 1947 Lat: 39.4542 Lon: -94.3292



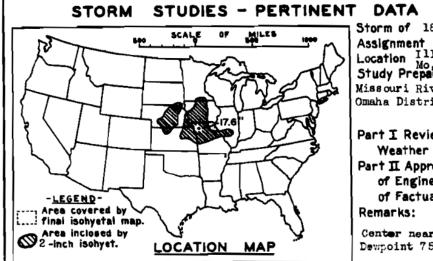


Total 108-hour Precipitation (inches)
June 19, 1947 0000 UTC - June 23,1947 1200 UTC
SPAS #1434



KLL 10/21/2014

CEPARTMENT OF THE ARMY



SHEET

Storm of 18-23 June 1947
Assignment MR 8-20
Location Ill, Ia, Kans, Minn.
Study Prepared by:
Missouri River Division
Omaha District Office

Part I Reviewed by H. M. Sec. of Weather Bureau, 12/17/52 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 9/10/54 Remarks:

Center near Holt, Mo. Dewpoint 75°, Ref. Pt. 140 S

# DATA AND COMPUTATIONS COMPILED Grid E-14 PART I

Preliminary isohyetai map, in sheet, scale Precipitation data and mass curves:

(Number of Sheets)

Form 5001-C (Hourly precip. data) -- NOTE: This study was computed Form 5001-B (24-hour " ") ------ by the Regional Method Form 5001-D (" " ") which does not employ the Miscl. precip. records, meteorological data, etc. Part I and Part II phases in their entirety.

#### PART II

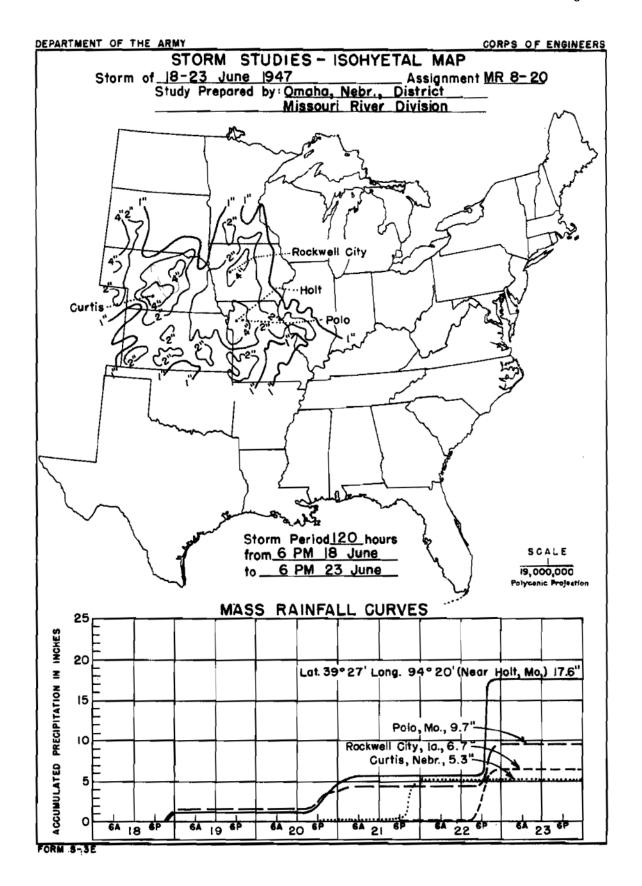
Final isohyetal maps, in 1 sheet, scale 1:100,000 Data and computation sheets:

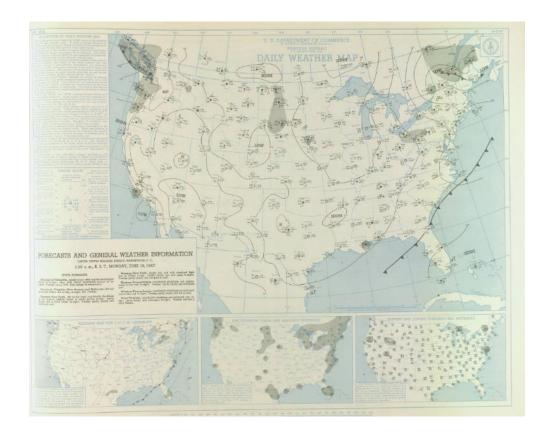
Form S-10 (Data from mass rainfall curves)	9
Form S-II (Depth-area data from isohyetai map)	4
Form S-12 (Maximum depth-duration data)	7
Maximum duration-depth-area curves	1
Data relating to periods of maximum rainfall	

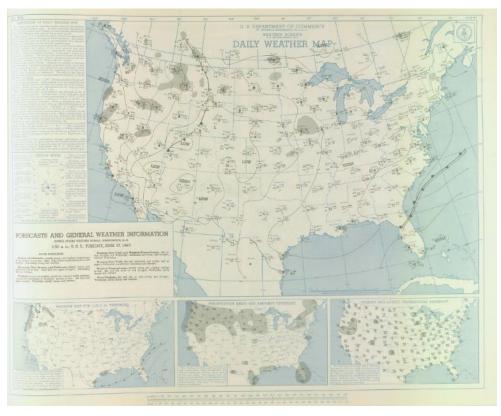
MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES

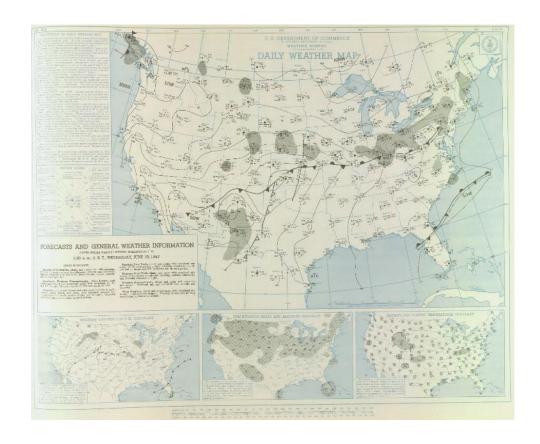
Area in Sq. Mi.			D	uratio	n of	Raint	all <u>in</u>	Hours	3	
	6	12	18	24	36	48	72	96	120	
Max.Station	12.0	12.0	12.0	12.0	12.0	14.4	16.6	18.8	17.6	
10	11.5	11.5	11.5	11.5	11.5	12.6	15.9	15.8	16.9	
100	7.9	7.9	7.9	7.9	7.9	9.3	12.9	12.9	14.1	
200	7.1	7.1	7.1	7.1	7.1	8.4	11.9	11.9	13.0	
500	6.3	6.3	6.3	6.3	6.3	7.4	10.6	10.6	11.6	
1000	5.6	5.6	5 <b>.6</b>	5.5	5.6	6.6	9.6	9.6	10.5	
2000	4.9	4.9	4.9	4.9	4,9	5.7	8.4	8.4	9.3	
5000	3.5	3.7	3.7	3.7	3.7	4.6	6.7	6.7	7.3	
10000	2.6	2.9	3.0	3.0	3.0	3.7	5.4	5.4	5.9	
20000	1.8	2.1	2.2	2.2	2.2	3.1	4.4	4.6	4.9	
50000	1.2	1.4	1.5	1.6	1.8	2.5	3.2	30.50	3.8	
100000	0.3 0.3	8.5	8.8	1:5	1.6	2.1	2.7	2.2	3.0	
306000	0.3	0.5	0:6	b:7	0.9	1.2	1.5	ĩ.ĕ	2.3	

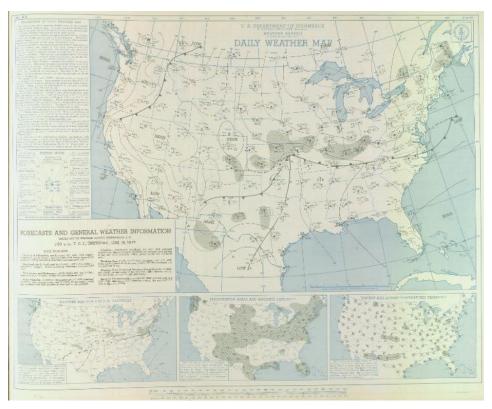
Form 5-2



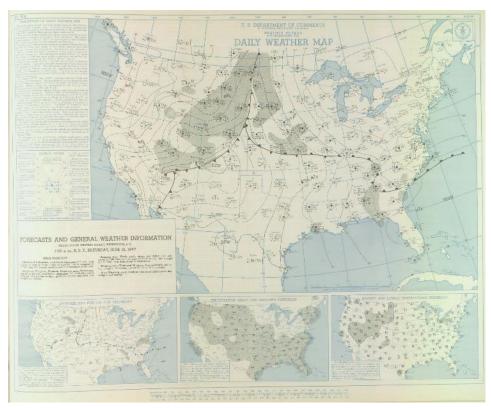


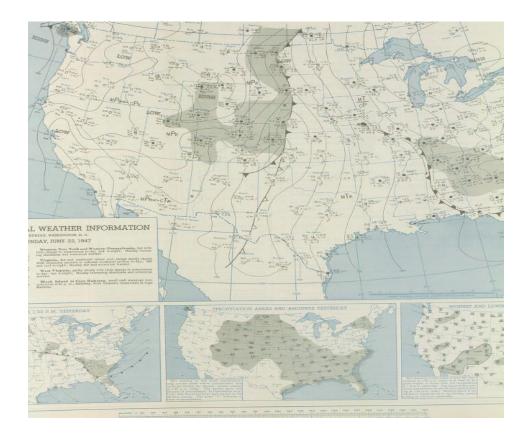


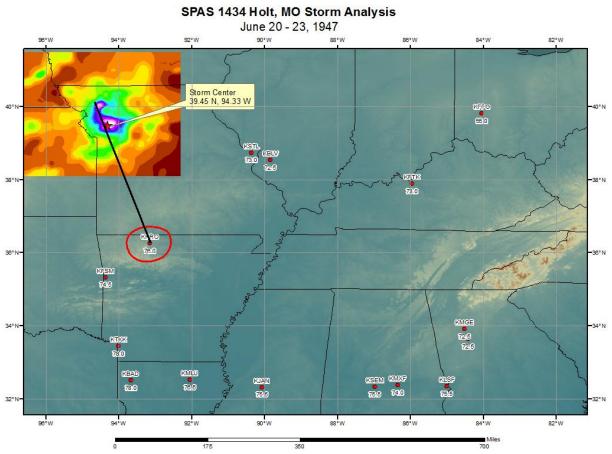












# Storm Precipitation Analysis System (SPAS) For Storm #1546 SPAS Analysis

General Storm Location: Virginia/West Virginia Border

Storm Dates: June 16-19, 1949

**Event**: Tropical Remnants

**DAD Zone 1** 

Latitude: 38.8625

**Longitude**: -79.1875

Max. Grid/Radar Rainfall Amount: 15.13"

Max. Observed Rainfall Amount: 14.26" at Brushy Run, VA

DAD Zone 2

Latitude: 38.4292

**Longitude**: -78.4625

Max. Grid/Radar Rainfall Amount: 14.36"

Max. Observed Rainfall Amount: 13.53" at Big Meadows 2, VA

Number of Stations: 112

SPAS Version: 10.0

Base Map Used: PRISM Mean June 1971-2000

Spatial resolution: 0.2577

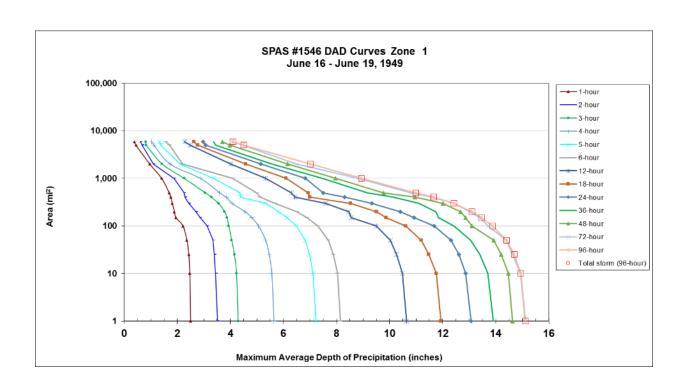
Radar Included: No

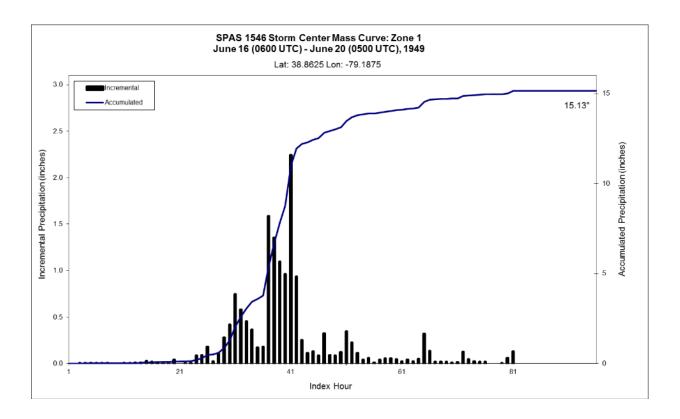
Depth-Area-Duration (DAD) analysis: Yes

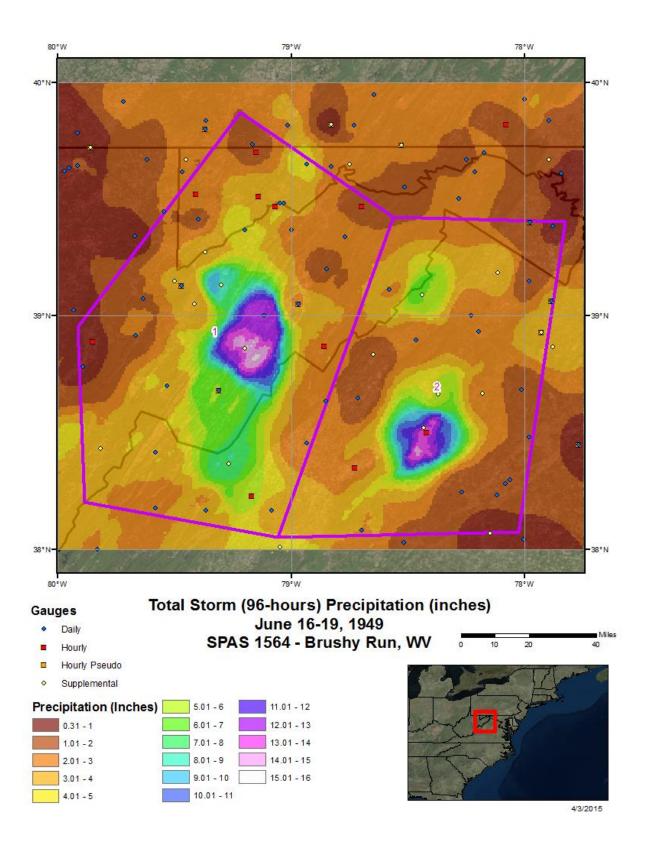
**Reliability of results:** This analysis was based on hourly data, daily data, and supplemental station data. We have a high degree of confidence in the station based storm total results. The spatial pattern is dependent on the basemap, and the timing is based on hourly and hourly pseudo stations. An additional twenty-two supplemental stations were created to ensure data consistency.

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u Aujusum		<b>T</b> 7:::	_	
9	ent for	virgini	a	
		7.040		
ure Inflow Direc		E @ 120	miles	
Average Elevation		N/A	feet	
Center Elevation		2,000	feet	
Analysis Duratio		24	hours	
ive Barrier Heig	ht	N/A	feet	
	_			
r above sea level o			2.31	inches.
r above sea level o			3.07	inches.
r above sea level o			#N/A	inches.
	precipitable		70.5 F	
	precipitable		76.5 F	
	precipitable		0.0	
x inches of	precipitable	water at	0.0	
215 1 1 1	an	c 0:		
DAD values taken fro				
as based on maximur stations KDCA and l	,	ge 1d values o	n June 16-17,	
SILIBIDIS KDCA allu l	MDW.			<b>!</b>
				<b>!</b>
				ļ
ours 36 Hours	48 Hours	72 Hours	96 Hours	
1 13.9	14.6	15.1	15.1	
9 13.7	14.5	14.9	15.0	
7 12.4	13.1	13.7	13.9	
4 11.7	12.7	13.0	13.1	
5 9.2	9.8	10.8	11.0	
8 7.5	8.0	8.8	8.9	
2 5.6	6.2	6.5	7.0	
1 3.4	4.0	4.5	4.5	
0 3.4	3.7	4.1	4.1	
Zone 1				
16				
16				
-				
June	July			
	77.707			
13.132	77.707			
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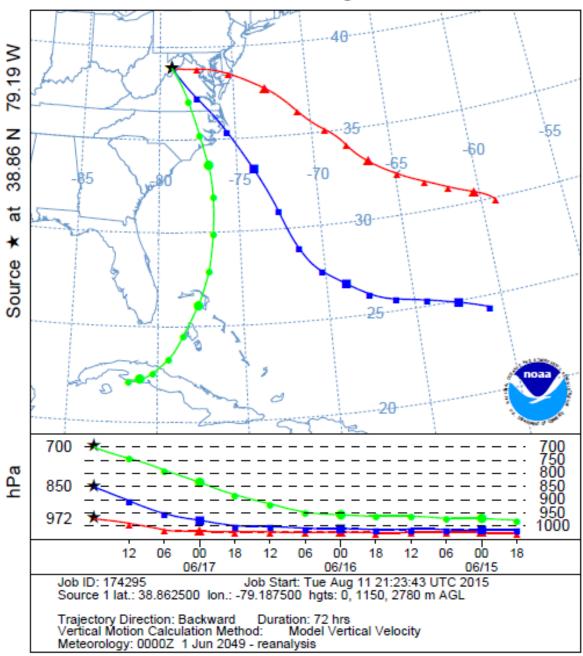
	Storm 1546 - June 16 (0600 UTC) - June 20 (0500 UTC), 1949														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
A (: ² )							Duration	(hours)							
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	96	Total	
0.3	2.50	3.52	4.30	5.65	7.23	8.16	10.65	11.96	13.09	13.92	14.65	15.13	15.13	15.13	
1	2.50	3.52	4.29	5.64	7.22	8.15	10.64	11.94	13.07	13.90	14.63	15.11	15.12	15.12	
10	2.47	3.44	4.23	5.56	7.12	8.03	10.48	11.76	12.87	13.70	14.47	14.94	14.95	14.95	
25	2.43	3.39	4.15	5.46	6.98	7.88	10.27	11.48	12.62	13.40	14.21	14.64	14.70	14.70	
50	2.36	3.34	4.05	5.33	6.82	7.69	10.03	11.20	12.32	13.06	13.93	14.39	14.41	14.41	
100	2.21	3.12	3.94	5.06	6.48	7.29	9.50	10.61	11.68	12.42	13.10	13.72	13.87	13.87	
150	1.95	2.85	3.87	4.80	6.13	6.89	8.56	9.86	10.93	11.84	12.87	13.41	13.46	13.46	
200	1.89	2.70	3.78	4.55	5.80	6.51	8.46	9.50	10.41	11.74	12.68	13.03	13.11	13.11	
300	1.81	2.43	3.55	4.06	5.33	5.69	7.59	8.52	9.33	11.11	12.01	12.42	12.43	12.43	
400	1.75	2.29	3.28	3.85	4.39	5.12	6.42	6.99	8.30	10.14	10.96	11.58	11.67	11.67	
500	1.69	2.25	3.05	3.59	4.36	4.99	6.30	6.94	7.50	9.17	9.77	10.82	10.99	10.99	
1,000	1.41	1.88	2.26	2.87	3.38	4.08	5.33	6.10	6.82	7.46	7.96	8.79	8.94	8.94	
2,000	0.96	1.10	1.43	1.73	2.11	2.20	4.02	4.58	5.15	5.56	6.16	6.49	7.01	7.01	
5,000	0.44	0.68	0.83	1.12	1.38	1.71	2.48	2.77	3.07	3.44	3.98	4.45	4.50	4.50	
5,832	0.38	0.61	0.81	1.03	1.33	1.57	2.27	2.63	2.97	3.37	3.70	4.06	4.09	4.09	



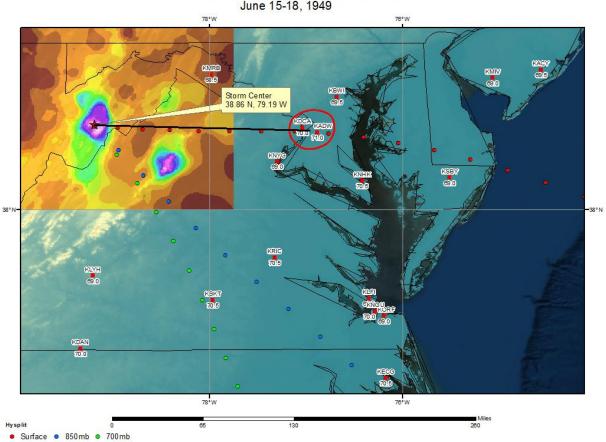




# NOAA HYSPLIT MODEL Backward trajectories ending at 1800 UTC 17 Jun 49 CDC1 Meteorological Data



### SPAS 1546 Brushy Run, WV Storm Analysis June 15-18, 1949



# Storm Precipitation Analysis System (SPAS) For Storm #1402 SPAS Analysis

General Storm Location: Tennessee Valley (-85.5, 37.8, 35.1, -82.0)

**Storm Dates**: July 22 – July 23, 1965

Event: Mesoscale Event with Embedded Convection (MEC) Convective

**DAD Zone 1** 

**Latitude**: 36.3625

**Longitude**: -83.7208

Max. Grid/Radar Rainfall Amount: 11.00"

Max. Observed Rainfall Amount: 11.00"

DAD Zone 2

Latitude: 36.1792

**Longitude**: -84.2292

Max. Grid/Radar Rainfall Amount: 13.32"

Max. Observed Rainfall Amount: 12.50"

Number of Stations: 154

SPAS Version: 9.5

Base Map Used: Combined manually contoured base map with mean annual maximum 48-hour

precipitation associated with MEC's

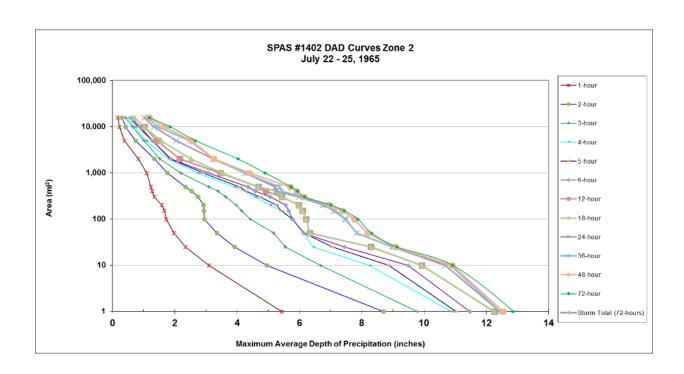
Spatial resolution: 0.2666 sq.mi.

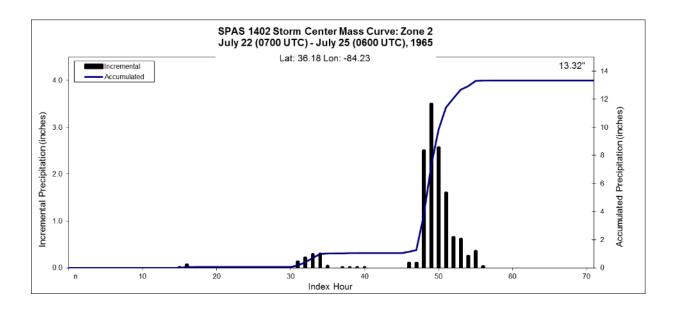
Radar Included: No

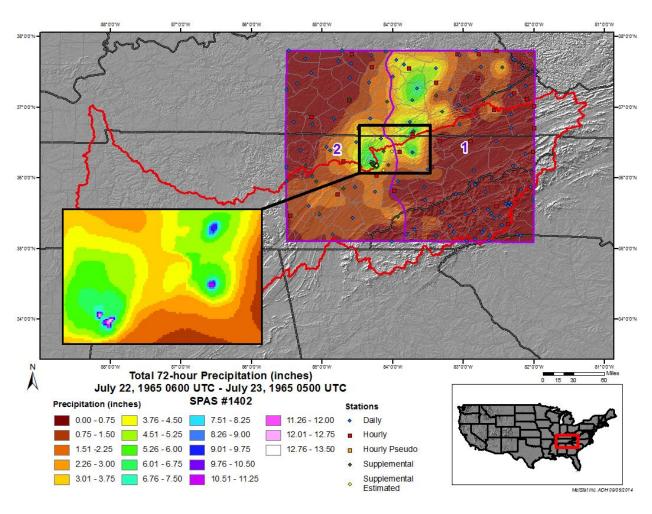
Depth-Area-Duration (DAD) analysis: Yes

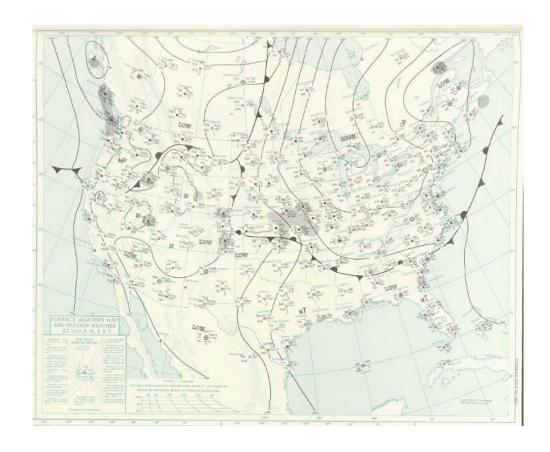
Storm Name: S	PAS 1402 - 1	Rosedale, T	N Zope 2								
	/22-23/1965				S	torm A	dinstm	ent for	Virginia	a	
	1/14/2015						Jasin	101	, S	-	
Temporal Transposition	n Date	8-Aug									
		Lat	Lon			Moisture	Inflow Dire	ction	NW @ 220	miles	
Storm Center Location		36.18 N	84.23 W				rage Elevat		N/A	feet	
Storm Rep Dew Point I	ocation	38.50 N	87.00 W				iter Elevati		2,700	feet	
Transposition Dew Point		30.30 14	07.00 W				dysis Durat		6	hours	
Basin Location	nt Location						Barrier Hei		N/A	feet	
								<del>o</del> ·			
The storm re	presentative of	dew point is	77.0 F	with tota	l precipitabl	e water abo	ve sea level o	of		3.14	inches.
	e maximum	-	80.0 F		•		ve sea level o			3.60	inches.
The transpositione	ed maximum	dew point is	0.0	with tota	l precipitabl	e water abo	ve sea level	of		#N/A	inches.
The in	-place storm	elevation is	2,700	feet whi	ch subtracts	0.685	inches o	f precipitable	e water at	77.0 F	
The in	-place storm	elevation is	2,700	feet whi	ch subtracts	0.75		f precipitable		80.0 F	
The transp	osition basin	elevation at	N/A	feet whi	ch subtracts	X.XX	inches o	f precipitable	e water at	0.0	
The inflow barrier	/basin elevati	on height is	N/A	feet whi	ch subtracts	x.xx	inches o	f precipitable	e water at	0.0	
					_						
The i	n-place storn	n maximizati	on factor is	1.16			-	-	lue was based o		
The tran	sposition/ele	vation to bas	sin factor is	#N/A			on July 23, 19	65. The statio	ns used are KB	AK, KSDF	
	The barr	rier adjustme	ent factor is	#N/A		and KEVV.					
	The to	otal adjustme	ent factor is	#N/A							
Observed St	orm Depth-A	·			·	,	,			,	,
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq mile	5.4	11.5	12.3	12.3	12.4	12.5	12.6	12.9	12.9	12.9
	10 sq miles	3.1	9.5	9.9	9.9	10.7	10.9	10.9	10.9	10.9	10.9
	100 sq miles	1.7	5.8	6.2	6.2	7.5	7.5	7.8	7.9	7.9	7.9
	200 sq miles	1.6	5.6	6.0	6.0	6.8	6.8	7.0	7.0	7.0	7.0
	500 sq miles	·	4.4	4.7	4.7	5.2	5.4	5.7	5.7	5.7	5.7
	000 sq miles	1.1	3.1	3.5	3.5	4.3	4.3	4.4	4.9	4.9	4.9
***************************************	000 sq miles 000 sq miles	<i>{</i>	1.9 1.3	2.2 1.4	2.5	3.2 2.1	3.3	3.3 2.5	2.7	4.0 2.7	4.0 2.7
	000 sq miles	0.4	0.9	1.0	1.0	1.3	1.5	1.7	1.9	1.9	1.9
	714 sq miles	0.2	0.6	0.7	0.7	1.0	1.1	1.2	1.2	1.2	1.2
13	/14 sq miles	0.2	0.0	0.7	0.7	1.0	1.1	1.2	1.2	1.2	1.2
Storm or Stor	rm Center Na			CDAC 1402	Dogodolo	TN Zono 2					
Storm Date	illi Celilei Iva	IIIC		<b>SPAS 1402</b> · 7/22-23/196		TN ZOHE Z					
Storm Type				Mesoscale w		ed Convecti	on MFC				
Storm Locati	on			36.18 N	84.23 W	ou convecu	OII IVILLE				
Storm Center				2,700	01.20 11						
Precipitation		tion		13.32" inche	s in 72 hour	S					
Storm Repres	sentative Dew	Point		77.0 F	6						
Storm Repres	sentative Dew	Point Locat	tion	38.50 N	87.00 W		July	Aug			
Maximum De	ew Point			80.0 F			79.48	80.16			
Moisture Infl	ow Vector			NW @ 220							
In-place Max	imization Fac	tor		1.16							
	nsposition (I			8-Aug							
	Dew Point I										ļ
	Maximum D										ļ
	Adjustment	Factor		#N/A							
Average Basi				N/A							
Highest Eleva				N/A							ļ
Inflow Barrie				N/A							
Barrier Adjus				#N/A							ļ
■Total ∆diustn	nent Factor			#N/A							1

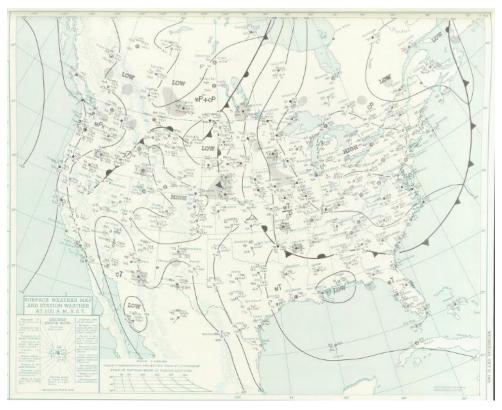
	Storm 1402 Zone 2 - July 22 (0700 UTC) - July 25 (0600 CST), 1965														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
						Dura	ation (hou	ırs)							
areasqmi	1	2	3	4	5	6	12	18	24	36	48	72	Total		
0.3	5.6	9.0	10.2	11.3	11.7	12.3	12.7	12.7	13.1	13.3	13.3	13.3	13.32		
1	5.4	8.7	9.8	10.9	11.0	11.5	12.3	12.3	12.4	12.5	12.6	12.9	12.86		
10	3.1	5.0	6.7	8.3	8.9	9.5	9.9	9.9	10.7	10.9	10.9	10.9	10.92		
25	2.3	3.9	5.6	6.4	7.1	7.4	8.3	8.3	9.0	9.0	9.1	9.1	9.13		
50	2.0	3.4	5.2	6.1	6.1	6.1	6.3	6.3	7.8	7.8	8.2	8.3	8.32		
100	1.7	3.0	4.4	5.8	5.8	5.8	6.2	6.2	7.5	7.5	7.8	7.9	7.88		
150	1.7	2.9	4.1	5.4	5.4	5.7	6.1	6.1	7.1	7.2	7.4	7.5	7.45		
200	1.6	2.9	4.0	5.1	5.3	5.6	6.0	6.0	6.8	6.8	7.0	7.0	7.02		
300	1.4	2.8	3.6	4.6	4.7	5.1	5.4	5.4	6.0	6.1	6.2	6.2	6.16		
400	1.3	2.5	3.4	4.2	4.3	4.6	4.9	5.3	5.3	5.4	5.9	5.9	5.94		
500	1.2	2.3	3.1	3.9	4.1	4.4	4.7	4.7	5.2	5.4	5.7	5.7	5.73		
1,000	1.1	1.8	2.2	2.7	2.9	3.1	3.5	3.5	4.3	4.3	4.4	4.9	4.90		
2,000	0.8	1.4	1.5	1.8	1.9	1.9	2.2	2.5	3.2	3.3	3.3	4.0	4.03		
5,000	0.4	0.7	1.0	1.1	1.3	1.3	1.4	1.6	2.1	2.5	2.5	2.7	2.67		
10,000	0.2	0.4	0.6	0.7	0.8	0.9	1.0	1.0	1.3	1.5	1.7	1.9	1.85		
15,714	0.2	0.3	0.4	0.5	0.6	0.6	0.7	0.7	1.0	1.1	1.2	1.2	1.19		



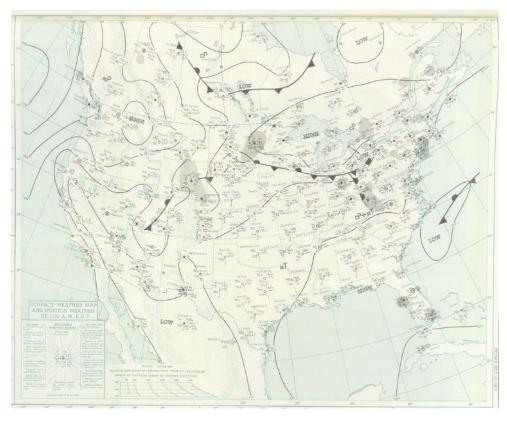




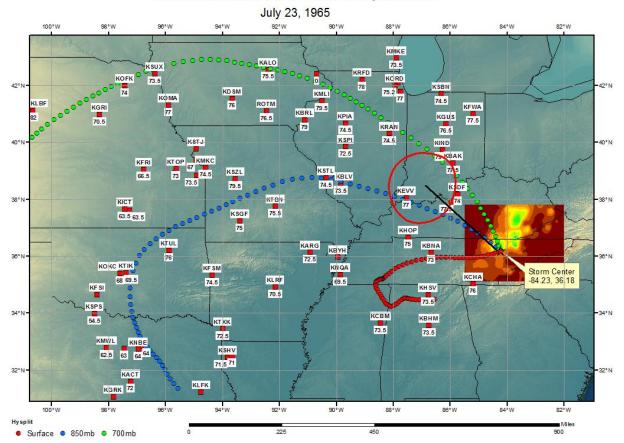








### SPAS 1402 Rosedale, TN Storm Analysis Zone 2



### Storm Precipitation Analysis System (SPAS) For Storm #1362 SPAS Analysis

General Storm Location: Tennessee Valley (-88.7, 37.9, 34.0, -81.2)

Storm Dates: April 2 – April 5, 1977

Event: Mid-latitude cyclone (MLC)

**DAD Zone 1** 

Latitude: 37.2792

Longitude: -81.8042

Max. Grid/Radar Rainfall Amount: 15.66"

Max. Observed Rainfall Amount: 15.5"

**DAD Zone 2** 

Latitude: 35.3208

**Longitude**: -83.6875

Max. Grid/Radar Rainfall Amount: 9.21"

Max. Observed Rainfall Amount: 8.00"

Number of Stations: 461

SPAS Version: 9.5

Base Map Used: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2681

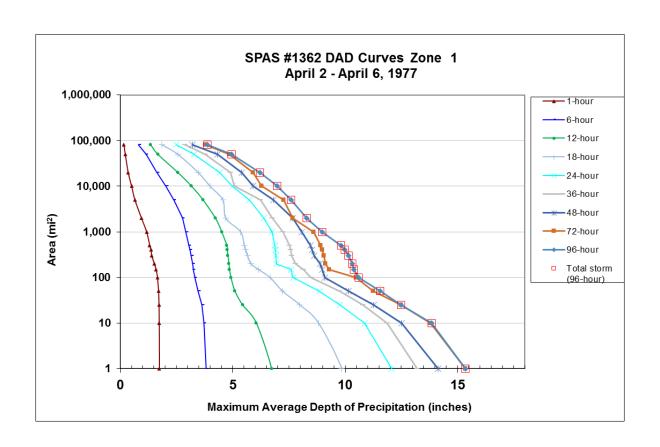
Radar Included: No

**Depth-Area-Duration (DAD) analysis:** Yes

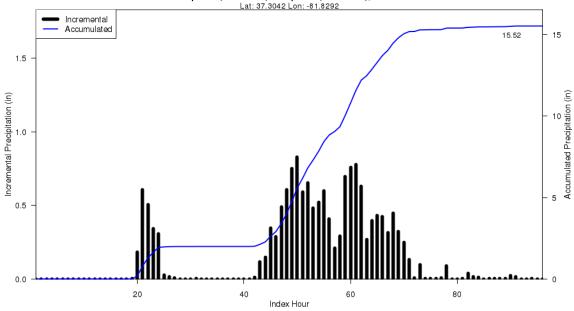
**Reliability of results**: In addition to the NCDC stations, seven supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble what the TVA reported from this storm. There were also seven hourly stations added via digitizing some of the stations listed in the TVA report. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the TVA report, this analysis is deemed quite reliable.

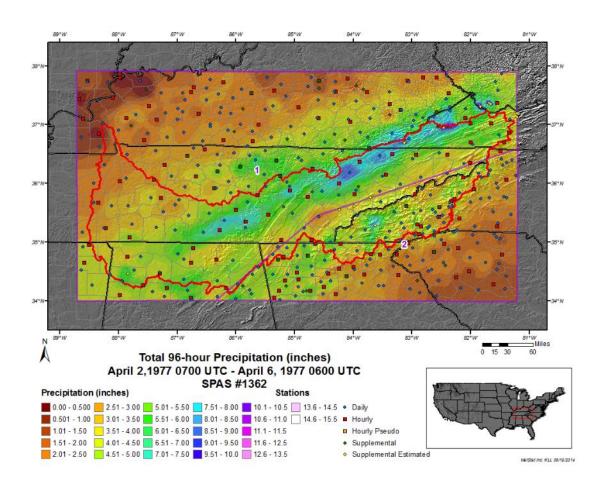
Storm Name:	SPAS 1362 -	Coeburn VA									
Storm Date:	4/2-5/1977	Cocbuin, v	•		S	Storm A	dinstm	ent for	Virginia	a	
AWA Analysis Date:		***************************************				, (01 111 71	ajustiii		VII SIIII		
Temporal Transposit	ion Date	20-Apr									
		Lat	Long			Moisture l	Inflow Dire	ction	SW @ 670	miles	
Storm Center Location	on	37.28 N	81.80 W			Basin Aver	rage Elevati	on	N/A	feet	
Storm Rep Dew Poin	t Location	30.00 N	89.50 W			Storm Cen	ter Elevatio	n	2,300	feet	
Transposition Dew P			0,100 11				lysis Durati		24	hours	
Basin Location							arrier Heig		N/A	feet	
The storm	representative	dew point is	72.5 F		tal precipitab					2.54	inches.
	olace maximum	-	74.5 F		tal precipitab					2.79	inches.
The transpositi		•	0.0		al precipitab					#N/A	inches.
	in-place storn		2,300		ch subtracts			f precipitabl		72.5 F	
	in-place storn		2,300		ch subtracts	0.54		f precipitabl		74.5 F	
The inflow barr	nsposition basii		N/A N/A		ich subtracts	X.XX X.XX		f precipitabl		0.0	
The millow barr	iei/basiii eieva	tion height is	IN/A	WIII	ich subtracts	X,XX	menes o	f precipitabl	e water at	0.0	
Т	he in-place stor	rm maximizati	ion factor is	1.11		Notes: Storm	rep from 24h	ave at KBIX	, KGPT, KMS	Y. KBVE on	
	transposition/e			#N/A		April 3.			, - ,		
The	•	arrier adjustm		#N/A							
	The	total adjustm	ent factor is	#N/A							
Observed	Storm Depth-	Area-Durati	on								
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
	1 sq miles	1.7	3.8	6.7	9.9	12.1	13.2	14.1	15.4	15.4	15.4
	10 sq miles	}	3.7	6.1	8.8	10.9	11.9	12.5	13.8	13.8	13.8
	100 sq miles		3.3	4.9	6.7	7.7	8.5	9.1	10.5	10.6	10.6
	200 sq miles	ç	3.2	4.8	5.8	7.0	7.8	8.9	9.1	10.3	10.3
	500 sq miles		3.1	4.7	5.5	6.9	7.5	8.5	8.9	9.8	9.8
	1000 sq miles 2000 sq miles	}	2.9	4.5 4.2	5.4 4.7	6.7 6.4	7.3 6.8	8.1 7.7	8.6 7.7	9.0 8.3	9.0 8.3
900000000000000000000000000000000000000	5000 sq miles		2.4	3.7	4.6	5.7	6.2	6.8	7.7	7.6	7.6
	0000 sq miles	(	2.0	3.2	4.0	5.0	5.1	5.9	6.3	7.0	7.0
	0000 sq miles		1.6	2.6	3.5	4.4	4.9	5.4	5.9	6.2	6.2
	0000 sq miles	}	1.1	1.7	2.6	3.3	3.8	4.3	4.9	4.9	4.9
	•										
Storm or S	torm Center Na	ame		SPAS 1362	- Coeburn,	VA					
Storm Date	e(s)			4/2-5/1977							
Storm Typ				Synoptic						-	
Storm Loc				37.28 N	81.80 W						
	ter Elevation			2,300	L						
Precipitati	on Total & Dur	ation		15.66 inch	es in 96 hou	:S					
Ctomm D	recentative D-	y Point		72.5 E	24		-				
	resentative Dev		ion	72.5 F 30.00 N	24		-	April	Mov		
	resentative Dev Dew Point	w roint locat	1011	74.5 F	89.50 W			April 74.06	May 76.39		
	nflow Vector			SW @ 670				, 1.00	.0.57		
	aximization Fa	ctor		1.11							
											Í
Temporal 7	Transposition (l	Date)		20-Apr							
Transposit	ion Dew Point	Location									
	ion Maximum I										
	on Adjustment	Factor		#N/A							
	asin Elevation			N/A							
	evation in Basii	n		N/A							
	rier Height			N/A							
	justment Factor	r		#N/A			-				
Total Adjus	stment Factor			#N/A							]

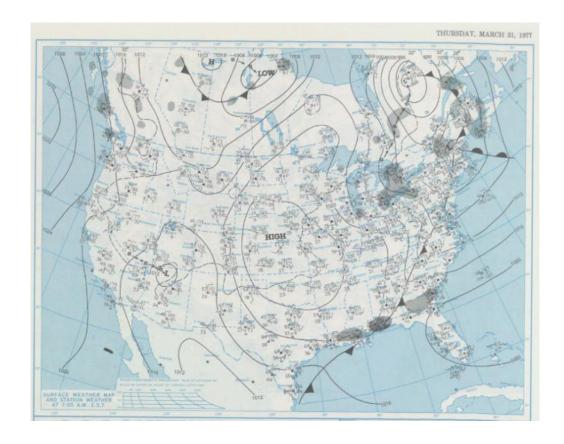
	Sto	rm 1362	2 - April	2 (0700	UTC) -	April 6	(0600 L	JTC), 19	977	
		MAXIMU	M AVER	AGE DEP	TH OF F	RECIPIT	ATION (I	NCHES)		
Araa (m:2)					Duration	n (hours)				
Area (mi²)	1	6	12	18	24	36	48	72	96	Total
0.3	1.74	3.92	6.82	9.95	12.21	13.39	14.29	15.52	15.52	15.52
1	1.74	3.81	6.73	9.85	12.07	13.20	14.14	15.35	15.36	15.36
10	1.73	3.72	6.05	8.82	10.86	11.86	12.51	13.79	13.84	13.84
25	1.72	3.63	5.44	7.99	9.76	10.80	11.27	12.48	12.50	12.50
50	1.70	3.46	5.10	7.22	8.86	9.74	10.16	11.24	11.56	11.56
100	1.65	3.31	4.92	6.66	7.69	8.47	9.10	10.48	10.60	10.60
150	1.59	3.24	4.86	6.14	7.59	8.14	8.98	9.28	10.40	10.40
200	1.51	3.21	4.83	5.81	6.95	7.80	8.89	9.12	10.32	10.32
300	1.40	3.15	4.79	5.66	6.92	7.62	8.62	9.05	10.15	10.15
400	1.36	3.10	4.76	5.58	6.90	7.57	8.54	8.99	9.98	9.98
500	1.31	3.05	4.74	5.51	6.87	7.52	8.46	8.92	9.81	9.81
1,000	1.17	2.91	4.51	5.35	6.74	7.25	8.07	8.60	8.97	8.97
2,000	0.94	2.76	4.23	4.69	6.38	6.76	7.66	7.66	8.29	8.29
5,000	0.65	2.38	3.68	4.56	5.74	6.24	6.82	7.27	7.59	7.59
10,000	0.50	2.03	3.17	3.99	4.99	5.07	5.91	6.28	6.98	6.98
20,000	0.35	1.63	2.56	3.46	4.42	4.91	5.40	5.91	6.22	6.22
50,000	0.22	1.14	1.67	2.56	3.27	3.78	4.33	4.85	4.94	4.94
80,939	0.16	0.81	1.35	1.85	2.50	2.87	3.20	3.77	3.88	3.88

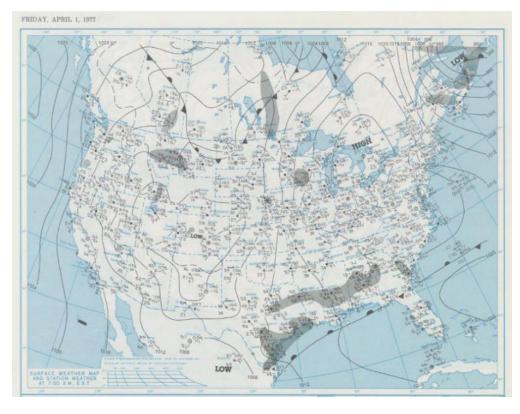


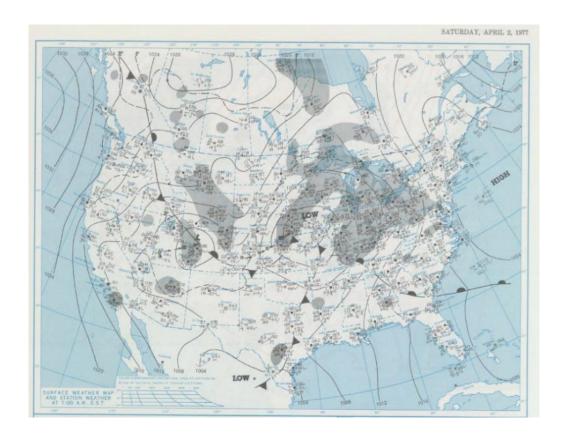
#### SPAS 1362 Storm Center Mass Curve Zone 1 April 2 (0700UTC) to April 6 (0600UTC), 1977 Lat: 37.3042 Lon: -81.8292

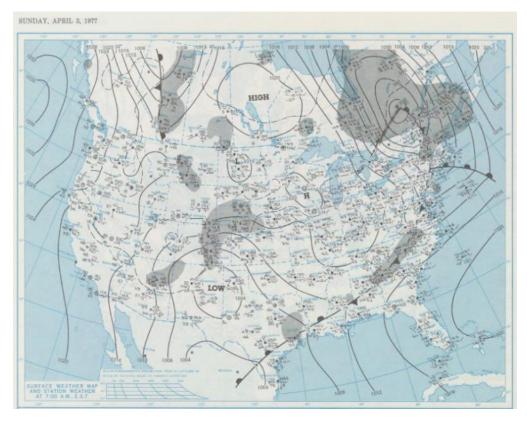


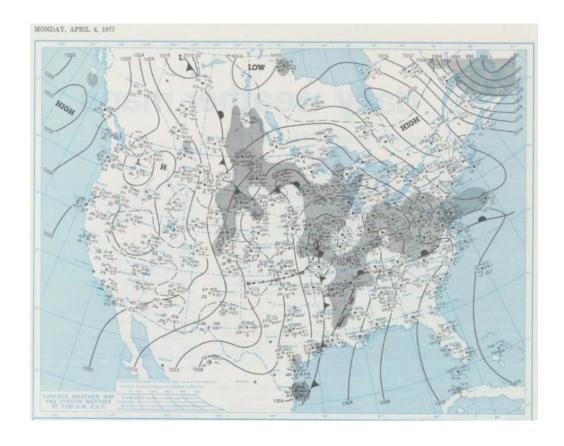


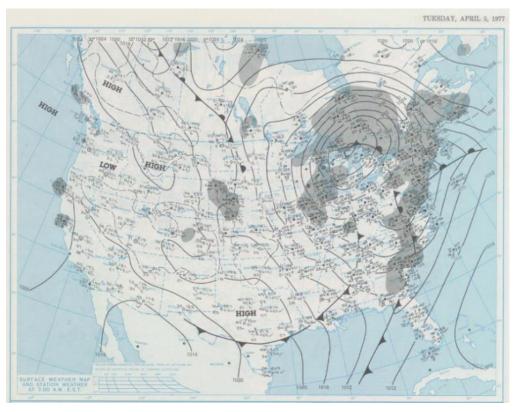




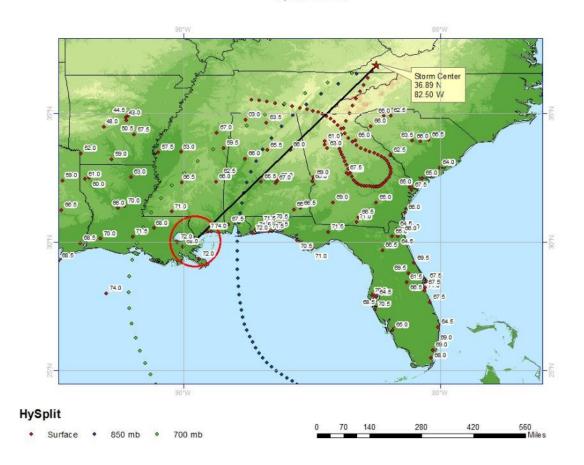








**SPAS 1362** April 2-6, 1977



## Storm Precipitation Analysis System (SPAS) For Storm #1550 SPAS Analysis

General Storm Location: Johnstown, PA

**Storm Dates**: July 18-19, 1977 (72-hours)

Event: Synoptic/Convective

**DAD Zone 1** 

Latitude: 40.3958

**Longitude**: -78.9542

Max. Grid Rainfall Amount: 12.64"

Max. Observed Rainfall Amount: 12.06" North of Johnstown, PA

Number of Stations: 263 (146 Daily, 72 Hourly, 15 Hourly Pseudo and 30 Supplemental)

SPAS Version: 10

Basemap: us_ppt_in_map_1961_1990_usda_northamerica

Spatial resolution: 00:00:30

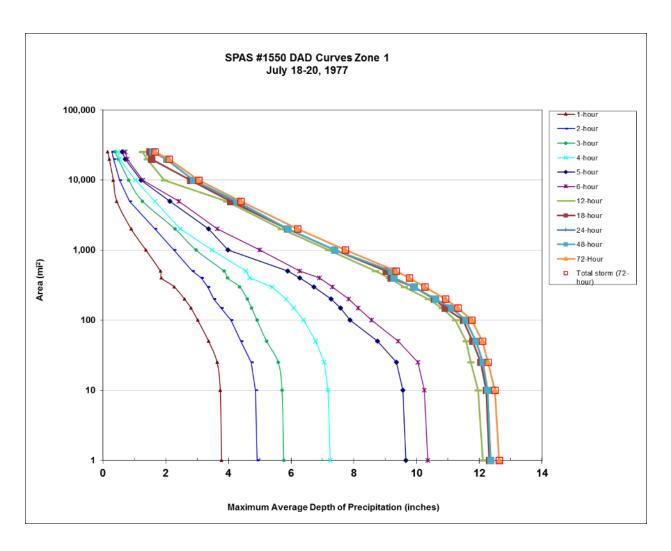
Radar Included: No

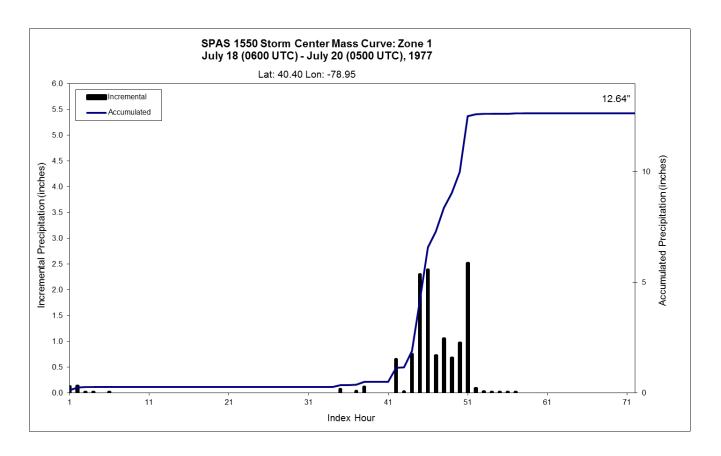
Depth-Area-Duration (DAD) analysis: Yes

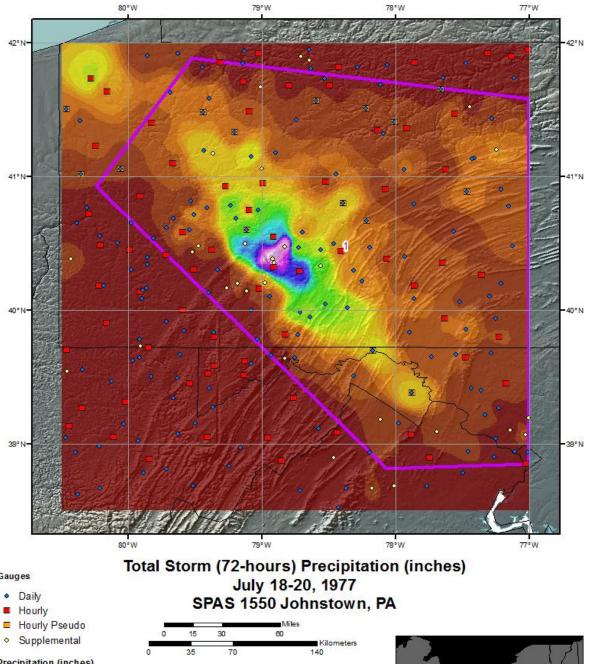
Reliability of results: This analysis was based on several hourly data, daily data and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap (us_ppt_in_map_1961_1990_usda_northamerica). It matches well with the rainfall analysis from USGS (see below; https://archive.org/details/meteorologicalan00atmo). There is a high degree of confidence with the timing based on the several hourly stations in and around the storm center. Some daily stations were moved to supplemental due to timing issues or removed due to duplicate storm precipitation observations. Additional details can be found in the "read_me_1550.txt" file.

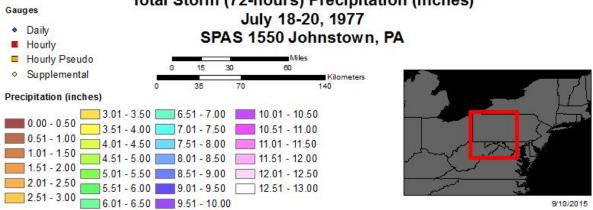
Storm Name:		SPAS 1550-Jo		A			G.			T.10		
Storm Date:		7/18-20/1977					Storm	Adjust	ment fo	r Virginia	a	
AWA Analysis	Date:	11/14/2015								-		
Temporal Tran	spositi	on Date	15-Jul									
			Lat	Long			Moisture 1	Inflow Dire	ction	SW@85	miles	
Storm Center 1	Location	n	40.40 N	78.95 W			Basin Ave	rage Elevati	ion	N/A	feet	
Storm Rep Dev	v Point	Location	39.50 N	80.00 W			Storm Cer	ter Elevati	on	2,500	feet	
Transposition 1	Dew Po	int Location					Storm Ana	lysis Durat	ion	12	hours	
Basin Location	1						Effective I	Barrier Hei	ght	N/A	feet	
TI.	4		4	75 A E		4-1:-:4-1	-1	11	- <b>C</b>		2.95	in the co
		representative	•	75.0 F 78.0 F		tal precipital tal precipital					2.85 3.29	inches.
		ace maximum ned maximum	•	0.0		tal precipital					#N/A	inches.
me trans	•	in-place storm	•	2,500		ch subtracts	0.60		f precipitable	water at	75.0 F	menes.
		in-place storm		2,500		ch subtracts			f precipitable		78.0 F	
7		sposition basin		N/A		ch subtracts	x.xx		f precipitable		0.0	
		er/basin elevati		N/A		ch subtracts			f precipitable		0.0	
The min	JW Ouri	ci/ basiii cic vati	ion neight is	14/71	icci wiii	en subtracts	АнАА	menes of	ргестриали	water at	0.0	
	The	in-place storn	n mavimizati	on factor is	1.17	1	Notes: Stor	rm renresent	itive Td was	based on the 24l	nr average Td	1
		ansposition/ele			#N/A			•		N and KMGW.	in average ra	
	THE U		rier adjustme		#N/A		on sury 20,	17// 110111	iterib, itibi	Evaluativio v.		
		THE OU	rier adjustine	in ractor is	#1471							
		The to	otal adjustme	ent factor is	#N/A							
		1110-1	otar adjustine	one rue tor 15	,,,,,,,							
Observed Stori	m Dentl	n-Area-Durati	on									
Subscrived Stori	пъсри	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours
1 so	q miles	3.8	4.9	5.8	7.3	9.7	10.4	12.1	12.3	12.4	12.4	12.6
	miles	3.7	4.9	5.7	7.2	9.6	10.3	12.0	12.2	12.3	12.3	12.5
	q miles	3.0	4.1	4.9	6.4	7.9	8.6	11.2	11.5	11.6	11.6	11.8
	q miles	2.6	3.5	4.6	5.8	7.3	7.8	10.4	10.6	10.6	10.6	10.9
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	q miles	1.8	2.8	3.9	4.6	5.9	6.3	8.7	9.0	9.2	9.2	9.4
1000 so	*****************************	1.4	2.3	3.0	3.5	4.0	5.0	7.2	7.4	7.4	7.4	7.7
2000 so	·	0.9	1.7	2.3	2.5	3.4	3.6	5.7	5.9	5.9	5.9	6.2
5000 so	*	0.4	0.9	1.3	1.7	2.1	2.4	4.0	4.1	4.2	4.3	4.4
10000 s	q miles	0.3	0.5	0.8	1.0	1.2	1.3	2.0	2.8	2.9	2.9	3.1
20000 so		0.2	0.3	0.5	0.5	0.7	0.8	1.4	1.6	2.0	2.0	2.1
		orm Center Na	me			0-Johnstow	n, PA					
	m Date(7/18-20/19							
	m Type				Synoptic/C							
	m Locat				40.40 N	78.95 W						
		er Elevation			2500							
Pred	cipitatio	n Total & Dura	ttion		12.64 inche	es in 72 hour	'S					
C+	D	esentative Dew	. D - : t		75.0 F	12					_	1
		esentative Dew		i	39.50 N	80.00 W					_	1
		Dew Point	Point Locat	1011	78.0 F	80.00 W						1
												1
		flow Vector ximization Fac	tor		SW@85							
ш-р	iacc ivia	Allinzation Fac	101		1.17							1
Tem	poral Tr	ansposition Da	ate		15-Jul							
		on Dew Point L										
		on Maximum D										
		n Adjustment	Factor		#N/A							
		sin Elevation			N/A							
Higl	hest Ele	vation in Basin			N/A							
		er Height			N/A							
Barr	rier Adju	stment Factor			#N/A							
	_	ment Factor			#N/A	_					_	

	Stor	m 155	0 Zone	1 - Ju	I. 18 (0	600 U	ГС) - J	ul. 20 ((0500 L	JTC), 1	977				
		MA	KIMUM	AVERA	GE DEP	TH OF	PRECIP	OITATIO	N (INCH	IES)					
		Duration (hours)													
areasqmi	1	2	3	4	5	6	12	18	24	48	72		Total		
0.3	3.79	4.92	5.77	7.25	9.67	10.36	12.13	12.32	12.37	12.37	12.64		12.64		
1	3.78	4.91	5.76	7.25	9.66	10.36	12.12	12.32	12.36	12.36	12.63		12.63		
10	3.74	4.86	5.71	7.18	9.56	10.25	11.96	12.22	12.27	12.27	12.50		12.50		
25	3.64	4.73	5.59	7.05	9.36	10.04	11.73	12.05	12.12	12.12	12.28		12.28		
50	3.37	4.39	5.22	6.78	8.75	9.41	11.58	11.78	11.90	11.90	12.10		12.10		
100	3.02	4.08	4.91	6.40	7.88	8.56	11.24	11.48	11.56	11.56	11.76		11.76		
150	2.80	3.77	4.74	6.08	7.57	8.14	10.81	10.91	11.11	11.11	11.32		11.32		
200	2.60	3.53	4.60	5.84	7.27	7.84	10.37	10.56	10.59	10.60	10.92		10.92		
300	2.27	3.34	4.36	5.40	6.73	7.32	9.60	9.91	9.92	9.92	10.26		10.26		
400	1.86	3.14	3.97	4.69	6.28	6.91	9.12	9.18	9.28	9.28	9.77		9.77		
500	1.83	2.84	3.86	4.56	5.89	6.28	8.68	9.03	9.20	9.20	9.35		9.35		
1,000	1.37	2.26	2.97	3.48	3.99	5.00	7.19	7.38	7.39	7.39	7.73		7.73		
2,000	0.90	1.65	2.30	2.46	3.37	3.64	5.69	5.87	5.89	5.89	6.20		6.20		
5,000	0.44	0.85	1.26	1.65	2.13	2.42	3.95	4.06	4.21	4.27	4.39		4.39		
10,000	0.33	0.53	0.82	1.04	1.21	1.27	1.96	2.79	2.89	2.89	3.05		3.05		
20,000	0.20	0.34	0.49	0.53	0.71	0.77	1.41	1.55	2.01	2.03	2.11		2.11		
25,225	0.15	0.28	0.38	0.48	0.61	0.71	1.25	1.49	1.59	1.59	1.66		1.66		

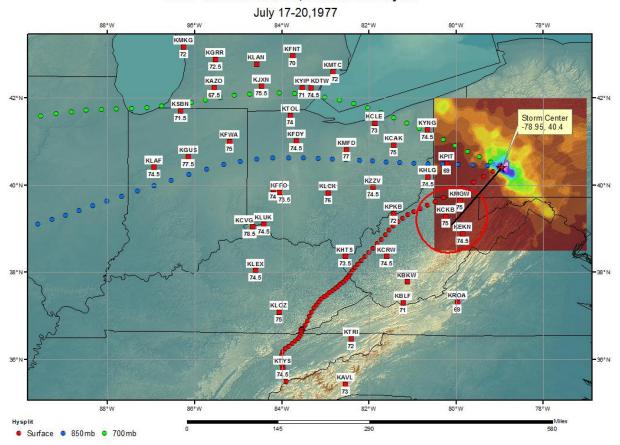








SPAS 1550 Johnstown, PA Storm Analysis



Storm Precipitation Analysis System (SPAS) For Storm #1376 SPAS Analysis

General Storm Location: Tennessee Valley

Storm Dates: May 5 – May 8, 1984

Event: Mesoscale Event with Embedded Convection (MEC)

DAD Zone 1

Latitude: 37.2625

Longitude: -84.9708

Max. Grid Rainfall Amount: 9.62"

Max. Observed Rainfall Amount: 9.50" at Liberty, KY

Number of Stations: 428 (252 Daily, 73 Hourly, 17 Hourly Pseudo and 86 Supplemental)

SPAS Version: 9.5

Basemap: Mean annual maximum 48-hour precipitation associated with MEC's

Spatial resolution: 0.2678 sq.mi.

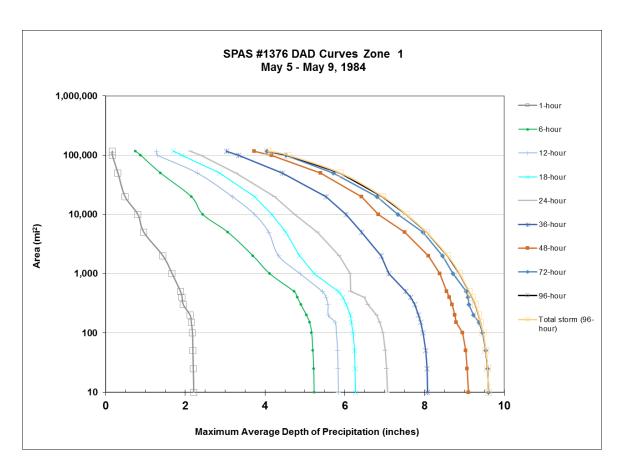
Radar Included: No

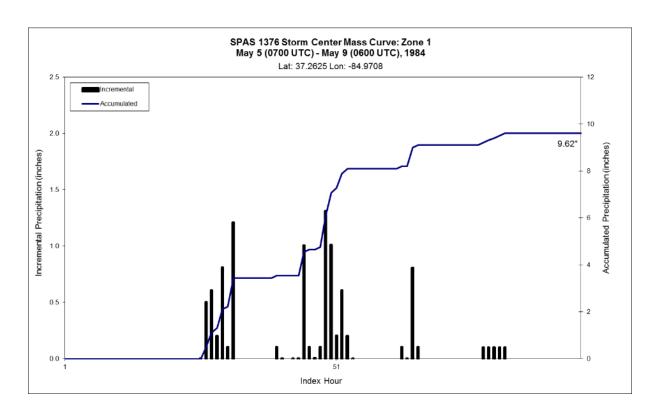
Depth-Area-Duration (DAD) analysis: Yes

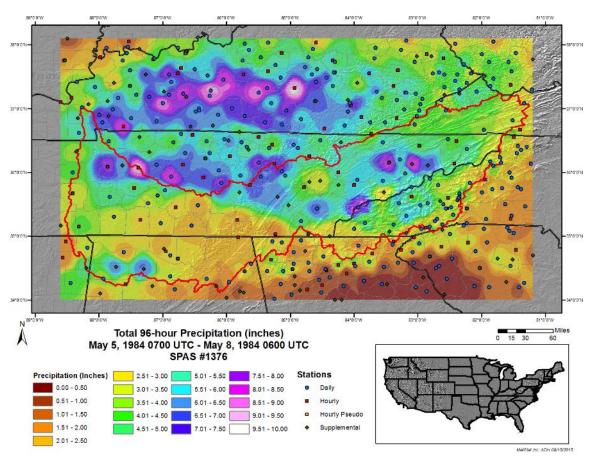
Reliability of results: In addition to the NCDC stations, six supplemental stations were added to ensure data were consistent with what TVA and NOAA reported for this storm. A large number of the hourly stations used for this analysis had a lower precision than that of similar hourly or daily stations, and thus resulted in accumulations and slight timing problems when low values were reported. With the density of stations available for this storm, the resulting SPAS analysis is deemed quite reasonable.

Storm Name:	SPAS 1376 - I	Dandrige, TN	Zone 1								
Storm Date:	5/5-8/1984					Storm A	Adjustr	nent for	r Virgini	a	
AWA Analysis Date:		20.75									
Temporal Transposit	ion Date	20-May	-					.,	CTT 0 400	.,	
a. a		Lat	Long				nflow Dire		SW @ 400	miles	
Storm Center Location		37.26 N	84.97 W				age Elevati		N/A	feet	
Storm Rep Dew Poin		32.50 N	89.00 W				ter Elevati		800	feet	
Transposition Dew P	oint Location					Storm Ana			24	hours	
Basin Location						Effective B	arrier Hei	ght	N/A	feet	
The storm	n representative	dammaint is	72 5 E	rrith tot	ما مسم منسنده ام	la rrotan abar	n and larmi	o f		2.54	inches.
	olace maximum		72.5 F 76.0 F		al precipitab al precipitab					2.99	inches.
	oned maximum		0.0		al precipitab					#N/A	inches.
	e in-place storn		800		ich subtracts	0.19		f precipitabl	e water at	72.5 F	menes.
	e in-place storn		800		ich subtracts	0.21		f precipitabl		76.0 F	
	nsposition basin		N/A		ich subtracts	X.XX		f precipitabl		0.0	
	rier/basin elevat		N/A	whi	ich subtracts	x.xx		f precipitabl		0.0	
T	he in-place stor	rm maximizati	ion factor is	1.19					76. Storm repres		
The	transposition/e			#N/A					age Td values on	May 6, 1984	
	The ba	arrier adjustm	ent factor is	#N/A		at stations KJ	AN, KMEI aı	nd KNMM.			
	The	total adjustm	ent factor is	#N/A							<u> </u>
Observed	Storm Depth-A	Area-Duratio	n	,	,	,	,	·	·		
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	2.2	5.2	5.9	6.3	7.1	8.1	9.1	9.6	9.6	9.6
	10 sq miles	2.2	5.2	5.8	6.3	7.1	8.1	9.1	9.6	9.6	9.6
	100 sq miles	2.2	5.2	5.8	6.2	7.0	8.0	9.0	9.5	9.5	9.5
······	200 sq miles	2.1	5.0	5.6 5.4	6.1	6.8	7.9	8.8	9.2	9.4	9.4
	500 sq miles 1000 sq miles	1.9 1.7	4.7 4.1	4.9	5.9 5.2	6.2 6.1	7.5 7.1	8.6 8.4	9.1 8.7	9.1 8.9	9.1 8.9
	2000 sq miles	1.4	3.7	4.3	4.9	5.9	6.9	8.1	8.5	8.6	8.6
	5000 sq miles	1.0	3.1	4.1	4.5	5.3	6.4	7.5	8.0	8.1	8.1
	0000 sq miles	0.8	2.4	3.7	4.2	4.7	6.0	6.9	7.3	7.5	7.5
	0000 sq miles	0.5	2.2	3.2	3.7	4.2	5.5	6.42	6.81	7.0	7.0
***************************************	0000 sq miles	0.3	1.4	2.3	2.9	3.3	4.4	5.39	5.72	5.9	5.9
	oooo sq mires	0.0	2								
Storm or S	torm Center Na	ime		SPAS 1376	- Dandrige	TN Zone 1					
Storm Date				5/5-8/1984							1
Storm Type	1			Convective							1
Storm Loc			_	37.26 N	84.97 W]
Storm Cen	er Elevation			800							
Precipitation	on Total & Dura	ation (10 sq m	ni)	9.62" in 96	hrs from SP.	AS 1376					
-	esentative Dew			72.5 F	24						1
	esentative Dew	Point Locati		32.50 N	89.00 W			May	June		
Maximum				76.0 F				75.00	78.48		4
	nflow Vector			SW @ 400				-			-
In-place M	aximization Fac	tor		1.19	-						1
m 10	ransposition (E	Data		20 M				-			1
	on Dew Point I			20-May							1
	on Dew Point I on Maximum I										1
	on Maximum 1			#N/A							1
	sin Elevation	1 40 101		N/A	-						1
	evation in Basin			N/A							1
Inflow Barr				N/A							1
	ustment Factor			#N/A							1
Barrier An											

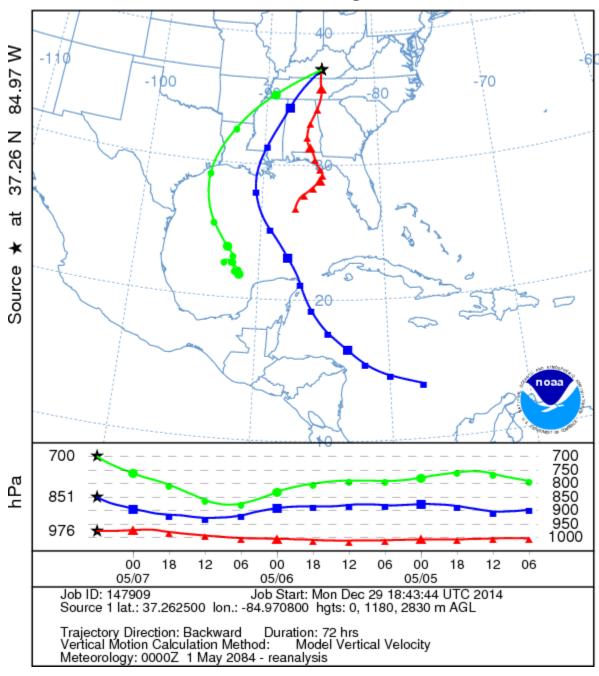
	Storm 1376 - May 5 (0700 UTC) - May 9 (0600 UTC), 1984													
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
Area (mi²)					Duration	n (hours)								
Area (IIII)	1	6	12	18	24	36	48	72	96	Total				
0.3	2.21	5.24	5.85	6.28	7.08	8.10	9.11	9.62	9.62	9.62				
1	2.21	5.24	5.85	6.28	7.08	8.10	9.11	9.62	9.62	9.62				
10	2.21	5.23	5.84	6.27	7.07	8.08	9.10	9.60	9.60	9.60				
25	2.20	5.22	5.83	6.26	7.05	8.06	9.07	9.58	9.58	9.58				
50	2.19	5.20	5.82	6.24	7.02	8.03	9.04	9.54	9.54	9.54				
100	2.18	5.17	5.79	6.21	6.96	7.96	8.96	9.46	9.47	9.47				
150	2.15	5.12	5.76	6.17	6.88	7.90	8.79	9.37	9.40	9.40				
200	2.12	5.04	5.59	6.14	6.80	7.85	8.76	9.23	9.36	9.36				
300	1.95	4.90	5.58	6.04	6.58	7.76	8.69	9.12	9.28	9.28				
400	1.92	4.81	5.53	5.95	6.49	7.65	8.62	9.09	9.20	9.20				
500	1.88	4.73	5.44	5.85	6.15	7.53	8.56	9.05	9.12	9.12				
1,000	1.67	4.12	4.88	5.24	6.14	7.11	8.39	8.72	8.88	8.88				
2,000	1.44	3.70	4.34	4.86	5.86	6.91	8.10	8.45	8.58	8.58				
5,000	0.96	3.07	4.09	4.52	5.31	6.42	7.51	7.96	8.05	8.05				
10,000	0.81	2.44	3.74	4.17	4.74	6.03	6.85	7.34	7.54	7.54				
20,000	0.49	2.15	3.18	3.74	4.24	5.53	6.42	6.81	6.95	6.95				
50,000	0.31	1.38	2.30	2.86	3.27	4.44	5.39	5.72	5.89	5.89				
100,000	0.17	0.88	1.30	1.91	2.39	3.34	4.16	4.53	4.57	4.57				
117,097	0.17	0.75	1.28	1.70	2.13	3.03	3.73	4.05	4.07	4.07				







NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 07 May 84
CDC1 Meteorological Data



Surface
 850mb
 700mb

Storm Precipitation Analysis System (SPAS) For Storm #1406 SPAS Analysis

General Storm Location: Rapidan, VA - Marion County

Storm Dates: June 26 – 27, 1995

Event: Orographic

DAD Zone 1

Latitude: 38.415

Longitude: -78.335

Max. Grid Rainfall Amount: 28.39" in 41 hours

Max. Observed Rainfall Amount: 27.4" – Storm Center as indicated by Sterling WSR-88D in Smith et al., 1995 Catastrophic rainfall from an upslope thunderstorm in the central Appalachians:

The Rapidan storm of June 27, 1995

DAD Zone 2

Latitude: 37.665

Longitude: -79.405

Max. Grid Rainfall Amount: 8.53" in 41 hours

Max. Observed Rainfall Amount: 8.43" - Glasgow, VA

Number of Stations: 295 (220 Daily, 48 Hourly, 18 Hourly Pseudo and 9 Supplemental)

SPAS Version: 10

Basemap: PRISM June 1981-2010; ippt_allsites_1406_sum_in (SPAS-NEXRAD hrly basemap)

Spatial resolution: 00:00:36

Radar Included: Yes

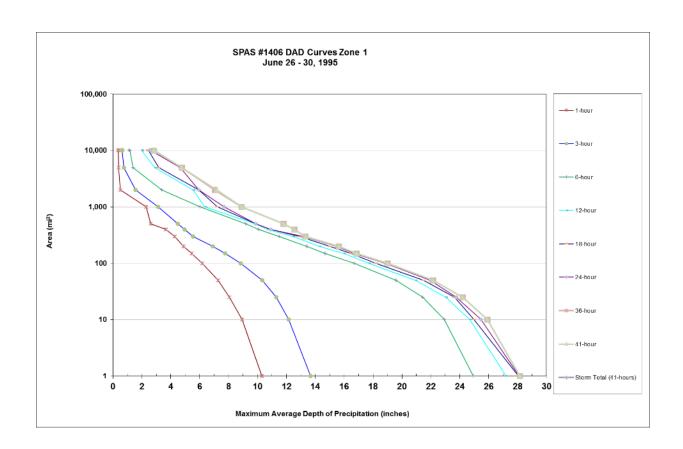
Radar Beam-Blockage shapefile created: Yes

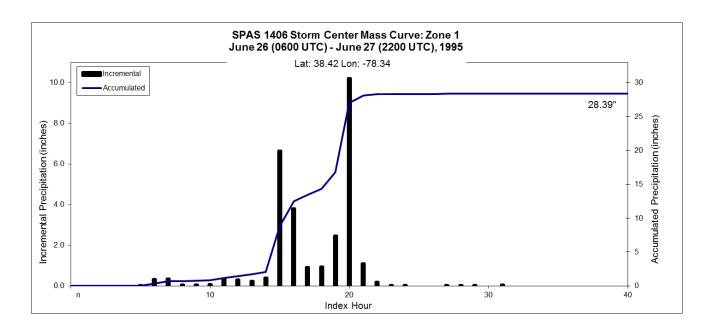
Depth-Area-Duration (DAD) analysis: Yes

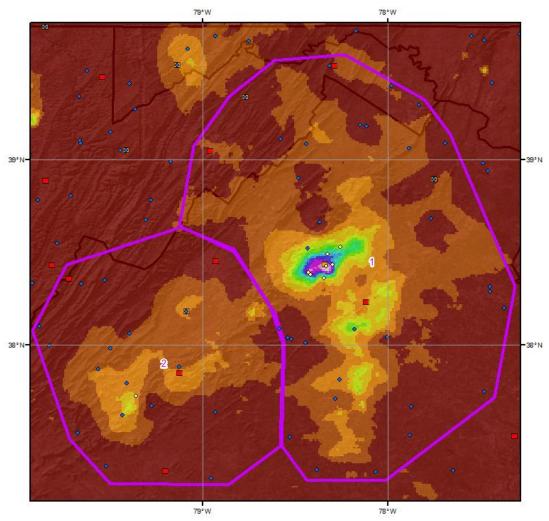
Reliability of results: This analysis was based on hourly data, daily data and supplemental station data paired with SPAS-NEXRAD. We have a high degree of confidence for the radar and station based storm total results. The spatial pattern dependent on the basemap and radar data with a high degree of confidence with the timing based on hourly and hourly pseudo stations (see below).

Storm Name:	Rapidan, V	A - SPAS 14	106 DAD 1								
Storm Date:	6/26-27,/19				S	torm A	diustm	ent for	Virginia	1	
AWA Analysis Date:	11/14/2015				D		ajastiii		, 11 S11110	•	
Temporal Transposit		10-Jul									
temporar Transposit	on Date	Lat	Lon			Moietura	Inflow Dire	ction	SSE @ 350	miles	
Y C											
storm Center Location		38.42 N	78.34 W				rage Elevat		N/A	feet	
Storm Rep SST Locat		33.50 N	77.00 W				ter Elevati		1,300	feet	
Fransposition SST Lo	cation						lysis Durat		6	hours	
Basin Location						Effective I	Barrier Hei	ght	N/A	feet	
	rm representa		82.0 F		al precipitabl					3.92	inches.
The in	n-place maxii	mum SST is	83.0 F	with tota	al precipitabl	e water abov	ve sea level o	of		4.08	inches.
The transpos	itioned maxir	mum SST is	0.0	with tota	al precipitabl	e water abov	ve sea level o	of		#N/A	inches.
The in-	place storm	elevation is	1,300	feet whi	ch subtracts	0.40	inches o	f precipitabl	e water at	82.0 F	
The in-	place storm	elevation is	1,300	feet whi	ch subtracts	0.41	inches o	f precipitabl	e water at	83.0 F	
The transpo	sition basin	elevation at	N/A	feet whi	ch subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
The inflow barrier/	basin elevation	on height is	N/A	feet whi	ch subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
								•			
The in	-place storm	n maximizati	on factor is	1.04	1	Notes: Stor	m represent	ative SST va	lue was based	on	1
	sposition/ele			#N/A			-		4, 1995 where		
THE CLAIR		ier adjustme		#N/A			ore than 1.0		., 1775 WHOLE	2215 aid	
	THE DALL	ici aujustilit	in ractor IS	π1 1/12		not vary inc	,, c thail 1.0 !				
	The t-	stal adinates	nt footon:-	#N/A							-
	ine to	otal adjustme	in ractor is	#1 \ /A							4
Observed	Storm Deptl	·	~~~~~~~		·		·	·	7		
***************************************		1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	41 Hours		
***************************************	1 sq mile	10.3	13.7	24.9	27.2	28.1	28.1	28.2	28.2		
	10 sq miles	8.9	12.2	22.9	24.7	25.0	25.5	25.9	25.9		
1	00 sq miles	6.2	8.8	16.7	17.7	18.2	18.9	19.0	19.0		
2	00 sq miles	4.9	6.9	13.4	14.3	15.0	15.5	15.6	15.6		
5	00 sq miles	2.6	4.5	9.2	9.9	9.9	9.9	11.8	11.8		
10	000 sq miles	2.3	3.1	6.0	6.4	7.2	7.7	8.9	8.9		
***************************************	000 sq miles	0.5	1.6	3.4	5.5	5.9	5.9	7.0	7.2		
	000 sq miles	0.4	0.8	1.4	2.9	3.2	4.7	4.8	4.8		
	000 sq miles	0.4	0.6	1.2	2.0	2.5	2.6	2.8	2.9		
		711									
Storm or S	torm Center	Nama		Rapidan, V	A CDAC 14	06 DAD 1					
		Name				JU DAD 1			-		1
Storm Date				6/26-27,/19		tion			+		+
Storm Type				Orographic 1		лоп			 		1
Storm Loc				38.42 N	78.34 W				-		┨
	ter Elevation			1,300							
Precipitation	on Total & D	uration		28.39" inche	s in 41 hours	3					4
					_						4
	resentative S			82.0 F	6		_				4
	resentative S	ST Location		33.50 N	77.00 W		June	July			I
Maximum				83.0 F			81	84			1
	nflow Vector			SSE @ 350							
In-place M	aximization I	Factor		1.04							
Temporal 7	ransposition	(Date)		10-Jul							
Transpositi	on SST Loca	tion									1
Transpositi	on Maximum	n SST							İ		
	on Adjustme			#N/A							1
	sin Elevation			N/A							1
	evation in Bas			N/A							1
				N/A							1
-	ier Height								1		ī
Inflow Barr	rier Height ustment Fact	tor		#N/A							

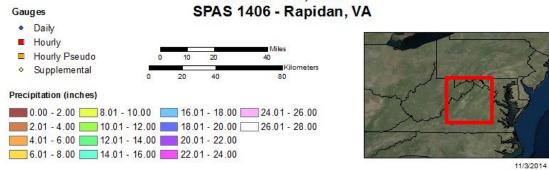
			S	torm 1	406 Zo	ne 1	June 2	6 (0500	UTC)	June 3	30 (040	0 CST	, 1995			
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
								D	uration (nours)						
areasqmi	1	3	6	12	18	24	36	41								Total
0.4	10.4	13.8	25.1	27.5	28.3	28.4	28.4	28.4								28.39
1	10.3	13.7	24.9	27.2	28.1	28.1	28.2	28.2								28.15
10	8.9	12.2	22.9	24.7	25.0	25.5	25.9	25.9								25.90
25	8.1	11.3	21.4	23.0	23.6	23.8	24.2	24.2								24.19
50	7.3	10.3	19.6	20.9	21.5	22.0	22.2	22.2								22.16
100	6.2	8.8	16.7	17.7	18.2	18.9	19.0	19.0								19.01
150	5.4	7.8	14.7	16.0	16.5	16.7	16.8	16.9								16.85
200	4.9	6.9	13.4	14.3	15.0	15.5	15.6	15.6								15.63
300	4.3	5.6	11.5	12.5	12.9	13.2	13.3	13.3								13.32
400	3.7	5.0	10.1	10.7	10.9	10.9	12.6	12.6								12.56
500	2.6	4.5	9.2	9.9	9.9	9.9	11.8	11.8								11.82
1,000	2.3	3.1	6.0	6.4	7.2	7.7	8.9	8.9								8.91
2,000	0.5	1.6	3.4	5.5	5.9	5.9	7.0	7.2								7.18
5,000	0.4	0.8	1.4	2.9	3.2	4.7	4.8	4.8								4.75
10,000	0.4	0.6	1.2	2.0	2.5	2.6	2.8	2.9								2.89
10,196	0.4	0.6	1.1	2.0	2.5	2.6	2.8	2.8								2.82



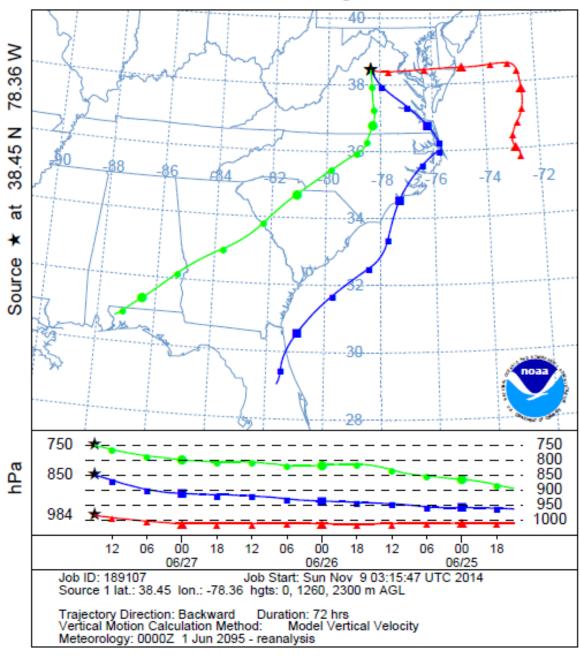




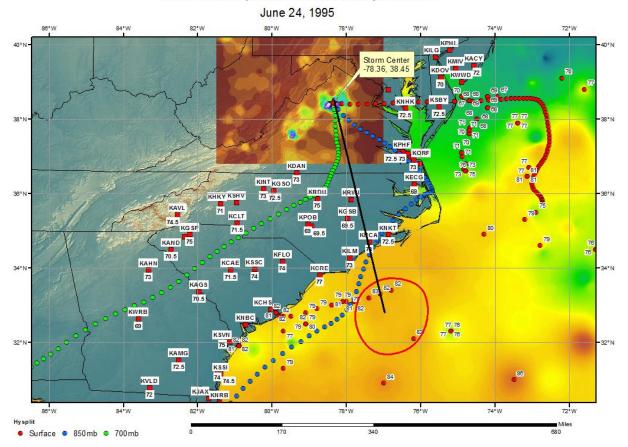
Total Storm (41-hours) Precipitation (inches)
June 26 - 27, 1995
SPAS 1406 - Rapidan, VA



NOAA HYSPLIT MODEL Backward trajectories ending at 1500 UTC 27 Jun 95 CDC1 Meteorological Data



SPAS 1406 Rapidan, VA Storm Analysis DAD 1

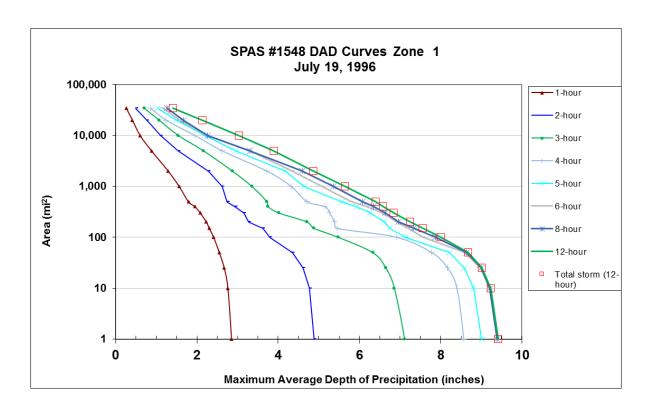


Storm Precipitation Analysis System (SPAS) For Storm #1548 SPAS Analysis

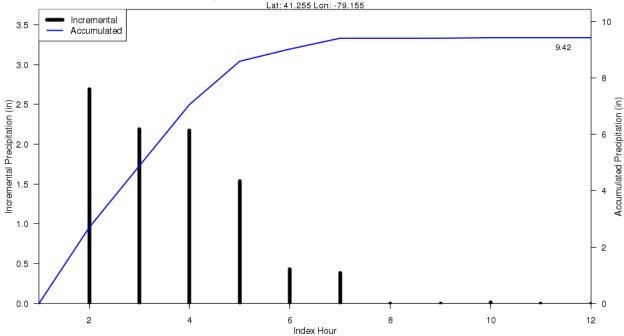
Redbank, PA July 19, 1996

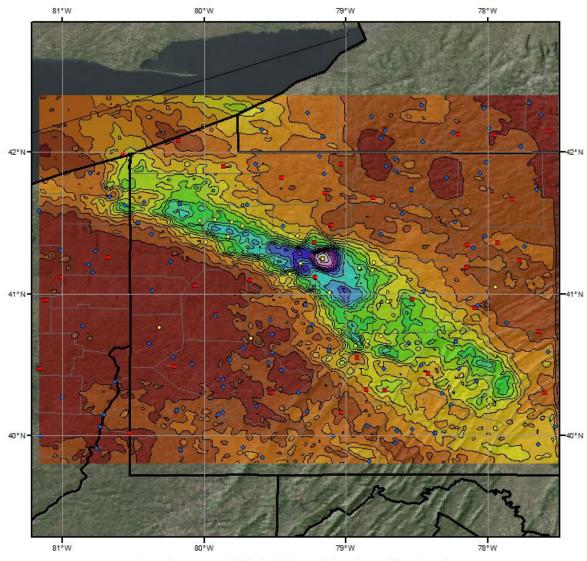
a	gp 1 g 1 5 10 p										
Storm Name:	SPAS 1548-Re	dbank, PA				14 A		4 C	X 72	_	
Storm Date: AWA Analysis Date:	7/19/1996				3	torm A	ajustm	ient Ior	Virgini	d	
Temporal Transposit	ion Date	15-Jul	_								
		Lat	Long				Inflow Dire		SW@130	miles	
Storm Center Locati	on	41.26 N	79.16 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep Dew Poir	t Location	40.20 N	81.10 W			Storm Cer	nter Elevati	on	1,700	feet	
Transposition Dew P	oint Location					Storm Ana	alysis Durat	ion	12	hours	
Basin Location						Effective I	Barrier Hei	ght	N/A	feet	
	m representative of		74.0 F				ove sea level			2.73	inches.
	-place maximum o	•	78.0 F				ove sea level			3.29	inches.
•	tioned maximum of	-	0.0				ove sea level			#N/A	inches.
	ne in-place storm		1,700		ch subtracts	0.40		f precipitable		74.0 F	
	ne in-place storm		1,700		ch subtracts	0.46		f precipitable		78.0 F	
The tr	ansposition basin	elevation at	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0	
The inflow ba	rrier/basin elevati	on height is	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0	
	The in-place storm	n maximizati	on factor is	1.215					d on the 24hr av		
The	transposition/ele	vation to bas	sin factor is	#N/A					B, KPIT and K		
	The barr	rier adjustme	ent factor is	#N/A			_	-	re did not vary r		•
						uegree over	a iarge area ar	u was as clos	est to the storm	center.	
	The to	otal adjustme	ent factor is	#N/A							
Observed	Storm Depth-Ar	rea-Duratio	n								
		1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	8 Hours	12 Hours		
	1 sq miles	2.9	4.9	7.1	8.6	9.0	9.4	9.4	9.4		
	10 sq miles	2.8	4.8	6.9	8.4	8.8	9.2	9.2	9.2		
	100 sq miles	2.4	3.8	5.5	6.9	7.1	7.6	7.9	8.0		
	200 sq miles	2.2	3.3	4.7	5.4	6.6	6.9	7.0	7.2		
	500 sq miles	1.8	2.7	3.7	4.7	5.6	5.8	6.1	6.4		
	1000 sq miles	1.6	2.6	3.4	4.3	4.6	5.1	5.4	5.7		
	2000 sq miles	1.3	2.3	2.9	3.7	4.2	4.3	4.6	4.9		
***************************************	5000 sq miles	0.9	1.5	2.2	2.6	3.0	3.3	3.3	3.9		
***************************************	10000 sq miles	0.6	1.1	1.5	2.0	2.2	2.3	2.3	3.0		
***************************************	20000 sq miles	0.4	0.8	1.1	1.2	1.5	1.6	1.7	2.1		
	20000 sq miles	07.	0.0		112	110	210				
Storm or S	Storm Center Nam	ne .		SPAS 1548	-Redbank,	PA					1
Storm Dat		ic .		7/19/1996	-Reubank,						
Storm Typ				General/Lo	cal						1
Storm Loc				41.26 N	79.16 W						1
	atton iter Elevation			1700							1
	on Total & Durati	ion			of rain in 12	Hours					1
recipitati	Total & Baran	ion		2.1 menes	71 14411 111 12	Tiours					
Storm Rer	oresentative Dew l	Point		74.0 F	12						
	presentative Dew l		on	40.20 N	81.10 W						1
-	Dew Point	JIM LOCALI	J.1	78.0 F	J1.1U 11						1
	Inflow Vector			SW@130							1
	Iaximization Factor	or		1.21							1
III-prace iv		-									
Temporal	Transposition Dat	re.		15-Jul							
	ion Dew Point Lo			1.J-3 UI							
	ion Maximum De						1				
	ion Maximum De			#N/A							1
	asin Elevation	ac 101		N/A							1
											1
	evation in Basin			N/A							-
	rier Height			N/A							
	justment Factor			#N/A							
Total Adju	stment Factor			#N/A							J

	Storm 1548 - July 19 (0600 UTC) - July 19 (1700 UTC), 1996													
	MAX	IMUM A	/ERAGE	DEPTH (OF PREC	IPITATIO	N (INCH	ES)						
A (:2)				Dui	ration (hou	ırs)								
Area (mi²)	1	2	3	4	5	6	8	12	Total					
0.4	2.86	4.89	7.13	8.59	9.02	9.40	9.40	9.42	9.42					
1	2.85	4.88	7.11	8.57	9.01	9.39	9.39	9.41	9.41					
10	2.76	4.77	6.86	8.40	8.81	9.21	9.21	9.24	9.24					
25	2.67	4.61	6.65	8.17	8.58	8.98	9.00	9.01	9.01					
50	2.55	4.35	6.33	7.78	8.22	8.60	8.64	8.67	8.67					
100	2.41	3.79	5.48	6.92	7.13	7.56	7.87	8.00	8.00					
150	2.30	3.62	4.88	5.45	6.75	7.19	7.33	7.56	7.56					
200	2.23	3.27	4.71	5.39	6.62	6.92	6.96	7.24	7.24					
300	2.08	3.15	4.02	5.27	6.27	6.55	6.63	6.84	6.84					
400	1.95	2.94	3.75	5.15	5.93	6.18	6.35	6.58	6.58					
500	1.79	2.74	3.72	4.71	5.58	5.80	6.07	6.40	6.40					
1,000	1.56	2.62	3.35	4.32	4.64	5.07	5.36	5.65	5.65					
2,000	1.29	2.28	2.87	3.72	4.18	4.34	4.59	4.86	4.86					
5,000	0.88	1.53	2.16	2.62	2.95	3.30	3.30	3.89	3.89					
10,000	0.60	1.10	1.54	1.95	2.19	2.27	2.27	3.03	3.03					
20,000	0.41	0.76	1.07	1.24	1.49	1.57	1.67	2.13	2.13					
34,275	0.26	0.49	0.70	0.86	1.03	1.16	1.26	1.41	1.41					

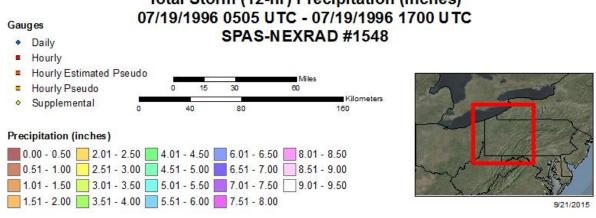


SPAS 1548 Storm Center Mass Curve Zone 1 July 19 (0600UTC) to July 19 (1700UTC), 1996 Lat: 41.255 Lon: -79.155

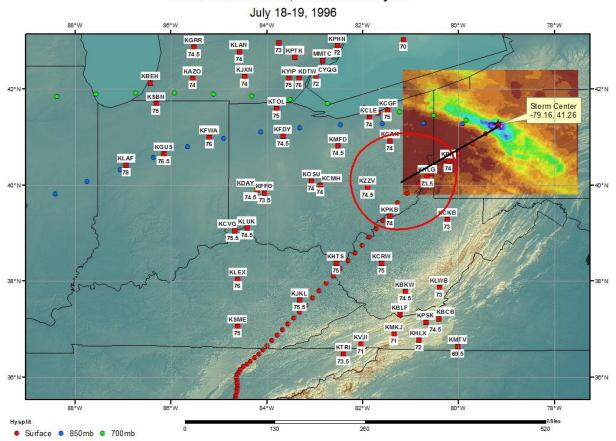




Total Storm (12-hr) Precipitation (inches)



SPAS 1548 Redbank, PA Storm Analysis



Storm Precipitation Analysis System (SPAS) For Storm #1017 SPAS Analysis

General Storm Location: Sparta, NJ

Storm Dates: August 11-12, 2000

Event: Local Thunderstorm

DAD Zone 1

Latitude: 41.03

Longitude: -74.64

Rainfall Amount: 16.70"

Number of Stations: 179

Base Map Used: A mosaic (KDIX, KOKX, KBGM and KDOX) total estimated radar rainfall grid.

Spatial resolution: 30 seconds

Radar Included: Yes

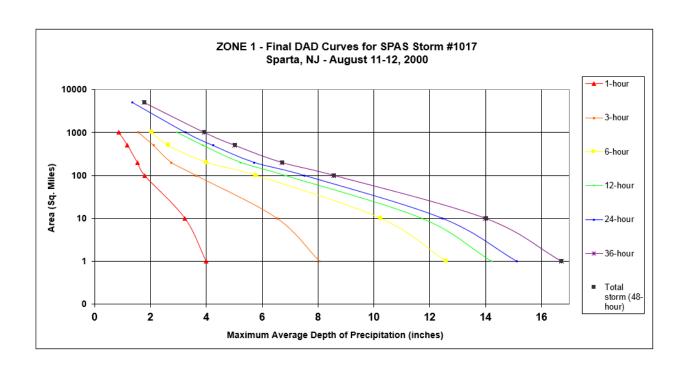
Depth-Area-Duration (DAD) analysis: No

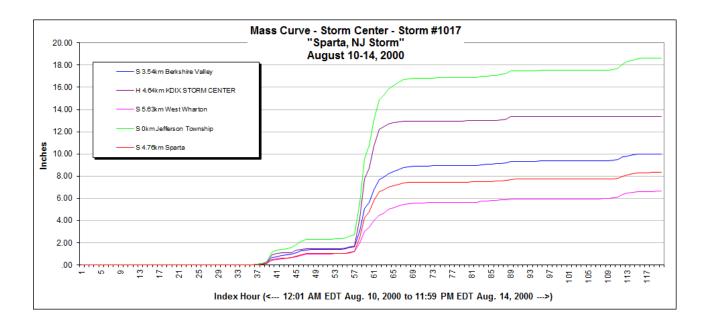
a	an i a i i i i										
Storm Name:	SPAS 1017-S					14 A	124	4 C	T 7••.	_	
Storm Date: AWA Analysis Date:	8/11-12/2000				S	otorm A	ajustm	ent for	Virginia	d	
		4 = 4									
Temporal Transposit	tion Date	15-Aug				35 1 . 3			ENTE 0 65	-,,	
a. a . .		Lat	Long				Inflow Dire		ENE @ 65	miles	
Storm Center Locati		41.03 N	74.64 W				rage Elevati		N/A	feet	
Storm Rep Dew Poir		41.17 N	73.44 W				ter Elevati		800	feet	
Transposition Dew P	oint Location						lysis Durat		12	hours	
Basin Location						Enecuve E	arrier Hei	gnt	N/A	feet	
77		1 1 1	(0.0 E	1.1	1		1 1	c		2.05	
	representative of	-	68.0 F				ve sea level			2.05 2.99	inches.
The transposition	olace maximum	•	76.0 F 0.0				ve sea level o ve sea level o			#N/A	inches.
	in-place storm	-	800		ch subtracts			precipitable	a water at	68.0 F	menes.
	in-place storm		800		ch subtracts			precipitable precipitable		76.0 F	
	sposition basin		N/A		ch subtracts			precipitable		0.0	
The inflow barr	-		N/A		ch subtracts			precipitable		0.0	
1110 111110 11 01111	ior, oubin ore turi	on neight is	1411		on suctructs	14,212	inches of	preerpreadi	o maror ar	0.0	
Th	e in-place storn	n maximizati	on factor is	1.47		Notes: Use	ed 12hr Td fi	om KHPN	KDXR, and K	BDR	
	ransposition/ele			#N/A		110105. 050	Ju 1211 1411	om min 14,	11D211t, uno 11	DDIC.	
		rier adjustme									
		,				1					
	The to	otal adjustme	ent factor is	#N/A							
Observed	Storm Depth-	Area-Durati	ion								
		1 Hour	3 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	
	1 sq mile	4.0	8.1	12.6	14.2	15.1	16.7	16.7	-	-	
	3 sq miles	3.6	7.4	11.6	13.2	14.0	15.6	15.6	-	-	
	10 sq miles	3.2	6.5	10.3	11.7	12.5	14.0	14.0	-	-	
	100 sq miles	1.8	3.6	5.8	6.8	7.5	8.6	8.6	-	-	
	200 sq miles		2.8	4.0	5.2	5.7	6.7	6.7	-	-	
	500 sq miles		2.1	2.6	3.9	4.2	5.0	5.0	-	-	
	1000 sq miles		1.6	2.1	3.0	3.3	3.9	4.0	-	-	
***************************************	5000 sq miles	-	-	-	-	-	-	-	-	-	
***************************************	10000 sq miles		-	-	-	-	-	-	-	-	
	20000 sq miles	-	-	-	-	-	-	-	-	-	
	Storm Center Na	ıme		SPAS 1017-							
Storm Dat				8/11-12/200							1
Storm Typ Storm Loc				Local Thund 41.03 N		rricane Albe	rto conncec	uon		-	
	ation iter Elevation			800	74.64 W						1
	ion Total & Dur	ation		14.0 inches	36 hours (AWA DAD)					
1 recipitati	on rotal & Dul			1 7.0 HICHES	JUNIOUIS (A	(שמשנויויו					1
Storm Rer	oresentative Dev	v Point		68.0 F	12						
	presentative Dev		tion	41.17 N	73.44 W						
	Dew Point	2000		76.0 F							
	Inflow Vector			ENE @ 65							Î
	Iaximization Fac	ctor	_	1.47							
Temporal	Transposition D	ate		15-Aug							
Transposit	ion Dew Point I	ocation									
	ion Maximum I										
	ion Adjustment	Factor		#N/A							
	asin Elevation			N/A							
	levation in Basir	1		N/A							
	rier Height			N/A							
	ljustment Factor			#N/A							
Total Adju	stment Factor			#N/A							

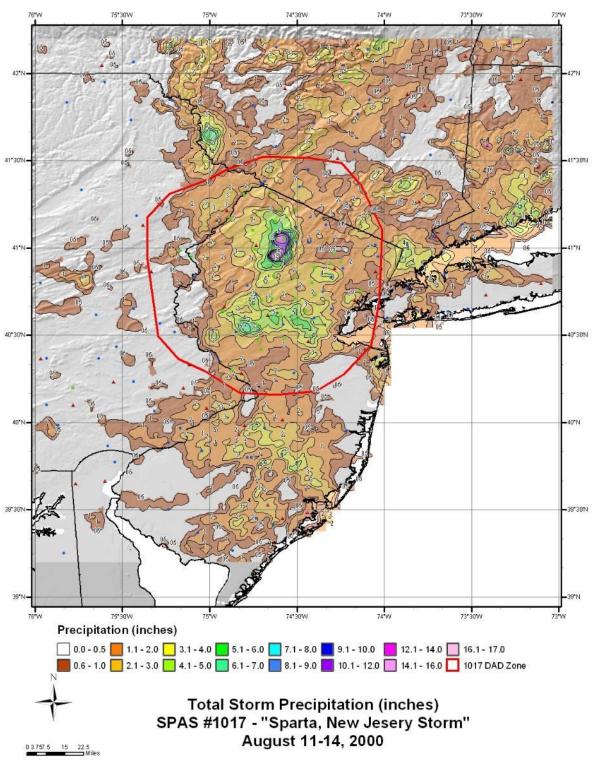
Storm 1017 - Sparta, NJ, August 11-12, 2000

MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

			Du	ıration (houi	rs)		
Area in Sq. Mi.	1	3	6	12	24	36	48
1.000	4.0	8.1	12.6	14.2	15.1	16.7	16.7
10.000	3.2	6.5	10.3	11.7	12.5	14.0	14.0
100.000	1.8	3.6	5.8	6.8	7.5	8.6	8.6
200.000	1.5	2.8	4.0	5.2	5.7	6.7	6.7
500.000	1.2	2.1	2.6	3.9	4.2	5.0	5.0
1000.000	0.9	1.6	2.1	3.0	3.3	3.9	4.0
5000.000					1.4	1.8	1.8





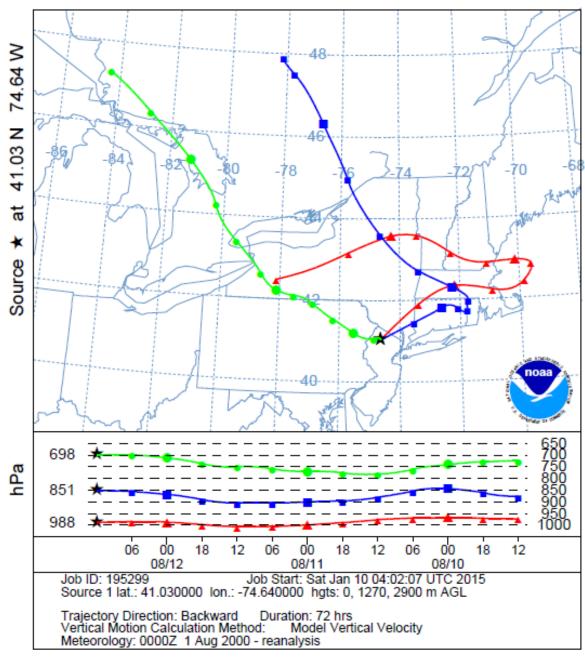


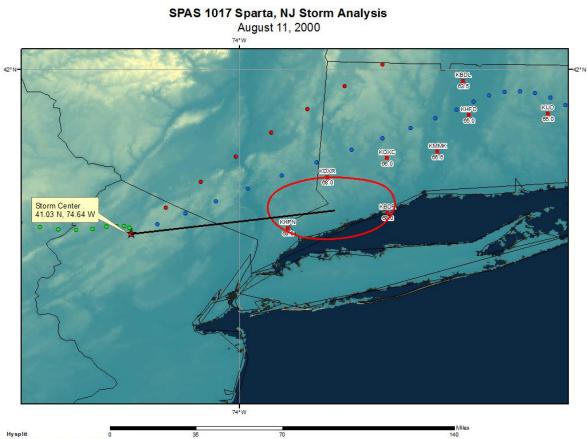
TWP 5/11/2005

NOAA HYSPLIT MODEL

Backward trajectories ending at 1200 UTC 12 Aug 00

CDC1 Meteorological Data





• Surface • 850 mb • 700 mb

Storm Precipitation Analysis System (SPAS) For Storm #1040 SPAS Analysis

General Storm Location: Tabernacle, NJ

Storm Dates: 7/12/2004 0600Z - 7/13/2004 0800Z

Event: Convective Thunderstorm

DAD Zone 1

Latitude: 39.88

Longitude: -74.69

Rainfall Amount: 15.63" (Grid/Pixel Point)

Number of Stations: 319 (131-hourly, 2-hourly pseudo, 118-daily, and 68-supplemental) gauging

stations within the defined search domain.

SPAS Version: 3.0

Base Map Used: No

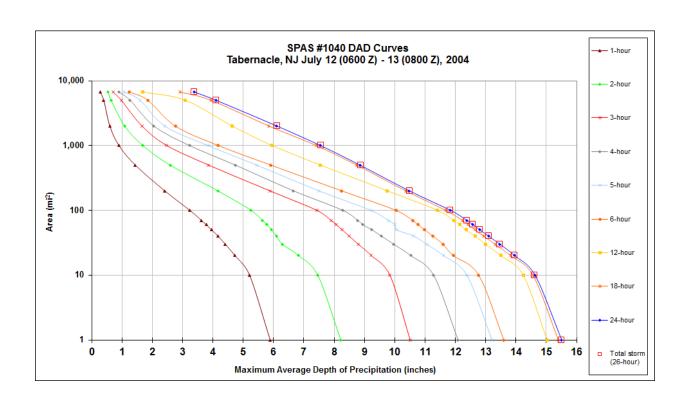
Spatial resolution: 0.005944 decimal degrees (21.386139 seconds)

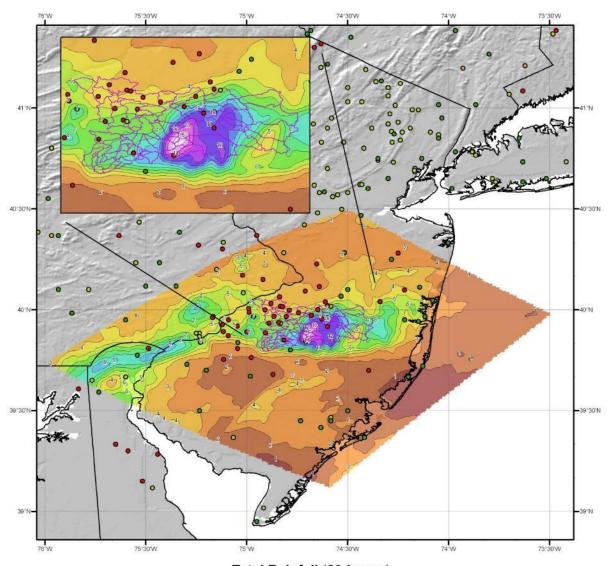
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

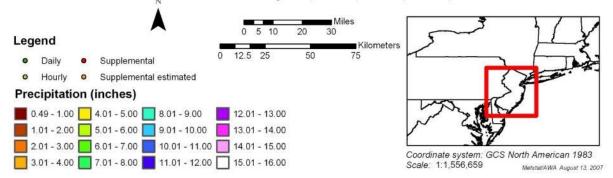
Storm Name:	SPAS 1040-Ta	bernacle, N	IJ		~				¥70		
Storm Date: AWA Analysis Date:	7/11-14/2004 11/14/2015				S	torm A	djustm	ent for	Virginia	1	
·		20 II									
Temporal Transposit	on Date	30-Jul Lat	Long			Moisture I	nflow Dino	otion	SSW @ 110	miles	
Storm Center Location		39.88 N	74.69 W			Basin Aver			N/A	feet	
		38.34 N	75.34 W				ter Elevati		100	feet	
Storm Rep Dew Poin Transposition Dew Po		30.34 IN	75.54 W			t e	lysis Durat		6	hours	
Basin Location	omi Location						arrier Hei		N/A	feet	
Justin Edeutron						Eliceti ve B	tarrier rier	5 ¹¹¹	IVA	Teet	
The storm	representative of	dew point is	74.0 F	with total	precipitable	water above	sea level o	f		2.73	inches
	olace maximum	-	79.0 F			water above				3.44	inches
	oned maximum	-	0.0			water above				#N/A	inches
	in-place storm	-	100		ch subtracts			f precipitabl	e water at	74.0 F	
	in-place storm		100	whi	ch subtracts	0.03		f precipitabl		79.0 F	
	nsposition basin		N/A	whi	ch subtracts	X.XX		f precipitabl		0.0	
The inflow barr	ier/basin elevati	on height is	N/A	whi	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
Th	e in-place storn	n maximizati	on factor is	1.26		Notes: DA	D values tak	en from SP.	AS 1040. Use	d 6hr Td	
	ransposition/ele			#N/A		from KSBY	and KOXB				
	The bar	rier adjustme	ent factor is	#N/A							
	The to	otal adjustme	ent factor is	#N/A							
Observed	Storm Depth-A	rea-Duratio	on								
		1 Hour	3 Hours	6 Hours	12 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	
	1 sq mile	5.9	10.5	13.6	15.0	15.5	-	-	-	-	
	3 sq miles	5.6	10.2	13.2	14.7	15.1	-	-	-	-	
	10 sq miles		9.8	12.8	14.2	14.6	-	-	-	-	
	100 sq miles	·	7.4	10.0	11.4	11.8	-	-	-	-	
***************************************	200 sq miles		5.9	8.3	9.8	10.5	-	-	-	-	
	500 sq miles	\$	3.9	5.9	7.6	8.9	-	-	-	-	
	1000 sq miles		2.5	4.2	6.0	7.6	-	-	-	-	-
	5000 sq miles		1.0	1.9	3.1	4.1	-	-	-	-	-
	10000 sq miles 20000 sq miles		_ 		-	-	-	-	-	-	
	20000 sq miles	-				_	-		-		
C+ C	t Ct N			CDAC 1040 7	Γ-1	NIT					1
	torm Center Na	me		SPAS 1040-7		NJ					-
Storm Date Storm Type				7/11-14/2004 Thunderstorm							1
Storm Loc				39.88 N	74.69 W						1
	ter Elevation			100	77.07 **						1
	on Total & Dura	tion		14.50 inches	24 hours (A	AWA DAD)					1
primi					(4)					Ī
Storm Rep	resentative Dew	Point		74.0 F	6						1
	resentative Dew		ion	38.34 N	75.34 W			July	Aug		
Maximum	Dew Point			79.0 F				79.52	78.29		
Moisture I	nflow Vector			SSW @ 110							
In-place M	aximization Fact	tor		1.26							
	Transposition Da			30-Jul							
	on Dew Point L										
	on Maximum D										
	on Adjustment I	Factor		#N/A							
	sin Elevation			N/A							
	evation in Basin			N/A							-
Inflow Barr				N/A							
	ustment Factor			#N/A					-		
	tment Factor			#N/A							1

		MAXIMU	JM AVE	RAGE DE	EPTH OF	PRECI	OITATIO	N (INCHE	ES)		
					Du	ration (ho	urs)				
Area (mi²)	1	2	3	4	5	6	12	18	24	total hr	•
1	5.9	8.2	10.5	12.1	13.2	13.6	15.0	15.4	15.5	15.5	50
10	5.2	7.5	9.8	11.3	12.4	12.8	14.2	14.6	14.6	14.0	
20	4.7	6.8	9.2	10.5	11.6	11.9	13.5	13.8	14.0	13.9	96
30	4.4	6.3	8.8	10.0	11.1	11.6	13.0	13.3	13.5	13.4	47
40	4.2	6.1	8.5	9.6	10.6	11.3	12.7	12.9	13.1	13.1	10
50	4.0	5.9	8.3	9.3	10.1	11.0	12.4	12.7	12.8	12.8	81
60	3.8	5.8	8.1	9.0	10.0	10.8	12.1	12.4	12.6	12.	58
70	3.6	5.6	7.9	8.8	9.8	10.6	12.0	12.2	12.4	12.3	38
100	3.2	5.3	7.4	8.3	9.2	10.0	11.4	11.7	11.8	11.8	84
200	2.4	4.2	5.9	6.7	7.5	8.3	9.8	10.4	10.5	10.4	49
500	1.4	2.6	3.9	4.7	5.4	5.9	7.6	8.7	8.9	8.8	37
1,000	0.9	1.7	2.5	3.2	3.8	4.2	6.0	7.4	7.6	7.5	6
2,000	0.6	1.1	1.7	2.1	2.4	2.8	4.6	5.9	6.1	6.1	2
5,000	0.4	0.6	1.0	1.3	1.6	1.9	3.1	3.9	4.1	4.1	10
6,720	0.3	0.5	0.7	0.9	1.1	1.3	1.7	2.9	3.4	3.3	38

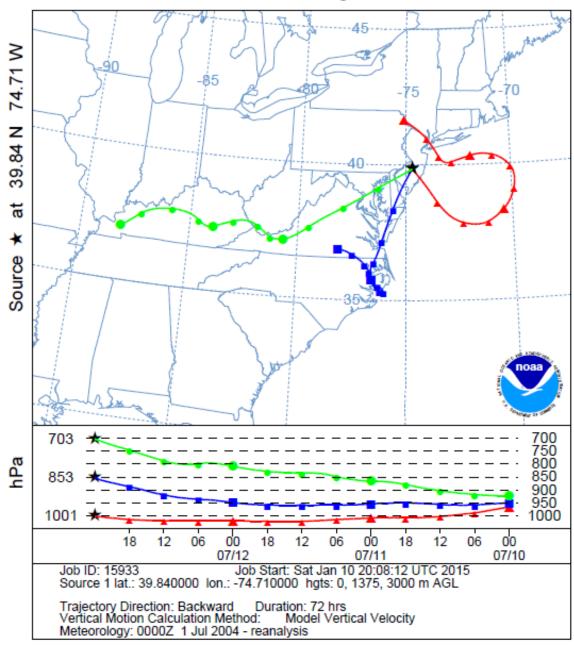


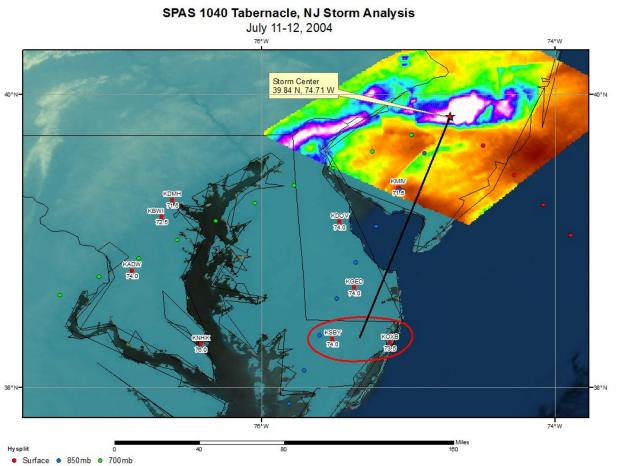


Total Rainfall (26-hours)
Tabernacle, New Jersey Storm
SPAS Storm #1040- July 12 (0600 Z) to 13 (0800 Z), 2004



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 13 Jul 04
CDC1 Meteorological Data





Storm Precipitation Analysis System (SPAS) For Storm #1049 SPAS Analysis

General Storm Location: Delaware County, NY

Storm Dates: 6/19/2007 1600Z – 6/20/2007 0700Z

Event: Cloudburst Thunderstorm

DAD Zone 1

Latitude: 42.01

Longitude: -74.90

Max. Grid/Radar Rainfall Amount: 11.69" (Grid/Pixel Point)

Max. Observed Rainfall Amount: 11.10" (9.58" grid cell at Bucket Data 6 "Upper Spring Brook", this station is located at a large precipitation gradient. Bucket Data 7 "Lower Spring Brook" Max. Obs 11.00" 10.38 Grid Cell)

Number of Stations: 65 (17-hourly, 1 hourly pseudo, 29-daily, 18-daily supplemental) gauging stations within the defined search domain.

SPAS Version: 5.0

Base Map Used: No

Spatial resolution: 0.36 mi²

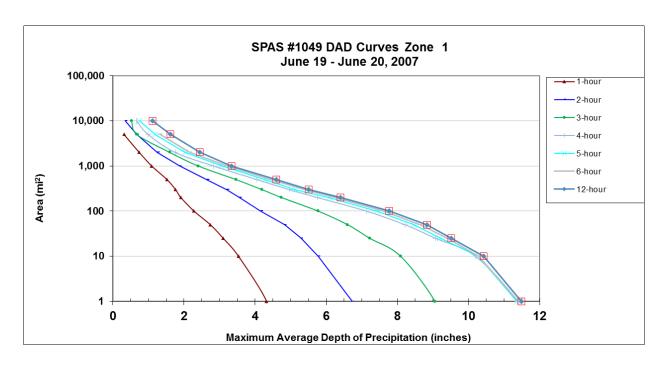
Radar Included: Yes, Weather Decision Technologies (WDT) Level-II radar reflectivity data based on

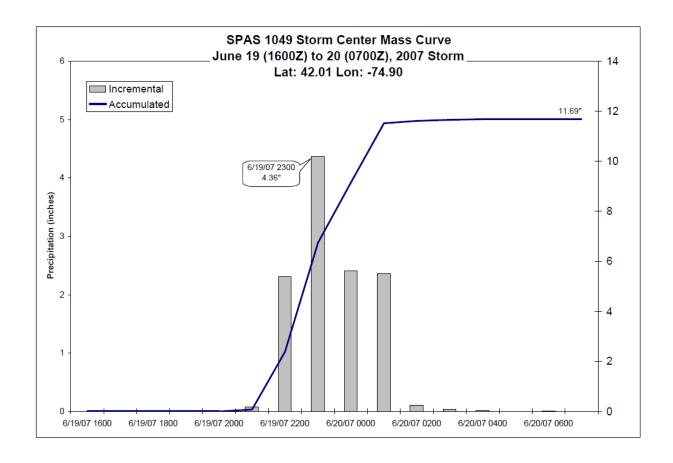
Binghamton, NY (KBGM) NEXRAD.

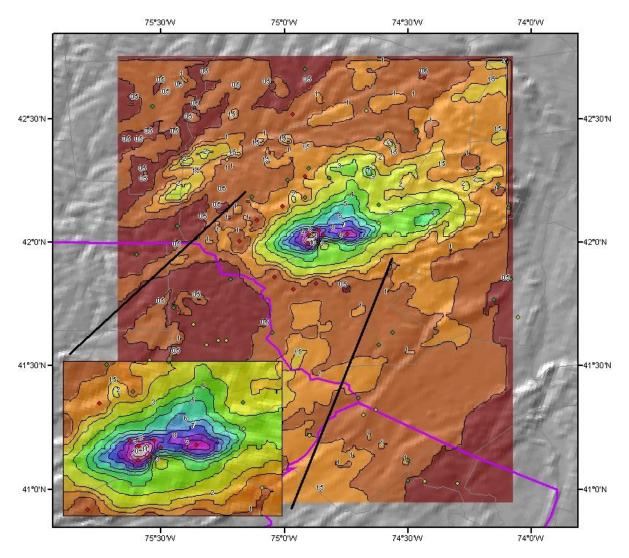
Depth-Area-Duration (DAD) analysis: Yes: 1, 2, 3, 4, 5, 6, 12, & 16 hours

Cu NT	ar.	G 10 10 7		A 187								
Storm Name:			elaware Co	ounty, NY		C	40 mm A	J: at	ant fan	T/inaini	_	
Storm Date: AWA Analysis		9/2007 14/2015				5	wrm A	ajustm	ent for	Virginia	i	
Temporal Trai	nsposition L	Date	1-Jul	_			34 14 3	G D'	4.	0.0.40		
			Lat	Long				Inflow Dire		S @ 40	miles	
Storm Center			42.01 N	74.90 W				rage Elevati		N/A	feet	
Storm Rep De			41.43 N	74.90 W				ter Elevati		2,200	feet	
Transposition		Location						lysis Durat		6	hours	
Basin Location	n						Effective B	Barrier Hei	ght	N/A	feet	
	storm repre			71.0 F		precipitable					2.36	inches.
	he in-place n		•	76.0 F		precipitable					2.99	inches.
The trans	spositioned n			0.0		precipitable					#N/A	inches.
			elevation is	2,200		ch subtracts			f precipitable		71.0 F	
			elevation is	2,200		ch subtracts	0.55		f precipitable		76.0 F	
	he transposit			N/A		ch subtracts			precipitable		0.0	
The inflo	w barrier/bas	sın elevatı	on height is	N/A	whi	ch subtracts	X.XX	inches of	f precipitable	water at	0.0	
		_				1						
				ion factor is	1.28		Notes: 6rf	n average Td	of 71° from	KMSV, KMO	ĴJ, KMPO.	
	The transp			sin factor is	#N/A							
		The bar	rier adjustm	ent factor is	#N/A							<u> </u>
		771	atal adit	ant fact	#N1/A							
		rne to	nai adjustm	ent factor is	#N/A	<u> </u>						<u> </u>
C	10.	D (1	A P									
Ob	served Stori	m Depth-A			10 П	24 11	20 11	26 11	40 II	CO II	72 11	
		1 1-	6 Hours	12 Hours	18 Hours	24 Hours	30 Hours	36 Hours	48 Hours	60 Hours	72 Hours	-
		1 sq mile	11.4 10.9	11.7	-	-	-	-	-	-	-	-
		sq miles	10.9	11.0	-	-	-	-	-	-	-	
		sq miles		10.4 7.8	-	-	-	-	-	-	-	
		sq miles	7.6 6.3	6.4	-	-	-	-	-	-	-	ł —
		sq miles sq miles	4.4	4.6	-	-	-	-	-	-	-	
	~~~~~	sq miles	3.2	3.3	-	-	-	-	-	-	<del>                                     </del>	-
		sq miles	1.3	2.4	-	-	-	-	-	-	-	
		sq miles	0.8	1.1	-	-	-	-	-	-	-	
***************************************		sq miles	- -	1.1		-	-	-	-			
	20000	sq miles	-	-		-	-	-	-	-	-	
C+-	rm or Storm	Conton No			CD AC 1040 T	)-l C	4 NIX7					1
	rm Date(s)	Center Na	une		SPAS 1049-I 6/19/2007	Jeraware Co	bunty, N 1					
	rm Type				Thunderstorm	18						1
	rm Location				42.01 N	74.90 W					-	1
	rm Center El				2,200	, <del>1</del> .20 W					-	1
	cipitation To		ation		11.62 Inches;	6 Hrs SPAS	S 1049 11 6	9 in 12hrs				1
110	primion 10	a Date			- 1.02 menes,	, , , , , , , , , , , , , , , , , , , ,	,					i –
Sto	rm Represen	tative Dev	v Point		71.0 F	6						1
	rm Represen			tion	41.43 N	74.90 W						1
Ma	ximum Dew	Point			76.0 F							
	isture Inflow				S @ 40							
	olace Maxim		ctor		1.28							
Ten	nporal Trans	osition D	ate		1-Jul							
Tra	nsposition D	ew Point I	Location									
Tra	nsposition M	Iaximum D	Dew Point									
Tra	nsposition A	djustment	Factor		#N/A							
Ave	erage Basin E	levation			N/A							
Hig	ghest Elevatio	on in Basin	1		N/A							
Infl	ow Barrier H	leight			N/A							
Bar	rier Adjustm	ent Factor			#N/A							
Tot	al Adjustmer	nt Factor			#N/A							

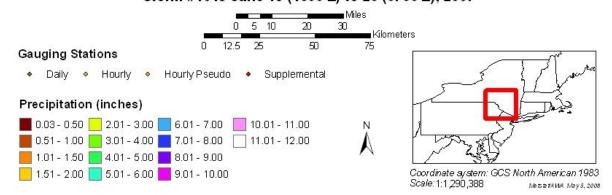
Storn	n 1049 -	June 1	9 (1600	UTC) -	June 2	0 (0700	UTC), 2	2007						
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
A (:2)				Duration	(hours)									
Area (mi²)	1	2	3	4	5	6	12	Total						
0.3	4.36	6.77	9.14	11.45	11.55	11.62	11.69	11.69						
1	4.32	6.72	9.05	11.37	11.36	11.40	11.49	11.49						
10	3.53	5.77	8.09	10.19	10.28	10.28	10.42	10.42						
25	3.10	5.28	7.22	9.07	9.20	9.40	9.51	9.51						
50	2.74	4.82	6.60	8.21	8.46	8.65	8.83	8.83						
100	2.28	4.16	5.77	7.13	7.42	7.60	7.77	7.77						
200	1.91	3.56	4.74	5.75	6.09	6.25	6.40	6.40						
300	1.76	3.21	4.19	4.96	5.13	5.39	5.51	5.51						
500	1.52	2.65	3.46	4.05	4.29	4.44	4.60	4.60						
1,000	1.09	1.87	2.40	2.83	3.06	3.22	3.34	3.34						
2,000	0.74	1.25	1.60	1.75	2.03	2.15	2.44	2.44						
5,000	0.31	0.67	0.67	0.99	1.19	1.32	1.62	1.62						
10,000	-	0.35	0.52	0.66	0.75	0.84	1.11	1.11						



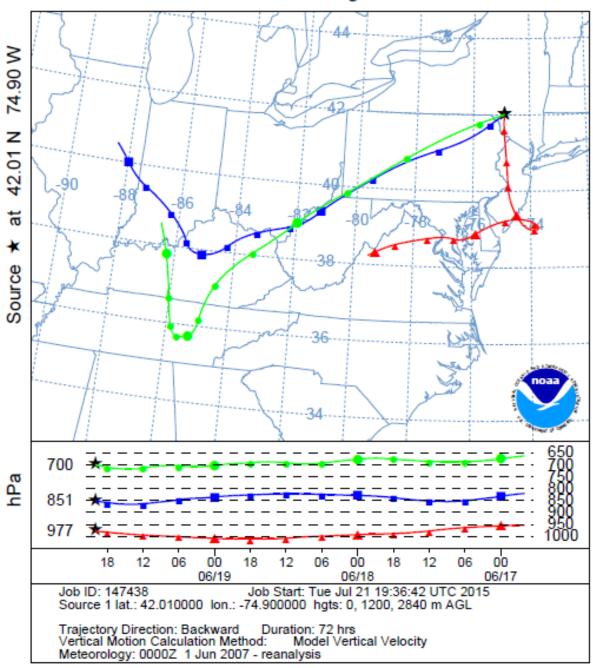


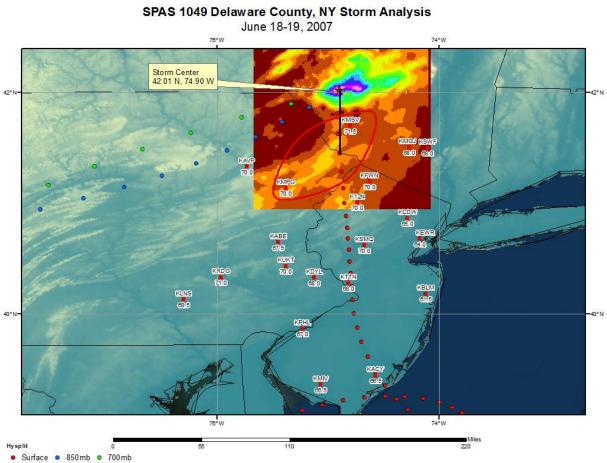


Total Rainfall (16-hours)
Delaware County, NY 2007 Storm
Storm #1049 June 19 (1600 Z) to 20 (0700 Z), 2007



# NOAA HYSPLIT MODEL Backward trajectories ending at 2000 UTC 19 Jun 07 CDC1 Meteorological Data





### Storm Precipitation Analysis System (SPAS) For Storm #1415 SPAS Analysis

General Storm Location: Islip, NY

Storm Dates: August 13, 2014

**Event**: Convective

**DAD Zone 1** 

**Latitude**: 40.805

Longitude: -73.065

Max. Grid Rainfall Amount: 14.23"

Max. Observed Rainfall Amount: 13.51"

Number of Stations: 253 (96 Daily, 97 Hourly, 11 Hourly Pseudo, 49 Supplemental, and 0 Supplemental

Estimated)

**SPAS Version**: 9.5/10.0

Basemap: Default ZR Radar Estimated Rainfall

Spatial resolution: 0.01 (~ 0.40 mi²)

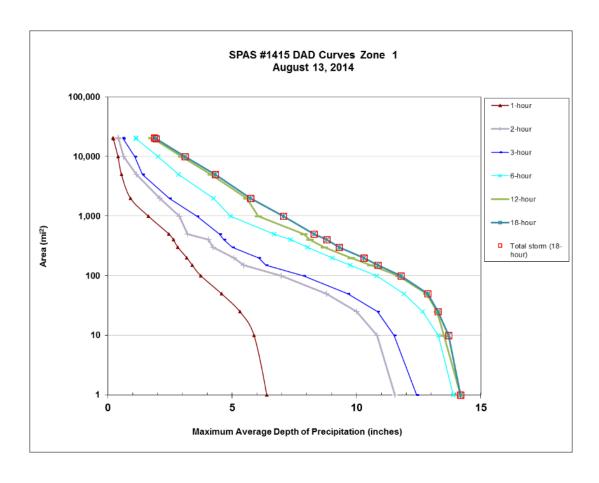
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

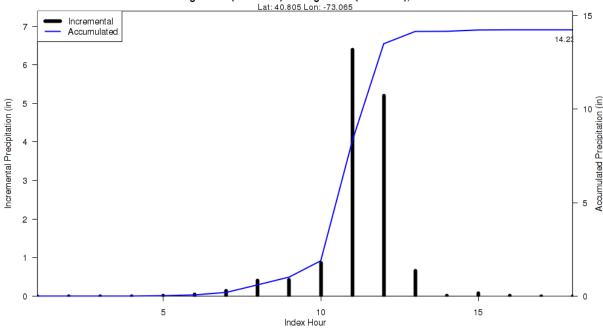
**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly and hourly pseudo stations.

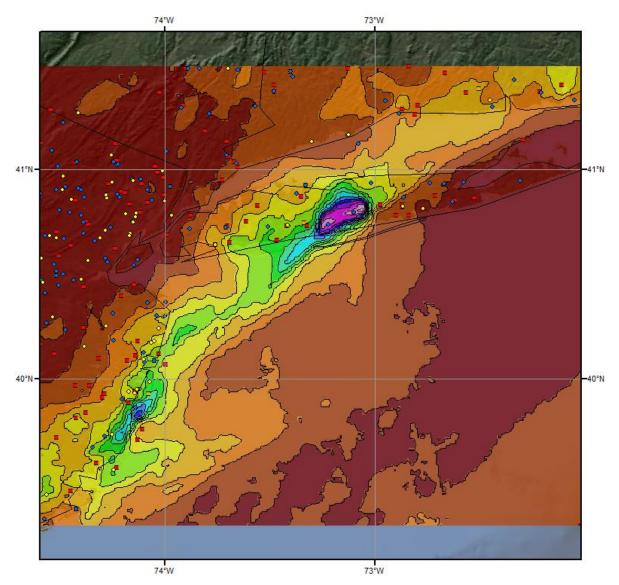
Storm Name:	Islip, NY SP	AS 1415			C		1	4.6	<b>T</b> 7• • •		
Storm Date: AWA Analysis Date:	8/13/14 11/14/2015			ł	Si	torm A	djustme	ent for	Virgini	a	
·	,	15 A									
Temporal Transpos	Ition Date	15-Aug Lat	Lon			Moisture	Inflow Dire	ction	S @ 160	miles	
Storm Center Locat	i an	40.81 N	73.07 W				rage Elevati		N/A	feet	
							Ŭ		100		
Storm Rep SST Loc Transposition SST I		38.50 N	73.00 W				iter Elevati ilysis Durat		24	feet	
Basin Location	жаны						Barrier Hei		N/A	feet	
Justin Edetation						Elicetric	Juli I I CI	511t	14/71	Teet	
The	storm represent	tative SST is	76.5 F	with tota	l precipitabl	e water abov	ve sea level o	of		3.07	inches.
	he in-place maxi		78.5 F				ve sea level o			3.37	inches.
	positioned maxi		0.0				ve sea level o			#N/A	inches.
Th	e in-place storm	elevation is	100	feet whi	ch subtracts	0.03	inches of	precipitable	e water at	76.5 F	
Th	e in-place storm	elevation is	100	feet whi	ch subtracts	0.03	inches of	precipitable	e water at	78.5 F	
The tra	nsposition basin	elevation at	N/A	feet whi	ch subtracts	x.xx	inches of	precipitable	e water at	0.0	
The inflow bar	rier/basin elevati	ion height is	N/A	feet whi	ch subtracts	X.XX	inches of	precipitable	e water at	0.0	
	he in-place storn						rm represent				
The	transposition/ele			-			on August 12		n where tem	peratures	
	The bar	rier adjustme	ent factor is	#N/A		were betwe	en 76 and 77	∕°F.			
	The t	otal adjustme	ent factor is	#N/A							
											-
	Observed Sto	orm Depth-A		<del>~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~</del>	T 0.11	1	1	40.77	10477		
			1 Hours	2 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours		
		1 sq mile	6.4	11.5	12.4	13.9	14.2	14.2			
	1	10 sq miles 100 sq miles	5.9 3.7	10.8 7.0	11.5 7.9	13.3 10.8	13.5 11.7	13.7 11.8			
		200 sq miles	3.2	5.1	6.1	9.0	9.8	10.3			
		500 sq miles	2.5	3.2	4.5	6.7	7.9	8.3			
		000 sq miles	1.6	2.9	3.6	4.9	6.1	7.1			
		000 sq miles	0.9	2.1	2.5	4.3	5.6	5.8			
		000 sq miles	0.6	1.2	1.4	2.9	4.2	4.3			
		000 sq miles	0.4	0.6	1.1	2.0	3.0	3.1			
		000 sq miles	0.2	0.4	0.6	1.1	1.8	1.9			
Storm or	Storm Center N	ame		Islip, NY SI	AS 1415						1
Storm Da			_	8/13/2014							
Storm Ty	pe			Convective							
Storm Lo	cation			40.81 N	73.07 W						
Storm Ce	nter Elevation			100							
Precipita	tion Total & Dur	ation (10 sq	mi)	11.38 inches	in 18 hours						1
_					2.1						1
	presentative SST			76.5 F	24						-
	presentative SST	Location		38.50 N	73.00 W				<del>                                     </del>		1
Maximur	Inflow Vector			78.5 F							1
	Inflow vector  Maximization Fa	ator		S @ 160 1.10	-	-	-				1
in-prace l	viaxiiiiizälion Fä	CiOI		1.10							-
Tempora	Transposition (	Date)		15-Aug							1
	tion SST Location			10 1 Mg							
	tion Maximum S										
	tion Adjustment			#N/A							
	Basin Elevation			N/A							1
	Elevation in Basis	n		N/A							1
	rrier Height			N/A							
	djustment Facto	r		#N/A							
	ustment Factor			#N/A							1

SPAS	1415 - Au	ugust 13	(0100 UT	C) - Aug	ust 13 (1	800 UTC)	, 2014
	MAXIMU	M AVERAG	E DEPTH	OF PRECI	PITATION	(INCHES)	
			Dı	uration (hou	rs)		
Area (mi²)	1	2	3	6	12	18	Total
0.4	6.44	11.60	12.47	13.95	14.23	14.23	14.23
1	6.39	11.54	12.42	13.90	14.18	14.19	14.19
10	5.88	10.83	11.51	13.29	13.51	13.71	13.71
25	5.31	10.00	10.84	12.66	13.25	13.27	13.27
50	4.57	8.79	9.65	11.90	12.81	12.86	12.86
100	3.74	6.97	7.87	10.81	11.68	11.79	11.79
150	3.40	5.46	6.36	9.75	10.58	10.86	10.86
200	3.18	5.08	6.07	9.03	9.78	10.29	10.29
300	2.82	4.23	5.00	8.03	8.71	9.30	9.30
400	2.64	4.04	4.66	7.35	8.12	8.80	8.80
500	2.46	3.21	4.50	6.69	7.88	8.29	8.29
1,000	1.63	2.89	3.58	4.93	6.05	7.06	7.06
2,000	0.91	2.10	2.47	4.25	5.59	5.75	5.75
5,000	0.55	1.16	1.39	2.85	4.15	4.32	4.32
10,000	0.41	0.64	1.08	2.02	2.97	3.11	3.11
20,000	0.22	0.43	0.62	1.14	1.84	1.94	1.94
20,565	0.21	0.42	0.60	1.13	1.77	1.87	1.87

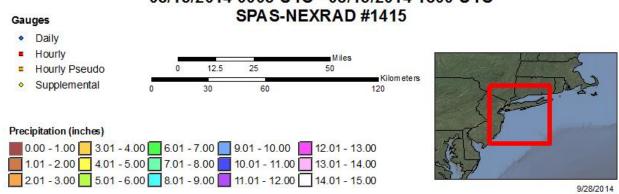


### SPAS 1415 Storm Center Mass Curve Zone 1 August 13 (0100UTC) to August 13 (1800UTC), 2014 Lat: 40.805 Lon: -73.065

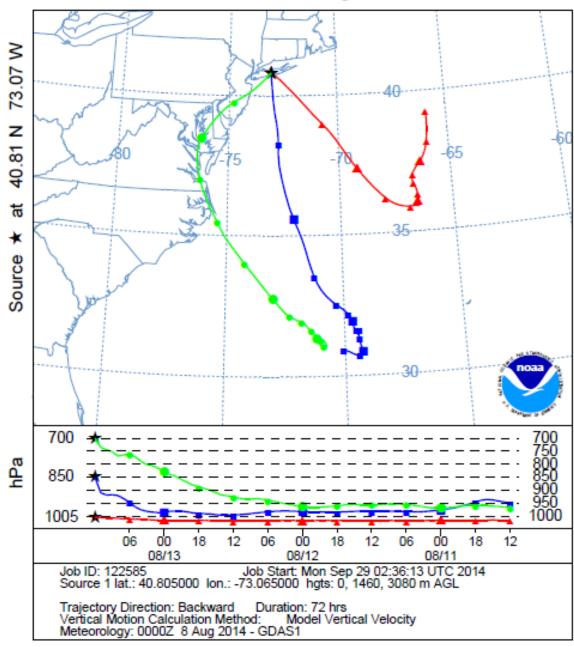




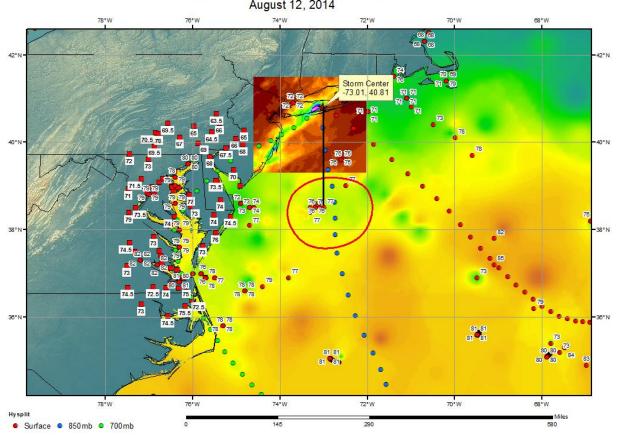
Total Storm (18-hr) Precipitation (inches) 08/13/2014 0005 UTC - 08/13/2014 1800 UTC SPAS-NEXRAD #1415



NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 13 Aug 14
GDAS Meteorological Data



### SPAS 1415 Islip, NY Storm Analysis August 12, 2014



## **Tropical Storms**

### Storm Precipitation Analysis System (SPAS) For Storm #1515 SPAS Analysis

General Storm Location: Florida, Georgia, South Carolina

Storm Dates: August 28 - August 31, 1911

**Event**: Tropical Cyclone and Synoptic Event

**DAD Zone 1** 

Latitude: 30.5208

**Longitude**: -82.0208

Max. Grid Rainfall Amount: 19.12"

Max. Observed Rainfall Amount: 19.10" (St. George, GA)

Number of Stations: 109

SPAS Version: 10.0

Basemap: Combined manually contoured basemap with August 1911 monthly precipitation grid

Spatial resolution: .2824

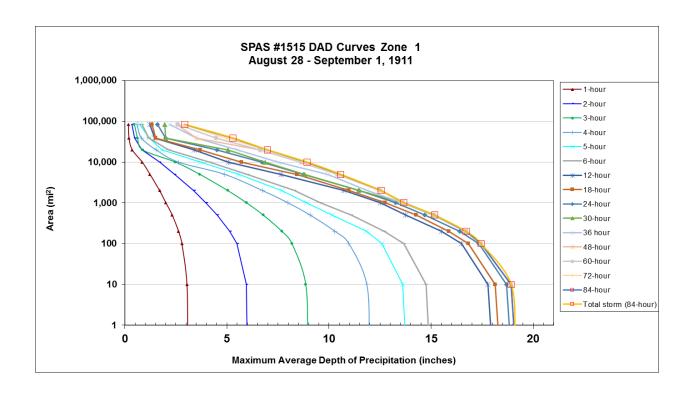
Radar Included: No

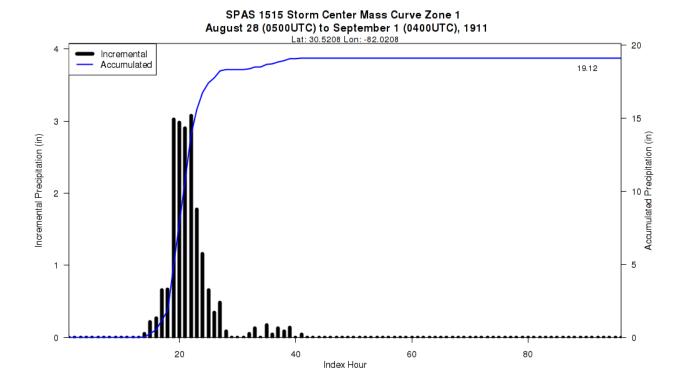
Depth-Area-Duration (DAD) analysis: No

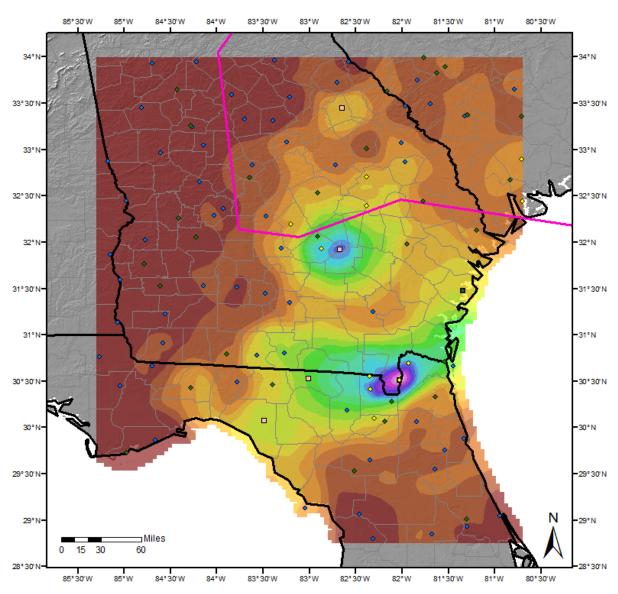
Reliability of results: While no NCDC hourly stations were available for this storms, six estimated hourly stations were digitized from the U.S. Army Corp of Engineers (USACE) Storm Study 3-11 Pertinent Data Sheet. These six stations provided all the SPAS timing and included the storm centers at St. George, Florida and Lumber City, Georgia; there were no official hourly recorder stations for this event. In order to confine the storm center, the USACE isohyetal map was reproduced and combined with PRISM monthly precipitation for use in the basemap, and three estimated stations were added surrounding St. George, FL. Reported timing for precipitation at Lumber City, GA is conflicting between the USACE mass curve, which has approximately 9 of 14 inches falling on the 8/29 and then approximately 2 inches on 8/30, and the AMS Monthly Weather Review (MWR), which reports 4.15 inches on 8/29 and 9.37 inches on the morning 8/30. Given the less-detailed timing of the precipitation from MWR and the similarity in timing between the mass curve at Lumber City and Jasper, FL, the USACE reported timing was used. Extensive efforts were done to match the SPAS DAD with the USACE DAD as close as possible. At the smallest area sizes, results are comparable, however given discrepancies in timing and lack of complete information from the USACE Data Sheet, a complete match between SPAS and USACE is not feasible. In order to continue this analysis, the USACE full report would be necessary, however it is currently unavailable. Given these conditions, the analysis is deemed reasonable and provides and accurate depiction of the storm event.

Storm Date: AWA Analysi		3/28 - 9/1/1 1/14/2015				S	Storm A	djustm	ent for	Virgini	a			
Temporal Tr			15-Aug											
cinporai ii	anspositio	n Date	Lat	Long			Moisture I	nflow Direc	tion	SE @ 390	miles			
Storm Cente	T4!	_	30.52 N	82.02 W						N/A				
								age Elevati		0	feet			
Storm Rep S			27.00 N	77.00 W				ter Elevatio			feet			
Franspositio Basin Locati		ation						lysis Durati arrier Heig		24	hours feet			
asın Locau	on						Ellective b	arrier Heig	nı	N/A	Teet			
	The sto	rm represei	ntative SST is	83.5 F	with to	tal precipitab	ole water abo	ve sea level o	of		4.16	inches.		
	The i	n-place max	imum SST is	86.0 F		tal precipitab					4.56	inches.		
Th	ne transpos	itioned max	imum SST is	0.0	with to	tal precipitab	ole water abo	ve sea level o	of		#N/A	inches.		
			n elevation is	0		ich subtracts			f precipitable	e water at	83.5 F			
	The in-	place storn	n elevation is	0	feet wh	ich subtracts	0.00	inches of	precipitable	e water at	86.0 F			
,			n elevation at	N/A		ich subtracts			f precipitable		0.0			
			tion height is	N/A		ich subtracts			precipitable		0.0			
					,	1	-							
			rm maximizati		1.10 #N/A					s based on SS region where t				
	Ine trai		levation to ba		#N/A #N/A					arge area and				
		The ba	arrier adjustme	ent factor is	#IN/A		closest to the		-8			-		
		Tho	total adjustme	ant factor is	#N/A									
		THE	totai aujustiik	ent ractor is	#IV/A									
bserved Sto	orm Depth	-Area-Dur	ation											
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hot
10	sq miles	3.0	5.9	8.9	11.9	13.6	14.8	17.8	18.1	18.7	18.9	18.9	18.9	18.9
100	sq miles	2.8	5.5	8.2	11.0	12.6	13.7	16.5	16.8	17.3	17.4	17.4	17.4	17.4
200	sq miles	2.6	5.1	7.7	10.3	11.8	12.7	15.5	15.9	16.4	16.7	16.7	16.7	16.7
500	sq miles	2.3	4.5	6.8	9.1	10.2	11.1	13.8	14.3	14.7	15.1	15.1	15.1	15.2
1000	sq miles	2.0	4.0	6.0	8.0	8.9	9.6	12.5	12.7	13.3	13.6	13.6	13.6	13.6
2000	sq miles	1.7	3.4	5.0	6.7	7.7	8.3	10.7	11.0	11.5	11.9	12.5	12.5	12.5
5000	sq miles	1.2	2.4	3.7	4.9	5.6	6.0	7.7	8.4	8.8	9.9	10.4	10.4	10.5
10000	sq miles	0.9	1.7	2.5	2.6	3.7	4.2	5.1	5.7	6.7	7.5	8.6	8.6	8.8
20000	sq miles	0.4	0.8	0.9	1.5	1.8	2.2	3.4	3.7	4.5	5.5	6.6	6.6	7.0
					an . a		~ .					-		
		rm Center	Name			- St. Georg	ge, GA							
	orm Date(	s)			8/28 - 9/1/							-		
	orm Type					clone and Sy	noptic Even							
	orm Locat				30.52 N	82.02 W								
		r Elevation			0	. 0.61						-		
Pi	recipitatioi	Total & D	uration		19.12 inche	es in 96 hour	S							
St	orm Repre	sentative S	ST		83.5 F	24						1		
			ST Location		27.00 N	77.00 W						i		
	Iaximum S				86.0 F							1		
					SE @ 390							1		
	Moisture Inflow Vector In-place Maximization Factor				1.10									
	Temporal Transposition Date Transposition SST Location				15-Aug							-		
		n SST Loca n Maximum										1		
		n Adjustme			#N/A							1		
					N/A							1		
	Average Basin Elevation Highest Elevation in Basin				N/A							1		
	flow Barri		2111		N/A							1		
		er Height stment Fact	or		#N/A							1		
D.	arrier Adili	зинені ғасі	.UI									1		
		ment Factor			#N/A									

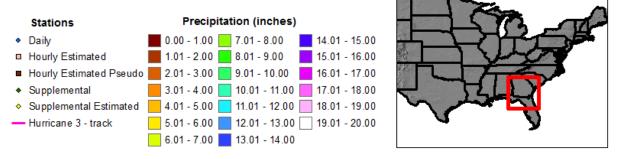
	Storm 1515 - August 28 (0500 UTC) - September 1 (0400 UTC), 1911  MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)															
	Duration (hours)															
Area (mi²)	1														Total	
0.3	3.08	6.00	8.96	11.98	13.76	14.92	17.98	18.34	18.90	19.12	19.12	19.12	19.12	19.12	19.12	19.12
10	3.04	5.94	8.86	11.85	13.61	14.76	17.79	18.14	18.70	18.92	18.92	18.92	18.92	18.92	18.92	18.92
100	2.79	5.49	8.18	10.97	12.59	13.66	16.48	16.82	17.34	17.44	17.44	17.44	17.44	17.44	17.44	17.44
200	2.63	5.13	7.69	10.29	11.82	12.70	15.50	15.87	16.39	16.69	16.69	16.70	16.71	16.71	16.71	16.71
500	2.32	4.52	6.78	9.08	10.16	11.08	13.75	14.26	14.68	15.09	15.12	15.14	15.14	15.15	15.17	15.17
1000	2.01	3.97	5.96	7.99	8.92	9.57	12.50	12.74	13.26	13.57	13.57	13.62	13.62	13.62	13.67	13.67
2000	1.70	3.37	5.04	6.74	7.69	8.30	10.72	10.96	11.47	11.47	11.85	12.48	12.48	12.51	12.54	12.54
5000	1.23	2.43	3.67	4.89	5.57	6.01	7.66	8.44	8.76	8.80	9.94	10.41	10.42	10.46	10.58	10.58
10000	0.85	1.69	2.47	2.62	3.68	4.16	5.08	5.72	6.71	6.88	7.53	8.60	8.63	8.80	8.93	8.93
20000	0.36	0.84	0.86	1.53	1.82	2.16	3.41	3.69	4.52	5.05	5.51	6.64	6.64	6.97	6.99	6.99
39,000	0.20	0.47	0.62	0.81	1.18	1.18	1.47	1.51	1.99	1.99	3.51	3.51	4.47	4.96	5.30	5.30
84,150	0.18	0.33	0.47	0.59	0.72	0.84	1.21	1.34	1.59	1.96	2.21	2.54	2.61	2.88	2.94	2.94



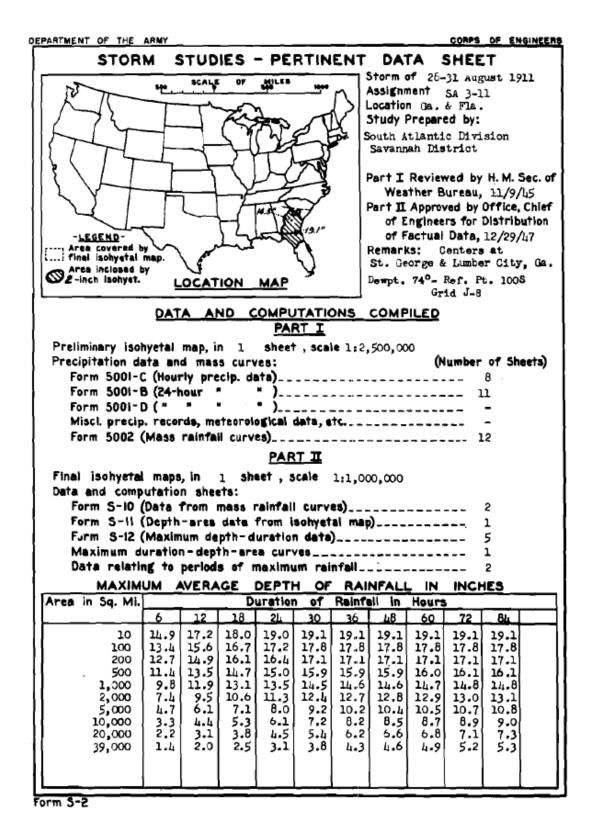


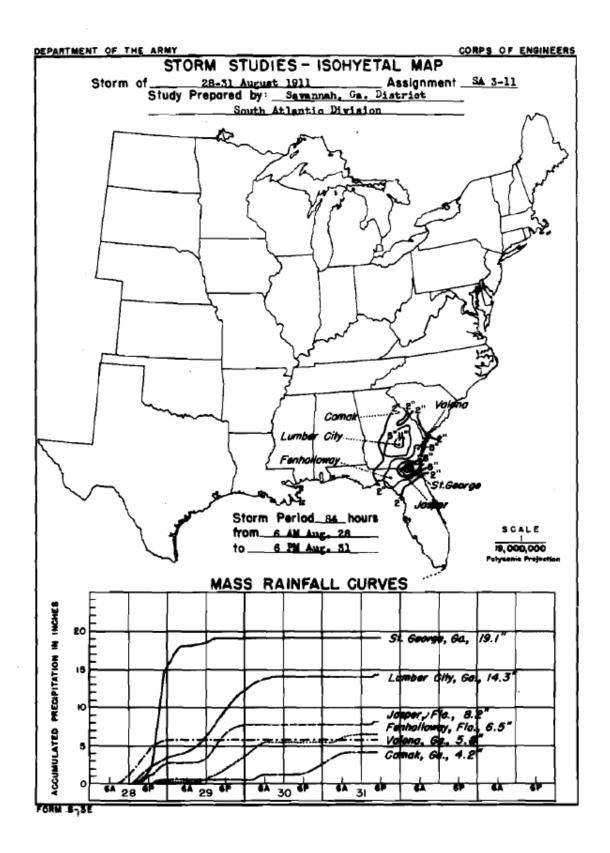


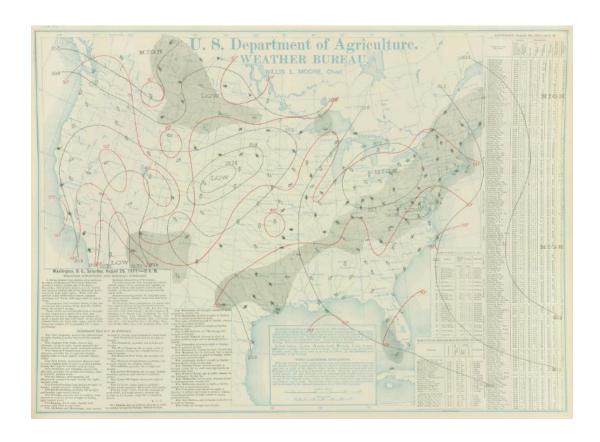
Total 96-hour Precipitation (inches)
August 28, 1911 (0500 UTC) - September 1, 1911 (0400 UTC)
SPAS #1515

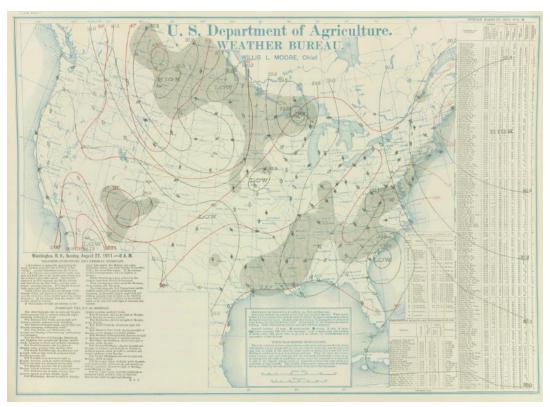


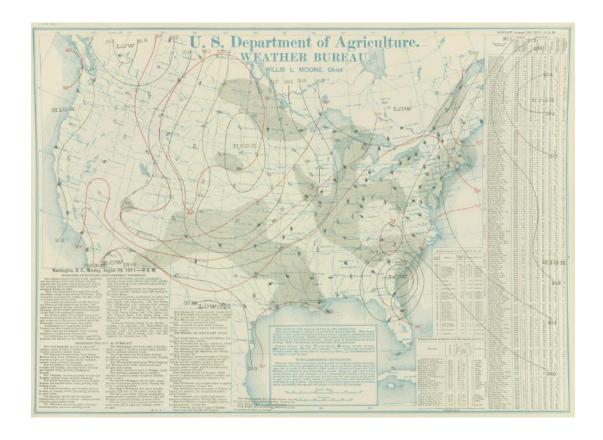
ADH 04/03/2015

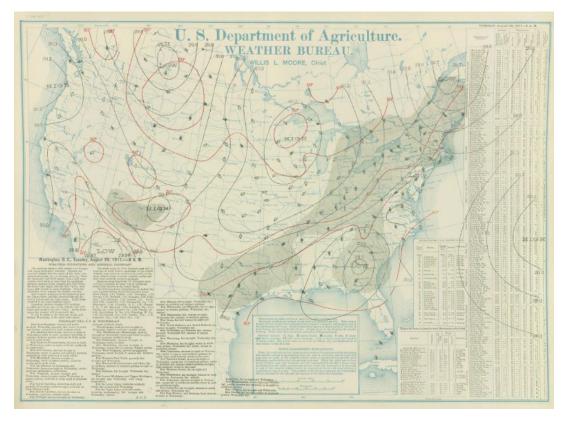


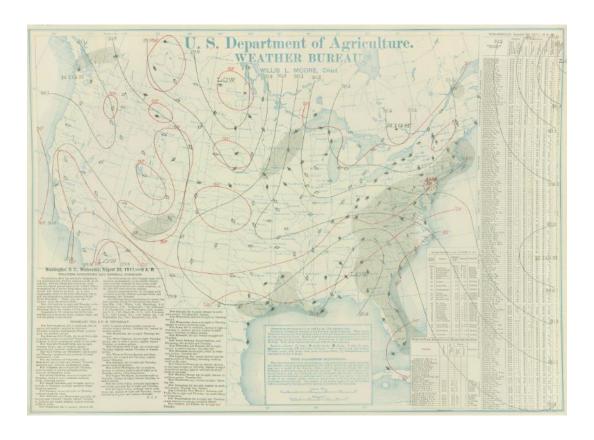


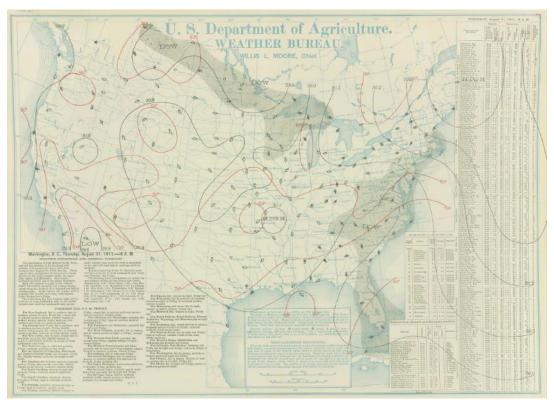


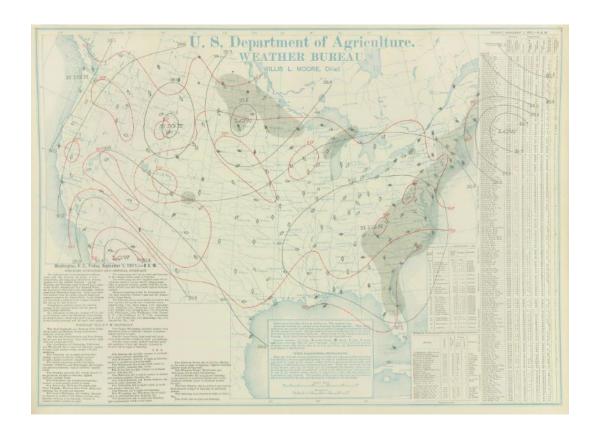




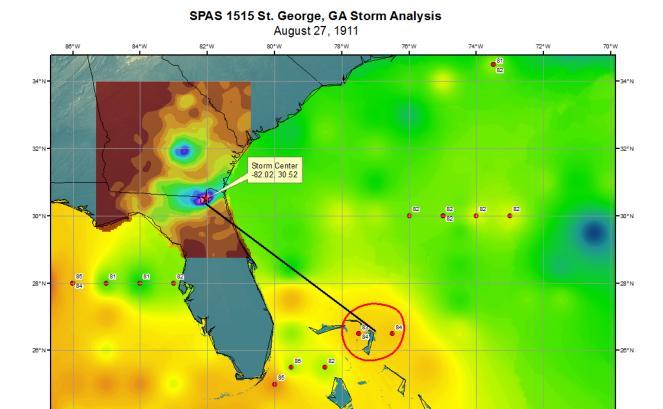








72°W



86°W

82°W

80°W

# Storm Precipitation Analysis System (SPAS) For Storm #1299 SPAS Analysis

General Storm Location: North Carolina and South Carolina

Storm Dates: July 13-17, 1916

Event: Alta Pass, NC (SA 2-9) and Kingstree, SC (SA 2-9a)

**DAD Zone 1** 

Latitude: 35.8792

Longitude: -81.8708

Max. Grid Rainfall Amount: 24.90"

Max. Observed Rainfall Amount: 23.73"

DAD Zone 2

Latitude: 33.6625

**Longitude**: -79.8292

Max. Grid Rainfall Amount: 16.79"

Max. Observed Rainfall Amount: 16.77"

Number of Stations: 240 (194 Daily, 1 Hourly, 6 Hourly Pseudo, and 39 Supplemental)

SPAS Version: 9.5

Basemap: PRISM July 1916 Precipitation

**Spatial resolution:** 00:00:30 (~ 0.30 mi²)

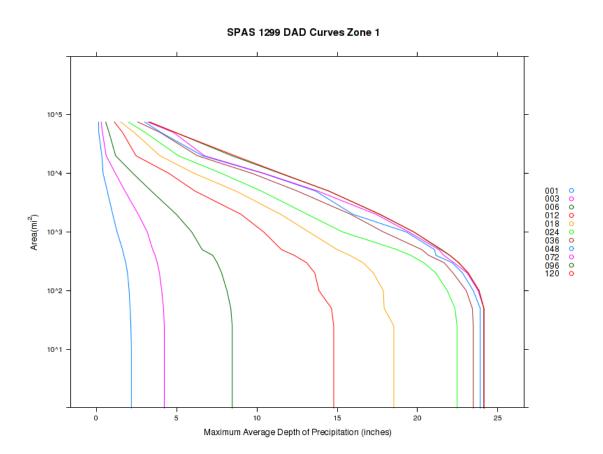
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

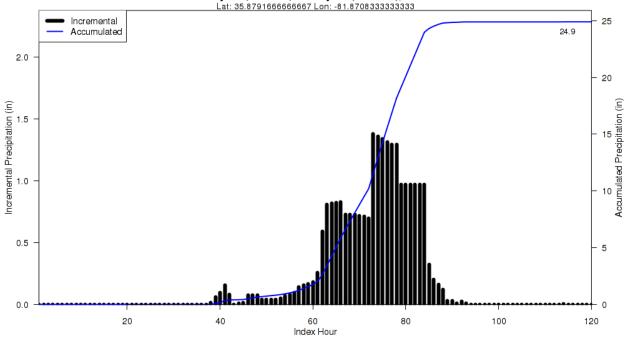
**Reliability of results:** This analysis was based on hourly data, Hourly pseudo data (derived from storm study mass curves), daily data, and supplemental station data. We have a high degree of confidence in the station based storm total results, the spatial pattern is dependent on basemap, and the timing is based on hourly and hourly pseudo stations.

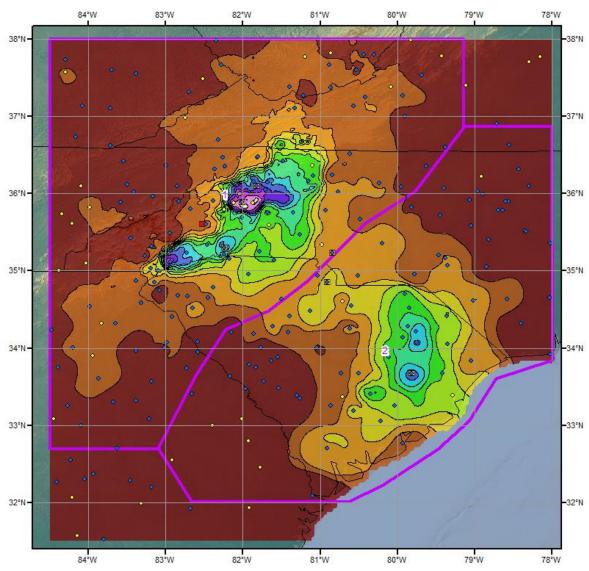
Storm Name:	SPAS 1299 - A	Alta Pace NC									
Storm Date:	7/13-17/1916				S	Storm A	diuctm	ent for	Virgini	9	
AWA Analysis Date:					D	ioi iii A	ajustin	ciit ioi	v II giiii	а	
Temporal Transposi		15-Jul									
Temportal Transposi	tron Dute	Lat	Long			Moisture I	nflow Direc	tion	SE @ 70	miles	
Storm Center Locat	ion	35.88 N	81.87 W				age Elevati		N/A	feet	
		35.23 N	80.95 W				ter Elevatio		2,000	feet	
Storm Rep Dew Poil Transposition Dew 1		35.23 N	80.95 W				ter Erevatio lysis Durati		24	hours	
Basin Location	oint Location						arrier Heig		N/A	feet	
Dusin Eccution						Elective B	urrier rierg	,111	1 1/11	reet	
The stor	m representative	dew point is	74.0 F	with tot	al precipitab	ole water abo	ve sea level o	of.		2.73	inches.
	-place maximum	-	78.5 F			ole water abo				3.37	inches.
	tioned maximum	•	0.0			ole water abo				#N/A	inches.
	he in-place storr	•	2,000		ich subtracts			precipitable	water at	74.0 F	
Т	he in-place storn	n elevation is	2,000	feet whi	ich subtracts		inches of	f precipitable	e water at	78.5 F	
The tr	ansposition basi	n elevation at	N/A	feet whi	ich subtracts	X.XX		f precipitable		0.0	
	rrier/basin eleva		N/A	feet whi	ich subtracts	X.XX	inches of	precipitable	e water at	0.0	
					_						
	The in-place stor	rm maximizati	on factor is	1.25			rep Td taken	from TVA Flo	ods and Flood	Control,	
Th	e transposition/e	elevation to ba	sin factor is	#N/A		Figure 47.					
	The ba	arrier adjustm	ent factor is	#N/A							
	The	total adjustm	ent factor is	#N/A							
Observed	Storm Depth-A	Area-Duratio	n	,	<del></del>	,	<del></del>			,	
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours
	1 sq miles	·	8.5	14.8	18.5	22.5	23.5	23.9	24.1	24.1	24.1
	10 sq miles	·	8.5	14.8	18.5	22.5	23.5	23.9	24.1	24.1	24.1
	100 sq miles		8.1	13.9	17.9	21.9	23.0	23.5	23.8	23.8	23.8
	200 sq miles	ļ	7.8	13.6	17.3	21.1	22.2	22.8	23.1	23.2	23.2
	500 sq miles		6.6	11.5	15.0	18.7	20.3	21.1	21.3	21.5	21.5
	1000 sq miles	<u> </u>	5.9 5.0	10.4 9.0	13.2	15.3 13.2	17.9	19.3 16.0	19.5 17.4	19.8 17.6	19.8 17.7
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	2000 sq miles 5000 sq miles	<u> </u>	3.4	6.1	11.5 8.7	10.3	15.8 12.5	13.7	13.8	14.5	14.5
	10000 sq miles		2.3	4.5	6.1	7.8	9.7	10.4	10.5	11.5	11.5
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	20000 sq miles	·	1.2	2.5	4.0	5.1	6.3	6.6	6.7	8.4	8.6
	50000 sq miles		0.8	1.6	2.4	3.0	4.0	4.0	4.8	4.9	4.9
	50000 sq miles	0.2	0.0	110	2.1	5.0	1.0	110	110	112	11.7
Storm or	Storm Center Na	me		SPAS 1299	- Alta Pass	NC					
Storm Dat				7/13-17/19		, , , , ,					
Storm Typ				Tropical rea							
Storm Loc				35.88 N	81.87 W						
	nter Elevation			2,000							
	ion Total & Dura	ation		24.9 inches	96-hours						
Storm Re	oresentative Dew	Point		74.0 F	24						
Storm Re	oresentative Dew	Point Location	on	35.23 N	80.95 W						
	Dew Point			78.5 F							
	Inflow Vector			SE @ 70							
In-place N	laximization Fac	tor		1.25							
	<u> </u>			15.1.							
	Transposition (E			15-Jul							
	tion Dew Point I										
	tion Maximum D			HNT/A							-
	tion Adjustment	ractor		#N/A							
	asin Elevation			N/A							
	levation in Basin			N/A							
	rrier Height			N/A	-	-					
	ljustment Factor			#N/A #N/A	-	-					
iotai Adji	stment Factor			#N/A							I

	Storm 1299 - July 13 (0600 UTC) - July 18 (0500 UTC), 1916												
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)  Duration (hours)												
Area (mi ² )	1	3	6	12	18	24	36	48	72	96	120	Total	
0.3	2.27	4.34	8.67	15.17	19.02	23.15	24.23	24.62	24.89	24.90	24.90	24.90	
1	2.18	4.23	8.46	14.78	18.52	22.46	23.47	23.90	24.13	24.13	24.13	24.13	
10	2.18	4.23	8.46	14.78	18.52	22.46	23.47	23.90	24.13	24.13	24.13	24.13	
25	2.15	4.23	8.46	14.78	18.52	22.46	23.47	23.90	24.13	24.13	24.13	24.13	
50	2.10	4.18	8.37	14.64	17.92	22.33	23.41	23.90	24.13	24.13	24.13	24.13	
100	2.04	4.07	8.13	13.86	17.87	21.85	23.03	23.47	23.77	23.83	23.83	23.83	
200	1.94	3.93	7.80	13.60	17.25	21.14	22.21	22.80	23.09	23.15	23.16	23.16	
300	1.83	3.79	7.52	13.09	16.60	20.38	21.65	22.15	22.26	22.55	22.57	22.57	
400	1.71	3.66	7.25	12.32	15.78	19.57	20.69	21.14	21.63	22.00	22.01	22.01	
500	1.63	3.51	6.59	11.53	15.00	18.73	20.27	21.06	21.33	21.45	21.51	21.51	
1,000	1.29	3.17	5.94	10.42	13.24	15.34	17.88	19.30	19.46	19.77	19.77	19.77	
2,000	1.02	2.61	4.98	9.01	11.48	13.15	15.84	15.99	17.42	17.64	17.67	17.67	
5,000	0.68	1.78	3.42	6.14	8.69	10.27	12.51	13.65	13.78	14.47	14.47	14.47	
10,000	0.42	1.19	2.28	4.52	6.09	7.79	9.70	10.39	10.45	11.45	11.52	11.52	
20,000	0.34	0.61	1.20	2.47	3.96	5.11	6.29	6.61	6.73	8.44	8.64	8.64	
50,000	0.15	0.38	0.79	1.63	2.35	3.04	3.97	4.02	4.80	4.91	4.92	4.92	
75,378	0.14	0.30	0.58	1.12	1.51	1.99	2.58	3.01	3.20	3.31	3.31	3.31	

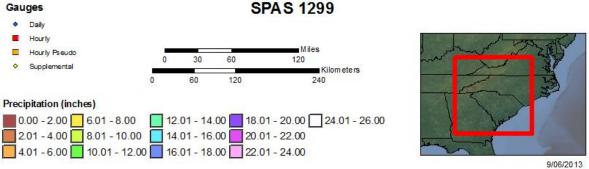


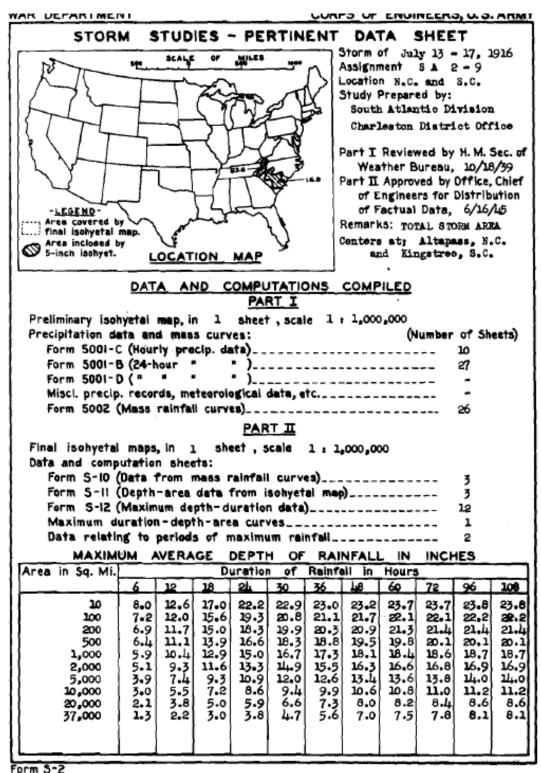
### SPAS 1299 Storm Center Mass Curve Zone 1 July 13 (600UTC) to July 18 (500UTC), 1916 Lat: 35.87916666666667 Lon: -81.87083333333333



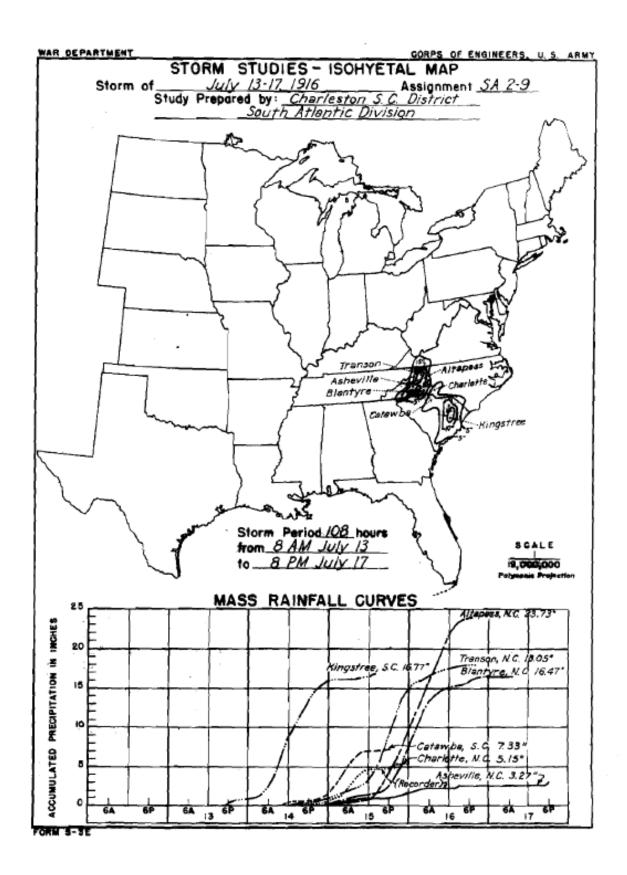


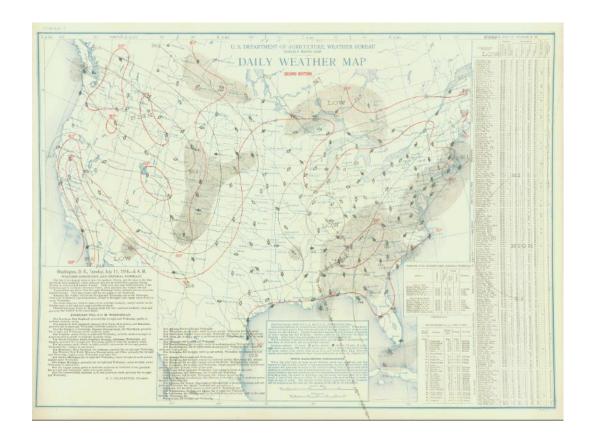
Total Storm (120-hr) Precipitation (inches) July 13-17, 1916 - Alta Pass, NC SPAS 1299

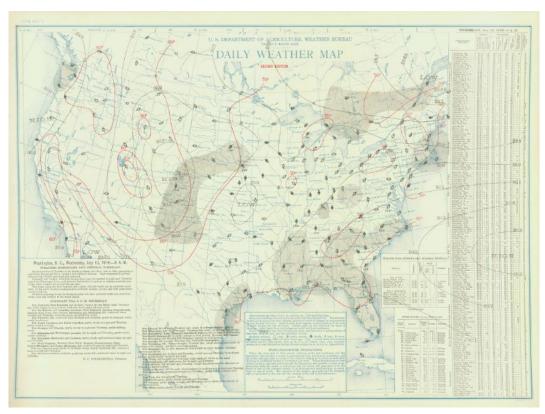


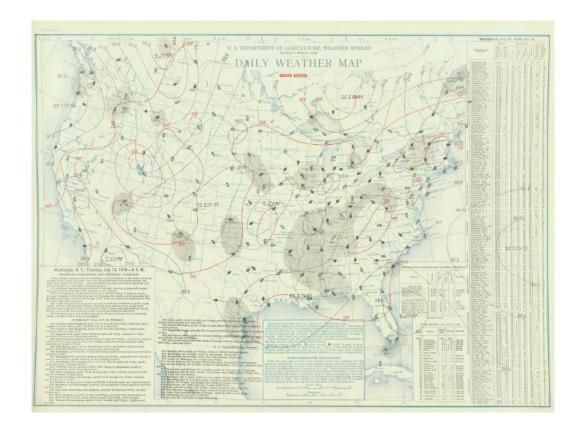


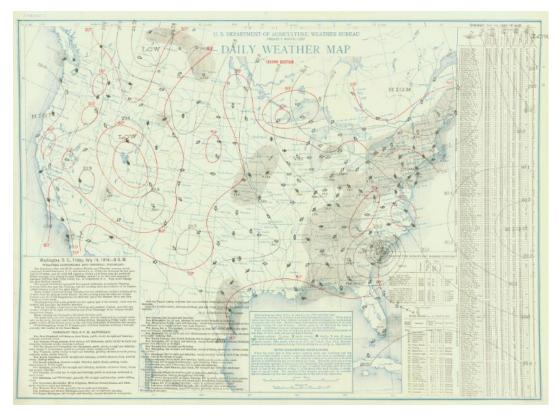
For Property on the Facility

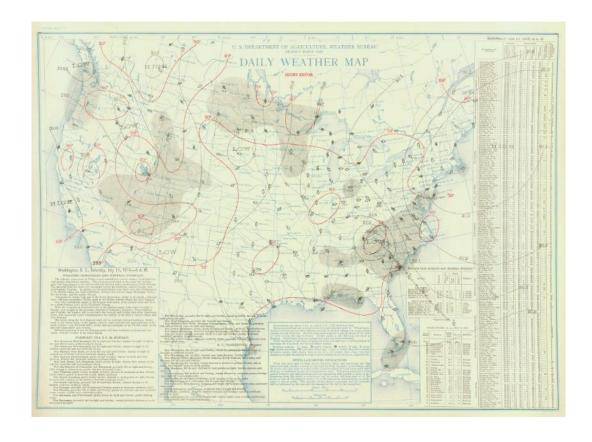


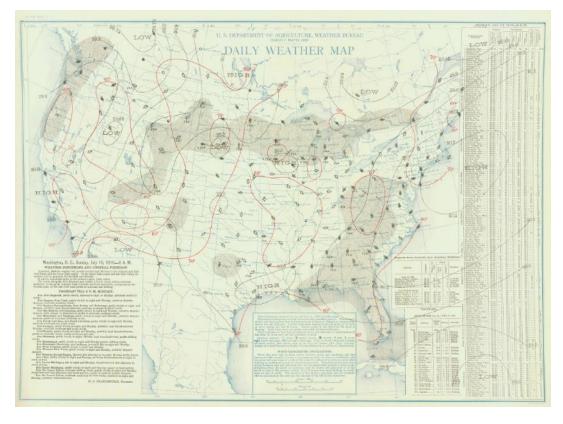


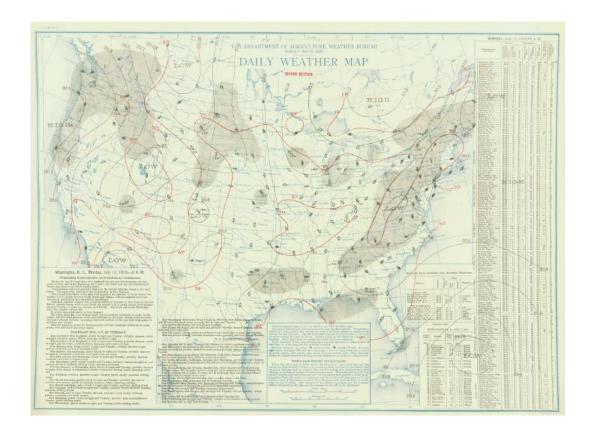












### FLOODS AND FLOOD CONTROL

TVA 3414 (WCP-2-46) Tennessee Valley Authority

Hydraulic Data Division

Observed and Maximum Factors of Storm Adjustment and Transposition

ocation oflow D oflow B ow Poin	Western irection arrier H t Station to Barr	SE-31 = 1600 n Charlo	arolina 0 tte, N.	C.	Basin Frenc Inflow Direc Inflow Barri Maximum Dew Barrier 50 1	tion SSE er H'= 2000 Point Locat	ve Ashevi	P Inflow
(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)
T Hours	DP(obs) Degrees	DP(max) Degrees	Inches	We(max) Inches H'= 2000		R	D(obs) Inches	D(max) Inches
1								
3								
6	74.8	76.9	1.42	1.57		1.104	6.0	6.6
12	74.5	76,6	1.40	1.55		1.107	10.4	11.5
18	74.2	76.3	1.37	1.51		1.101	13.0	14.3
24	74.0	76,1	1,35	1.49		1.103	15.1	16.7
30	73.8	75.9	1.33	1.47		1.105	16.8	18,6
36	73.6	75.7	1.31	1.45		1.107	17.4	19.3
42	73.6	75.7	1.31	1.45		1.107	18.1	20.0
48	73.5	75.6	1.30	1.44		1.108	18.2	20.2
54								
60								
66								
72	72.9	75.0	1.25	1.39		1.111	18.7	20.8
78		L	ļ					
84		ļ	ļ					
96		-	-	ļ				

FIGURE 47.—Example of method used to adjust and transpose storms.

# Storm Precipitation Analysis System (SPAS) For Storm #1299 SPAS Analysis

General Storm Location: North Carolina and South Carolina

**Storm Dates**: July 13-17, 1916

Event: Alta Pass, NC (SA 2-9) and Kingstree, SC (SA 2-9a)

**DAD Zone 1** 

**Latitude**: 35.8792

**Longitude**: -81.8708

Max. Grid Rainfall Amount: 24.90"

Max. Observed Rainfall Amount: 23.73"

DAD Zone 2

Latitude: 33.6625

**Longitude**: -79.8292

Max. Grid Rainfall Amount: 16.79"

Max. Observed Rainfall Amount: 16.77"

Number of Stations: 240 (194 Daily, 1 Hourly, 6 Hourly Pseudo, and 39 Supplemental)

SPAS Version: 9.5

Basemap: PRISM July 1916 Precipitation

**Spatial resolution:** 00:00:30 (~ 0.30 mi²)

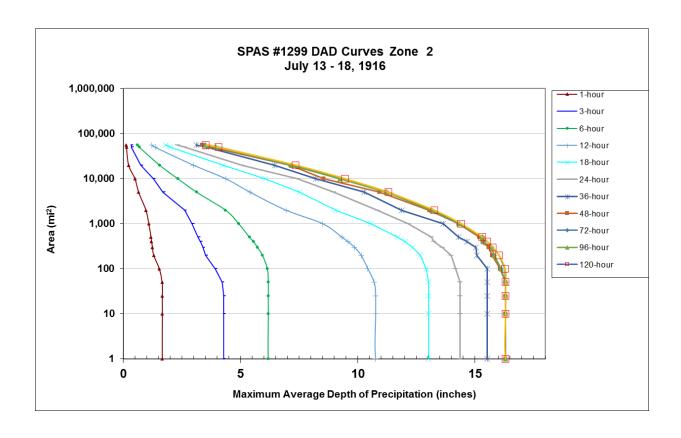
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

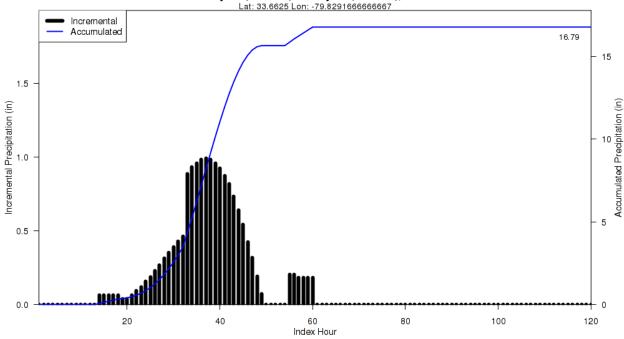
**Reliability of results:** This analysis was based on hourly data, Hourly pseudo data (derived from storm study mass curves), daily data, and supplemental station data. We have a high degree of confidence in the station based storm total results, the spatial pattern is dependent on basemap, and the timing is based on hourly and hourly pseudo stations.

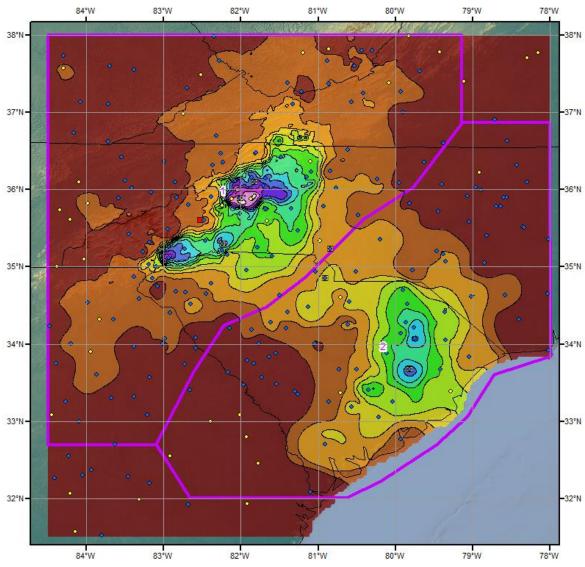
Storm Name:	SPAS 1299-Ki	ngstree, SC I	OAD 2								
Storm Date:	July 13-17, 19				S	Storm A	djustm	ent for	Virginia	a	
AWA Analysis Date:	11/14/2015									-	
Temporal Transposit	tion Date	15-Jul									
		Lat	Long			Moisture I	Inflow Direc	ction	ENE @ 110	miles	
Storm Center Locati	on	33.63 N	79.83 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep Dew Poir	nt Location	34.20 N	78.00 W			Storm Cen	ter Elevatio	n	0	feet	
Transposition Dew P							lysis Durati		24	hours	
Basin Location							arrier Heig		N/A	feet	
The stor	rm representative	dew point is	76.0 F	with tot	al precipitat	ole water abo	ve sea level o	of		2.99	inches.
The in	n-place maximum	dew point is	78.5 F	with tot	al precipitab	ole water abo	ve sea level o	of		3.37	inches.
The transposi	tioned maximum	dew point is	0.0	with tot	al precipitat	le water abo	ve sea level o			#N/A	inches.
	he in-place storn		0		ch subtracts			f precipitabl		76.0 F	
	he in-place storn		0		ch subtracts			f precipitabl		78.5 F	
	ransposition basis		N/A		ch subtracts			f precipitabl		0.0	
The inflow ba	arrier/basin eleva	tion height is	N/A	feet whi	ch subtracts	X,XX	inches of	f precipitabl	e water at	0.0	
	The in-place sto			1.13					dded 2°F to the U 24-hr 100yr reutri		
Th	ne transposition/e			#N/A					1 based on gridde		
	The ba	arrier adjustm	ent factor is	#N/A		rainfall accumu	lation area over	general area as	sociated with the	storm.	
				F 11571.							
	The	total adjustm	ent factor is	#N/A							
Observed	Storm Depth-A			1		7	*				
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		····
***************************************	10 sq miles	6.2	10.8	13.0	14.4	16.3	16.3	16.3	16.3		_
***************************************	100 sq miles	6.1	10.4	12.9	14.2	16.1	16.1	16.1	16.3		
	200 sq miles	5.9	10.1	12.7	14.0	15.7	15.8	15.8	16.0		_
WEAR WEAR WEAR WEAR WEAR WEAR WEAR WEAR	500 sq miles	5.4	9.3	11.7	13.2	15.2	15.3	15.3	15.3		
***************************************	1000 sq miles	4.9	8.5	10.6	12.2	14.3	14.3	14.3	14.4		
***************************************	2000 sq miles	4.4	6.9	9.1	10.9	13.1	13.2	13.2	13.3		
***************************************	5000 sq miles	3.1 2.3	5.4 4.4	7.5 6.1	9.0	10.9 8.5	9.3	9.3	9.5		
	10000 sq miles 20000 sq miles	1.5	3.0	4.2	7.4 5.1	7.1	7.2	7.2	7.4		
	55915 sq miles	0.6	1.2	1.8	2.3	3.4	3.5	3.5	3.5		_
	55715 sq miles	0.0	1.2	1.0	2.0	3.4	3.5	3.0	3.0		-
Storm or S	Storm Center Nar	no		SDAS 1200	-Kingstree.	SC DAD 2					
Storm Date		iic		7/13-17/19		SC DAD 2					1
Storm Typ				Tropical rei							1
Storm Loc				33.63 N	79.83 W						
	ter Elevation			0	77.00 11						1
	on Total & Durat	ion		16.91 48-h	ours						
Storm Rep	oresentative Dew	Point		76.0 F	24						
	resentative Dew		n	34.20 N	78.00 W						
	Dew Point			78.5 F							
Moisture I	nflow Vector			ENE @ 110	from HMR	25A					
In-place M	laximization Fact	or		1.13							
	Transposition (D			15-Jul							<b>.</b>
	ion Dew Point L										4
	ion Maximum De										4
	ion Adjustment I	actor		#N/A							4
	asin Elevation			N/A							-
	evation in Basin			N/A					-		-
	rier Height			N/A					-		-
	justment Factor			#N/A							-
Total Adju	stment Factor			#N/A							

	Storm 1299 - July 13 (0600 UTC) - July 18 (0500 UTC), 1916													
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHÉS)													
Area (mi²)		Duration (hours)												
Area (IIII )	1	3	6	12	18	24	36	48	72	96	120	Total		
0.3	1.71	4.38	6.33	11.11	13.40	14.76	15.95	16.79	16.79	16.79	16.79	16.79		
1	1.66	4.27	6.18	10.76	13.02	14.36	15.53	16.31	16.31	16.31	16.31	16.31		
10	1.66	4.27	6.18	10.76	13.02	14.36	15.53	16.31	16.31	16.31	16.31	16.31		
25	1.66	4.27	6.18	10.76	13.02	14.36	15.53	16.31	16.31	16.31	16.31	16.31		
50	1.65	4.21	6.18	10.70	13.02	14.36	15.53	16.31	16.31	16.31	16.31	16.31		
100	1.53	3.92	6.14	10.43	12.92	14.18	15.52	16.07	16.12	16.12	16.29	16.29		
200	1.29	3.50	5.93	10.14	12.66	13.98	15.07	15.74	15.82	15.82	16.02	16.02		
300	1.24	3.39	5.72	9.86	12.34	13.61	15.04	15.59	15.71	15.71	15.75	15.75		
400	1.20	3.28	5.55	9.58	12.02	13.24	14.66	15.34	15.35	15.35	15.53	15.53		
500	1.18	3.19	5.38	9.33	11.71	13.15	14.31	15.18	15.31	15.31	15.32	15.32		
1,000	1.08	2.94	4.92	8.51	10.58	12.15	13.64	14.30	14.33	14.33	14.41	14.41		
2,000	0.96	2.61	4.36	6.94	9.06	10.85	11.87	13.06	13.17	13.17	13.26	13.26		
5,000	0.65	1.69	3.13	5.41	7.52	8.96	10.27	10.93	11.22	11.22	11.30	11.30		
10,000	0.49	1.28	2.32	4.37	6.07	7.42	8.22	8.54	9.25	9.25	9.45	9.45		
20,000	0.22	0.74	1.54	2.99	4.24	5.07	6.45	7.13	7.18	7.18	7.35	7.35		
50,000	0.13	0.34	0.68	1.35	2.02	2.61	3.54	3.70	3.94	3.96	4.05	4.05		
55,915	0.12	0.33	0.61	1.21	1.80	2.30	3.10	3.36	3.49	3.51	3.52	3.52		

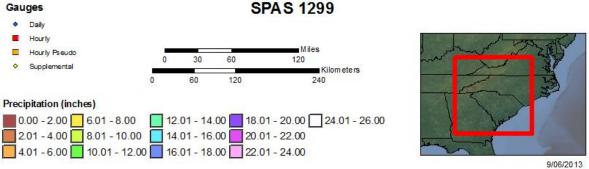


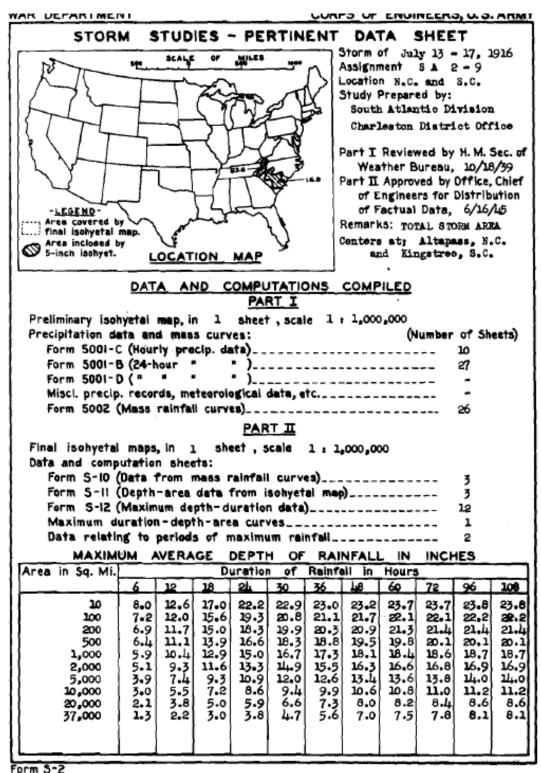
## SPAS 1299 Storm Center Mass Curve Zone 2 July 13 (600UTC) to July 18 (500UTC), 1916 Lat: 33.6625 Lon: -79.82916666666667





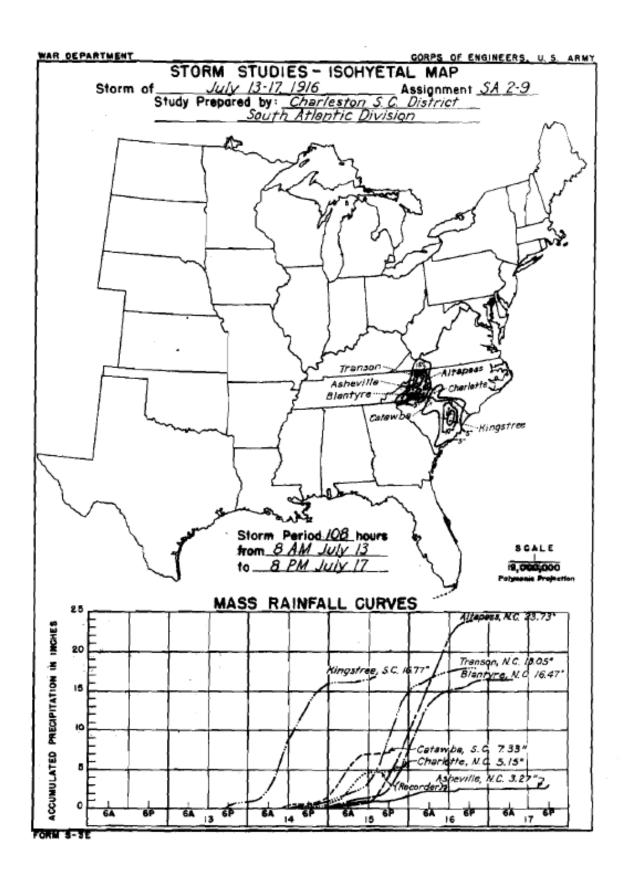
Total Storm (120-hr) Precipitation (inches) July 13-17, 1916 - Alta Pass, NC SPAS 1299

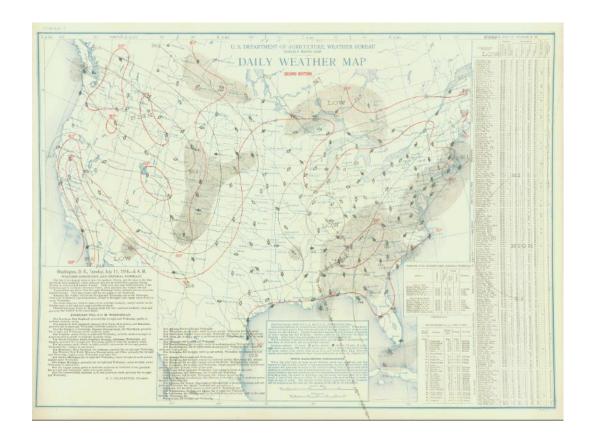


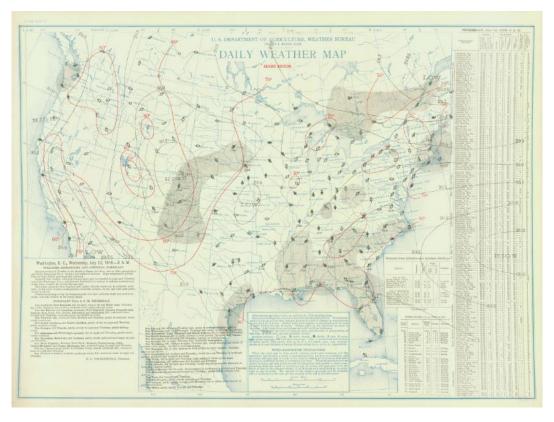


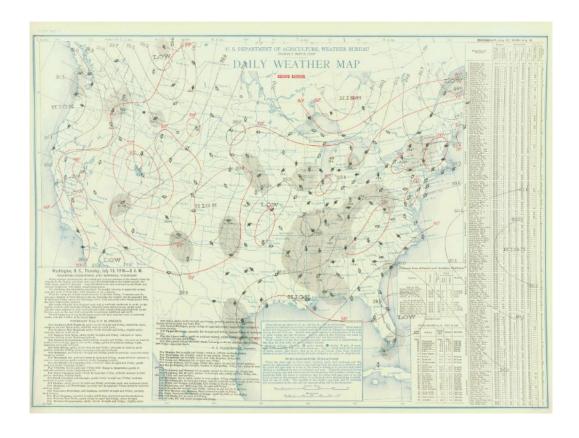
FORM 3-2

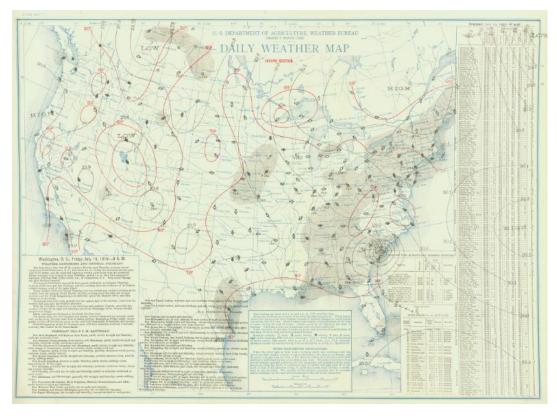
For Property on the Facility

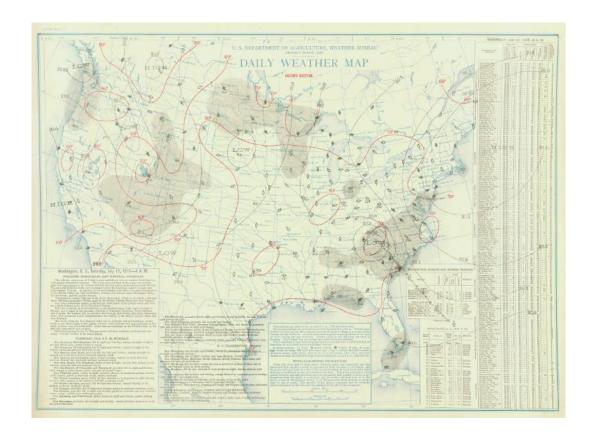


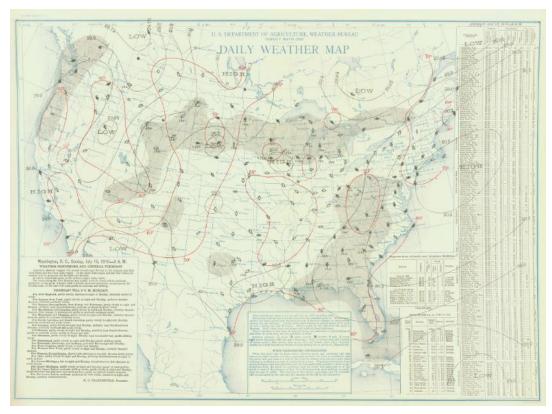


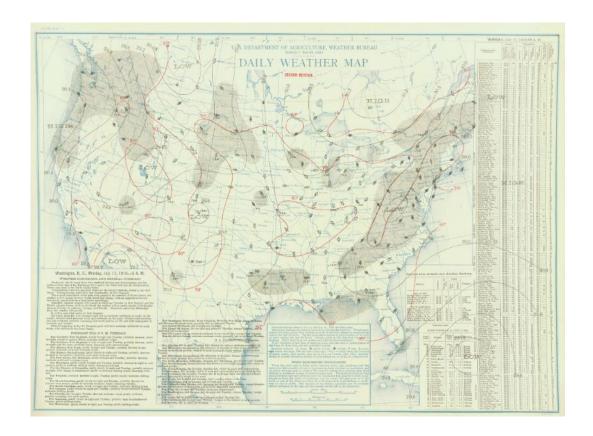












Storm Date	Assignment Number	Paprasentative Storm Dawpoint	Reference Point
Jul 13-17 Jul 13-17	MR 2-13 GL 4-14 GL 1-15 GL 1-16 MR 2-12 GM 1-19 SA 2-9 SA 2-9 UMV 1-16 UMV 2-9	65 67 76 74 74	310 SSW of Ironton, Mo. 250 SSE of Washington, Iowa. 250 S of York, W. Y. 325 SW of Brockport, N. Y. 170 SSE of Newhirk, Okla. 75 WSW of Bonifay, Fla. 225 S of Altapass, N. C. 110 ENE of Kingstree, S. C. 170 S of New Ulm, Minn. 250 SW of Louisiana, Mo.
1917 Jan 4-5 Mar 31-Apr : Jun 1-6	UMV 3-3 2 UMV 3-4 MR 2-16	61 62 64	235 SSE of Vincennes, Ind. 85 SSW of Dutton, Ark. 200 SSE of Atlantic, Iowa.
	GL 2-30	71 70	160 S of Viroqua, Wis. Eatters, N. C.
1918 Mar 12-15 Mar 13-14 May 9-13 May 22-23 Jun 3-6 Jul 14-15 Aug 19-22 Oct 24-27 Oct 27-31 Nov 6-8	OR 3-10 GL 2-17 LMV 1-11 UMV 3-5 MR 5-23 MR 4-16 SA 2-10 SA 3-14 MR 2-18	58 58 68 69 68 67 768	310 WSW of Holcomb, W. Va. 250 SSE of Trowbridge, Mich. 300 S of Mt. Home, Ark. 265 S of Warrenton, Mo. 190 SSE of Ames, Iowa. 375 ESE of Pine Grove, Mont. 220 SW of Mayville, N. Dak. 125 S of Tryon, N. C. 400 SW of Highlands, N. C. 525 S of Neosha, Mo.
1919 Mar 14-16 Mar 15-17 Apr 5-11 May 2-4 May 30-Jun 1 Jul 16-25	GL 2-19 MR 2-20	60 67 54 64 68 73	225 SSW of St. Joseph, Mo. 260 SSW of Henderson, Tenn. 250 SSE of Oconto, Wis. 350 SSE of Conception, Mo. 325 SSE of Corydon, Iowa. 230 SSW of Callaville, Va.

## Storm Precipitation Analysis System (SPAS) For Storm #1516 SPAS Analysis

General Storm Location: Washington and Glenville, GA

Storm Dates: September 23-28, 1929

**Event**: Extreme Precipitation Event

**DAD Zone 1** 

Latitude: 34.8625

**Longitude**: -84.2875

Max. Grid Rainfall Amount: 20.80"

Max. Observed Rainfall Amount: 20.77" (Glenville, GA)

Number of Stations: 215

SPAS Version: 10.0

Base Map Used: PRISM Monthly Basemap for September 1929(us_ppt_1941_09_30sec_in)

Spatial resolution: .2775

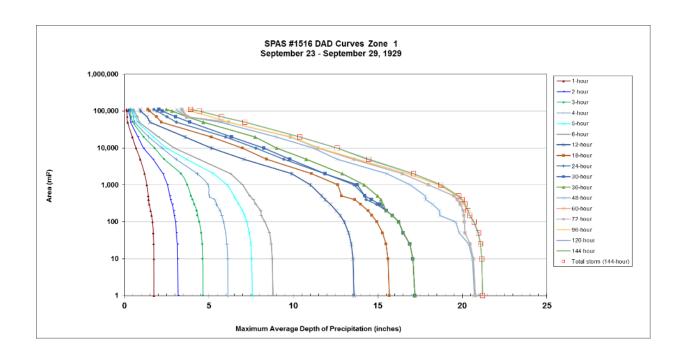
Radar Included: No

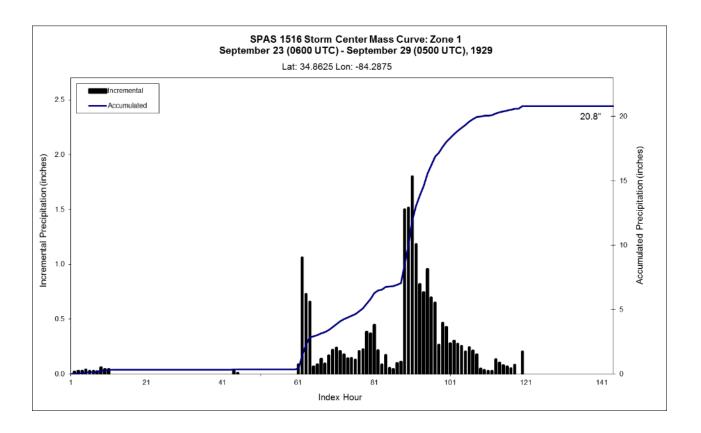
Depth-Area-Duration (DAD) analysis: No

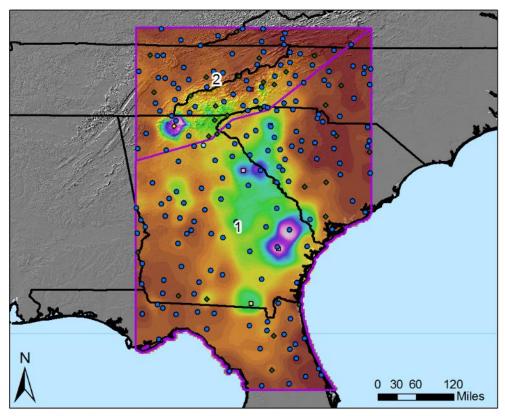
Reliability of Results: Thirty supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE) report, five hourly stations were digitized based on the mass rainfall curves from the USACE report. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable to the fact that this analysis only had six hourly stations. Attempts were made to the USACE branches for the full storm reports to no avail.

Storm Nan	ne: SPAS 1516 -	Glennville, (	GA Zone 1							•		
Storm Date						Storm A	Adjustn	nent for	Virginia	a		
AWA Anal	ysis Date: 11/14/2015											
Temporal '	Transposition Date	10-Sep										
		Lat	Long			Moisture l	Inflow Dire	ction	SE @ 510	miles		
Storm Cen	ter Location	34.86 N	84.29 W			Basin Aver	rage Elevati	ion	N/A	feet		
Storm Rep	SST Location	29.0 N	79.0 W			Storm Cer	ter Elevati	on	1,800	feet		
	ansposition SST Location 25.0 W						lysis Durat		24	hours		
Basin Loca							Barrier Hei		N/A	feet		
						•						
	The storm represer	ntative SST is	82.0 F	with tot	tal precipitab	le water abo	ve sea level	of		3.92	inches.	1
	The in-place max		85.0 F	with tot	tal precipitab	le water abo	ve sea level	of		4.40	inches.	
	The transpositioned max		0.0		tal precipitab					#N/A	inches.	
	The in-place storn		1,800		ich subtracts			f precipitable	water at	82.0 F		
	The in-place storn		1,800	whi	ich subtracts	0.59		f precipitable		85.0 F		
	The transposition basis		N/A		ich subtracts			f precipitable		0.0		
The	inflow barrier/basin elevar		N/A		ich subtracts	x.xx		f precipitable		0.0		
				•		•	•	•		•		
	The in-place stor	rm maximizat	ion factor is	1.13		Notes: DAD	values taken f	rom SPAS 151	6 Zone 1. Storr	n	1	
	The transposition/e					representativ	e SST value w	as based on ma	aximum 24-hr av	verage SST		
		arrier adjustm				values at 29.0	N, 79.0 W or	September 24	, 1929.			
	2.70 00					1						
	The	total adjustm	ent factor is	#N/A		i						
	Observed Storm Depth-	Area-Duratio	on									
	observed storm Depth	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Ho
	1 sq miles	1.8	8.8	13.6	15.7	17.2	17.2	20.7	20.8	21.2	21.2	21.2
	10 sq miles	1.7	8.8	13.5	15.6	17.1	17.1	20.6	20.7	21.2	21.2	21.2
	100 sq miles	1.7	8.3	13.0	15.0	16.2	16.2	19.6	20.1	20.7	20.7	20.7
	200 sq miles	1.6	8.1	12.5	14.4	15.5	15.5	18.6	20.1	20.3	20.4	20.4
	500 sq miles	1.4	7.4	11.7	12.9	14.2	15.0	17.8	19.5	19.7	19.8	19.8
	1000 sq miles	1.3	7.0	11.0	12.6	13.6	14.2	16.9	18.0	18.6	18.7	18.7
	2000 sq miles	1.2	6.3	9.9	11.1	11.9	12.9	15.5	16.5	16.8	17.1	17.1
	5000 sq miles	0.9	4.4	7.1	8.4	9.4	10.8	12.6	13.6	13.8	14.4	14.5
	10000 sq miles	0.7	3.0	5.2	7.0	7.8	9.0	11.2	11.5	11.6	12.6	12.6
	20000 sq miles	0.5	2.0	3.6	5.1	6.0	7.7	9.0	9.8	9.9	10.4	10.4
	50000 sq miles	0.2	0.9	1.5	2.2	3.1	4.7	5.7	6.2	6.2	7.1	7.1
	100000 sq miles	0.1	0.6	1.0	1.5	1.9	2.8	3.2	3.5	4.0	4.4	4.4
	Storm or Storm Center Na	ame		SPAS 1516	- Glennvill	le, GA Zone	1					
	Storm Date(s)			9/23-28/19	29							
	Storm Type			Thundersto	rm							
	Storm Location			34.86 N	84.29 W							
	Storm Center Elevation			1,800							ļ	
	Precipitation Total & Dur	ation (10 sq n	ni)	21.20" in 14	44hrs from S	PAS 1516					ļ	
	Storm Representative SST			82.0 F	24							
	Storm Representative SST	Location		29.0 N	79.0 W		Aug	Sept				
	Maximum SST			85.0 F			85.5	84.5				
	Moisture Inflow Vector			SE @ 510								
	In-place Maximization Fac	ctor		1.13							1	
											1	
		Date)		10-Sep								-
	Temporal Transposition (I											
	Transposition SST Location											
	Transposition SST Location Transposition Maximum S	SST		/UST/ 1								
	Transposition SST Location Transposition Maximum S Transposition Adjustment	SST		#N/A								
	Transposition SST Location Transposition Maximum S Transposition Adjustment Average Basin Elevation	SST Factor		N/A								
	Transposition SST Locatic Transposition Maximum S Transposition Adjustment Average Basin Elevation Highest Elevation in Basin	SST Factor		N/A N/A								
	Transposition SST Location Transposition Maximum S Transposition Adjustment Average Basin Elevation	SST Factor		N/A								

	Storm 1516 - September 23 (0600 UTC) - September 29 (0500 UTC), 1929																	
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																	
Area (mi²)									Duration	n (hours)								
Area (IIII )	1	2	3	4	5	6	12	18	24	30	36	48	60	72	96	120	144	Total
0.3	1.75	3.17	4.65	6.14	7.57	8.80	13.60	15.69	17.20	17.20	17.20	20.73	20.79	20.79	21.20	21.20	21.20	21.20
1	1.75	3.17	4.65	6.13	7.57	8.79	13.60	15.69	17.19	17.19	17.19	20.72	20.78	20.78	21.20	21.20	21.20	21.20
10	1.74	3.15	4.63	6.11	7.53	8.76	13.54	15.61	17.08	17.08	17.08	20.60	20.66	20.66	21.15	21.15	21.15	21.15
25	1.73	3.13	4.60	6.06	7.48	8.69	13.44	15.49	16.89	16.89	16.89	20.38	20.46	20.46	21.07	21.07	21.08	21.08
50	1.70	3.07	4.54	5.99	7.39	8.59	13.28	15.29	16.49	16.49	16.52	19.83	20.16	20.16	20.94	20.94	20.95	20.95
100	1.66	3.03	4.43	5.87	7.24	8.32	13.01	14.95	16.24	16.24	16.24	19.61	20.13	20.13	20.68	20.68	20.70	20.70
150	1.60	2.94	4.32	5.76	7.10	8.10	12.77	14.65	15.86	15.86	15.86	18.66	20.10	20.10	20.44	20.44	20.45	20.45
200	1.55	2.91	4.28	5.66	6.98	8.07	12.54	14.42	15.50	15.50	15.51	18.64	20.07	20.07	20.30	20.35	20.35	20.35
300	1.46	2.83	4.14	5.45	6.77	7.77	12.19	13.99	14.93	15.12	15.30	18.26	19.89	19.89	20.10	20.17	20.17	20.17
400	1.43	2.72	4.03	5.34	6.59	7.63	11.87	13.64	14.30	14.62	15.18	17.83	19.71	19.71	19.97	19.99	19.99	19.99
500	1.41	2.69	3.94	5.02	6.50	7.41	11.68	12.86	14.22	14.22	14.99	17.82	19.51	19.51	19.69	19.79	19.79	19.79
1,000	1.32	2.54	3.72	4.95	6.10	7.00	11.00	12.64	13.60	13.79	14.19	16.91	17.99	17.99	18.61	18.73	18.74	18.74
2,000	1.19	2.28	3.35	4.31	5.29	6.29	9.91	11.08	11.85	11.88	12.90	15.54	16.45	16.45	16.77	17.09	17.11	17.11
5,000	0.93	1.69	2.35	3.05	3.66	4.41	7.05	8.41	9.42	9.78	10.76	12.59	13.53	13.61	13.80	14.37	14.46	14.46
10,000	0.68	1.12	1.79	2.23	2.47	2.95	5.15	6.98	7.78	8.26	9.02	11.19	11.47	11.47	11.55	12.59	12.59	12.59
20,000	0.46	0.79	1.14	1.44	1.72	2.03	3.59	5.14	5.99	6.34	7.73	8.99	9.82	9.82	9.89	10.39	10.39	10.39
50,000	0.18	0.36	0.50	0.61	0.77	0.87	1.51	2.19	3.08	3.88	4.67	5.67	6.17	6.17	6.17	7.14	7.14	7.14
70,000	0.16	0.34	0.39	0.53	0.66	0.76	1.35	1.91	2.52	3.04	3.70	3.70	3.70	3.78	5.09	5.75	5.75	5.75
100,000	0.14	0.23	0.34	0.44	0.49	0.57	0.95	1.48	1.93	2.23	2.82	3.15	3.42	3.46	3.96	4.44	4.44	4.44
112,054	0.12	0.23	0.32	0.39	0.46	0.53	0.92	1.38	1.74	2.05	2.47	3.10	3.38	3.39	3.82	3.91	3.91	3.91







Total 144-hour Precipitation (Inches)
September 23, 1929 0600 UTC - September 29, 1929 0500 UTC
SPAS #1516





#### Stations

- Daily
- Daily Estimated
- Hourly
- Hourly Estimated
- Supplemental
- Supplemental Estimated

WJM 03/26/2015

## WAR DEPARTMENT STUDIES - PERTINENT STORM DATA MILES LEGEND Area covered by .... final isohyetal map. Area inclosed by 5-inch isohyet. Glennville, Ga. LOCATION MAP DATA AND PART I Data and computation sheets:

#### CORPS OF ENGINEERS, U.S. ARMY

Storm of September 23-28 1929 Assignment SA 3-20 Location Eastern Georgia Study Prepared by: South Atlantic Division Savannah District Office

SHEET

Part I Reviewed by H. M. Sec. of Weather Bureau, 5/27/40 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 10/13/43 Remarks: Conters at Washington, Ga. and

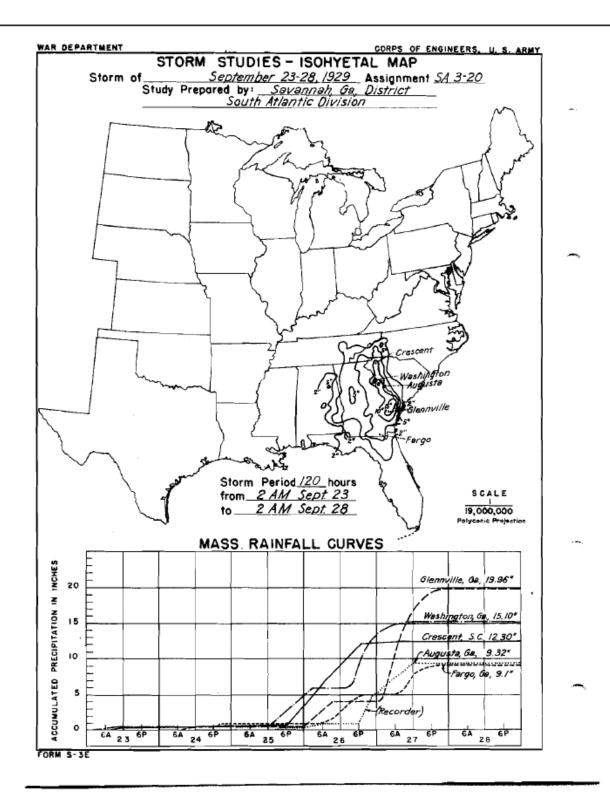
## COMPUTATIONS COMPILED

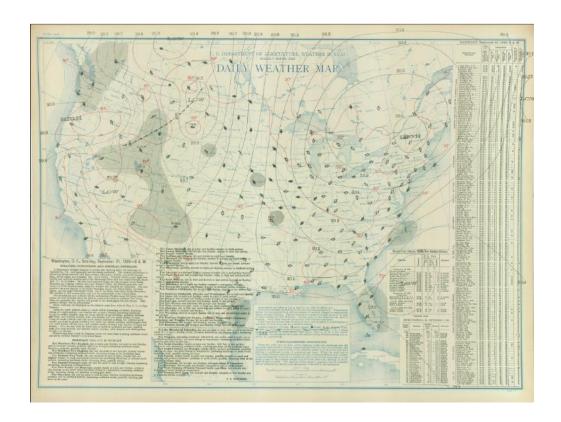
Preliminary isohyetal map, in 1 sheet, scale 1:2,500,000	
Precipitation data and mass curves:	(Number of Sheets)
Form 5001-C (Hourly precip. data)	18
Form 5001-B (24-hour " " )	
Form 5001-D (" " " ")	
Miscl. precip. records, meteorological data, etc	2
Form 5002 (Mass rainfall curves)	50
PART II	
Final isohvetal maps in 1 sheet scale 1:1.000.000	

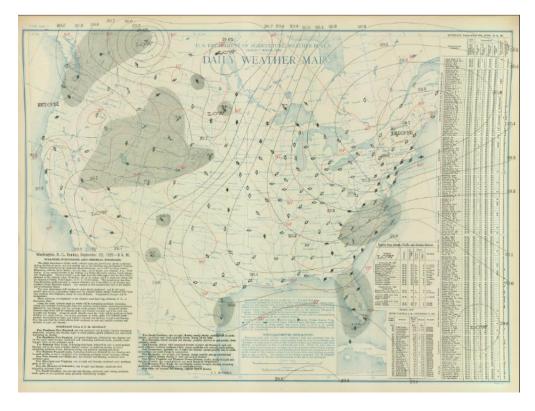
Form S-10 (Data from mass rainfall curves)_____ Form S-II (Depth-area data from isohyeta) map)_____ Form S-12 (Maximum depth-duration data)_____ Maximum duration-depth-area curves_____ Data relating to periods of maximum rainfall.....

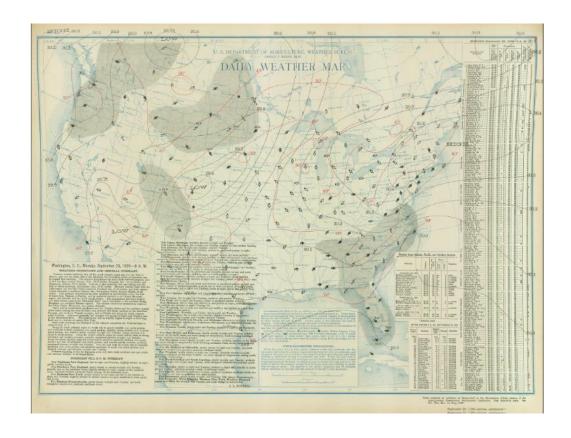
MAXIMUM AVERAGE DEPTH OF RAINFALL IN INCHES Area in Sq. Mi. Duration of Rainfall in Hours 36 48 60 72 120 6 12 18 24 30 10 8.4 12.9 15.3 16.0 16.0 19.6 20.0 16.4 19.0 19.6 20.0 100 8.1 12.4 14.1 15.1 15.6 16.3 18.4 19.2 .19.3 19.7 19.7 14.6 15.3 200 7.9 12.1 13.7 18.1 16.1 18.9 19.0 19.6 19.6 12.9 13.9 14.7 7.5 11.6 500 15.9 17.3 18.5 18.7 19.1 19.1 13.1 12.2 1,000 7.1 10.9 15.3 16.5 17.8 18.0 18.2 18.2 2,000 6.5 10.0 11.3 12.9 14.1 15.3 16.3 16.5 16.8 16.8 5,000 9.8 10.6 13.4 5.2 7.8 9.1 11.8 14.2 14.3 14.6 14.7 10,000 5.6 3.6 6.9 3.7 7.6 11.8 8.5 9.9 12.5 12.5 12.6 12.7 20,000 2.1 5.8 6.7 7.9 4.9 9.8 10.5 10.5 10.6 10.7 50,000 1.0 1.9 2.8 3.7 7.5 4.5 3.8 6.4 7.0 7.4 7.7 5.1 70,000 0.7 5.2 5.7 6.1 6.6 6.7

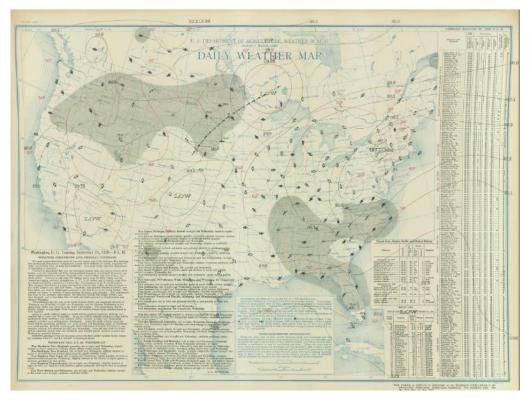
Form 5-2

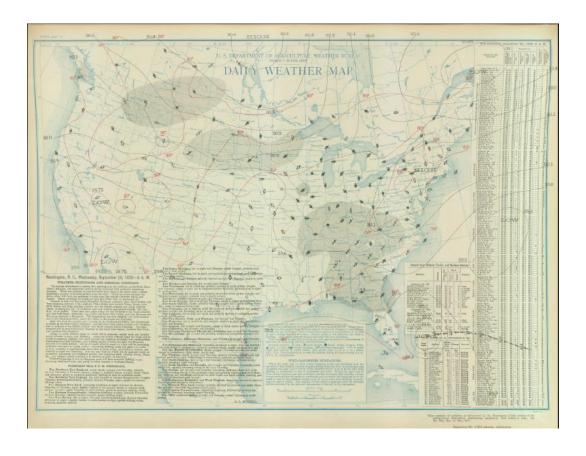


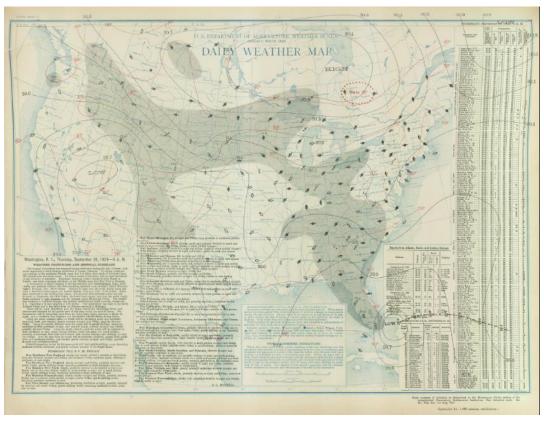


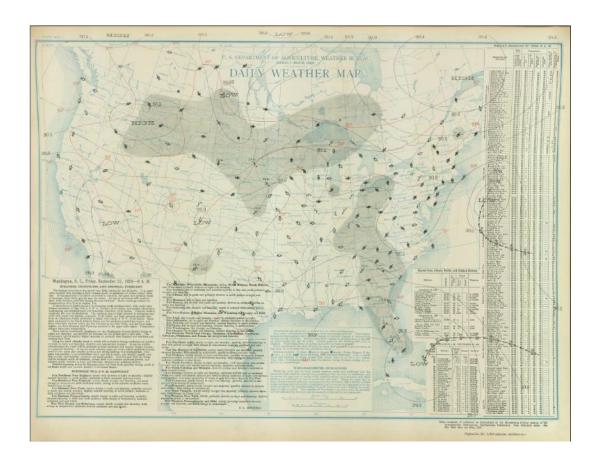


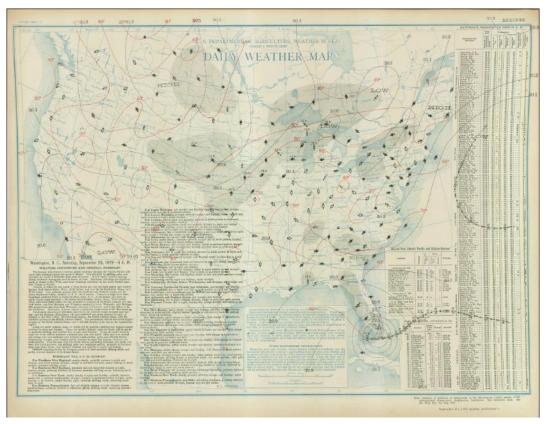


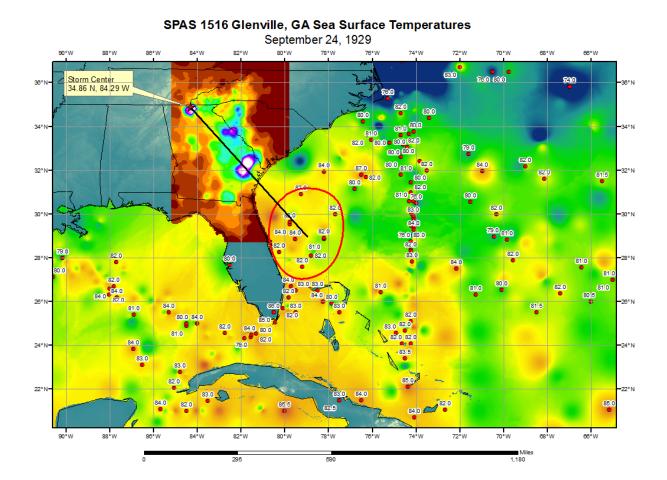












## Storm Precipitation Analysis System (SPAS) For Storm #1516 SPAS Analysis

General Storm Location: Washington and Glenville, GA

Storm Dates: September 23-28, 1929

**Event**: Extreme Precipitation Event

**DAD Zone 2** 

Latitude: 34.8833

**Longitude**: -84.2833

Max. Grid Rainfall Amount: 20.88"

Max. Observed Rainfall Amount: 20.32"

Number of Stations: 215

SPAS Version: 10.0

Base Map Used: PRISM Monthly Basemap for September 1929(us_ppt_1941_09_30sec_in)

Spatial resolution: .2775

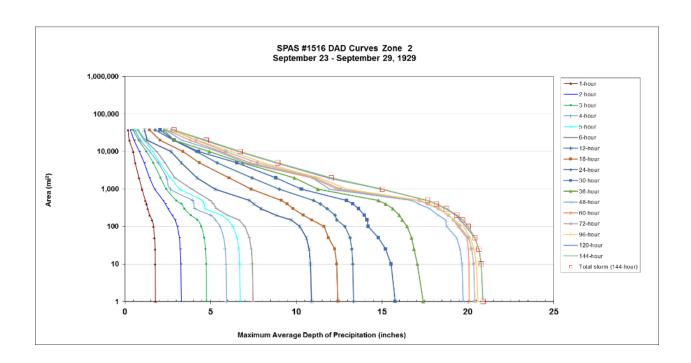
Radar Included: No

Depth-Area-Duration (DAD) analysis: No

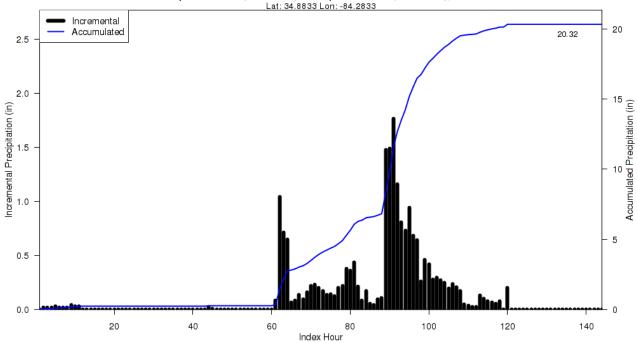
Reliability of Results: Thirty supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE) report, five hourly stations were digitized based on the mass rainfall curves from the USACE report. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable to the fact that this analysis only had six hourly stations. Attempts were made to the USACE branches for the full storm reports to no avail.

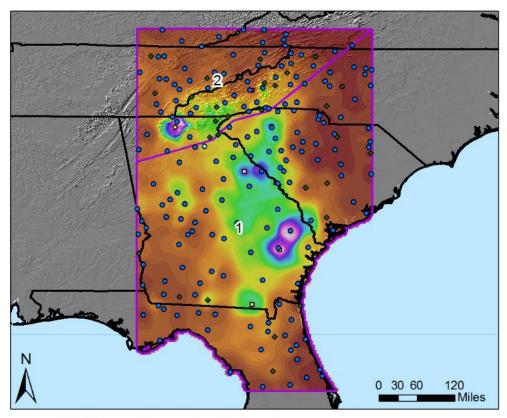
Storm Name:	SPAS 1516 -	Glennville, (	GA Zone 2									
Storm Date:	9/23-28/1929	· · · · · · · · · · · · · · · · · · ·			9	Storm A	Adiustn	ent for	Virginia	a		
AWA Analysis Dat	e: 11/14/2015				•	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	-ajastii	10110 101	· g	•		
Temporal Transpo	sition Date	10-Sep										
Типроти Типоро	SILION DUCC	Lat	Long			Maisture l	Inflow Direc	ction	SE @ 510	miles		
storm Center Loc	ation	34.88 N	84.28 W				rage Elevati		N/A	feet		
									1,600			
torm Rep SST Lo		29.0 N	79.0 W				ter Elevatio			feet		
ransposition SST	Location						lysis Durati		24	hours		
asin Location						Effective E	Barrier Heig	gnt	N/A	feet		
									1			
1	he storm represer		82.0 F 85.0 F		tal precipitab					3.92	inches.	
	The in-place maximum SST is			with tot	tal precipitab	le water abo	ve sea level		4.40	inches.		
The tra	anspositioned max	imum SST is	0.0	with tot	tal precipitab	le water abo	ve sea level	of		#N/A	inches.	
	The in-place storn	n elevation is	1,600	whi	ich subtracts	0.48	inches o	f precipitable	e water at	82.0 F		
	The in-place storn	n elevation is	1,600	whi	ich subtracts	0.51	inches o	f precipitable	e water at	85.0 F		
The	transposition basii	n elevation at	N/A	whi	ich subtracts	x.xx	inches o	f precipitable	e water at	0.0		
The inflow b	arrier/basin elevat	tion height is	N/A	whi	ich subtracts	x.xx	inches o	f precipitable	e water at	0.0		
	The in-place stor	m maximizati	on factor is	1.13		Notes: DAD	values taken fi	rom SPAS 151	6 Zone 2. Storr	n		
Т	he transposition/e	levation to ba	sin factor is	#N/A		representative	e SST value w	as based on ma	aximum 24-hr av	verage SST		
		rrier adjustm		#N/A		values at 29.0	N, 79.0 W on	September 24	, 1929.			
	The	total adjustme	ent factor is	#N/A		1						
		.,		-	•						1	
Observ	ed Storm Depth-	Area-Duratio	n									
Observ	cu storiii Beptii	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hours	144 Hc
***************************************	1 sq miles	1.8	8.8	13.6	15.7	17.2	17.2	20.7	20.8	21.2	21.2	21.2
	10 sq miles	1.7	8.8	13.5	15.6	17.1	17.1	20.6	20.7	21.2	21.2	21.2
	100 sq miles	1.7	8.3	13.0	15.0	16.2	16.2	19.6	20.1	20.7	20.7	20.7
***************************************	200 sq miles	1.6	8.1	12.5	14.4	15.5	15.5	18.6	20.1	20.3	20.7	20.4
	500 sq miles	1.4	7.4	11.7	12.9	14.2	15.0	17.8	19.5	19.7	19.8	19.8
	1000 sq miles	1.3	7.0	11.0	12.6	13.6	14.2	16.9	18.0	18.6	18.7	18.7
	2000 sq miles	1.2	6.3	9.9	11.1	11.9	12.9	15.5	16.5	16.8	17.1	17.1
	5000 sq miles	0.9	4.4	7.1	8.4	9.4	10.8	12.6	13.6	13.8	14.4	14.5
	10000 sq miles	0.7	3.0	5.2	7.0	7.8	9.0	11.2	11.5	11.6	12.6	12.6
	20000 sq miles	0.7	2.0	3.6	5.1	6.0	7.7	9.0	9.8	9.9	10.4	10.4
	50000 sq miles	0.2	0.9	1.5	2.2	3.1	4.7	5.7	6.2	6.2	7.1	7.1
					1.5	1.9	2.8	3.2		<del>\</del>	4.4	
	100000 sq miles	0.1	0.6	1.0	1.5	1.9	2.8	3.2	3.5	4.0	4.4	4.4
-							_		1			
	r Storm Center Na	ame			- Glennvill	e, GA Zone	2					
Storm D				9/23-28/19								
Storm T				Thundersto							1	
	ocation			34.88 N	84.28 W						1	
	Center Elevation			1,600							1	
Precipit	ation Total & Dur	ation (10 sq n	ni)	20.88" in 14	44hrs from S	PAS 1516					1	
											1	
	Representative SST			82.0 F	24							
	Representative SST	`Location		29.0 N	79.0 W		Aug	Sept				
Maximu				85.0 F			85.5	84.5				
	e Inflow Vector			SE @ 510								
In-place	Maximization Fac	ctor		1.13								
	al Transposition (I			10-Sep								
	sition SST Location											
	sition Maximum S										Į	
	sition Adjustment	Factor		#N/A								
	Basin Elevation			N/A							ļ	
	Elevation in Basin	1		N/A							ļ	
	Barrier Height			N/A							ļ	
D	Adjustment Factor	r		#N/A								
	ljustment Factor			#N/A								

				Sto	rm 1510	6 - Sept	ember 2	23 (0600	UTC) -	Septen	nber 29	(0500 L	JTC), 19	29				
						MAXIMU	M AVER	AGE DEF	TH OF F	RECIPIT	ATION (I	NCHES)						
Area (mi²)									Duration	(hours)								
Area (IIII )	1	2	3	4	5	6	12	18	24	30	36	48	60	72	96	120	144	Total
0.3	1.78	3.28	4.76	5.93	6.74	7.48	10.89	12.42	13.41	15.79	17.43	19.74	20.41	20.41	20.59	20.88	20.88	20.88
1	1.78	3.28	4.76	5.93	6.74	7.47	10.89	12.41	13.33	15.77	17.40	19.73	20.09	20.41	20.58	20.87	20.87	20.87
10	1.77	3.26	4.74	5.90	6.70	7.43	10.83	12.35	13.30	15.52	17.06	19.66	20.07	20.34	20.51	20.79	20.79	20.79
25	1.76	3.23	4.70	5.85	6.65	7.37	10.74	12.24	13.24	15.20	16.86	19.54	20.02	20.23	20.37	20.64	20.64	20.64
50	1.73	3.18	4.62	5.76	6.55	7.26	10.58	11.88	13.14	14.78	16.72	19.35	19.95	20.05	20.15	20.40	20.40	20.40
100	1.67	3.07	4.46	5.55	6.31	7.00	10.20	11.61	12.84	14.19	16.45	18.76	19.42	19.51	19.75	19.88	20.02	20.02
150	1.59	2.92	4.24	5.28	6.00	6.66	9.70	10.91	12.36	14.12	16.19	18.71	19.16	19.16	19.16	19.54	19.68	19.68
200	1.45	2.76	3.85	5.00	5.68	5.99	8.82	10.41	12.25	13.97	16.00	18.27	18.86	18.86	18.88	19.31	19.37	19.37
300	1.33	2.51	3.47	4.10	4.67	5.35	7.93	9.80	11.79	13.63	15.62	17.77	18.29	18.30	18.36	18.71	18.75	18.75
400	1.26	2.36	3.32	4.02	4.62	5.17	7.52	9.47	11.41	13.29	15.21	17.13	17.66	17.66	17.71	18.16	18.18	18.18
500	1.19	2.22	2.99	3.95	4.52	4.99	7.28	9.13	11.00	12.94	14.79	16.76	17.17	17.17	17.23	17.63	17.65	17.65
1,000	1.00	1.73	2.42	2.66	3.19	3.92	5.27	7.37	9.02	10.31	11.26	11.94	12.40	12.60	12.97	14.96	15.02	15.02
2,000	0.83	1.44	2.08	2.44	2.64	2.91	4.22	6.09	7.41	8.82	9.89	10.95	10.95	11.11	11.33	11.85	12.03	12.03
5,000	0.60	1.14	1.66	1.94	2.04	2.33	3.29	4.35	5.39	6.54	6.86	7.04	7.29	7.74	8.10	8.83	8.91	8.91
10,000	0.48	0.85	1.26	1.46	1.65	1.87	2.70	3.40	4.18	4.32	4.92	5.47	5.60	5.88	6.23	6.65	6.72	6.72
20,000	0.26	0.54	0.81	0.91	1.13	1.18	1.30	2.07	2.86	2.87	2.87	3.34	3.81	4.18	4.24	4.62	4.74	4.74
37,777	0.18	0.32	0.49	0.59	0.69	0.76	1.14	1.45	1.77	2.06	2.27	2.38	2.46	2.73	2.79	2.86	2.86	2.86



### SPAS 1516 Storm Center Mass Curve Zone 2 September 23 (0600UTC) to September 29 (0500UTC), 1929 Lat: 34.8833 Lon: -84.2833





Total 144-hour Precipitation (Inches)
September 23, 1929 0600 UTC - September 29, 1929 0500 UTC
SPAS #1516





#### Stations

- Daily
- Daily Estimated
- Hourly
- Hourly Estimated
- Supplemental
- Supplemental Estimated

WJM 03/26/2015

18

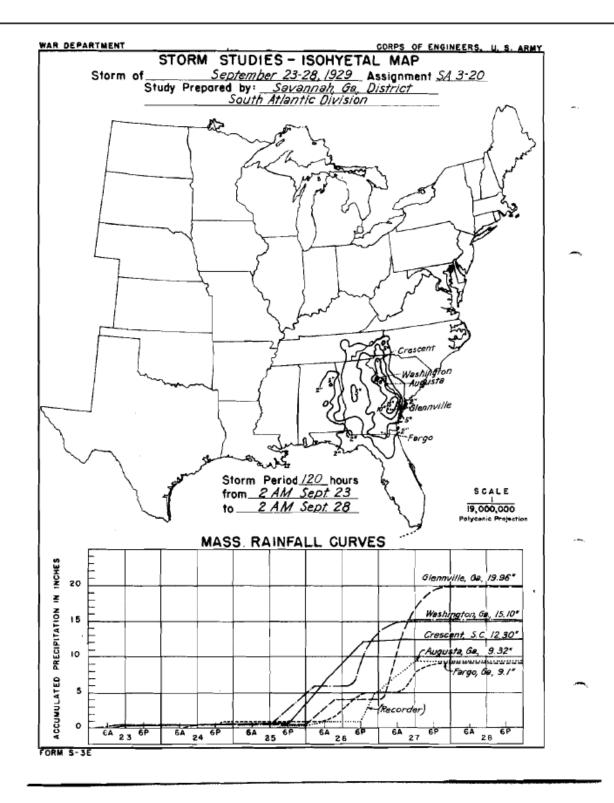
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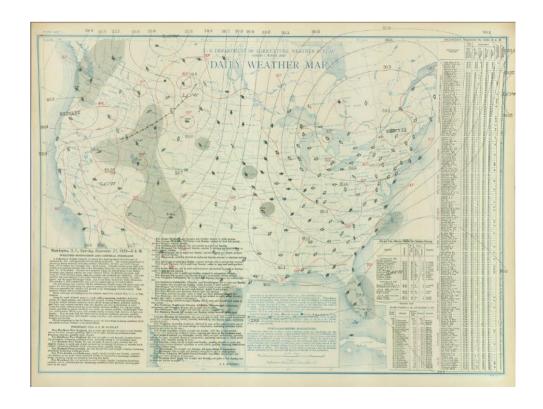
#### CORPS OF ENGINEERS, U.S. ARMY WAR DEPARTMENT STUDIES - PERTINENT STORM DATA SHEET Storm of September 23-28 1929 Assignment SA 3-20 Location Eastern Georgia Study Prepared by: South Atlantic Division Savannah District Office Part I Reviewed by H. M. Sec. of Weather Bureau, 5/27/40 Part II Approved by Office, Chief of Engineers for Distribution of Factual Data, 10/13/43 LEGEND. Area covered by .... final isohyetal map. Remarks: Conters at Washington, Ga. and Area inclosed by 5-inch isohyet. Glennville, Ga. LOCATION MAP AND COMPUTATIONS COMPILED PART I Preliminary isohyetal map, in 1 sheet, scale 1:2,500,000 Precipitation data and mass curves: (Number of Sheets) Form 5001-C (Hourly precip. data)_____ Form 5001-B (24-hour * Form 5001-D (* * * Miscl. precip. records, meteorological data, etc. Form 5002 (Mass rainfall curves)_____ PART II Final isohyetal maps, in 1 sheet, scale 1:1,000,000 Data and computation sheets: Form S-10 (Data from mass rainfall curves)_____ Form S-II (Depth-area data from isohyetal map)_____ Form S-12 (Maximum depth-duration data)_____ Maximum duration-depth-area curves_____ Data relating to periods of maximum rainfall.

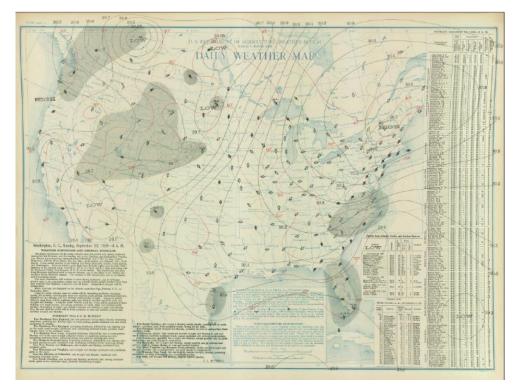
	MICOIM	<u> </u>	VAFIVA	WE _	DEFI	1 OF		MEV C		II4CI	153	
Area	in Sq. Mi.			D	<u>uratio</u>	of_	Rainf	all in	Hours	3		
<u> </u>		6	12	18	24	30	36	48	60	72	96	120
						• / •	-4.					
ı	10	8.4	12.9	15.3	16.0	16.0	16.4	19.0	19.6	19.6	20.0	20.0
1	100	8.1	12.4	14.1	15.1	15.6	16.3	18.4	19.2	19.3	19.7	19.7
l	200	7.9	12.1	13.7	14.6	15.3	16.1	18.1	18.9	19.0	19.6	19.6
l	500	7.5	11.6	12.9	13.9	14.7	15.9	17.3	18.5	18.7	19.1	19.1
I	1,000	7.1	10.9	12.2	13.1	14.0	15.3	16.5	17.8	18.0	18.2	18.2
l	2,000	6.5	10.0	11.3	12.1	12.9	14.1	15.3	16.3	16.5	16.8	16.8
l	5,000	5.2	7.8	9.1	9.8	10.6	11.8	13.4	14.2	14.3	14.6	14.7
l	10,000	3.7	5.6	6.9	7.6	8.5	9.9	11.8	12.5	12.5	12.6	12.7
ì	20,000	2.1	3,6	4.9	5.8	6.7	7.9	9.8	10.5	10.5	10.6	10.7
l	50,000	1.0	1.9	2.8	3.7	4.5	5.1	6.4	7.0	7.4	7.5	7.7
1	70,000	0.7	1.5	2.2	3.1	3.8	4.2	5.2	5.7	6.1	6.6	6.7
1		1										1

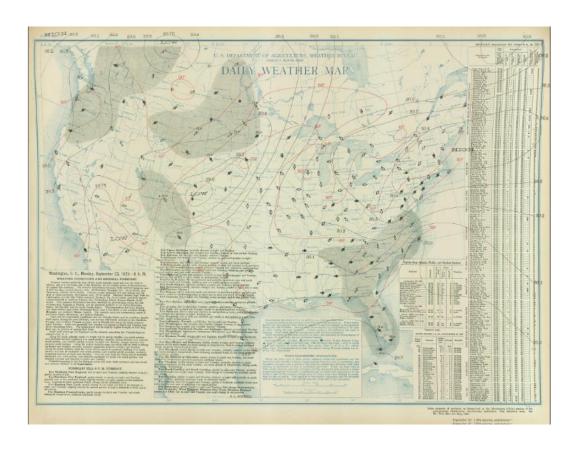
MAXIMUM AVERAGE DEPTH OF PAINEALL IN INCHES

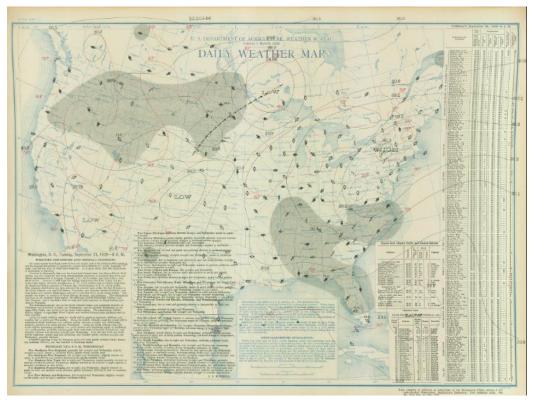
Form 5-2

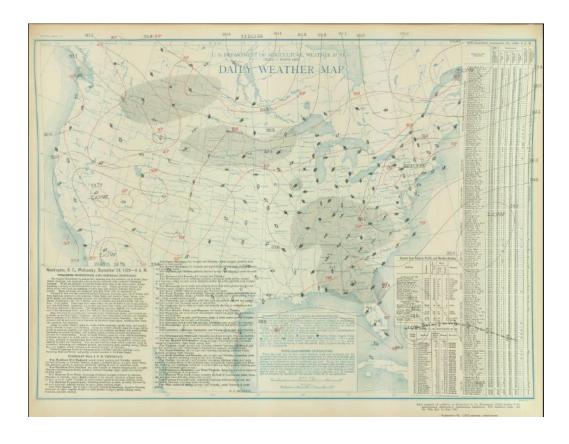


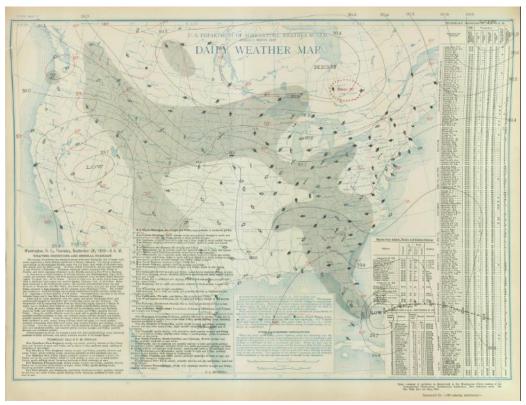


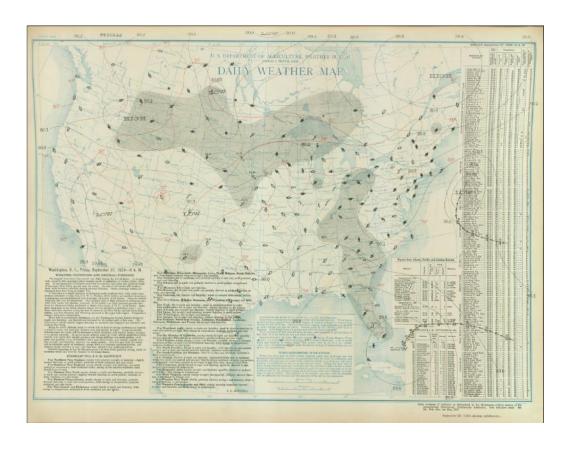


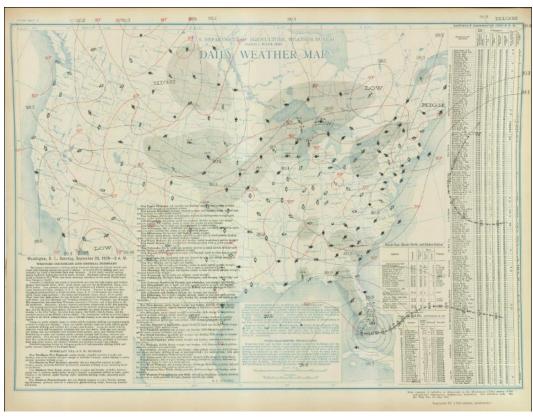


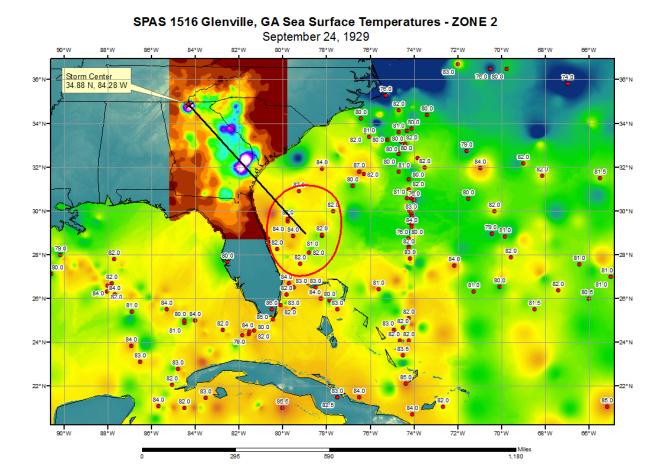












# Storm Precipitation Analysis System (SPAS) For Storm #1517 SPAS Analysis

General Storm Location: Vernon, FL

Storm Dates: September 29 – October 3, 1929

**Event**: Extreme Precipitation Event

**DAD Zone 2** 

Latitude: 35.6042

**Longitude**: -79.0708

Max. Grid Rainfall Amount: 11.55"

Max. Observed Rainfall Amount: 11.55" (Moncure, NC)

**DAD Zone 3** 

Latitude: 35.9458

Longitude: -80.6958

Max. Grid Rainfall Amount: 9.97"

Max. Observed Rainfall Amount: 9.63" (Settle, NC)

Number of Stations: 516

SPAS Version: 10.0

Base Map Used: USACE Report SA 3-23 Isohyetal Basemap

(nwsmetstat_isohyetal_spas1517_surf_surf_sm)

Spatial resolution: .2739

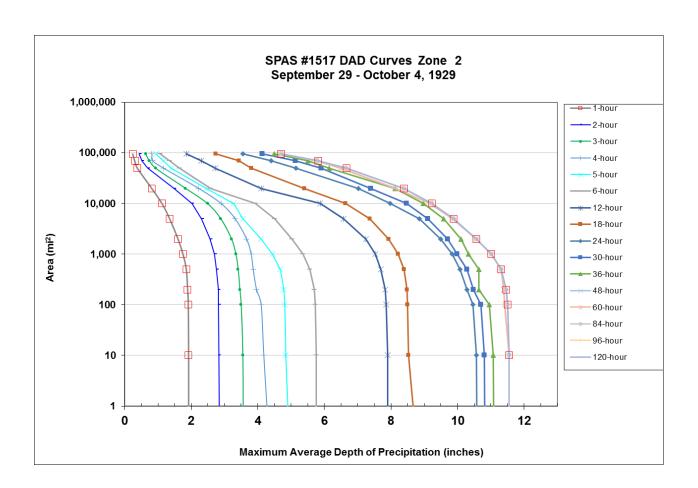
Radar Included: No

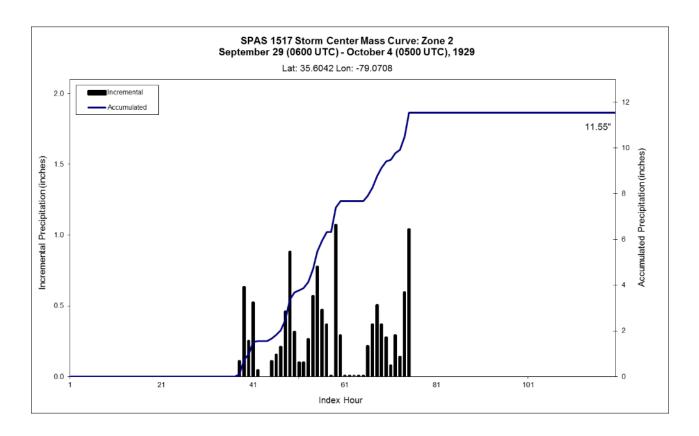
Depth-Area-Duration (DAD) analysis: No

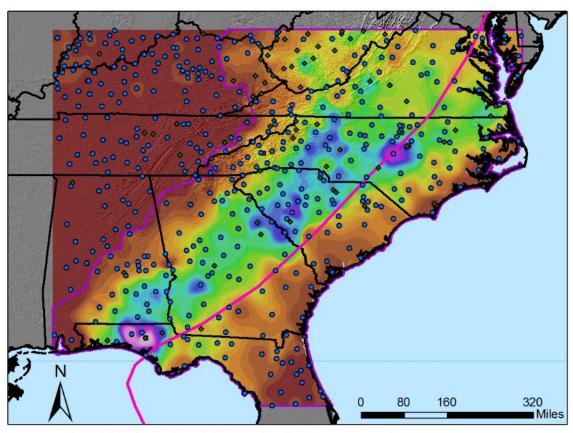
Reliability of Results: Seventy-six supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE) report, five hourly stations were digitized based on the mass rainfall curves from the USACE report. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable to the fact that this analysis had only 6 hourly stations on the eastern side of the Appalachian Mountains. Attempts were made to the USACE branches for the full storm reports to no avail.

Storm Nam			Zone 2			74 a mare	A:a+	omt for	T/imairai			
torm Date	e: 9/29 - 10/03/1 //sis Date: 11/14/2015	.929			2	storm A	Adjustm	ent for	Virginia	ì		
	*	4.5.0										
emporal T	Transposition Date	15-Sep				35.4	( D)		CCE C 225	- 21		
		Lat	Long				Inflow Direc		SSE @ 325	miles		
	ter Location	35.60 N	79.07 W				rage Elevati		N/A	feet		
	SST Location	31.00 N	78.00 W				ter Elevatio		200	feet		
	ion SST Location						lysis Durati		24	hours		
asin Loca	tion					Effective I	arrier Heig	ht	N/A	feet		
	The storm represent	totico CCT in	80.0 F	with tot	al praginitab	la motar aba	ın saa laınl s	·t		3.60	inches.	
	The storm represer The in-place max		84.0 F				ve sea level o			4.24	inches.	
	The transpositioned max		0.0				ve sea level o			#N/A	inches.	
	The in-place storn		200		ch subtracts	0.06		precipitable	water at	80.0 F	menes.	
	The in-place storn		200		ch subtracts	0.06		precipitable		84.0 F		
	The transposition basis		N/A		ch subtracts	x.xx		precipitable		0.0		
The	inflow barrier/basin eleva		N/A		ch subtracts	X.XX		precipitable		0.0		
								protection				
Г	The in-place stor	m maximizati	ion factor is	1.18		Notes: DAD	values taken fr	om SPAS 151	7 Zone 2. Storn	n	1	
	The transposition/e			#N/A		representativ	e SST value wa	is based on ma	aximum 24-hr av	erage SST		
	•	rrier adjustm		#N/A		values on Sej	otember 29-30,	1929.				
		, , , , , , , , , , , , , , , , , , ,										
	The	total adjustme	ent factor is	#N/A								
	Observed Storm Depth-A	Area-Duratio	n									
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	84 Hours	96 Hours	120 H
	10 sq miles	1.9	5.8	7.9	8.5	10.6	11.1	11.6	11.6	11.6	11.6	11.0
	100 sq miles	1.9	5.7	7.9	8.5	10.5	11.0	11.4	11.4	11.5	11.5	11.5
	200 sq miles	1.9	5.7	7.8	8.5	10.3	10.6	11.4	11.4	11.5	11.5	11.
	500 sq miles	1.9	5.6	7.7	8.4	10.1	10.6	11.3	11.3	11.3	11.3	11.
	1000 sq miles	1.8	5.4	7.5	8.2	9.8	10.3	11.0	11.0	11.0	11.0	11.0
	2000 sq miles	1.6	5.0	7.3	7.9	9.5	10.1	10.6	10.6	10.6	10.6	10.0
	5000 sq miles	1.4	4.5	6.6	7.4	8.9	9.6	9.9	9.9	9.9	9.9	9.9
	10000 sq miles	1.1	3.9	5.9	6.6	8.0	9.0	9.2	9.2	9.2	9.2	9.2
	20000 sq miles	0.8	2.6	4.1	5.4	7.0	8.1	8.2	8.2	8.4	8.4	8.4
	50000 sq miles	0.4	1.7	2.7	3.8	5.1	6.1	6.5	6.5	6.7	6.7	6.7
	95317 sq miles	0.2	1.1	1.9	2.7	3.6	4.5	4.7	4.7	4.7	4.7	4.7
	g. g. g . M			GD 4 G 4 5 4 5		NO.	1				1	
	Storm or Storm Center Na	me			- Moncure,	NC Zone 2	-				_	
	Storm Date(s) Storm Type			9/29 - 10/0 Tropical	3/1929						1	
	Storm Type Storm Location			35.60 N	79.07 W						†	
	Storm Center Elevation			200	17.01 W						1	
	Precipitation Total & Dura	ation (10 sa m	ni)		20hrs from S	PAS 1517					1	
İ	- Filmer Total & Duri		,	m 1							1	
	Storm Representative SST			80.0 F	24						İ	
	Storm Representative SST			31.00 N	78.00 W							
	Maximum SST			84.0 F								
	Moisture Inflow Vector			SSE @ 325								
	In-place Maximization Fac	tor		1.18								
	Temporal Transposition (I			15-Sep								
	Transposition SST Location											
	Transposition Maximum S											
	Transposition Adjustment	Factor		#N/A							<del> </del>	
	Average Basin Elevation			N/A							<del> </del>	
	Highest Elevation in Basin	1		N/A							<del> </del>	
	Inflow Barrier Height			N/A							1	
	Barrier Adjustment Factor			#N/A							<b>.</b>	
,	Total Adjustment Factor			#N/A							J	

				Storr	n 1517 -	Septer	nber 29	(0600 l	JTC) - C	ctober	4 (0500	UTC),	1929		-		
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)																
Area (mi²)		Duration (hours)															
Area (IIII )	1	2	3	4	5	6	12	18	24	30	36	48	60	84	96	120	Total
0.3	1.92	2.84	3.56	4.32	4.93	5.76	7.90	8.74	10.58	10.82	11.09	11.55	11.55	11.55	11.55	11.55	11.55
10	1.92	2.83	3.55	4.18	4.84	5.76	7.90	8.52	10.57	10.81	11.07	11.55	11.55	11.55	11.55	11.55	11.55
100	1.91	2.82	3.50	4.10	4.81	5.73	7.86	8.50	10.46	10.70	10.96	11.42	11.42	11.51	11.51	11.51	11.51
200	1.89	2.81	3.46	3.96	4.78	5.69	7.82	8.48	10.29	10.48	10.64	11.39	11.39	11.46	11.46	11.46	11.46
500	1.85	2.76	3.41	3.86	4.67	5.57	7.70	8.39	10.08	10.28	10.64	11.31	11.31	11.31	11.31	11.31	11.31
1000	1.75	2.70	3.34	3.80	4.44	5.36	7.53	8.22	9.83	9.98	10.33	11.01	11.01	11.02	11.02	11.02	11.02
2000	1.60	2.57	3.21	3.66	4.09	5.03	7.25	7.93	9.49	9.71	10.11	10.56	10.56	10.57	10.57	10.57	10.57
5000	1.35	2.31	2.89	3.32	3.56	4.51	6.58	7.37	8.86	9.10	9.58	9.85	9.85	9.88	9.88	9.88	9.88
10000	1.12	2.02	2.49	2.90	3.27	3.92	5.87	6.63	7.97	8.47	8.97	9.17	9.17	9.23	9.23	9.23	9.23
20000	0.81	1.48	1.83	2.22	2.44	2.59	4.10	5.40	7.02	7.40	8.12	8.16	8.16	8.39	8.39	8.39	8.39
50,000	0.38	0.69	0.93	1.17	1.39	1.65	2.72	3.81	5.14	5.90	6.14	6.49	6.49	6.65	6.66	6.66	6.66
70,000	0.30	0.52	0.74	0.84	1.17	1.35	2.30	3.43	4.40	5.13	5.51	5.76	5.76	5.79	5.80	5.81	5.81
95,317	0.24	0.44	0.63	0.82	0.94	1.07	1.85	2.73	3.55	4.13	4.49	4.67	4.69	4.70	4.70	4.70	4.70

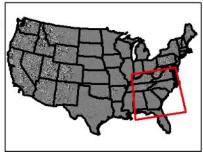






Total 120-hour Precipitation (Inches)
September 29, 1929 0600 UTC - October 4, 1929 0500 UTC
SPAS #1517-Hurricane #2



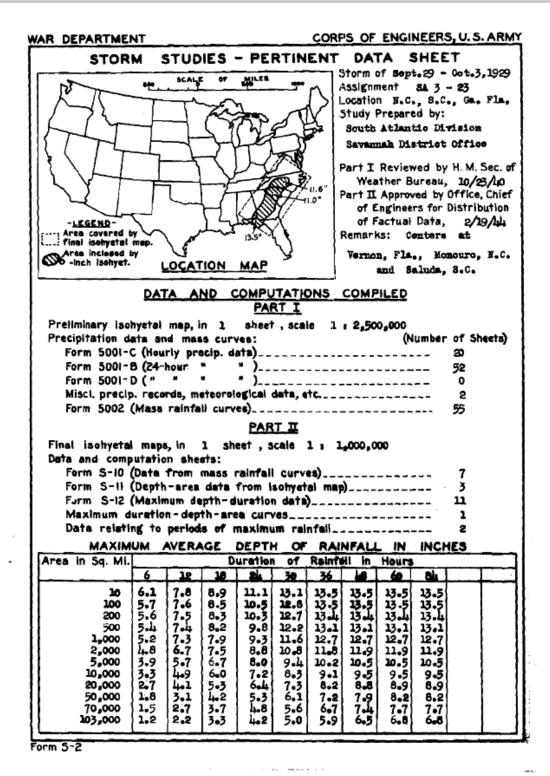


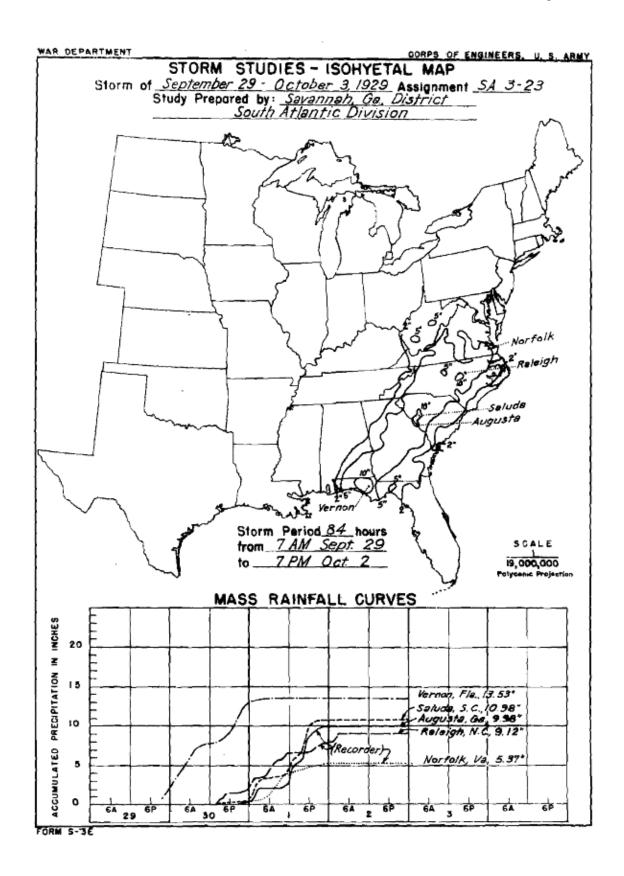
#### **Statoins**

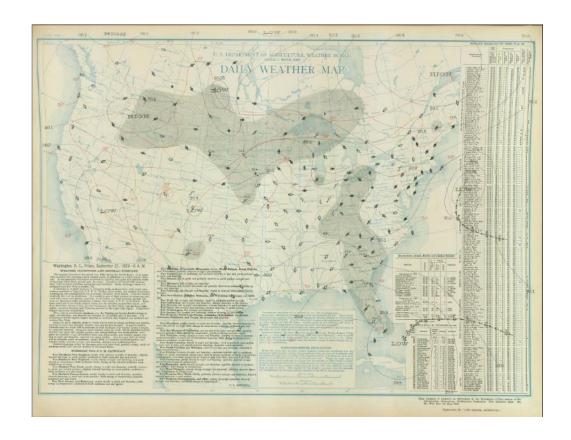
- Daily
- Hourly
- Hourly Estimated
- Supplemental

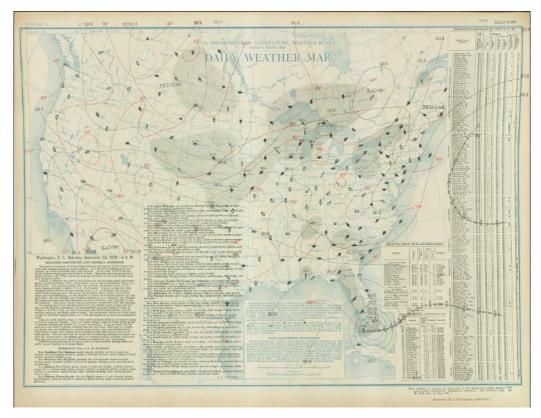
----- Hurricane #2 Track

WJM 03/26/2015

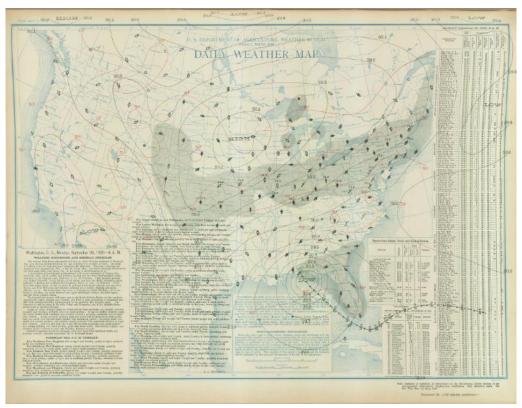


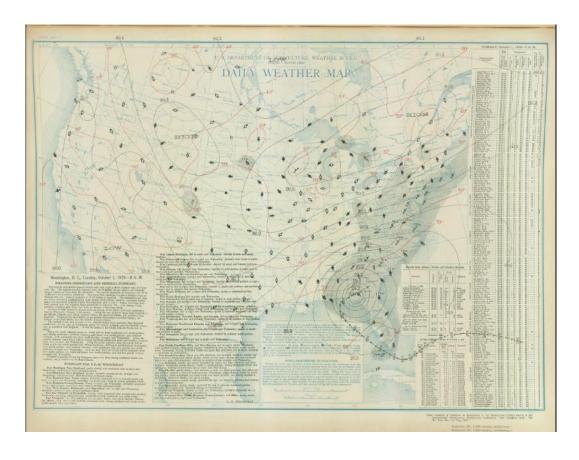




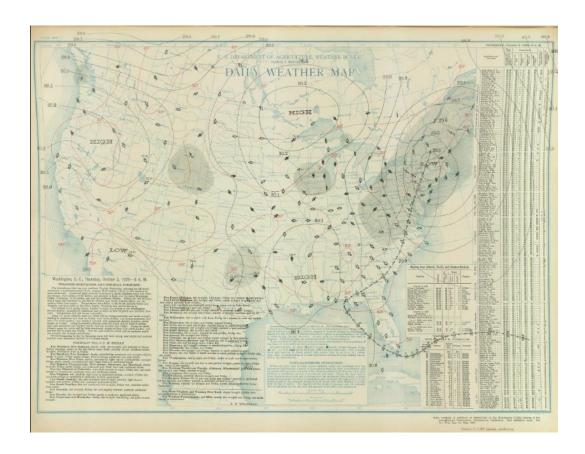




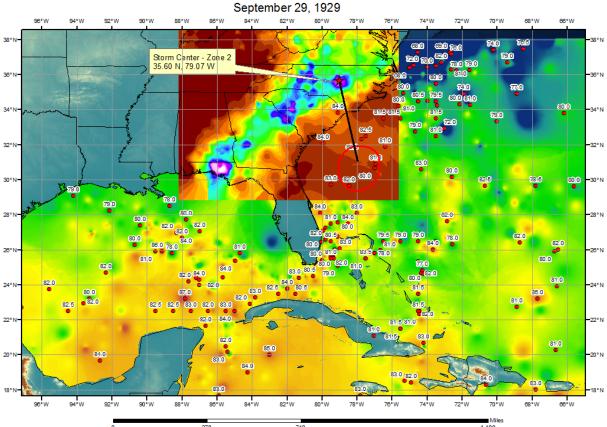




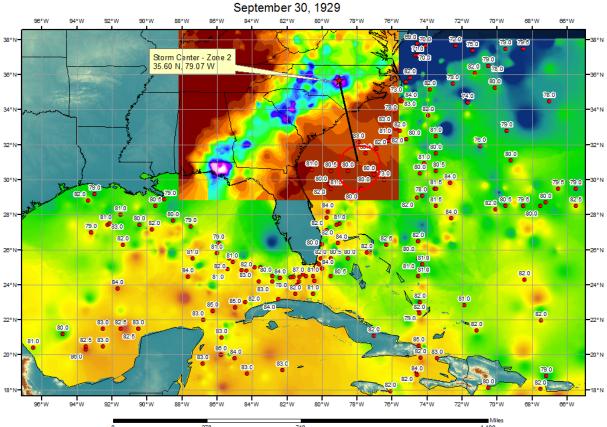




### SPAS 1517 Moncure, NC Sea Surface Temperatures (F)



### SPAS 1517 Moncure, NC Sea Surface Temperatures (F)



# Storm Precipitation Analysis System (SPAS) For Storm #1517 SPAS Analysis

General Storm Location: Vernon, FL

Storm Dates: September 29 – October 3, 1929

**Event**: Extreme Precipitation Event

**DAD Zone 2** 

Latitude: 35.6042

**Longitude**: -79.0708

Max. Grid Rainfall Amount: 11.55"

Max. Observed Rainfall Amount: 11.55" (Moncure, NC)

**DAD Zone 3** 

Latitude: 35.9458

Longitude: -80.6958

Max. Grid Rainfall Amount: 9.97"

Max. Observed Rainfall Amount: 9.63" (Settle, NC)

Number of Stations: 516

SPAS Version: 10.0

Base Map Used: USACE Report SA 3-23 Isohyetal Basemap

(nwsmetstat_isohyetal_spas1517_surf_surf_sm)

Spatial resolution: .2739

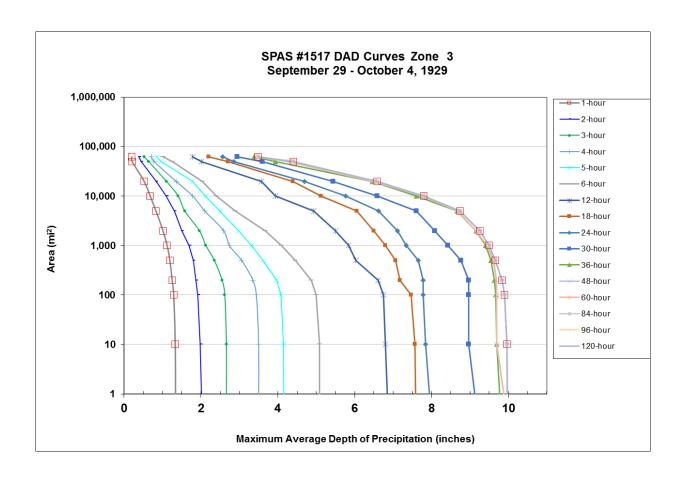
Radar Included: No

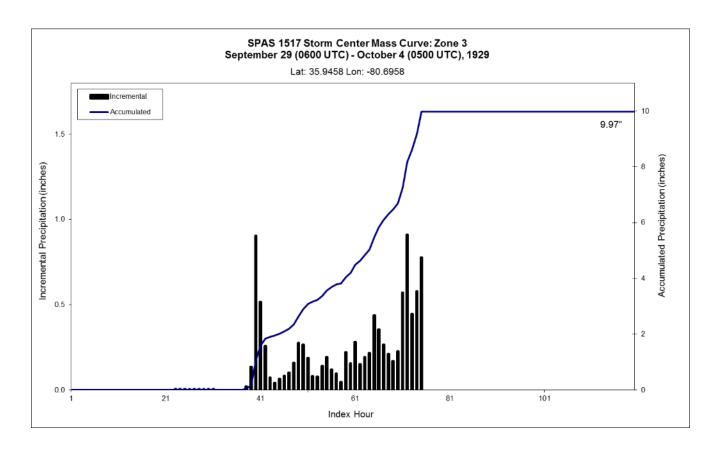
Depth-Area-Duration (DAD) analysis: No

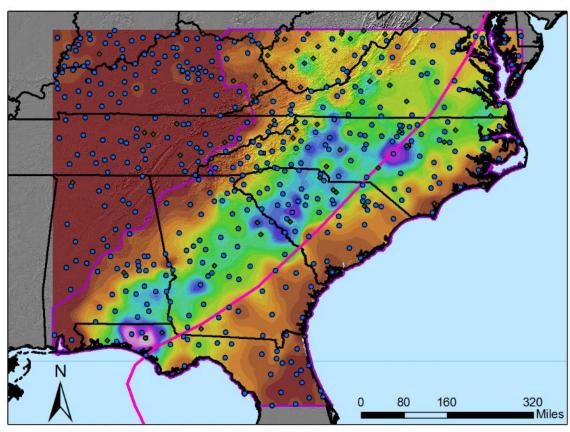
Reliability of Results: Seventy-six supplemental stations were added to ensure data consistency. Due to the amount and integrity of the U.S. Army Corps of Engineers (USACE) report, five hourly stations were digitized based on the mass rainfall curves from the USACE report. With the density of stations available and the consistency of the resulting SPAS analysis to the U.S. Army Corps of Engineers report, this analysis is deemed quite reliable to the fact that this analysis had only 6 hourly stations on the eastern side of the Appalachian Mountains. Attempts were made to the USACE branches for the full storm reports to no avail.

Storm Nan	ne: SPAS 1517 - S	Settle, NC Zo	ne 3									1
Storm Date	e: 9/29 - 10/03/1	929			9	Storm A	Adjustm	ent for	Virginia	ı		
AWA Anal	ysis Date: 11/14/2015											<u> </u>
Temporal '	Transposition Date	15-Sep										
		Lat	Long			Moisture l	Inflow Direc	ction	SSE @ 375	miles		
Storm Cen	ter Location	35.95 N	80.70 W			Basin Aver	rage Elevati	on	N/A	feet		
Storm Rep	SST Location	31.00 N	78.00 W			Storm Cen	ter Elevatio	n	900	feet		
Transposit	ion SST Location					Storm Ana	lysis Durati	on	24	hours		
Basin Loca	ntion					Effective E	arrier Heig	ht	N/A	feet		
					•							
	The storm represer	ntative SST is	80.0 F	with tot	tal precipitab	le water abo	ve sea level o	of		3.60	inches.	
	The in-place max	imum SST is	84.0 F	with tot	tal precipitab	le water abo	ve sea level o	of		4.24	inches.	
	The transpositioned max	imum SST is	0.0	with tot	tal precipitab	le water abo	ve sea level o	of		#N/A	inches.	
	The in-place storn	n elevation is	900	whi	ich subtracts	0.27	inches of	f precipitable	e water at	80.0 F		
	The in-place storn	n elevation is	900	whi	ich subtracts	0.31	inches of	f precipitable	e water at	84.0 F		
	The transposition basis	n elevation at	N/A	whi	ich subtracts	x.xx	inches of	f precipitable	e water at	0.0		
The	inflow barrier/basin eleva	tion height is	N/A	whi	ich subtracts	x,xx	inches of	f precipitable	e water at	0.0		
	The in-place stor	m maximizat	ion factor is						7 Zone 3. Storm			
	The transposition/e	levation to ba	sin factor is	-					aximum 24-hr av	erage SST		
	The ba	ırrier adjustm	ent factor is	#N/A		values on Sep	otember 29-30,	1929.				
				_								
	The	total adjustm	ent factor is	#N/A							J	
	Observed Storm Depth-A	Area-Duratio	n									
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	84 Hours	96 Hours	120 Hot
	10 sq miles	1.3	5.1	6.8	7.6	7.8	9.7	9.7	9.7	10.0	10.0	10.0
	100 sq miles	1.3	5.0	6.8	7.5	7.8	9.7	9.7	9.7	9.9	9.9	9.9
	200 sq miles	1.3	4.9	6.6	7.2	7.8	9.6	9.7	9.7	9.8	9.8	9.8
	500 sq miles	1.2	4.5	6.0	7.1	7.7	9.6	9.6	9.6	9.7	9.7	9.7
	1000 sq miles	1.1	4.1	5.8	6.8	7.3	9.4	9.4	9.4	9.5	9.5	9.5
	2000 sq miles	1.0	3.7	5.5	6.5	7.1	9.2	9.2	9.2	9.3	9.3	9.3
	5000 sq miles	0.8	2.9	4.9	6.1	6.6	8.7	8.7	8.7	8.7	8.7	8.7
	10000 sq miles	0.7	2.4	3.9	5.1	5.8	7.6	7.8	7.8	7.8	7.8	7.8
	20000 sq miles	0.5	2.0	3.6	4.4	4.7	6.5	6.5	6.5	6.6	6.6	6.6
	50000 sq miles	0.2	1.3	2.0	2.7	2.9	3.9	4.3	4.3	4.4	4.4	4.4
	62591 sq miles	0.2	1.0	1.8	2.2	2.6	3.4	3.5	3.5	3.5	3.5	3.5
	Storm or Storm Center Na	me			- Settle, NO	C Zone 3						
	Storm Date(s)			9/29 - 10/0	3/1929							
	Storm Type			Tropical							-	
	Storm Location			35.95 N	80.70 W						4	-
	Storm Center Elevation	(10		900	01 6 5=	101515					<del> </del>	
	Precipitation Total & Dura	ation (10 sq m	11)	9.97" in 120	Ohrs from SP	'AS 1517					1	
	C. D			90 0 E	2.4						1	
	Storm Representative SST			80.0 F	78.00 W						1	-
	Storm Representative SST	Location		31.00 N	78.00 W						1	
	Maximum SST			84.0 F							1	
	Moisture Inflow Vector In-place Maximization Fac	tor		SSE @ 375 1.18							1	
	m-piace iviaxiiiiizatioii Fac	101		1.10							1	
	Temporal Transposition (I	Date)		15-Sep							1	
	Transposition SST Location	_		10-0ch			-				1	-
	Transposition Maximum S						-				1	
	Transposition Adjustment			#N/A							1	
	Average Basin Elevation	1 40101		N/A							1	
	Highest Elevation in Basin		N/A							1		
	Inflow Barrier Height			N/A							1	
				4 1/ 4 2			1					
	Barrier Adjustment Factor			#N/A								

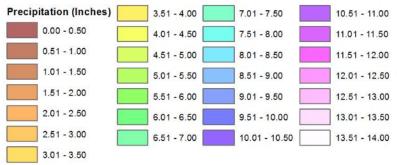
				Storr		Septer		•			•		1929				•
					IVIAA	CINIOINI A	VERAGE		ration (hou		IN (INCH	E3)					
Area (mi²)	1	2	3	4	5	6	12	18	24	30	36	48	60	84	96	120	Total
0.3	1.34	2.03	2.66	3.50	4.16	5.09	6.88	7.59	8.00	9.20	9.81	9.97	9.97	9.97	9.97	9.97	9.97
10	1.33	1.98	2.66	3.50	4.15	5.08	6.80	7.57	7.84	8.97	9.70	9.70	9.70	9.96	9.96	9.96	9.96
100	1.29	1.92	2.62	3.44	4.08	5.00	6.75	7.47	7.78	8.96	9.67	9.70	9.70	9.90	9.90	9.90	9.90
200	1.25	1.87	2.55	3.35	3.97	4.87	6.61	7.18	7.78	8.96	9.64	9.69	9.69	9.83	9.83	9.83	9.83
500	1.19	1.80	2.35	3.06	3.62	4.46	6.03	7.06	7.65	8.76	9.55	9.61	9.62	9.66	9.66	9.66	9.66
1000	1.12	1.69	2.13	2.74	3.32	4.09	5.84	6.80	7.34	8.42	9.41	9.44	9.44	9.49	9.49	9.49	9.49
2000	1.01	1.50	1.96	2.59	2.98	3.67	5.50	6.50	7.11	8.08	9.15	9.16	9.16	9.25	9.25	9.25	9.25
5000	0.83	1.31	1.58	2.10	2.50	2.89	4.93	6.06	6.62	7.61	8.67	8.68	8.68	8.74	8.74	8.74	8.74
10000	0.68	1.10	1.41	1.79	2.12	2.40	3.94	5.12	5.76	6.58	7.60	7.77	7.77	7.79	7.80	7.80	7.80
20000	0.52	0.83	1.10	1.35	1.78	2.03	3.57	4.39	4.70	5.44	6.46	6.48	6.49	6.57	6.58	6.58	6.58
50,000	0.21	0.44	0.64	0.78	0.96	1.25	2.01	2.70	2.86	3.60	3.94	4.28	4.29	4.41	4.41	4.41	4.41
62,591	0.20	0.38	0.52	0.71	0.85	1.01	1.78	2.20	2.56	2.94	3.39	3.46	3.48	3.48	3.48	3.48	3.48

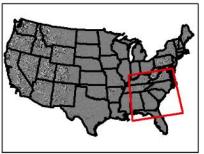






Total 120-hour Precipitation (Inches)
September 29, 1929 0600 UTC - October 4, 1929 0500 UTC
SPAS #1517-Hurricane #2



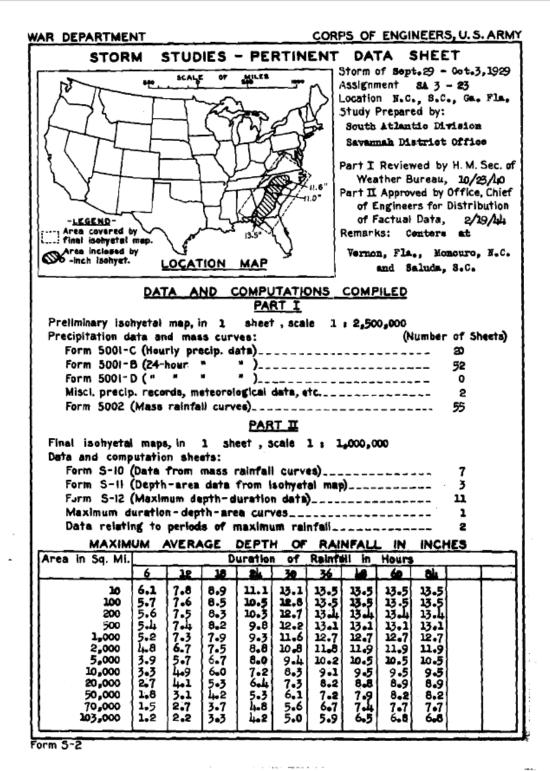


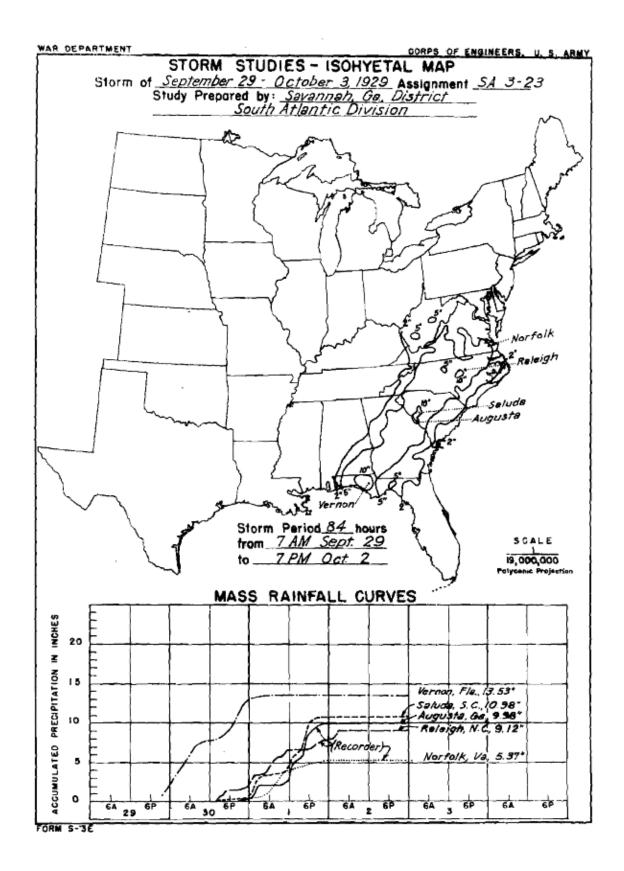
#### **Statoins**

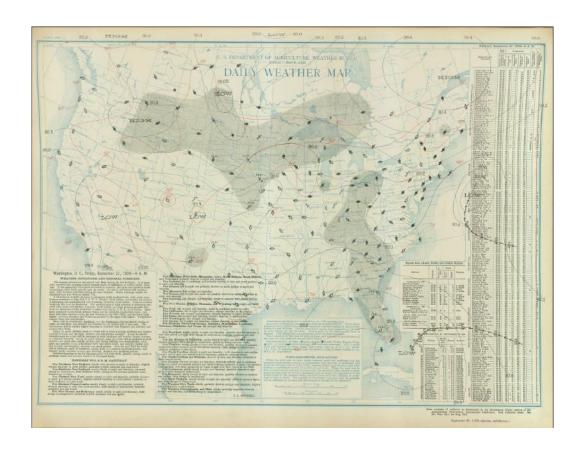
- Daily
- Hourly
- Hourly Estimated
- Supplemental

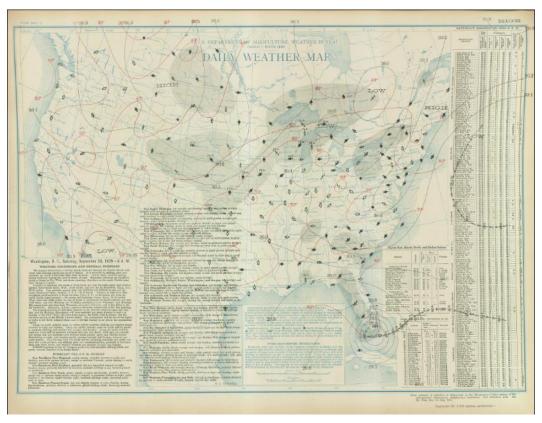
----- Hurricane #2 Track

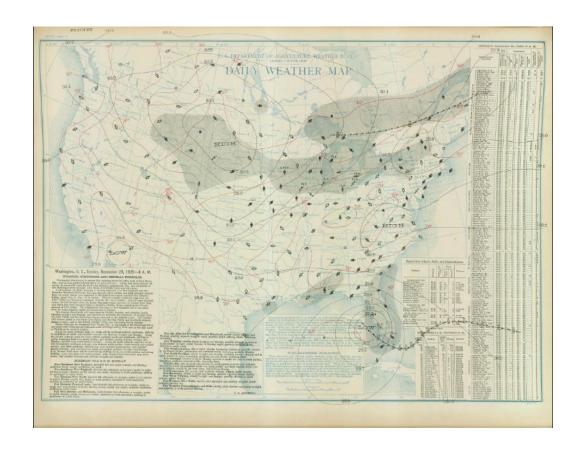
WJM 03/26/2015

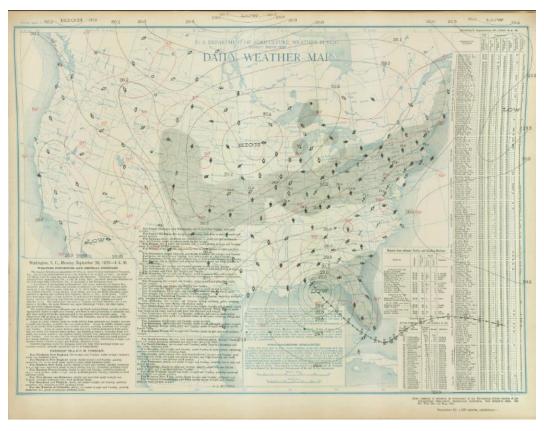


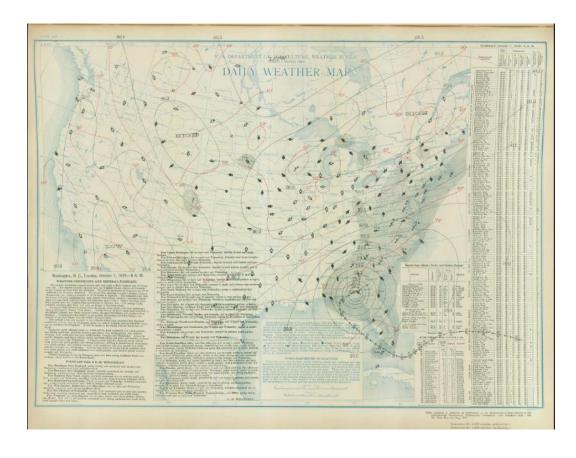


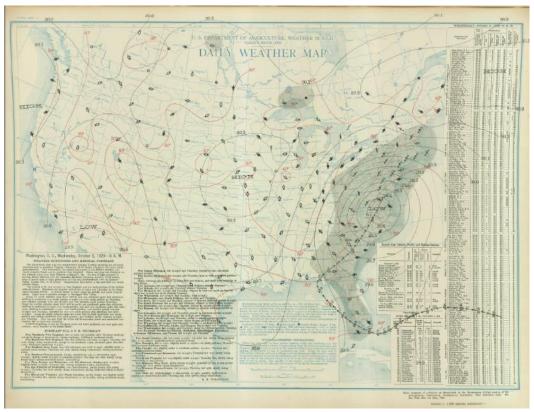


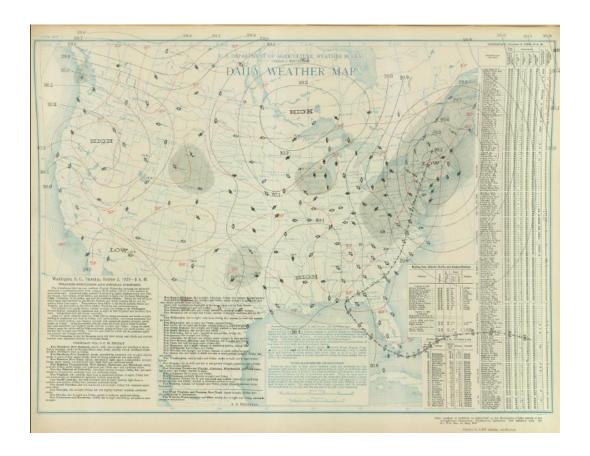




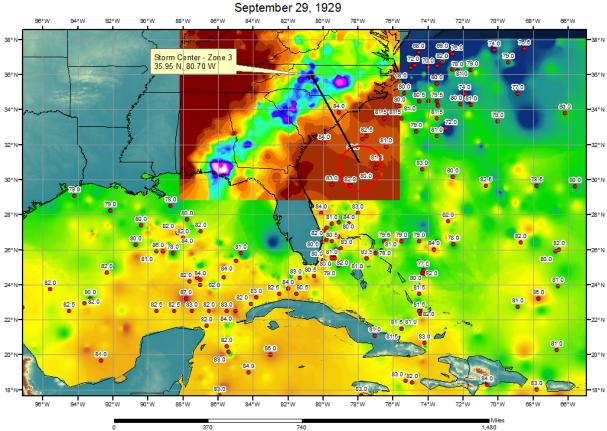




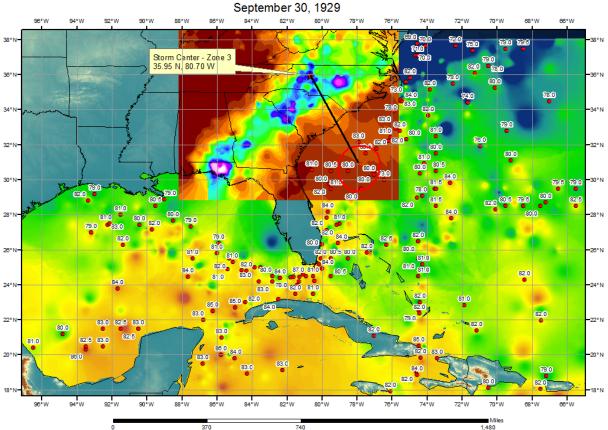




### SPAS 1517 Settle, NC Sea Surface Temperatures (F)



### SPAS 1517 Settle, NC Sea Surface Temperatures (F)



# Storm Precipitation Analysis System (SPAS) For Storm #1490 SPAS Analysis

General Storm Location: Easton, MD

Storm Dates: September 2 -9, 1935

Event: Hurricane

**DAD Zone 1** 

Latitude: 38.8625

**Longitude**: -76.0708

Max. Grid Rainfall Amount: 17.00"

Max. Observed Rainfall Amount: 16.70" at Easton, MD

Number of Stations: 441

SPAS Version: 10.0

Basemap: Conus_prism_ppt_in_1981_2010_09

Spatial resolution: 00:00:30

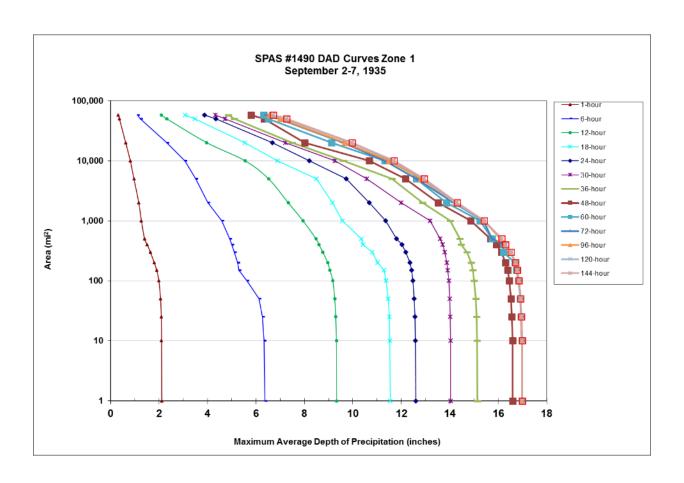
Radar Included: No

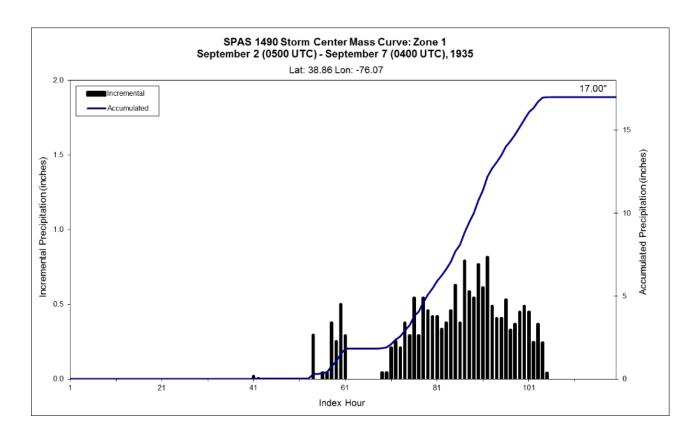
Depth-Area-Duration (DAD) analysis: Yes

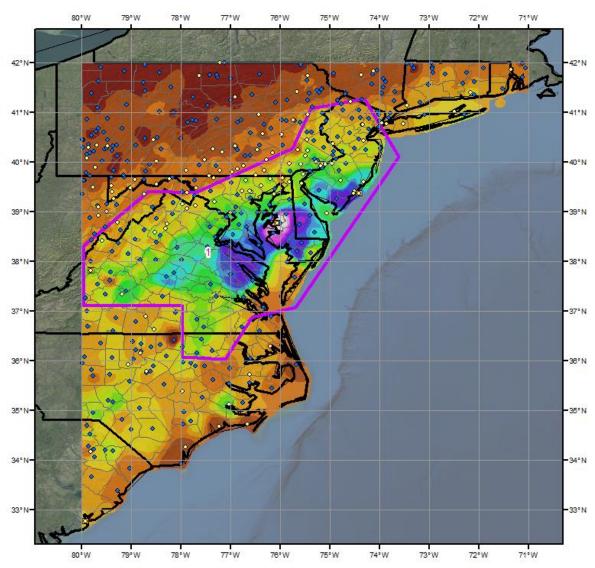
Reliability of results: This storm is originally USACE SA 1-26. This analysis was based on hourly pseudo data, daily data and supplemental station data. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the basemap and we have a high degree of confidence with the timing based on the location of the five hourly pseudo stations (see below). One hourly USACE mass curve captured the largest storm center at Easton, MD allowing high confidence in the spatiotemporal isohyetal pattern of this critical location. Some daily stations lacked timing, so they had to be converted into supplemental stations. The five hourly pseudo stations were consistent in timing with one another. There was no hourly data after the 6th, but so timing of the supplemental stations thereafter is linear in trend. There isn't much if any precipitation that SPAS has falling on the 7th (no more than 0.5" at the very most).

Storm Name:		SPAS 1490	- Easton, M	D									
Storm Date:		9/2-7/1935				S	torm A	djustm	ent for	Virginia	a		
AWA Analysis	s Date:	11/14/2015											
Temporal Tra	nsposit	on Date	20-Aug										
			Lat	Long			Moisture I	Inflow Direc	ction	SSE @ 315	miles		
Storm Center	Locatio	n	38.86 N	76.07 W			Basin Aver	rage Elevati	on	N/A	feet		
Storm Rep SS	T Locat	ion	35.00 N	73.00 W			Storm Cen	ter Elevatio	n	100	feet		
Transposition	SST Lo	cation					Storm Ana	lysis Durati	on	24	hours		
Basin Locatio	n						Effective B	Barrier Heig	ght	N/A	feet		
	The sto	rm represen	tative SST is	80.5 F		tal precipitab					3.68	inches.	
			imum SST is	82.0 F		tal precipitab					3.92	inches.	
The			imum SST is	0.0		tal precipitab					#N/A	inches.	
		•	elevation is	100		ich subtracts	0.03		f precipitabl		80.5 F		
TI.		-	elevation is	100		ich subtracts	0.03		f precipitabl		82.0 F		
			elevation at	N/A		ich subtracts	X.XX		f precipitabl		0.0		
The Initio	w barrier	basin elevat	ion height is	N/A	leet will	ich subtracts	X,XX	menes o	f precipitabl	e water at	0.0		
	TIL :	m mlooo o' - ::		an fastar '-	1.07	1	Notes: Storm	rancantativo	SST value we	as based on SS	C values for		
		•	m maximizati levation to ba		1.07 #N/A					in region where		l	
	me trai	•	rrier adjustm							, matched the s			
		ine ba	iiici aajustiii	1act01 18	171 V F1					track, and was			
		The	total adjustm	ent factor is	#N/A		the storm cen	nter.					
		IIIC	car aajastiii	100101 13	1/12	1							
Observed Sto	rm Dont	h-Aroo-Du	ration										
Observed Sto.	тиг Бері	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	60 Hours	72 Hours	96 Hours	120 Hours	144 Hou
1 9	sq miles	2.1	6.4	9.3	11.6	12.6	15.1	16.6	17.0	17.0	17.0	17.0	17.0
	sq miles	2.1	6.3	9.3	11.5	12.6	15.1	16.6	17.0	17.0	17.0	17.0	17.0
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	sq miles	2.0	5.6	9.2	11.4	12.5	15.0	16.5	16.8	16.9	16.9	16.9	16.9
	sq miles	1.8	5.2	9.0	11.0	12.4	14.9	16.3	16.7	16.7	16.7	16.7	16.7
	sq miles	1.4	4.9	8.5	10.3	11.8	14.4	15.7	15.8	15.8	16.1	16.1	16.2
	sq miles	1.3	4.6	7.9	9.6	11.4	14.0	14.9	15.2	15.4	15.4	15.4	15.4
2000 s	sq miles	1.2	4.0	7.3	9.2	10.7	12.9	13.5	13.9	14.2	14.2	14.2	14.3
5000 s	sq miles	1.0	3.5	6.5	8.5	9.7	11.6	12.2	12.6	12.6	12.8	12.9	12.9
10000 s	sq miles	0.8	3.1	5.6	6.9	8.2	9.6	10.7	11.3	11.3	11.5	11.7	11.7
20000 s	sq miles	0.6	2.3	4.0	5.5	6.7	7.5	8.0	9.1	9.6	9.7	9.9	10.0
50000 s	sq miles	0.4	1.2	2.3	3.5	4.3	5.1	6.3	6.5	6.9	7.0	7.2	7.3
		orm Center	Name			- Easton, M	ID						
	orm Date				9/2-7/1935								
	orm Type				Frontal								
	orm Loca				38.86 N	76.07 W							
		er Elevation			100	. 101							
Pro	ecipitatio	on Total & D	uration		14.6 inches	in 12 hours						1	
Sto	rm Dan	esentative S	СТ		80.5 F	24							
			STLocation		35.00 N	73.00 W							
	aximum S		31 Location		82.0 F	73.00 W							
		flow Vector			SSE @ 315							1	
		aximization			1.07								
	, 0 1/10											1	
Ter	mporal T	ransposition	(Date)		20-Aug								
	•	on SST Loca											
		on Maximur											
	_	on Adjustme			#N/A							Ī	
		sin Elevation			N/A								
Hi	ghest Ele	vation in Ba	sin		N/A								
		ier Height			N/A								
		ustment Fac	tor		#N/A								
	. 1 . 11	tment Facto			#N/A								

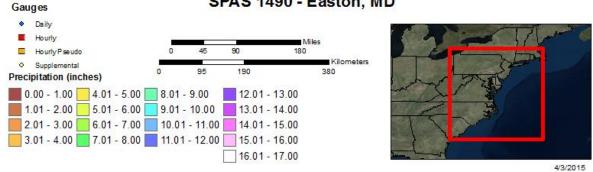
		Sto	rm 149	0 Zone	1 - Se	p. 2 (0	500 U	ΓC) - S	ep. 7 (0400 U	TC), 1	935			
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
							Dur	ation (ho	urs)						
areasqmi	1	6	12	18	24	30	36	48	60	72	96	120	144		Total
0.3	2.11	6.37	9.33	11.55	12.71	14.15	15.14	16.60	16.98	17.00	17.00	17.00	17.00		17.00
1	2.11	6.37	9.33	11.55	12.59	14.04	15.14	16.60	16.98	16.98	16.98	17.00	17.00		17.00
10	2.10	6.33	9.32	11.53	12.58	14.03	15.13	16.59	16.97	16.97	16.97	16.99	16.99		16.99
25	2.09	6.27	9.29	11.50	12.56	14.02	15.11	16.57	16.94	16.95	16.95	16.96	16.96		16.96
50	2.06	6.12	9.25	11.46	12.53	14.00	15.08	16.53	16.91	16.92	16.92	16.93	16.93		16.93
100	1.99	5.63	9.17	11.37	12.48	13.96	15.01	16.45	16.83	16.85	16.85	16.86	16.86		16.86
150	1.90	5.30	9.05	11.28	12.42	13.92	14.95	16.38	16.75	16.78	16.78	16.78	16.78		16.78
200	1.80	5.24	8.96	11.03	12.36	13.88	14.88	16.30	16.68	16.71	16.71	16.71	16.71		16.71
300	1.64	5.11	8.76	10.80	12.19	13.80	14.71	16.13	16.22	16.50	16.50	16.51	16.52		16.52
400	1.51	5.00	8.60	10.41	12.02	13.71	14.47	15.92	16.21	16.25	16.26	16.31	16.31		16.31
500	1.40	4.92	8.48	10.34	11.81	13.61	14.42	15.68	15.75	15.75	16.09	16.14	16.15		16.15
1,000	1.27	4.59	7.94	9.57	11.35	13.18	14.01	14.87	15.24	15.39	15.40	15.42	15.42		15.42
2,000	1.16	4.02	7.33	9.16	10.67	12.00	12.88	13.52	13.86	14.15	14.22	14.22	14.32		14.32
5,000	0.96	3.52	6.52	8.49	9.72	10.57	11.61	12.16	12.62	12.64	12.82	12.91	12.94		12.94
10,000	0.81	3.07	5.55	6.89	8.20	9.25	9.61	10.68	11.32	11.32	11.49	11.65	11.69		11.69
20,000	0.62	2.32	3.97	5.53	6.68	7.22	7.49	8.02	9.12	9.61	9.68	9.92	9.97		9.97
50,000	0.36	1.23	2.32	3.47	4.34	4.72	5.10	6.34	6.50	6.94	7.01	7.22	7.26		7.26
57,977	0.31	1.10	2.10	3.08	3.88	4.32	4.86	5.80	6.32	6.45	6.56	6.67	6.71		6.71

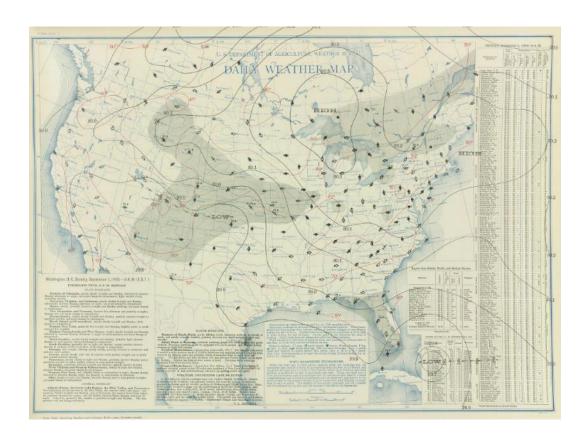


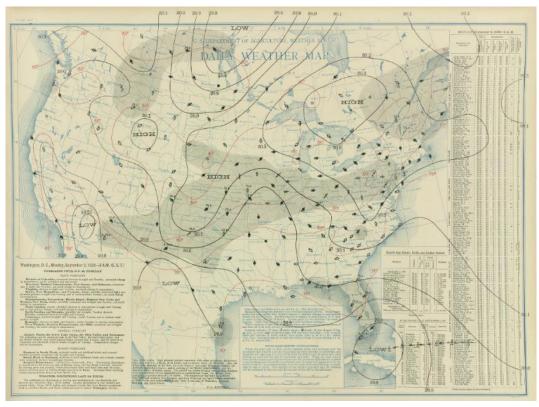


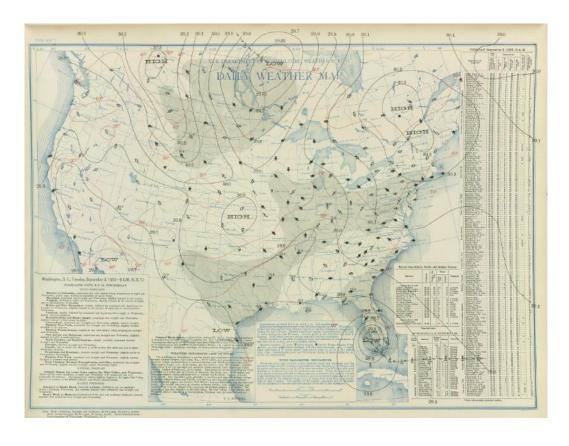


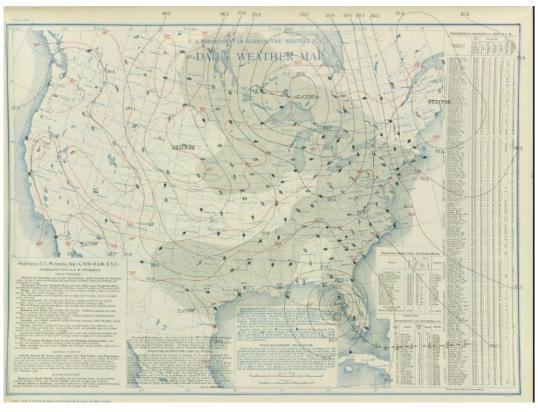
Total Storm (144-hours) Precipitation (inches) September 2 - 7, 1935 SPAS 1490 - Easton, MD

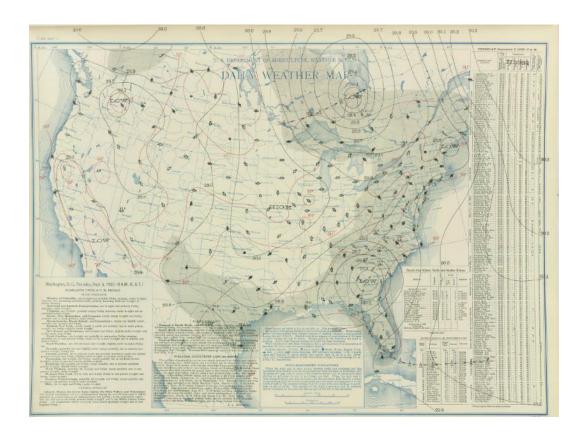


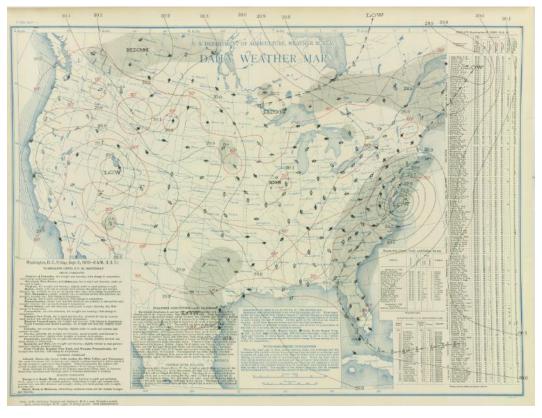






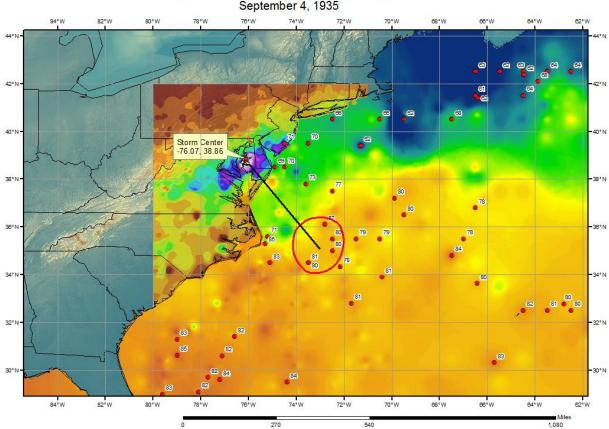








SPAS 1490 Easton, MD Storm Analysis September 4, 1935



Storm Precipitation Analysis System (SPAS) For Storm #1342 SPAS Analysis

General Storm Location: Idlewild, North Carolina (40.0, -86.0, 31.0, -74.0)

Storm Dates: August 10-August 16, 1940

Event: Extreme Precipitation Event

DAD Zone 1

Latitude: 36.3

Longitude: -81.45

Max. Grid Rainfall Amount: 20.27"

Max. Observed Rainfall Amount: 20.03"

Number of Stations: 823

SPAS Version: 10.0

Basemap: Continental United States 2-yr 24-hr (conus_0002y24h)

Spatial resolution: 0.2679

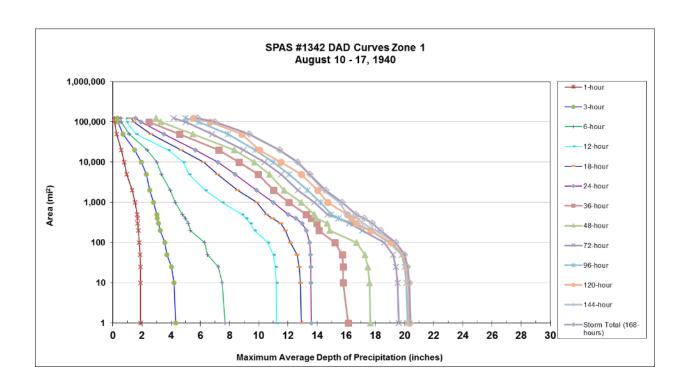
Radar Included: No

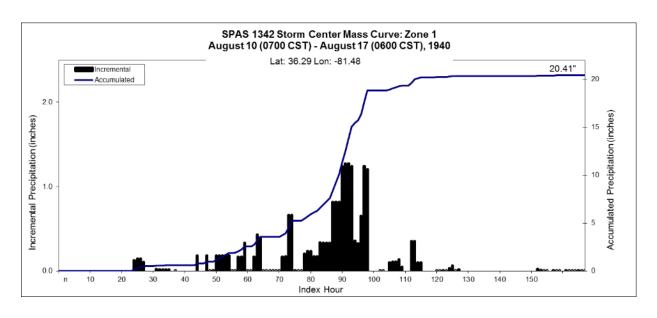
Depth-Area-Duration (DAD) analysis: Yes

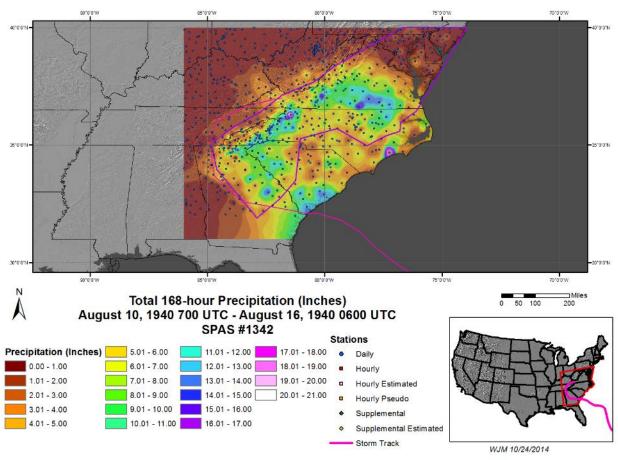
Reliability of results: In addition to the NCDC stations, eighteen supplemental stations along with one supplemental estimated station were added to ensure data consistency. Due to the amount and integrity of the Tennessee Valley Authority (TVA), no stations within the main storm area had hourly data available to time precipitation on the last two days of the storm analysis. Upon further inspection of a Department of Interior (DOI) report, several hourly stations were found and entered in. Looking in NCDC local climatology, four hourly stations were found but in the northeast extent of the storm domain that were used for timing of the precipitation. With the density of stations available and the consistency of the resulting SPAS analysis, this analysis is deemed quite reliable in and near the storm center.

Storm Name:	SPAS 1342 -	Mt Mitchel	II, NC								
Storm Date:	8/10-16/1940				S	torm A	djustm	ent for	Virginia	a	
AWA Analysis Date:	11/14/2015										
Temporal Transposi	tion Date	15-Aug									
		Lat	Lon			Moisture 1	Inflow Dire	ction	ESE @ 480	miles	
Storm Center Locat	ion	36.29 N	81.48 W			Basin Ave	rage Elevati	ion	N/A	feet	
Storm Rep SST Loca	tion	33.00 N	74.00 W			Storm Cer	ter Elevati	on	3,100	feet	
Transposition SST I	ocation					Storm Ana	lysis Durat	ion	24	hours	
Basin Location						Effective I	arrier Hei	ght	N/A	feet	
								_	1		
	storm represent		82.0 F		• •		e sea level o			3.92	inches.
	e in-place maxi		83.5 F		• •		ve sea level o			4.16	inches.
	ositioned maxi in-place storm		3.100		ch subtracts	0.89	e sea level o	n f precipitabl	a water at	#N/A 82.0 F	inches.
	in-place storm		3,100		ch subtracts	0.92		f precipitabl		83.5 F	
	sposition basin		N/A		ch subtracts	X.XX		f precipitabl		0.0	
	ier/basin elevati		N/A		ch subtracts	X.XX		f precipitabl		0.0	
		Ü						•			
	e in-place storn			1.07					as based on SS		
The t	ransposition/ele			#N/A		-	•		e hurricane. Va not vary more t		
	The bar	rier adjustme	ent factor is	#N/A			-		ature recordings		-
	Tho	otal adiustme	nt footo=:-	#N/A		the period.	-			3	
	The to	otai adjustine	ent factor is	#IN/A							
Observe	Storm Depth-	Area-Durat	ion								
Observe	i Storm Deptii-	1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hou
	1 sq mile	-	7.7	11.2	12.9	13.6	16.2	17.7	19.6	20.2	20.3
······································	10 sq miles	~ /~~~~~~~	7.5	11.2	12.9	13.6	15.8	17.6	19.5	20.1	20.3
	100 sq miles	1.8	6.3	10.6	12.2	13.5	15.2	16.7	18.6	19.0	19.1
	200 sq miles	1.8	5.3	9.7	11.8	13.3	14.1	14.9	17.1	17.7	17.7
	500 sq miles	1.7	4.8	8.9	10.6	12.0	13.3	13.8	14.7	15.0	16.1
	1000 sq miles		4.3	7.5	9.9	11.0	12.1	12.9	13.8	14.3	14.7
	2000 sq miles	·	4.0	6.3	8.6	9.9	11.0	11.7	12.7	13.4	14.1
	5000 sq miles		3.3	5.2	7.2	8.4	10.0	10.7	11.6	12.1	12.9
	10000 sq miles	·/	3.0	4.8	6.2	7.2	8.6	9.7	10.4	11.0	11.5
	20000 sq miles		2.4	3.8	2.6	5.7 3.5	7.3 4.6	8.3 5.5	9.0	9.8 7.9	10.1
	50000 sq miles 00000 sq miles	·	1.1 0.6	1.0	1.4	1.9	2.5	3.3	6.8 5.0	5.9	8.8 6.7
1	boood sq miles	0.1	0.0	1.0	1.7	1.7	2.5	3.3	3.0	3.7	0.7
Storm or	Storm Center N	ame		SPAS 1342	- Mt Mitche	ell. NC					Ì
Storm Da				8/10-16/194		11,110					
Storm Ty				Landfalling 7		lone					
Storm Lo	cation			36.29 N	81.48 W						
	nter Elevation			3,100							
Precipitat	ion Total & Dur	ration (100 s	q mi)	20.27" inche	s in 120 hou	irs					
G, B		Т		92 O F	24						1
	presentative SST			82.0 F	24 74.00 W						
Maximun	presentative SST	1 LOCATION		33.00 N 83.5 F	74.00 W						
	Inflow Vector			ESE @ 480							1
	Maximization Fa	ctor		1.07							
III place I											ĺ
Temporal	Transposition (Date)		15-Aug							
Transposi	tion SST Location	on									
	tion Maximum S										
	tion Adjustment	t Factor		#N/A							
	Basin Elevation			N/A							
	levation in Basi	n		N/A							
- ~ -				N/A							
Inflow Ba	frier Height djustment Facto	-		#N/A							

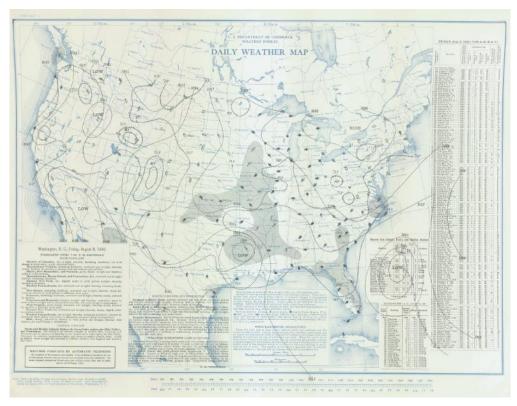
	Sto	orm 134	12 Zon	e 1 - Aı	ugust 1	0 (070	0 CST)	- Augı	ust 17 (0600 0	ST), 1	940		,	
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
							Duration	(hours)							
areasqmi	1	3	6	12	18	24	36	48	72	96	120	144	168	Total	
0.3	1.9	4.3	7.7	11.3	12.9	13.7	16.3	17.7	19.6	20.2	20.3	20.4	20.4	20.41	
1	1.9	4.3	7.7	11.2	12.9	13.6	16.2	17.7	19.6	20.2	20.3	20.4	20.4	20.41	
10	1.9	4.2	7.5	11.2	12.9	13.6	15.8	17.6	19.5	20.1	20.3	20.3	20.3	20.34	
25	1.9	4.0	7.2	11.1	12.8	13.6	15.8	17.5	19.4	20.0	20.1	20.2	20.2	20.21	
50	1.9	3.7	6.5	11.0	12.6	13.6	15.8	17.3	19.2	19.8	19.9	20.0	20.0	20.01	
100	1.8	3.6	6.3	10.6	12.2	13.5	15.2	16.7	18.6	19.0	19.1	19.4	19.4	19.41	
200	1.8	3.3	5.3	9.7	11.8	13.3	14.1	14.9	17.1	17.7	17.7	18.0	18.4	18.35	
300	1.7	3.1	5.2	9.4	11.5	13.0	14.0	14.7	16.2	16.4	16.7	17.1	17.8	17.79	
400	1.7	3.1	5.0	9.1	11.0	12.5	13.6	14.0	15.5	15.5	16.4	16.8	17.2	17.24	
500	1.7	3.0	4.8	8.9	10.6	12.0	13.3	13.8	14.7	15.0	16.1	16.1	16.7	16.68	
1,000	1.5	2.8	4.3	7.5	9.9	11.0	12.1	12.9	13.8	14.3	14.7	15.5	15.7	15.73	
2,000	1.3	2.5	4.0	6.3	8.6	9.9	11.0	11.7	12.7	13.4	14.1	14.4	14.6	14.60	
5,000	1.0	2.3	3.3	5.2	7.2	8.4	10.0	10.7	11.6	12.1	12.9	13.5	13.5	13.50	
10,000	8.0	2.0	3.0	4.8	6.2	7.2	8.6	9.7	10.4	11.0	11.5	12.6	12.7	12.68	
20,000	0.6	1.5	2.4	3.8	4.7	5.7	7.3	8.3	9.0	9.8	10.1	11.4	11.4	11.44	
50,000	0.3	0.7	1.1	1.6	2.6	3.5	4.6	5.5	6.8	7.9	8.8	9.3	9.4	9.36	
100,000	0.1	0.3	0.6	1.0	1.4	1.9	2.5	3.3	5.0	5.9	6.7	7.0	7.0	7.01	
124,364	0.1	0.3	0.6	0.9	1.3	1.6	2.2	3.0	4.2	5.0	5.5	5.8	5.8	5.82	



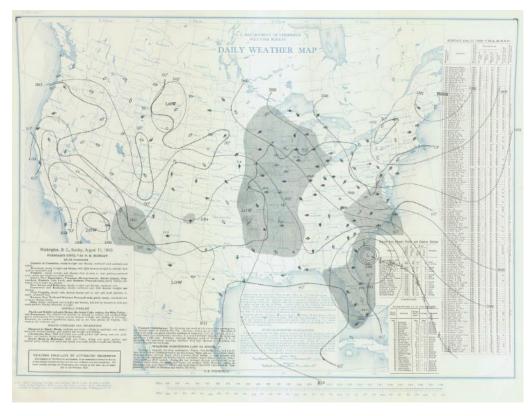


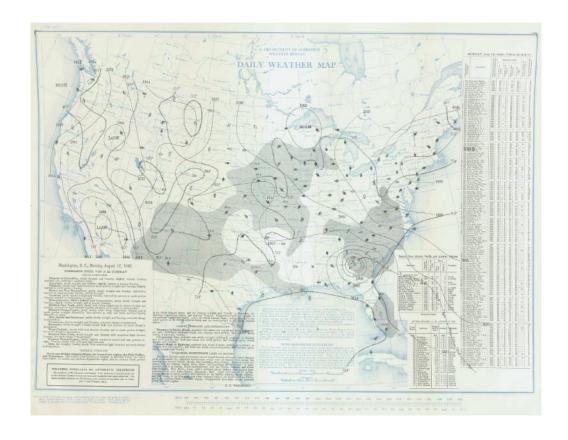


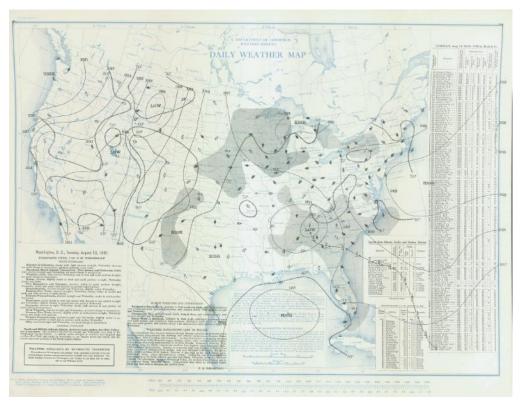




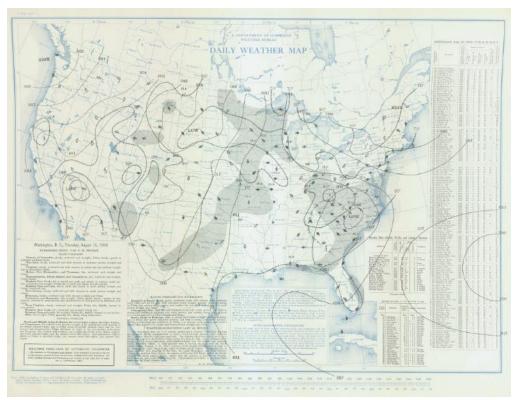


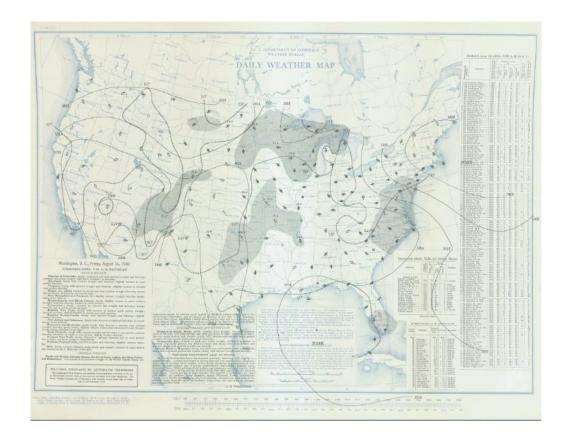










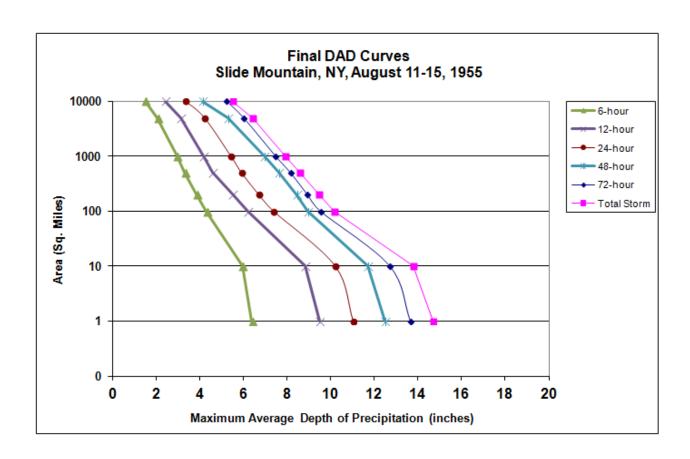


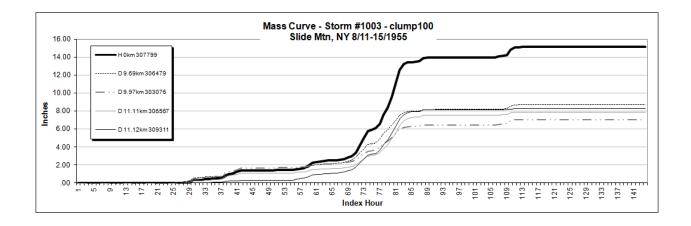
Storm Precipitation Analysis System (SPAS) For Storm #1003 SPAS Analysis

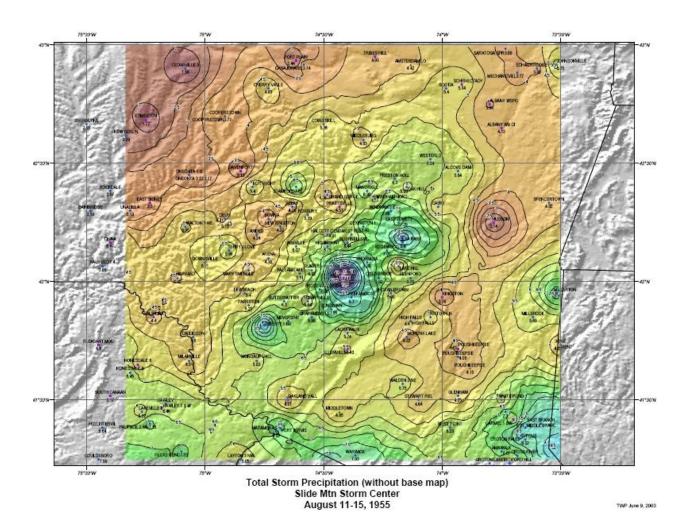
Slide Mountain, NY August 11, 1955

Storm Name:	SPAS 1003-Slic	de Mountain.	NY-DAD v								
Storm Date:	8/11-15/1955				S	Storm A	diustm	ent for	Virginia	a	
AWA Analysis Date					~		ajasan		, S	•	
emporal Transpo	sition Date	5-Aug									
emporur Trunspo	5717011 D 1110	Lat	Long			Moisture I	nflow Dire	rtion	SE @ 105	miles	
torm Center Loca	ntion	42.02 N	74.42 W				age Elevati		N/A	feet	
torm Rep Dew Po		40.80 N	73.20 W				ter Elevati		3,000	feet	
•		40.80 N	73.20 W								
ransposition Dew asin Location	Point Location						lysis Durati arrier Heig		24 N/A	hours feet	
asin Location						Elective D	arrier rier	3111	IN/A	icci	
The		dovumeintie	73.0 F	rrith tot	tal precipitab	la motan aba	un ann larml	of		2.60	inches.
	storm representative e in-place maximum		76.0 F		tal precipitat					2.99	inches.
	ositioned maximum	•	0.0		tal precipitat					#N/A	inches.
The transp	The in-place storn		3,000		ich subtracts	0.66		f precipitabl	a water at	73.0 F	menes.
	The in-place storn		3,000		ich subtracts	0.73		f precipitabl		76.0 F	
Th	e transposition basis		N/A		ich subtracts	X.XX		f precipitabl		0.0	
	v barrier/basin eleva		N/A		ich subtracts	X.XX		f precipitabl		0.0	
The millov	v darrier/ dasin ele va	tion neight is	11/71	reet win	ch subtracts	АнАА	menes o	г ргсстриаот	c water at	0.0	
	The in place stor	rm movimizati	on footor is	1.165	1	Notes: DAD va	lues taken from	NA 2-21A for (Conowingo only b	ecause of the	large hasir
	The in-place stor			#N/A					on smaller area siz		
	The transposition/e	arrier adjustm		#N/A #N/A		relevant storm	centers. Storm	representative d	ew point value w		
	The Da	arici aujustiii	ont ractor IS	#1¶/A		values for Aug	ust 11-12, 1955	at KJFK, KFOK	, and KBDR.		
	Th.a	total adjustes	ant factor :	#N/A							
	Ine	total adjustm	ont ractor IS	#1 \ /A	<u> </u>						
	164 5 0	D (1									-
Observe	ed Storm Depth-Ar		10.11	10.17	24.17	40.17	70.11	0617	120 17		
	10 3	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	5.6	8.8	10.3	10.8	12.5	13.5	14.5	14.5		-
	100 sq miles	4.4	6.9	8.0	8.4	12.0	12.7	13.1	13.1		-
	200 sq miles	3.9	6.0	6.9	7.5	11.6	12.3	12.5	12.5		_
	500 sq miles	3.3	4.8	5.6	6.5	10.7	11.3	11.5	11.5		-
***************************************	1000 sq miles	3.0	4.1	5.0	6.0	9.8	10.4	10.6	10.6		_
	2000 sq miles	2.6	3.6	4.6	5.5	9.0	9.6	9.8	9.8		_
	5000 sq miles	2.1	3.0	4.0	5.0	8.1	8.7	9.0	9.0		-
0.0000000000000000000000000000000000000	10000 sq miles	1.7	2.6	3.6	4.5	7.2	8.0	8.4	8.4		
***************************************	20000 sq miles	1.4	2.3	3.1	3.9	6.2	7.2	7.5	7.5		_
	50000 sq miles	1.0	1.9	2.5	3.1	4.8	5.7	6.0	6.0		
	81000 sq miles	0.9	1.7	2.2	2.7	4.0	4.8	5.1	5.1		4
_											_
	r Storm Center Nam	ne				ntain, NY-D	AD values i	rom USAC	E NA 2-21A		
Storm D				8/11-15/19		<u> </u>			-		4
Storm T	••				urricane Con	nie			-		4
Storm L				42.02 N	74.42 W				-		-
	enter Elevation			3,000	1441						-
Precipit	ation Total & Durati	ion		14.70 Inche	s 144-hours						+
G. 7		D = 1 = 4		72.0 E	24						+
	epresentative Dew I			73.0 F	24			T 1			+
	epresentative Dew I	oint Location		40.80 N	73.20 W			July	Aug		-
	m Dew Point			76.0 F				75.81	75.83		+
	e Inflow Vector			SE @ 105							+
In-place	Maximization Factor	or		1.16							+
	1 T			5 A							+
	al Transposition Dat			5-Aug							1
	sition Dew Point Lo										1
	sition Maximum De			HNT/A							+
	sition Adjustment Fa	actor		#N/A							+
	Basin Elevation			N/A							4
	Elevation in Basin			N/A							4
	Barrier Height			N/A					-		4
	Adjustment Factor			#N/A							4
	ljustment Factor			#N/A					1		1

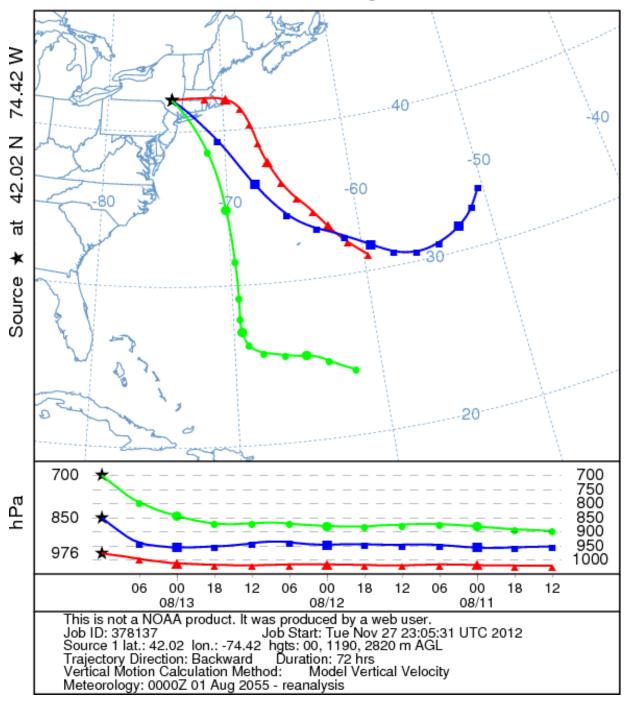
	Storm 1003 - Slide Mountain, NY, August 11-15, 1955 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
		Duration (hours)										
Area in Sq. Mi.		6	12	24	48	72		total (144)				
1.000		6.4	9.5	11.1	12.5	13.7		14.7				
10.000		6.0	8.8	10.2	11.7	12.7		13.8				
100.000		4.3	6.2	7.4	9.0	9.5		10.2				
200.000		3.9	5.5	6.7	8.4	8.9		9.4				
500.000		3.3	4.6	5.9	7.6	8.2		8.6				
1000.000		3.0	4.2	5.4	7.0	7.5		7.9				
5000.000		2.1	3.2	4.2	5.3	6.0		6.4				
10000.000		1.5	2.5	3.4	4.2	5.3		5.5				



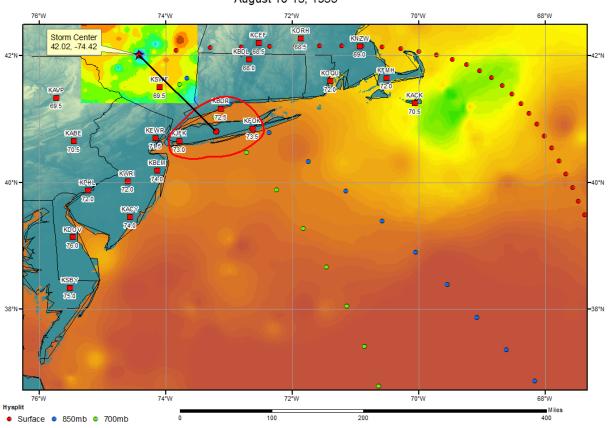




NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 13 Aug 55 CDC1 Meteorological Data



SPAS 1003 Slide Mtn, NY Storm Analysis August 10-13, 1955

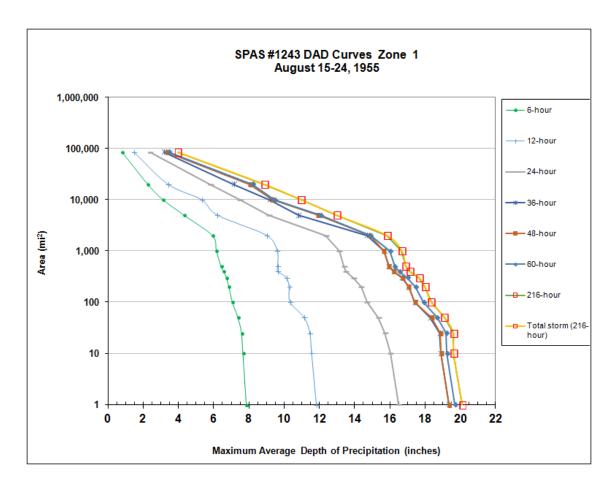


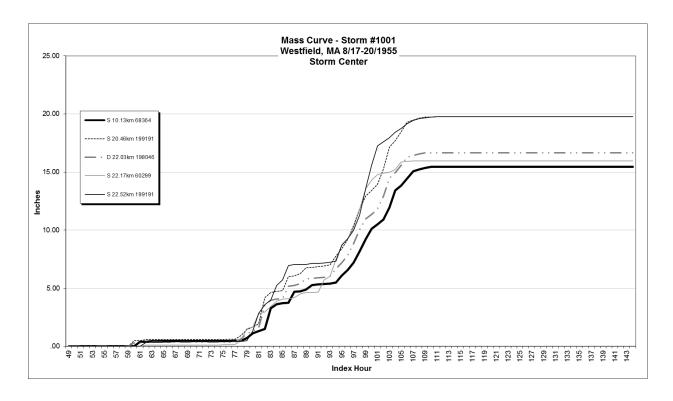
Storm Precipitation Analysis System (SPAS) For Storm #1243 SPAS Analysis

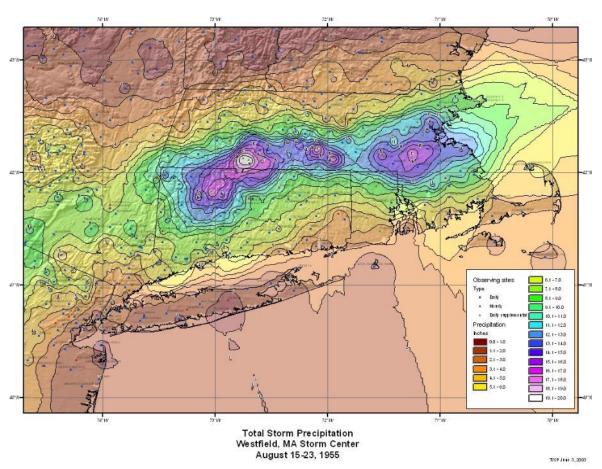
Westfield, MA August 17, 1955

Storm Nam	GD + G 10 10 T	7 (0 1135)		I							
		Vestfield, MA	<u> </u>			A		4 C	T 72		
Storm Date	e: 17-Aug-55 ysis Date: 11/14/2015				5	torm A	ajustm	ent for	Virginia	1	
•	•						i		1		T
Temporal '	Transposition Date	15-Aug									
		Lat	Long				nflow Direc		SSW @ 155	miles	
Storm Cen	ter Location	42.12 N	72.70 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep	Dew Point Location	40.20 N	74.25 W			Storm Cen	ter Elevatio	n	300	feet	
Transposit	ion Dew Point Location					Storm Ana	lysis Durati	on	24	hours	
Basin Loca	ntion					Effective B	arrier Heig	ht	N/A	feet	
					•						
	The storm representative	dew point is	75.0 F	with tot	al precipitab	le water abo	ve sea level o	of		2.85	inches.
	The in-place maximum	dew point is	76.0 F	with tot	al precipitab	le water abo	ve sea level o	of		2.99	inches.
The	transpositioned maximum	dew point is	0.0	with tot	al precipitab	le water abo	ve sea level o	of		#N/A	inches.
	The in-place storn	n elevation is	300	feet whi	ch subtracts	0.08	inches of	f precipitabl	e water at	75.0 F	
	The in-place storn	n elevation is	300	feet whi	ch subtracts	0.08	inches of	f precipitabl	e water at	76.0 F	
	The transposition basis	n elevation at	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
The	inflow barrier/basin elevat	tion height is	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitabl	e water at	0.0	
	The in-place stor	m maximizat	ion factor is	1.05		Notes: DAD	values taken fr	om SPAS 124	13. Storm rep T	d taken fron	ı
	The transposition/e			#N/A					R, and KJFK (19		
		rrier adjustm		#N/A							
	2.10 00										
	The	total adjustm	ent factor is	#N/A							
	The			11.2							
	Observed Storm Depth-A	Aron-Durott	n								
	Observed Storm Depth-2	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	06 Hours	120 Hours		
	10 sq miles	7.7	~~~~~	}	24 Hours 16.0		72 Hours	96 Hours			-
		7.1	11.6	13.8 12.6		18.9 17.4	19.2 17.9	19.6	19.6	-	1
	100 sq miles	7.1 6.9	10.4	ţ	14.7		 	18.3	18.3	-	-
	200 sq miles		10.3	12.3	14.4	17.1	17.5	18.0	18.0	-	-
	500 sq miles	6.4	9.6	11.5	13.4	15.9	16.3	16.9	16.9	-	-
	1000 sq miles	6.2	9.6	11.4	13.1	15.7	16.0	16.7	16.7	-	-
	2000 sq miles	5.9	9.0	10.7	12.4	14.9	14.9	15.8	15.8	-	
	5000 sq miles	4.3	6.2	7.7	9.1	11.9	12.1	13.0	13.0	-	-
	10000 sq miles	3.1	5.3	6.4	7.5	9.4	9.4	11.0	11.0	-	
	20000 sq miles	2.2	3.4	4.6	5.8	8.1	8.2	8.9	8.9	-	
ļ	84855 sq miles	0.8	1.5	2.0	2.4	3.4	3.5	4.0	4.0	-	J
	Storm or Storm Center Na	me			-Westfield,	MA					
	Storm Date(s)			8/17/1955							1
	Storm Type			Hurricane D							1
	Storm Location			42.12 N	72.70 W						1
				1							J
	Storm Center Elevation			300							
	Storm Center Elevation Precipitation Total & Dura	ation			s 72-hours S	SPAS 1001 I	DAD				
	Precipitation Total & Dura				s 72-hours S	SPAS 1001 I	DAD				
					s 72-hours S	SPAS 1001 I	DAD				
	Precipitation Total & Dura	v Point	ion	19.75 Inche 75.0 F	s 72-hours S 74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev	v Point	on	19.75 Inche 75.0 F		SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev	v Point	ion	19.75 Inche 75.0 F 40.20 N	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point	v Point v Point Locat	ion	19.75 Inche 75.0 F 40.20 N 76.0 F	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector	v Point v Point Locat	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector	v Point v Point Locat ctor	on	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximization Fac	v Point v Point Locat ctor ate	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Duranton Total & D	v Point v Point Locat etor ate Location	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximization Fac Temporal Transposition D	v Point Locat v Point Locat etor ate cocation Dew Point	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximum Temporal Transposition Dew Point I Transposition Dew Point I Transposition Maximum I	v Point Locat v Point Locat etor ate cocation Dew Point	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximization Fac Temporal Transposition D Transposition Dew Point I Transposition Maximum D Transposition Adjustment Average Basin Elevation	v Point Locat eter ate _ocation Dew Point Factor	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05 15-Aug #N/A N/A	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximization Fac Temporal Transposition D Transposition Dew Point I Transposition Maximum E Transposition Adjustment Average Basin Elevation Highest Elevation in Basin	v Point Locat eter ate _ocation Dew Point Factor	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05 15-Aug #N/A N/A N/A	74.25 W	SPAS 1001 I	DAD				
	Precipitation Total & Dura Storm Representative Dev Storm Representative Dev Maximum Dew Point Moisture Inflow Vector In-place Maximization Fac Temporal Transposition D Transposition Dew Point I Transposition Maximum D Transposition Adjustment Average Basin Elevation	v Point Locat ctor ate	ion	19.75 Inche 75.0 F 40.20 N 76.0 F SSW @ 155 1.05 15-Aug #N/A N/A	74.25 W	SPAS 1001 I	DAD				

	Storm 1243 - August 15 (600 UTC) - August 24 (0500 UTC), 1955 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)											
							,					
Area (mi ²)	6	12	24	36	48	60	216	Total				
1	7.85	11.84	16.5	19.34	19.37	19.69	20.09	20.09				
10	7.66	11.57	16.03	18.88	18.91	19.23	19.61	19.61				
25	7.58	11.47	15.72	18.83	18.86	19.18	19.6	19.60				
50	7.37	11.15	15.35	18.28	18.36	18.67	19.09	19.09				
100	7.06	10.35	14.69	17.41	17.41	17.91	18.34	18.34				
200	6.86	10.29	14.37	17.06	17.06	17.45	17.98	17.98				
300	6.72	10.14	13.94	16.68	16.73	17.01	17.65	17.65				
400	6.56	9.64	13.5	16.21	16.21	16.52	17.12	17.12				
500	6.41	9.64	13.39	15.94	15.94	16.27	16.89	16.89				
1,000	6.15	9.62	13.13	15.66	15.66	16.01	16.67	16.67				
2,000	5.92	9.03	12.35	14.69	14.86	14.9	15.83	15.83				
5,000	4.3	6.21	9.13	10.8	11.92	12.06	12.98	12.98				
10,000	3.1	5.32	7.48	9.17	9.36	9.43	10.96	10.96				
20,000	2.24	3.41	5.81	7.14	8.05	8.22	8.87	8.87				
84,855	0.79	1.48	2.4	3.17	3.35	3.46	3.96	3.96				







CEPARTMENT OF THE ARMY STUDIES - PERTINENT DATA SHEET STORM -LEGEND-Area covered by final isohyetal map. Area inclosed by 3-inch isohyet. LOCATION MAP

CORPS OF ENGINEERS

Storm of 17-20 Aug. 1955 Assignment MA 2-22A Location Mass. to Maryland Study Prepared by: New England Division

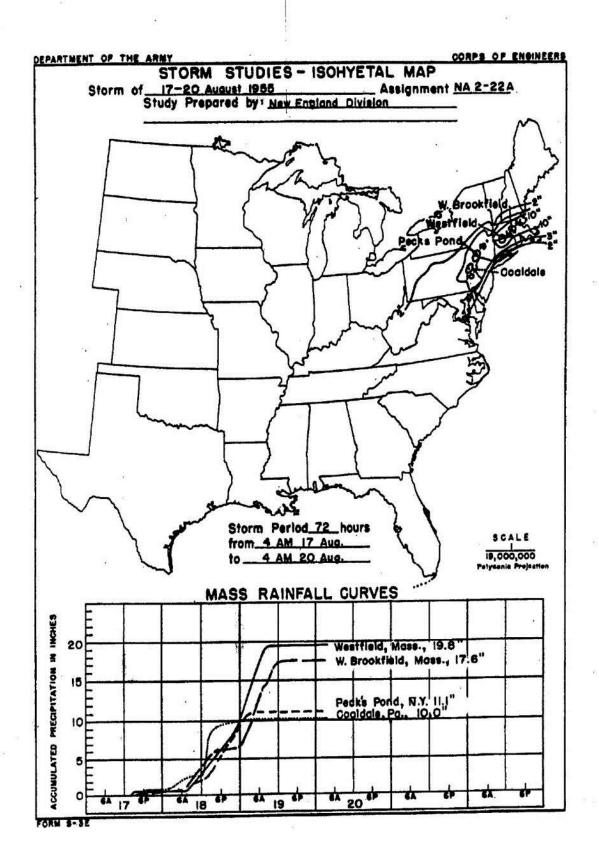
Part I Reviewed by H. M. Sec. of Weather Bureau, Dec. 1955 Part I Approved by Office, Chief of Engineers for Distribution of Factual Data, 1/8/59 Remarks: Genter at Westfield, Mass., Dewpt 74°, Ref. Pt. 105 S. Orid D-3

DATA AND COMPUTATIONS COMPILED PART I

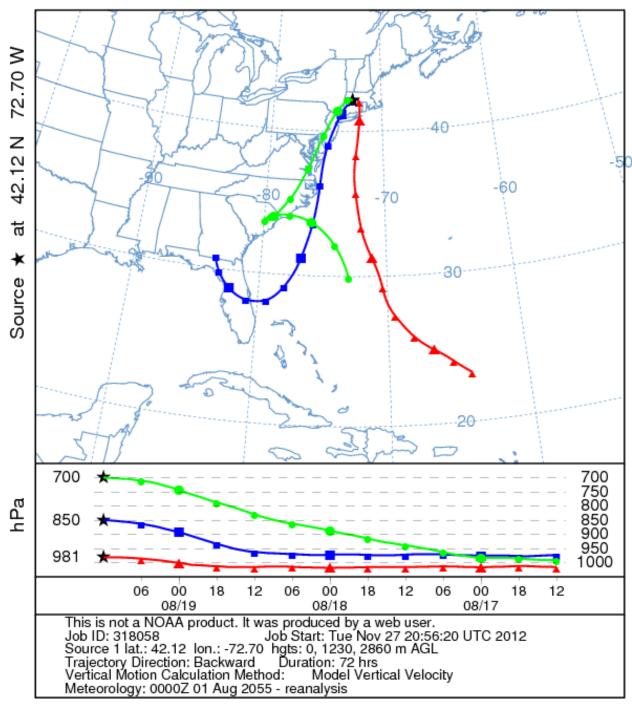
Preliminary isohyetal map, in 1 sheet, scale 1:1,000,000 Precipitation data and mass curves: (Number	of Sheets)
Form 5001-C (Hourly precip. data)	280
Form 5001-B (24-hour " ")	~~
Form 5001-D (" " ")	91
Miscl. precip. records, meteorological data, etc	~
Form 5002 (Mass rainfall curves)	689
PART II	
Final isohyetal maps, in 1 sheet, scale 1:1,000,000	
Data and computation sheets:	
Form S-10 (Data from mass rainfall curves)	4
Form S-II (Depth-ares data from Isohyetal map)	3
Furm S-12 (Maximum depth-duration data)	9
Maximum duration-depth-area CUTY65	2
Data relating to periods of maximum rainfall	0
THE PART OF PAINTALL IN INCH	IES .

Area in Sq. Ml.		Duration of Rainfall in Hours											
	6	12	18	24	30	36	48	60	72	-			
Max. Station	7.9	11.7	14.3	18.2	19.4	19.5	19.8	19.8	19.8				
10	7.8	11.1	13.0	16.4	18.5	18.9	19.4	19.6	19.6				
100	7.6	10.5	11.6	24.6	17.6	18.1	18.8	19.0	19.0	- 1			
200	7.4	10.2	11.4	14.2	17.1	17.6	18.2	18.4	18.4				
500	6.8	9.7	10.8	13.4	16.3	16.8	17.2	17.3	17.3				
1,000	6.2	9.2	10,2	12.4	15.4	15.9	16.2	16.4	16.4	- 1			
2,000	5.4	8.0	9.4	11.2	14.0	14.5	14.9	15.2	15.2				
5,000	4.0	6.3	7.9	9.5	11.7	12.1	12.6	13.0	13.0				
10,000	3.1	5.0	6.5	8.0	9.7	10.0	10.6	10.8	10.8	1			
20,000	2.1	3.6	4.9	6.3	7.6	7.9	8.3	8.5	8.5	- 1			
35,000	1.3	3.6	3.6	4.7	5.6	6.0	6.4	6.5	6.5				

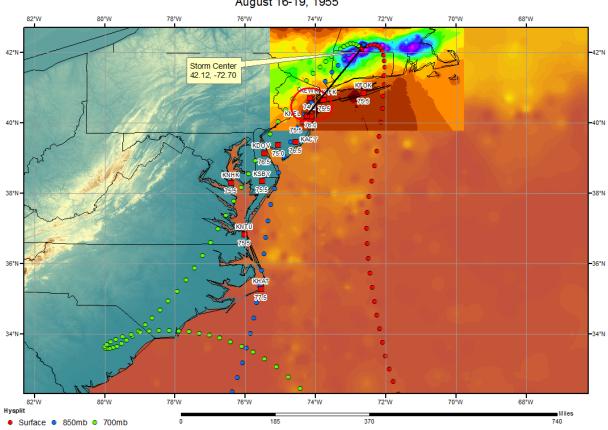
Form 5-2

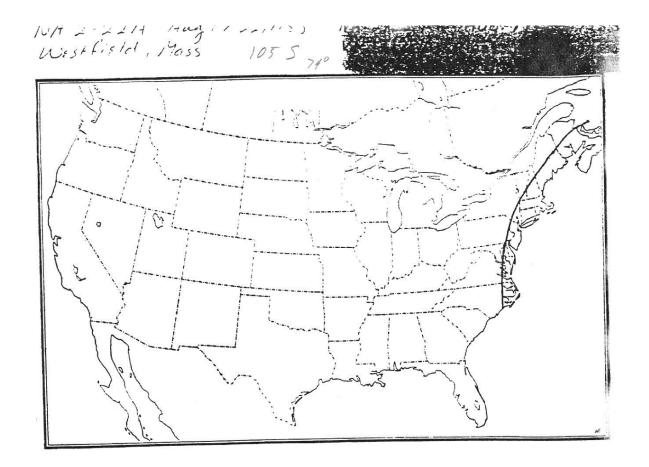


NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 19 Aug 55
CDC1 Meteorological Data



SPAS 1001 Westfield, MA Storm Analysis August 16-19, 1955





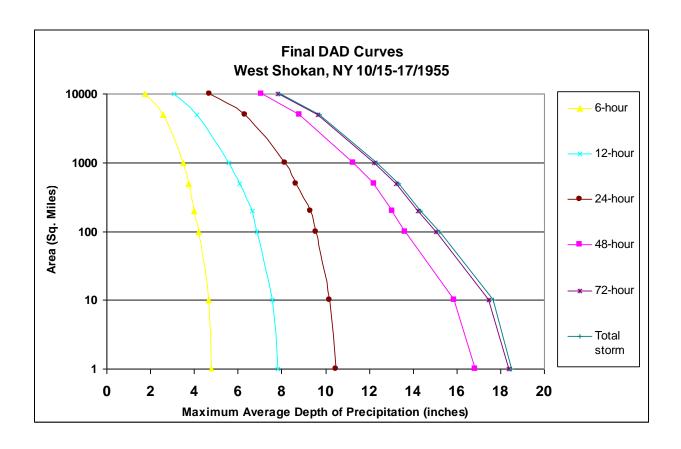
Storm Precipitation Analysis System (SPAS) For Storm #1006 SPAS Analysis

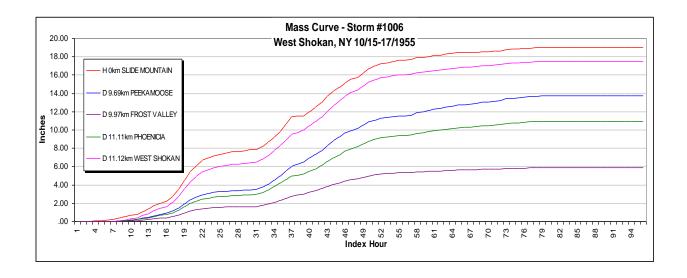
West Shokan, NY October 14, 1955

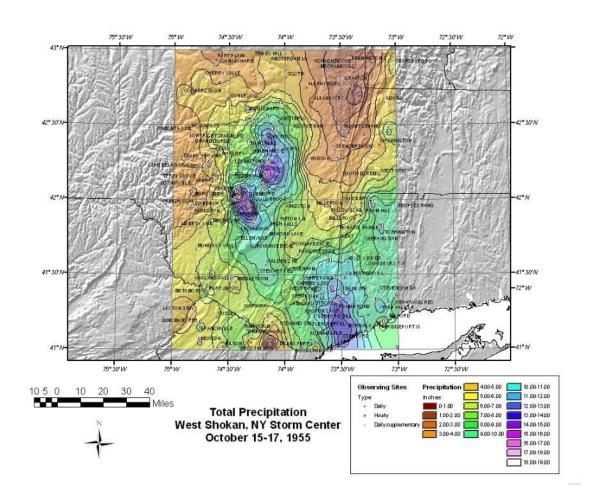
g. 37	GD 1 G 100 6										
		-West Shoka	m, NY		C	4 A	.1	4 C	T 7:		
Storm Date: AWA Analysis Date:	15-Oct-55				3	torm A	ajustmo	ent for	Virginia	l	
·											
Temporal Transpositi	on Date	1-Oct	_								
		Lat	Long				nflow Direc		SSE @ 500	miles	
Storm Center Locatio	n	41.95 N	74.32 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep SST Locati	ion	35.00 N	71.00 W			Storm Cen	ter Elevatio	n	900	feet	
Transposition SST Lo	cation					Storm Ana	lysis Durati	on	24	hours	
Basin Location						Effective B	arrier Heig	ht	N/A	feet	
The sto	rm represen	ntative SST is	78.0 F	with tota	l precipitable	e water abov	e sea level of	f		3.29	inches.
The in	n-place max	imum SST is	81.0 F	with tota	l precipitable	e water abov	e sea level of	f		3.76	inches.
The transpos	itioned max	imum SST is	0.0	with tota	l precipitable	e water abov	e sea level of	f		#N/A	inches.
The in-	place storn	n elevation is	900	feet whi	ch subtracts	0.26	inches of	f precipitable	e water at	78.0 F	
		n elevation is	900	feet whi	ch subtracts	0.28	inches of	f precipitable	e water at	81.0 F	
The transpo	osition basir	n elevation at	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0	
The inflow barrier/	basin elevat	tion height is	N/A	feet whi	ch subtracts	X.XX	inches of	f precipitable	e water at	0.0	
The i	n-place stor	m maximizati	ion factor is	1.15		Notes: Use	d Oct 1/2 an	d Sept 1/2 S	ST 2 sigma m	aps at	
	-	levation to ba		#N/A			on for In Pla	-	-		
	•	rrier adjustm		#N/A							
L	The	total adjustm	ent factor is	#N/A							
				•							1
Observed S	Storm Dept	h-Area-Dura	ntion								
	•	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
***************************************	0 sq miles	4.7	7.6	7.6	10.2	15.9	17.5	17.7	17.7		
***************************************	00 sq miles	4.2	6.9	6.9	9.6	13.6	15.1	15.2	15.2		
	00 sq miles	4.0	6.6	6.6	9.3	13.1	14.2	14.4	14.4		1
***************************************	00 sq miles	3.7	6.1	6.1	8.7	12.2	13.2	13.3	13.3		
	00 sq miles	3.5	5.6	5.6	8.2	11.3	12.2	12.3	12.3		1
***************************************	00 sq miles	2.6	4.1	4.1	6.3	8.8	9.6	9.7	9.7		1
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	00 sq miles	1.8	3.1	3.1	4.7	7.1	7.8	7.9	7.9		1
	00 sq miles	-	-	-	-	-	-	-	-		_
	00 sq miles	-	-	-	-	-	-	-	-		_
	1										4
Storm or St	orm Center	Name		SPAS 1006-	West Sheke	n NV					1
Storm Date		Ivanic		10/15/1955	West Shoka	11, 1 1 1					1
Storm Type	` '			Tropical-Hu	ricana Katia						1
Storm Loca				41.95 N	74.32 W						1
	er Elevation			900	17.J4 W				_		1
	n Total & D			18.40 Inches	72-hours at	1sa mile fra	m SPAS 100	)6			1
i recipitatio	10tal & L	aration		10.70 HICHES	, 2-nours at	roq miic iic	DI 733 100	,,,			1
Storm Repr	esentative S	ST		78.0 F							1
		ST Location		35.00 N	71.00 W	From Octob	er 13, 1955	SST man			1
Maximum S		,51 Location		81.0 F	, 1.00 W	110111 00101	13, 1333	551 map			1
	flow Vector	r		SSE @ 500							1
	ximization			1.15							1
III-place Wil	IIIZALIOII			2110							1
Temporal T	ransposition	n Date		1-Oct							1
	on SST Loca			1-001					<del>                                     </del>		1
	on Maximur								<del>                                     </del>		1
	on Adjustme			#N/A					<del>                                     </del>		1
	sin Elevatio			N/A					<del>                                     </del>		+
	vation in Ba			N/A							1
Inflow Barr		19111		N/A N/A							1
		tor		#N/A							1
	ustment Fac								-		1
Total Adjus	tment Facto	Γ		#N/A							

**MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)** 

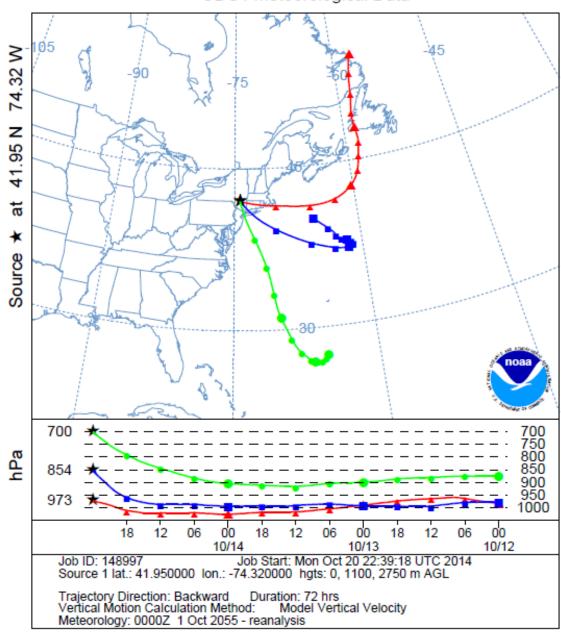
			Duration	n (hours)			
Area in Sq. Mi.	6	12	24	48	72	96	total
1.000	4.8	7.8	10.5	16.9	18.4	18.5	18.5
10.000	4.7	7.6	10.2	15.9	17.5	17.7	17.7
100.000	4.2	6.9	9.6	13.6	15.1	15.2	15.2
200.000	4.0	6.6	9.3	13.1	14.2	14.4	14.4
500.000	3.7	6.1	8.7	12.2	13.2	13.3	13.3
1000.000	3.5	5.6	8.2	11.3	12.2	12.3	12.3
5000.000	2.6	4.1	6.3	8.8	9.6	9.7	9.7
10000.000	1.8	3.1	4.7	7.1	7.8	7.9	7.9
		·				·	

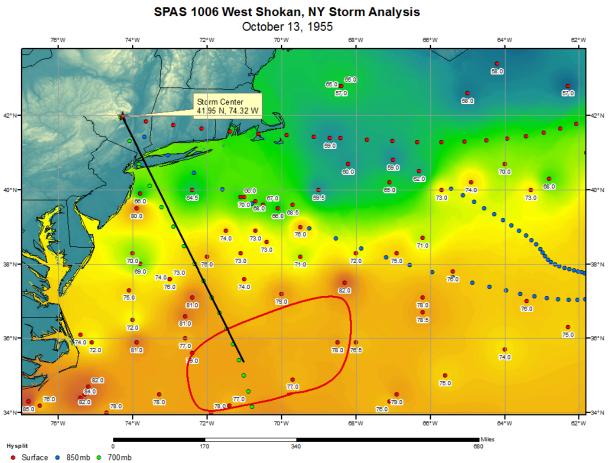






NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 15 Oct 55
CDC1 Meteorological Data





# Storm Precipitation Analysis System (SPAS) For Storm #1312B SPAS Analysis

General Storm Location: Rosman, NC has the max total of 35.38"

Storm Dates: October 3 – October 6, 1964

Event: Heavy frontal rain with moisture from Hurricane Hilda

**DAD Zone 1 - Northwest** 

Latitude: 32.74583

Longitude: -88.65416

Max. Grid Rainfall Amount: 3.67"

**DAD Zone 2 - Central** 

Latitude: 35.1375

**Longitude**: -82.8375

Max. Grid Rainfall Amount: 17.53

**Number of Stations**: 1,365 stations (325 of which are hourly)

SPAS Version: 9.5

Base Map Used: Digitized TVA Isohyetal Map (storm total Sept 28 – Oct 6); expanded using SPAS storm

totals

Spatial resolution: 30 seconds

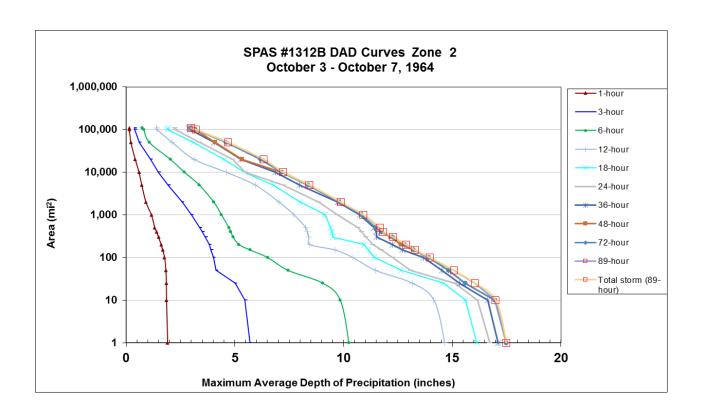
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

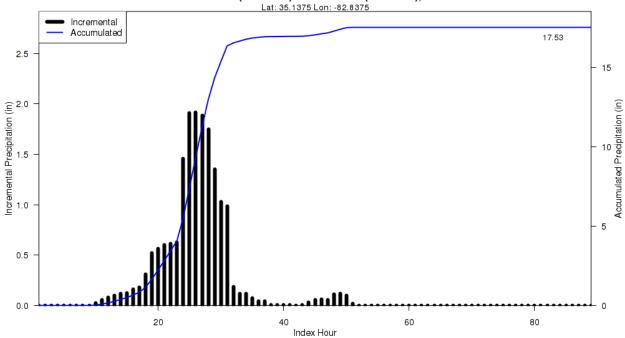
**Reliability of Results**: In addition to the 314 hourly stations from NCDC used in the whole project area, fourteen additional hourly stations were digitized from the TVA report adding more certainty to the timing of the storm center. The extent and magnitude of the rainfall is moderately reliable given the surprising large number of daily rain gauges available.

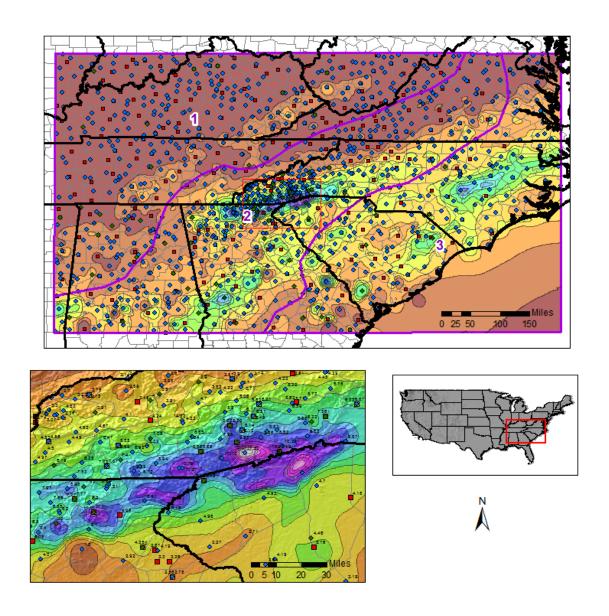
Storm Name:	SPAS 1312B -	- Rosman, N	IC Zone 2								
	10/3-6/1964	140511111,1	O Zone 2		$\mathbf{S}$	torm A	djustm	ent for	Virgini	ia	
AWA Analysis Date:	11/14/2015						<del>-</del>				
Temporal Transpositi	on Date	20-Sep	_								
		Lat	Long				Inflow Dire		S @ 310	miles	
Storm Center Location		35.14 N	82.84 W				rage Elevat		N/A	feet	
Storm Rep Dew Point		30.65 N	82.50 W				nter Elevati		2,400	feet	
Transposition Dew Po	oint Location						alysis Dura		24	hours	
Basin Location						Effective	Barrier Hei	ght	N/A	feet	
The storm i	representative (	dew point is	75.5 F	with tot	al precipitab	ole water abo	ove sea level	of		2,92	inches.
	ace maximum		76.5 F		al precipitab					3.07	inches.
The transposition	ned maximum	dew point is	0.0	with tot	al precipitat	ole water abo	ve sea level	of		#N/A	inches.
	in-place storm		2,400	whi	ch subtracts	0.59	inches of	precipitable	e water at	75.5 F	
The	in-place storm	elevation is	2,400	whi	ch subtracts	0.61	inches of	precipitable	e water at	76.5 F	
The trans	position basin	elevation at	N/A	whi	ch subtracts	x.xx		precipitable		0.0	
The inflow barrie	er/basin elevati	on height is	N/A	whi	ch subtracts	X,XX	inches of	precipitable	e water at	0.0	
	in-place storm			1.05		Notes:					
The tra	insposition/ele			#N/A							
	The barr	rier adjustme	ent factor is	#N/A							
	771	. 1 11 .		Шът/ А							
	The to	otal adjustme	ent factor is	#N/A							
0116	Storm Depth-A	Amoo De cot	07								
Observed	storm Deptn-A	1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
	1 sq miles		10.24	14.65	16.13	16.74	17.11	17.49	17.49	17.49	17.49
	10 sq miles	<del>-</del>	9.85	14.16	15.60	16.16	16.63	16.97	16.97	17.00	17.00
	100 sq miles	<del></del>	6.51	10.43	11.41	12.27	13.68	13.92	13.92	13.97	13.97
	200 sq miles	<del>-</del>	5.20	8.46	10.96	11.36	12.27	12.64	12.82	12.88	12.88
***************************************	500 sq miles		4.73	8.27	9.41	10.67	11.42	11.47	11.47	11.67	11.67
	1000 sq miles	-	4.39	7.73	9.14	9.73	10.75	10.81	10.81	10.92	10.92
	2000 sq miles	<del></del>	4.03	7.03	7.98	8.86	9.73	9.80	9.80	9.87	9.87
	5000 sq miles	0.72	3.37	5.95	6.79	7.22	7.98	8.35	8.35	8.44	8.44
1	0000 sq miles	0.59	2.68	4.61	5.47	5.47	6.87	7.15	7.15	7.22	7.22
2	0000 sq miles	0.42	2.04	3.13	4.52	4.90	5.29	5.33	6.19	6.32	6.32
5	0000 sq miles	0.22	1.07	2.12	3.11	3.40	4.05	4.09	4.60	4.69	4.69
10	0000 sq miles	0.15	0.81	1.42	1.93	2.25	2.95	3.17	3.17	3.20	3.20
9 9				GD 1 G 1 2 1 2							ī
	orm Center Na	me			B - Rosmar	, NC Zone	2				
Storm Date				10/3-6/196		an interest	ion with Hu	mioono Hild	o (Oot 4.5)		
Storm Type Storm Loca				35.14 N	ent including 82.84 W	g am mieract	IOH WILN HU	TICANE HIID	a (OCI 4-5)		1
	er Elevation			2400	02.04 W						
	n Total & Dura	ation			s in 48 hour	e					
1 recipitatio	n rotat & Duli			11.JJ IIICILE	5 m 70 HOUL						l
Storm Repr	esentative Dev	v Point		75.5 F	24						
	esentative Dev		tion	30.65 N	82.50 W		Sep	Oct			
Maximum I		, I olik Botk		76.5 F	02.00		76.619	75.389			
	flow Vector			S @ 310							
In-place Ma	ximization Fac	ctor		1.05							
	ransposition (I	,		20-Sep							ļ
	on Dew Point I										
	on Maximum E			una :							
	on Adjustment	Factor		#N/A							
	sin Elevation			N/A							
	vation in Basin	1		N/A							
Inflow Barr		-		N/A	-					-	
	ustment Factor			#N/A							
Total Adjus	tment Factor			#N/A							]

	Stor	m 1312	B - Octo	ober 3 (	1300 U	ГС) - Oc	tober 7	(0500 \	JTC), 19	964	
						OF PREC		•			
A :2\					Dui	ration (hou	ırs)				
Area (mi²)	1	3	6	12	18	24	36	48	72	89	Total
0.3	1.92	5.71	10.27	14.69	16.17	16.77	17.15	17.53	17.53	17.53	17.53
1	1.91	5.69	10.24	14.65	16.13	16.74	17.11	17.49	17.49	17.49	17.49
10	1.86	5.47	9.85	14.16	15.60	16.16	16.63	16.97	16.97	17.00	17.00
25	1.85	5.01	9.05	13.17	14.60	15.12	15.34	15.59	15.59	16.05	16.05
50	1.83	4.13	7.45	11.47	12.65	13.10	14.53	14.84	14.84	15.08	15.08
100	1.77	4.01	6.51	10.43	11.41	12.27	13.68	13.92	13.92	13.97	13.97
150	1.68	3.91	5.71	9.62	11.14	11.73	12.70	13.20	13.23	13.29	13.29
200	1.61	3.82	5.20	8.46	10.96	11.36	12.27	12.64	12.82	12.88	12.88
300	1.49	3.65	4.92	8.40	9.52	11.04	11.52	12.17	12.26	12.29	12.29
400	1.40	3.50	4.82	8.34	9.47	10.85	11.50	11.75	11.75	11.82	11.82
500	1.32	3.38	4.73	8.27	9.41	10.67	11.42	11.47	11.47	11.67	11.67
1,000	1.16	2.99	4.39	7.73	9.14	9.73	10.75	10.81	10.81	10.92	10.92
2,000	0.91	2.57	4.03	7.03	7.98	8.86	9.73	9.80	9.80	9.87	9.87
5,000	0.72	1.94	3.37	5.95	6.79	7.22	7.98	8.35	8.35	8.44	8.44
10,000	0.59	1.49	2.68	4.61	5.47	5.47	6.87	7.15	7.15	7.22	7.22
20,000	0.42	1.12	2.04	3.13	4.52	4.90	5.29	5.33	6.19	6.32	6.32
50,000	0.22	0.60	1.07	2.12	3.11	3.40	4.05	4.09	4.60	4.69	4.69
100,000	0.15	0.40	0.81	1.42	1.93	2.25	2.95	3.17	3.17	3.20	3.20
108,165	0.14	0.38	0.75	1.40	1.92	2.25	2.87	2.97	2.98	2.98	2.98

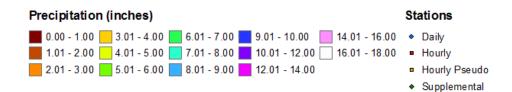


### SPAS 1312 Storm Center Mass Curve Zone 2 October 3 (1300UTC) to October 7 (0500UTC), 1964 Lat: 35.1375 Lon: -82.8375

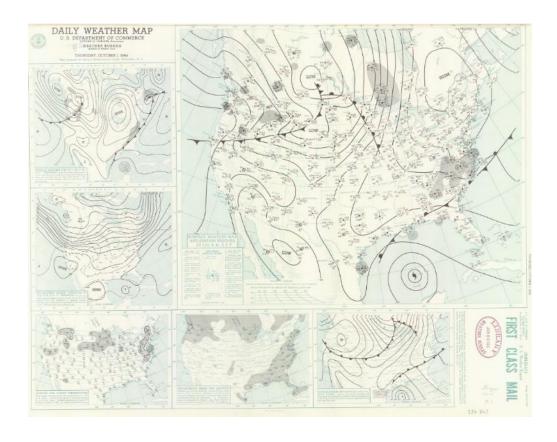


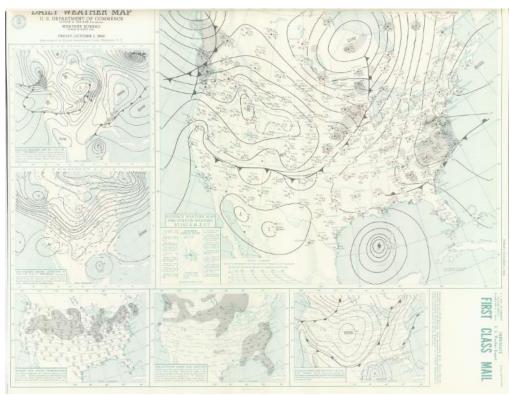


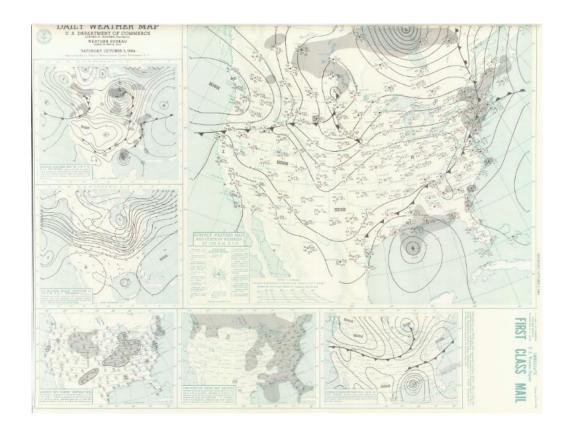
Total 89-hour Precipitation (inches)
October 3, 1964 1300 UTC - October 7, 1964 0500 UTC
SPAS #1312B

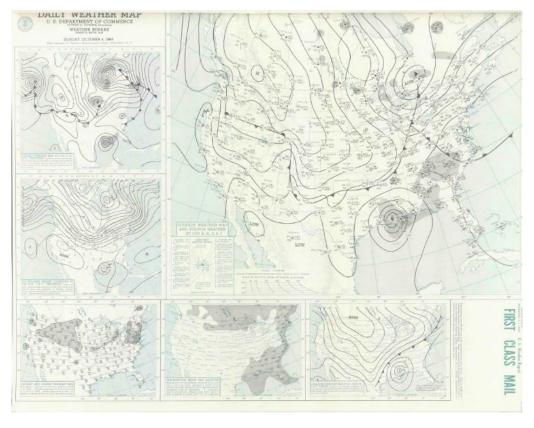


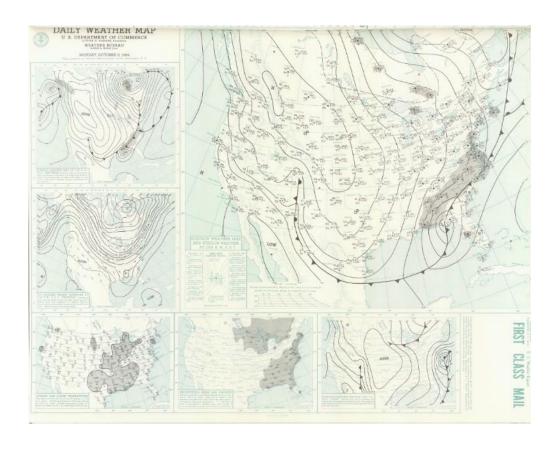
TWP 02/20/2014

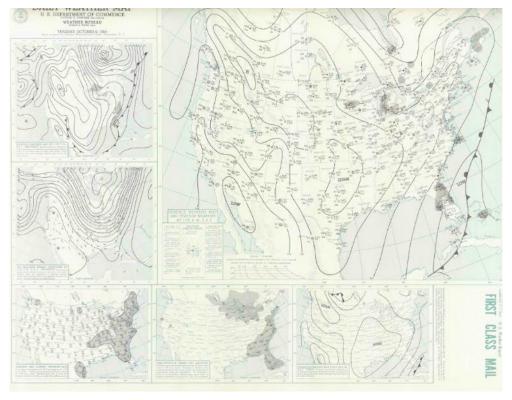


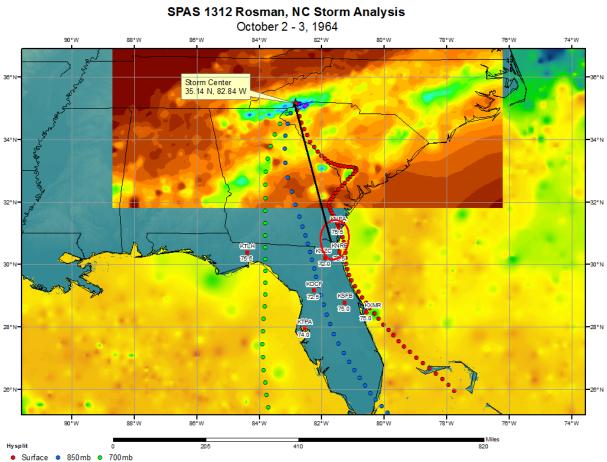












# Storm Precipitation Analysis System (SPAS) For Storm #1491 SPAS Analysis

General Storm Location: Tyro, VA (Tropical Storm Camille)

**Storm Dates**: August 18-20, 1969

**Event**: Tropical Storm Camille

**DAD Zone 1** 

Latitude: 37.8125

**Longitude**: -79.0042

Max. Grid Rainfall Amount: 27.23"

Max. Observed Rainfall Amount: 27.00"

Number of Stations: 512 (363 Daily, 75 Hourly, 33 Hourly Pseudo, and 41 Supplemental)

SPAS Version: 10.0

Basemap: Blended USGS total storm map and PRISM August 1969 Precipitation

**Spatial resolution:** 0:00:30 second (~ 0.3 mi²)

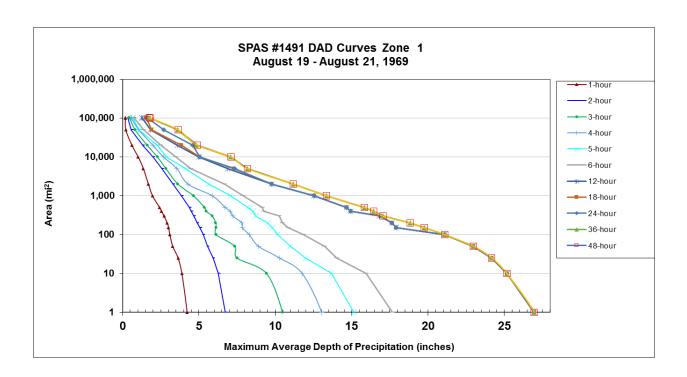
Radar Included: No

Depth-Area-Duration (DAD) analysis: Yes

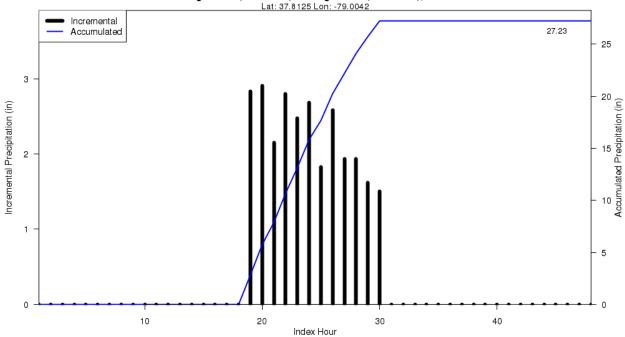
Reliability of results: This analysis was based on hourly data, daily data, supplemental station data and bucket survey data. Hourly station USACE Tyro, VA was digitized from the USACE Storm Studies report. Bucket survey rainfall timing and magnitude at the storm center (Tyro, VA) were diligently recorded and utilized in the SPAS storm analysis. We have a good degree of confidence in the station based storm total results, the spatial pattern is dependent on the station data and the USGS basemap, the timing is based on hourly and hourly pseudo stations. *** Could not match the 22.0" rainfall amount in 6-hours based on the USACE Storm Study report (Listed as Station R, "Tyro, VA").

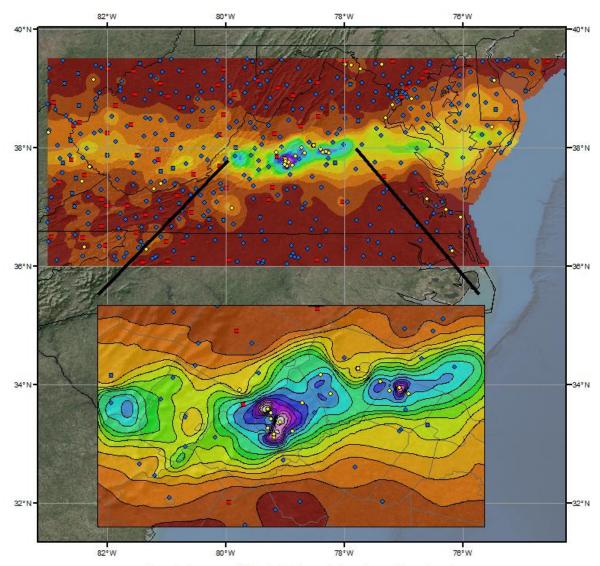
Storm Name:	SPAS 1491 - 7	Гуго, VA									
Storm Date:	8/19-20/1969				St	torm A	djustme	ent for <b>Y</b>	Virginia	a	
AWA Analysis Date:	11/14/2015										
Temporal Transposit	ion Date	5-Aug									
		Lat	Long			Moisture l	Inflow Dire	ction	SW @ 130	miles	
Storm Center Locati	on	37.82 N	79.00 W			Basin Aver	rage Elevati	on	N/A	feet	
Storm Rep Dew Poir	t Location	36.08 N	79.95 W			Storm Cen	ter Elevatio	on	800	feet	
Transposition Dew P		2010011	7555 11			t	lysis Durat		12	hours	
Basin Location	om Botation						Barrier Hei		N/A	feet	
The stor	m representative	dew point is	77.5 F	with total	l precipitable	water above	sea level of			3.22	inches.
	-place maximum		79.0 F		l precipitable					3.44	inches.
	ioned maximum		0.0		l precipitable					#N/A	inches.
•	ne in-place storn	•	800		ich subtracts			f precipitable	e water at	77.5 F	inches.
	ne in-place storn		800		ich subtracts			f precipitable		79.0 F	
	ansposition basi		N/A		ich subtracts			f precipitable		0.0	
	rrier/basin eleva		N/A		ich subtracts			f precipitable		0.0	
THE THIOW BE	error, outsin ore va	tron nergin is	11/12	*****	ion such acts		meness	r preespitator	e maior ai	0.0	
	The in place stor		ion footonio	1.07	Ī	Notes: DAD	values taken f	rom SPAS 149	91 Storm ren	resentative	1
	The in-place stor			1.07 #N/A			lue was based				
In In	transposition/e			-			GSO. Values			-	
	Ine ba	arrier adjustm	ent ractor is	#N/A			did not vary me		-		
	73	total adi	ant factor'	#N/A			•		-	-	
	Ine	total adjustm	ent factor is	#IN/A							
0.	a. 5 a										
Observed	Storm Depth-A	,			1		T	T	T		
		1 Hours	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	·		48 Hour
***************************************	1 sq miles	4.2	6.7	10.5	13.0	15.2	17.7	27.0	27.0	27.0	27.0
***************************************	10 sq miles	3.9	6.3	9.4	11.8	13.7	16.0	25.2	25.2	25.2	25.2
	100 sq miles	3.1	5.3	6.1	8.3	10.2	11.9	21.1	21.1	21.1	21.1
	200 sq miles	2.9	4.9	6.1	7.8	9.5	10.5	17.7	17.7	17.7	18.8
	500 sq miles	2.4	4.4	5.4	6.7	8.2	9.2	14.7	14.7	14.7	15.8
	1000 sq miles	2.0	3.9	4.6	5.9	7.1	7.9	12.5	12.5	12.5	13.4
***************************************	2000 sq miles	1.7	3.3	3.6	4.3	5.6	6.7	9.8	9.8	9.8	11.2
	5000 sq miles	1.4	2.6	2.8	3.6	4.1	4.5	6.9	7.3	7.4	8.2
	10000 sq miles	1.0	2.0	2.3	2.7	2.9	3.5	5.0	5.0	5.1	7.1
	20000 sq miles	0.6	1.3	1.6	2.0	2.3	2.5	3.6	3.9	4.6	4.9
Storm or S	storm Center Na	me		SPAS 1491 -	Tyro, VA						
Storm Dat	e(s)			8/19-20/196	9						
Storm Typ	e			Convective							
Storm Loc	ation			37.82 N	79.00 W						
Storm Cer	ter Elevation			800						-	
Precipitati	on Total & Dura	tion		23.23 Inches	12-hours						
			-								
Storm Rep	resentative Dew	Point		77.5 F	12						
Storm Rep	resentative Dew	Point Location	on	36.08 N	79.95 W			July	Aug		
Maximum	Dew Point			79.0 F				79.06	78.6		
Moisture 1	nflow Vector			SW @ 130							
In-place M	laximization Fac	tor		1.07							
	Transposition (E	Date)		5-Aug							
Temporal	ion Dew Point L	ocation									
	IOH Dew I OHK L	D 1 .									
Transposit	ion Maximum D	ew Point									
Transposit Transposit				#N/A							
Transposit Transposit Transposit	ion Maximum D			# <b>N/A</b> N/A							
Transposit Transposit Transposit Average B	ion Maximum D ion Adjustment	Factor									
Transposit Transposit Transposit Average B Highest E	ion Maximum D ion Adjustment asin Elevation	Factor		N/A							
Transposit Transposit Transposit Average B Highest El Inflow Bar	ion Maximum D ion Adjustment asin Elevation evation in Basin	Factor		N/A N/A							

		Storm 1	491 - A	ugust 1	9 (0600	UTC) -	Augus	t 21 (05	00 UTC	), 1969		
			MAXIMU	M AVER	AGE DEP	TH OF F	PRECIPIT	ATION (I	NCHES)			
Auga (m:2)						Duration	n (hours)					
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	Total
0.3	4.26	6.77	10.57	13.14	15.29	17.85	27.23	27.23	27.23	27.23	27.23	27.23
1	4.22	6.71	10.47	13.03	15.15	17.68	26.96	26.96	26.96	26.96	26.96	26.96
10	3.88	6.27	9.42	11.76	13.68	15.95	25.16	25.16	25.16	25.16	25.16	25.16
25	3.63	5.92	7.49	10.28	11.97	14.03	24.17	24.17	24.17	24.17	24.17	24.17
50	3.28	5.55	7.35	8.90	10.97	13.22	22.97	22.97	22.97	22.98	22.98	22.98
100	3.09	5.28	6.12	8.29	10.15	11.86	21.08	21.09	21.09	21.09	21.09	21.09
150	3.01	5.07	6.11	7.84	9.80	10.83	17.93	17.93	17.93	19.74	19.75	19.75
200	2.92	4.87	6.10	7.82	9.48	10.46	17.65	17.65	17.65	18.83	18.84	18.84
300	2.71	4.66	5.87	7.22	8.72	10.26	16.81	16.87	16.89	17.07	17.07	17.07
400	2.55	4.50	5.47	7.05	8.54	9.25	14.93	14.93	14.93	16.45	16.45	16.45
500	2.42	4.37	5.36	6.72	8.19	9.16	14.68	14.68	14.68	15.83	15.83	15.83
1,000	1.96	3.85	4.64	5.88	7.07	7.90	12.53	12.54	12.54	13.36	13.36	13.36
2,000	1.69	3.30	3.62	4.28	5.62	6.67	9.77	9.77	9.77	11.17	11.18	11.18
5,000	1.36	2.58	2.84	3.56	4.14	4.47	6.88	7.28	7.36	8.19	8.19	8.19
10,000	1.02	2.00	2.28	2.68	2.88	3.50	4.98	5.04	5.05	7.06	7.10	7.10
20,000	0.61	1.32	1.61	1.98	2.29	2.51	3.58	3.87	4.59	4.81	4.91	4.91
50,000	0.21	0.58	0.82	1.06	1.10	1.38	1.83	1.91	2.68	3.62	3.63	3.63
100,000	0.18	0.34	0.46	0.57	0.68	0.77	1.28	1.55	1.65	1.79	1.80	1.80
102,155	0.18	0.34	0.44	0.56	0.66	0.75	1.25	1.53	1.62	1.72	1.73	1.73

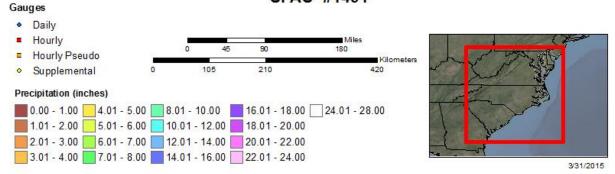


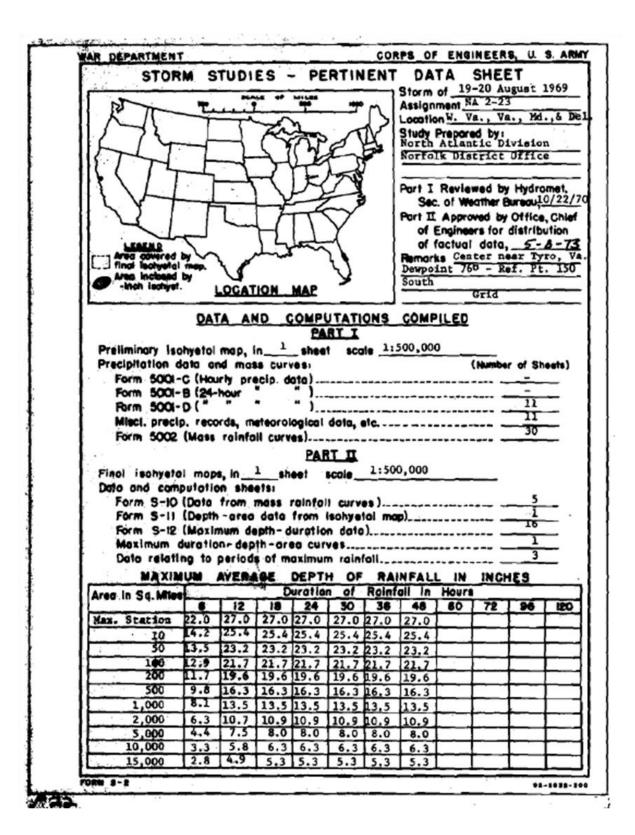
### SPAS 1491 Storm Center Mass Curve Zone 1 August 19 (0600UTC) to August 21 (0500UTC), 1969 Lat: 37.8125 Lon: -79.0042

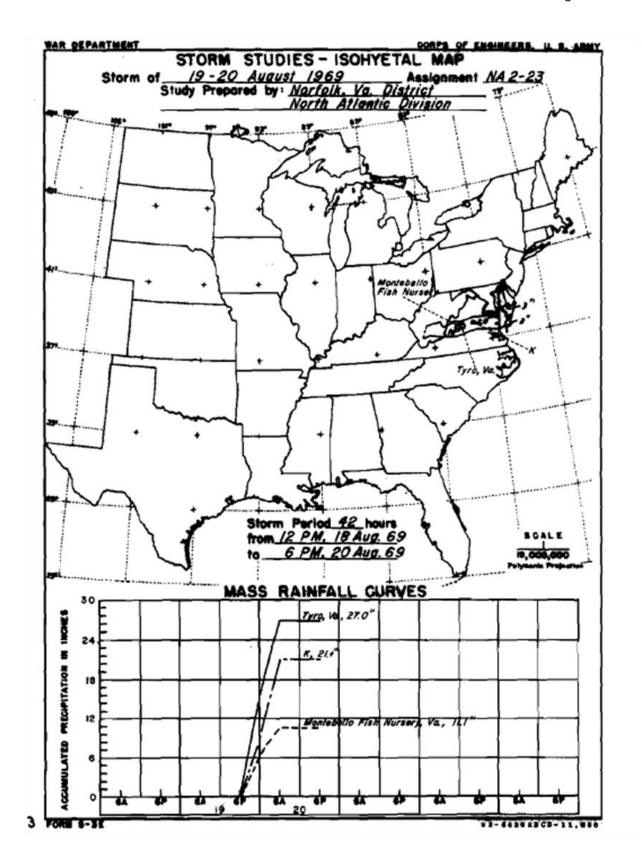




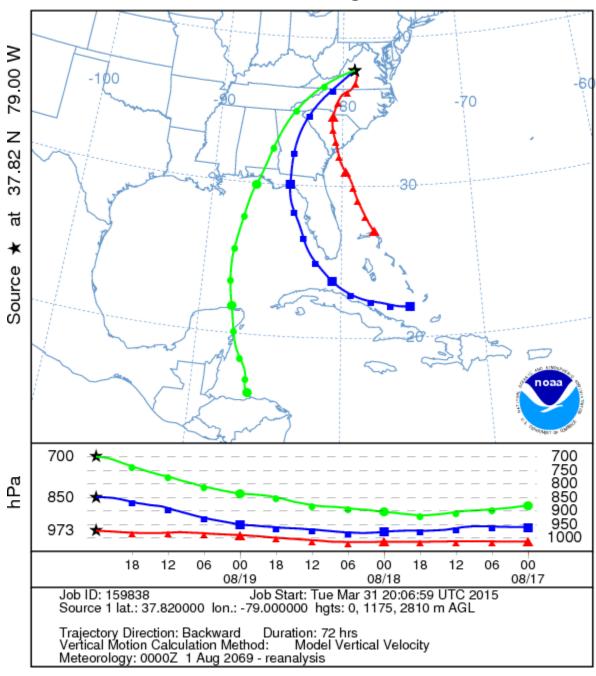
Total Storm (48-hr) Precipitation (inches) 08/19/1969 0600 UTC - 08/21/1969 0500 UTC SPAS- #1491

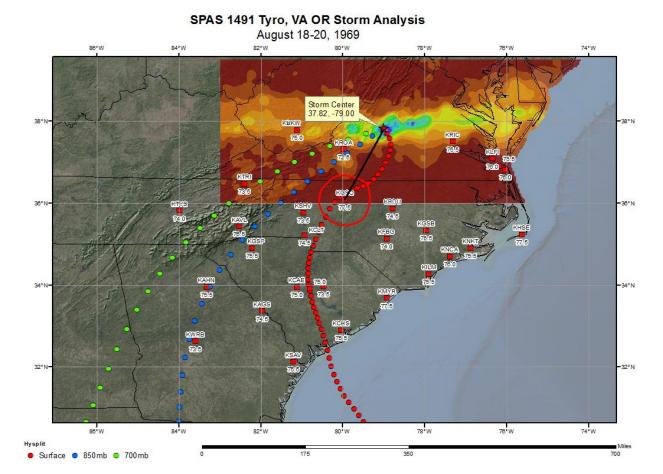






# NOAA HYSPLIT MODEL Backward trajectories ending at 0000 UTC 20 Aug 69 CDC1 Meteorological Data





# Storm Precipitation Analysis System (SPAS) For Storm #1276 SPAS Analysis

General Storm Location: Pennsylvania, New York

**Storm Dates**: June 18-24, 1972

**Event**: Hurricane Agnes

**DAD Zone 1** 

Latitude: 42.0375

**Longitude**: -78.0708

Max. Grid Rainfall Amount: 18.78"

Max. Observed Rainfall Amount: 18.13"

DAD Zone 2

Latitude: 40.5375

**Longitude**: -76.6208

Max. Grid Rainfall Amount: 18.79"

Max. Observed Rainfall Amount: 18.50"

Number of Stations: 1272 (874 Daily, 173 Hourly, 51 Hourly Pseudo, and 174 Supplemental)

SPAS Version: 9.5

Basemap: PRISM 30-yr Mean (1971-2000) June Precipitation

**Spatial resolution:** 00:00:30 (~ 0.30 mi²)

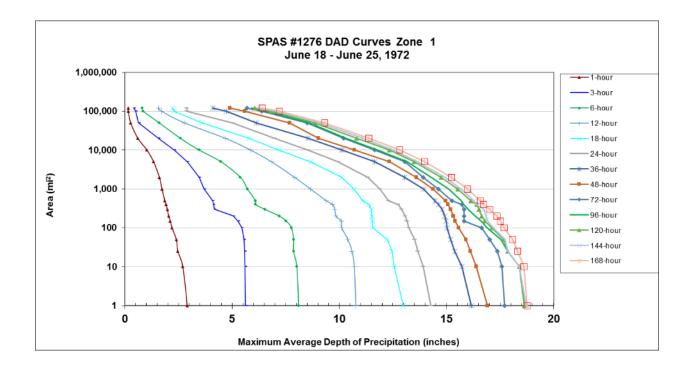
Radar Included: No

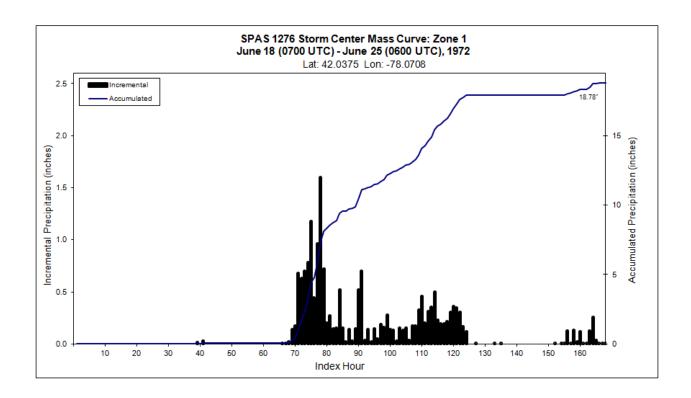
Depth-Area-Duration (DAD) analysis: Yes

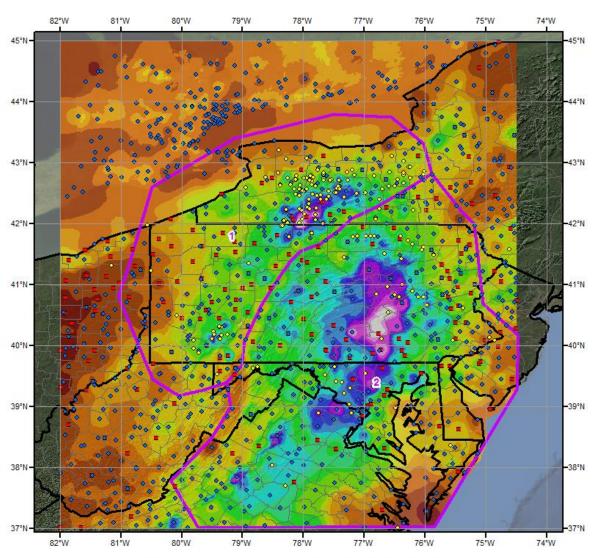
**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and bucket survey data from the USGS report. We have a high degree of confidence in the station based storm total results, the spatial pattern is dependent on basemap, and the timing is based on hourly and hourly pseudo stations.

Storm Name:	SPAS 1276- Z	orbo DA All	DAD Zones								
	6/18-23/1972	erbe, PA, All	DAD Zones		0	torm A	diuctm	ant far	Virginia		
AWA Analysis Date:					S	WIIII A	ujustill	chi lul	v ii giiila		
Temporal Transpositi		5-Jul									
Temporar Transpositi	on Date	Lat	Long			Moisture I	nflow Dire	ction	ESE @ 610	miles	
Storm Center Location	\n	40.54 N	76.62 W			Basin Aver			N/A	feet	
		36.00 N	67.00 W			Storm Cen			1,600	feet	
Storm Rep SST Locat Fransposition SST Lo		30.00 N	67.00 W			Storm Cen Storm Ana			24	hours	
Basin Location	Cation					Effective B			N/A	feet	
2000000						Eliceti ve B		5	1012	1001	
The	storm represen	tative SST is	78.0 F	with tota	al precipitabl	e water abov	e sea level o	f		3.29	inches.
	ne in-place max		80.0 F		• •	e water abov				3.60	inches.
	positioned max		0.0			e water abov				#N/A	inches.
	in-place storm		1,600		ch subtracts			f precipitabl	e water at	78.0 F	
The	in-place storm	n elevation is	1,600	whi	ch subtracts	0.46		f precipitabl		80.0 F	
	nsposition basir		N/A	whi	ch subtracts	x.xx		f precipitabl		0.0	
The inflow barr			N/A	whi	ch subtracts			f precipitabl		0.0	
								•	'		
	The in-place sto	orm maximiza	tion factor is	1.10		Notes: Used S	SST values on	June 18-19 al	ong with HYSP	LIT	
The	e transposition/	elevation to b	asin factor is	#N/A		backward traj	ectory.				
	The I	barrier adjusti	nent factor is	#N/A							
				_							
	Th	e total adjustr	nent factor is	#N/A							
Observed S	Storm Depth-A										
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		000
	10 sq miles	8.0	10.7	12.6	13.9	16.4	17.6	18.4	18.4		
	100 sq miles	7.8	10.1	11.6	13.2	15.6	16.7	16.9	17.1		
	200 sq miles	7.2	9.9	11.5	13.1	15.3	15.8	16.3	16.7		
	500 sq miles	6.1	9.4	11.1	12.3	15.0	15.3	15.7	16.1		
***************************************	1000 sq miles	5.7	8.7	10.7	11.9	14.4	14.6	15.1	15.5		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	2000 sq miles	5.4	7.9	10.1	11.3	13.6	13.9	14.3	14.8		
***************************************	5000 sq miles	4.5	6.8	8.7	9.9	12.3	13.1	13.2	13.5		_
***************************************	0000 sq miles	3.5	5.9	7.2	8.5	10.7	11.7	11.8	12.3		
***************************************	0000 sq miles 0000 sq miles	2.6	2.8	5.8	7.0	9.0 7.7	10.2 8.5	10.3 8.6	10.8 8.9		
	0000 sq miles	1.6 0.9	1.7	3.6 2.3	5.0 2.9	5.6	6.4	6.6	6.8		
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0975 sq miles	0.8	1.6	2.2	2.9	4.9	5.7	5.9	6.5		
12	0973 sq IIIIcs	0.0	1.0	2.2	2.9	7.7	3.7	3.7	0.0		_
Storm on St	orm Center Na			CD AC 1276	Zouho DA	All DAD 7					1
Storm or St Storm Date		IIIC		6/18-23/197		All DAD Zo	nes				-
Storm Type				Hurricane A							1
Storm Loca				40.54 N	76.62 W						1
	er Elevation			1,600	. 0.02 11						1
	on Total & Dura	ition		-	s 72-hours S	PAS 1276 D	AD Zone 2				1
- recipitatio				· · · · · · · · · · · · · · · · · · ·							1
Storm Repr	esentative SST			78.0 F	24						1
Storm Repr	esentative SST	Location		36.00 N	67.00 W			June	July		
Maximum S				80.0 F				78	81		
Moisture In	flow Vector			ESE @ 610							
In-place Ma	ximization Fac	tor		1.10							
	ransposition Da			5-Jul							
	on SST Locatio										
	on Maximum S			,							
	on Adjustment	Factor		#N/A							
	sin Elevation			N/A							
	vation in Basin			N/A							1
Inflow Barr				N/A							1
	ustment Factor			#N/A							1
Total Adjus	tment Factor			#N/A							

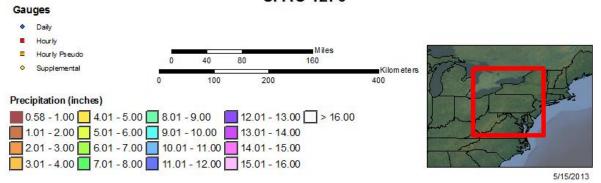
			Stor	m 1276-	June 1	8 (0700	UTC) -	June 2	5 (0600	UTC), 1	972			
				MAXIMU	M AVER	AGE DEF	TH OF P	RECIPIT	ATION (I	NCHES)				
A (;2)							Duration	(hours)						
Area (mi²)	1	3	6	12	18	24	36	48	72	96	120	144	168	Total
0.2	2.91	5.63	8.10	10.77	13.02	14.31	16.19	16.95	17.85	18.65	18.73	18.78	18.79	18.79
1	2.90	5.63	8.10	10.77	12.98	14.28	16.16	16.91	17.71	18.63	18.63	18.71	18.77	18.77
10	2.70	5.61	8.02	10.70	12.57	13.92	15.73	16.39	17.58	18.40	18.40	18.40	18.61	18.61
25	2.47	5.59	7.87	10.59	12.46	13.67	15.38	16.11	17.37	17.86	17.86	17.86	18.33	18.33
50	2.40	5.56	7.87	10.40	12.23	13.52	15.19	15.91	17.03	17.54	17.67	17.73	18.08	18.08
100	2.20	5.45	7.77	10.12	11.56	13.24	15.03	15.58	16.65	16.90	17.13	17.18	17.70	17.70
150	2.12	5.27	7.52	10.09	11.54	13.16	14.98	15.40	15.83	16.62	16.80	16.92	17.53	17.53
200	2.04	5.05	7.21	9.85	11.52	13.08	14.93	15.32	15.83	16.34	16.65	16.86	17.36	17.36
300	1.98	4.17	6.53	9.79	11.50	12.91	14.79	15.20	15.83	16.01	16.52	16.74	17.03	17.03
400	1.92	4.13	6.09	9.68	11.37	12.75	14.63	15.08	15.72	15.80	16.41	16.41	16.73	16.73
500	1.86	4.09	6.09	9.39	11.09	12.30	14.47	14.97	15.26	15.70	16.14	16.28	16.59	16.59
1,000	1.73	3.70	5.72	8.66	10.68	11.91	13.93	14.37	14.62	15.12	15.53	15.67	15.99	15.99
2,000	1.61	3.46	5.39	7.91	10.11	11.33	13.05	13.60	13.92	14.29	14.75	14.95	15.23	15.23
5,000	1.34	2.91	4.49	6.84	8.67	9.94	11.65	12.34	13.06	13.16	13.50	13.64	13.99	13.99
10,000	1.03	2.31	3.47	5.87	7.19	8.52	10.12	10.71	11.66	11.77	12.34	12.52	12.83	12.83
20,000	0.61	1.57	2.60	4.70	5.81	6.98	8.55	9.04	10.21	10.32	10.81	11.10	11.38	11.38
50,000	0.27	0.64	1.61	2.79	3.59	5.02	6.14	7.69	8.50	8.62	8.87	9.10	9.32	9.32
100,000	0.16	0.50	0.86	1.71	2.30	2.89	4.74	5.59	6.39	6.59	6.80	7.03	7.21	7.21
120,975	0.16	0.42	0.82	1.56	2.23	2.88	4.10	4.90	5.69	5.90	6.05	6.24	6.40	6.40



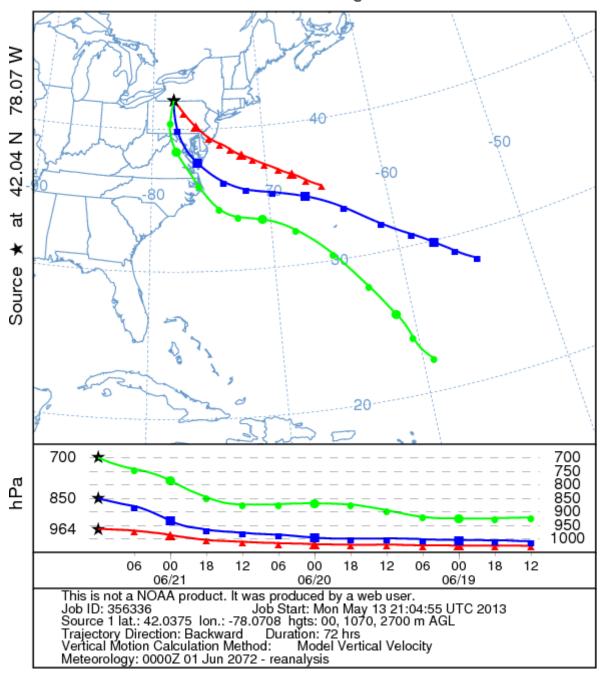




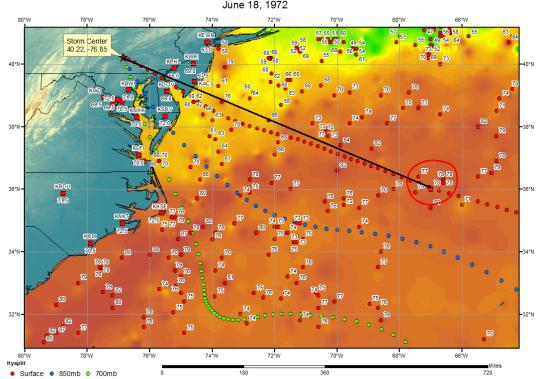
Total Storm (168-hr) Precipitation (inches) June 18-24, 1972 SPAS 1276

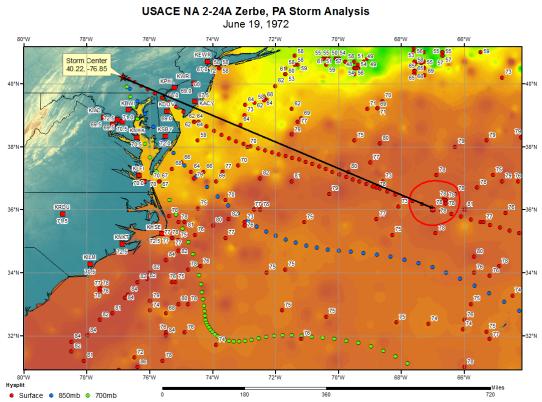


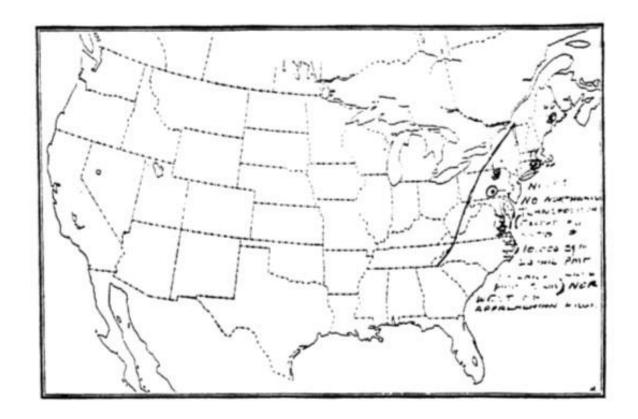
# NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 21 Jun 72 CDC1 Meteorological Data



# USACE NA 2-24A Zerbe, PA Storm Analysis June 18, 1972







### Storm Precipitation Analysis System (SPAS) For Storm #1317 SPAS Analysis

General Storm Location: Americus, GA

Storm Dates: June 30-July 7, 1994

**Event**: Tropical Storm Alberto

**DAD Zone 1** 

Latitude: 32.0958

**Longitude**: -84.2292

Max. Grid Rainfall Amount: 28.09"

Max. Observed Rainfall Amount: 27.85"

Number of Stations: 272 stations (189 daily, 44 hourly, 13 hourly pseudo, and 26 supplemental)

SPAS Version: 9.5

Base Map Used: Digitized NWS Isohyetal Map (storm total Jun 30 - Jul 8, 1994)

Spatial resolution: 30 seconds

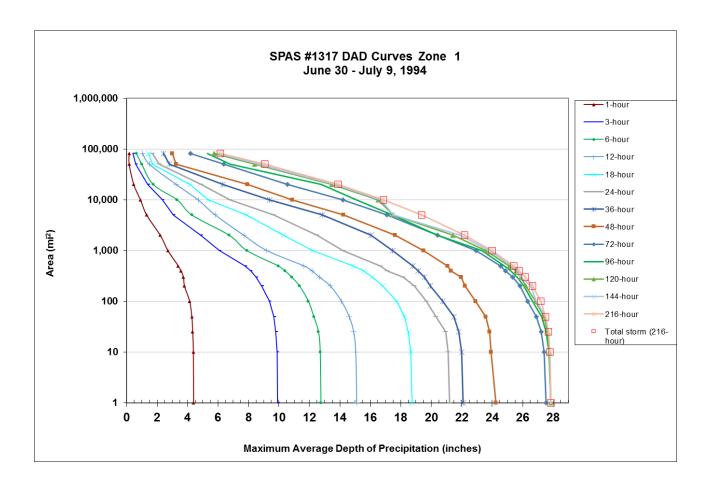
Radar Included: No

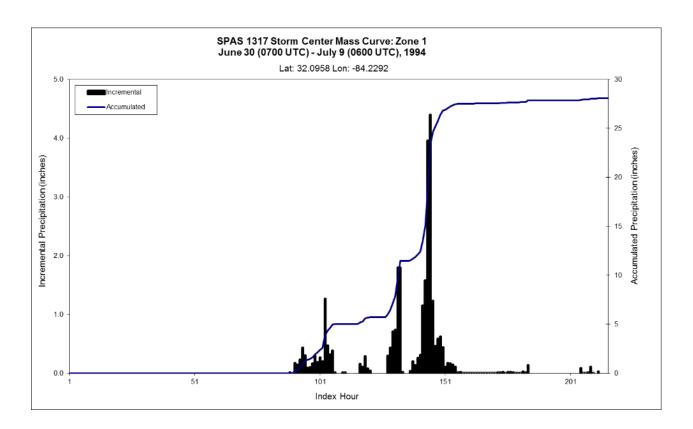
Depth-Area-Duration (DAD) analysis: Yes

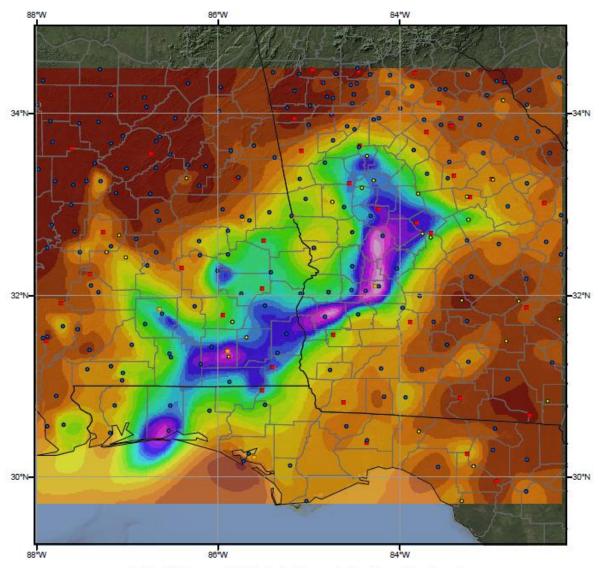
**Reliability of Results**: This analysis was based on hourly data, daily data, supplemental station data and NWS total storm basemap. We have a good level of confidence in the station based storm total results, the spatial pattern is dependent on the station data and NWS basemap. The timing is based on hourly and hourly pseudo stations.

Storm Nam			<b>GA</b>								
Storm Date		l		ļ	S	storm A	Adjustn	nent for	r Virgini	a	
·	sis Date: 1/22/2013										
Temporal T	ransposition Date	15-Jul	-			24	I d D:		TYCTY O 225	*1	
		Lat	Long				Inflow Dire		WSW @ 325		
	er Location	32.09 N	84.23 W				rage Elevat		N/A	feet	
_	Dew Point Location	30.40 N	89.35 W			t .	ıter Elevati		500	feet	
	on Dew Point Location						dysis Durat		24	hours	
Basin Locat	tion					Effective I	Barrier Hei	ght	N/A	feet	
r	The steem consequentity of	lave maint is	76.0 F	with to	tal measimits	hla rrotan ah	orn son lorn	1 of		2.99	inches.
	The storm representative of The in-place maximum of		80.5 F		tal precipita tal precipita					3.68	inches.
The tr	anspositioned maximum of	•	0.0		tal precipita					#N/A	inches.
THC tr	The in-place storm		500		ch subtracts			precipitabl	e water at	76.0 F	menes.
	The in-place storm		500	-	ch subtracts	0.15		precipitabl		80.5 F	
	The transposition basin		N/A		ch subtracts	X.XX		precipitabl		0.0	
The in	flow barrier/basin elevation		N/A		ch subtracts	x.xx		precipitabl		0.0	
	The in-place storm	maximizati	on factor is	1.23		Notes: DAD	values taken	from SPAS 1	317. Storm repr	esentative	
	The transposition/elev			#N/A					24-hr Td values		
	The barr	ier adjustme	nt factor is	#N/A			4 at KBIX, K	GPT, KHUM	, KMSY, KNBC	and	
						KNEW.					
	The to	tal adjustme	nt factor is	#N/A							
_											
	Observed Storm Depth-A	Area-Durat	ion								
		1 Hour	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	96 Hours	120 Hour
	1 sq miles	4.4	12.8	15.1	18.7	21.2	22.1	24.2	27.5	27.9	27.9
	10 sq miles	4.4	12.7	15.0	18.7	21.1	22.0	23.9	27.4	27.7	27.8
	100 sq miles		11.9	14.1	17.7	19.7	20.8	22.9	26.3	26.7	26.8
	200 sq miles	3.8	11.4	13.4	16.8	18.9	19.9	22.2	25.8	26.1	26.2
	500 sq miles	3.4	10.0	11.6	14.9	16.7	18.8	21.1	24.6	24.8	25.1
	1000 sq miles	2.7	7.9	9.2	12.2	14.2	17.5	19.5	22.9	23.3	23.6
	2000 sq miles	2.2	6.7	7.7	10.3	12.5	16.0	17.6	20.4	20.4	21.4
	5000 sq miles	1.3	4.3	5.8	7.9	9.6	12.8	14.3	17.1	17.4	17.5
	10000 sq miles	0.9	3.3	4.7	5.3	6.8	9.4	10.9	14.2	15.1	16.5
	20000 sq miles	0.5	1.8	3.3	4.2	4.9 2.1	6.3	7.9	10.6	12.8	13.5
	50000 sq miles	0.2	1.0	1.5	1.7	2.1	2.8	3.3	6.4	6.8	8.4
	Tr. Gr. C. A.			CD AC 121/	7 4						
	Storm or Storm Center Na Storm Date(s)	ime		6/30-7/7/1	<mark>7 - Americu</mark>	S, GA					1
	Storm Type			Synoptic	774						
	Storm Location			32.09 N	84.23 W						
	Storm Center Elevation			500	04.23 11						
	Precipitation Total & Dura	ation (10 sa	mi)		es in 216 ho	urs					
-	Teepraaron Total & Bart		,	20.07 111011	<u> </u>						1
5	Storm Representative Dev	v Point		76.0 F	24						
	Storm Representative Dev		tion	30.40 N	89.35 W						
N	Maximum Dew Point			80.5 F							
	Moisture Inflow Vector			WSW @ 3	25						
J	n-place Maximization Fac	ctor		1.23							
	Temporal Transposition (I			15-Jul							Į
	Transposition Dew Point I										
	Transposition Maximum D										
	Transposition Adjustment	Factor		#N/A							
/	Average Basin Elevation			N/A							
	T' 1 ( T') ( ' ' ' ' D ' '	1		N/A							
I	Highest Elevation in Basin										
I	nflow Barrier Height Barrier Adjustment Factor			N/A #N/A							

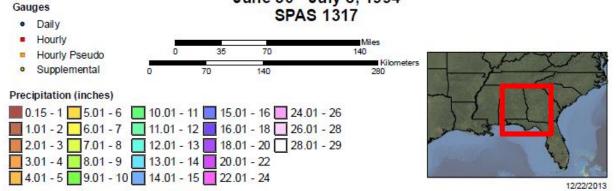
				Storm 1			•	•	-		•				
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)  Duration (hours)														
Area (mi²)															
` ′	1	2	3	6	12	18	24	36	48	72	96	120	144	216	Total
0.3	4.42	8.35	9.93	12.76	15.11	18.74	21.20	22.08	24.23	27.53	27.85	28.05	28.09	28.09	28.09
1	4.40	8.35	9.93	12.76	15.11	18.74	21.20	22.08	24.23	27.53	27.85	27.85	27.85	27.85	27.85
10	4.38	8.31	9.88	12.71	15.04	18.66	21.11	21.99	23.93	27.42	27.74	27.77	27.79	27.79	27.79
25	4.34	8.24	9.80	12.60	14.91	18.51	20.95	21.82	23.82	27.23	27.55	27.63	27.68	27.68	27.68
50	4.28	8.13	9.67	12.29	14.61	18.24	20.31	21.50	23.57	26.91	27.24	27.40	27.50	27.50	27.50
100	4.14	7.87	9.37	11.94	14.11	17.72	19.67	20.76	22.90	26.32	26.66	26.84	26.89	27.19	27.19
200	3.80	7.44	8.88	11.36	13.38	16.82	18.89	19.94	22.22	25.82	26.07	26.22	26.52	26.64	26.64
300	3.73	7.11	8.49	10.84	12.66	16.12	18.16	19.57	21.97	25.36	25.63	25.90	25.92	26.17	26.17
400	3.56	6.78	8.13	10.39	12.17	15.56	17.13	19.13	21.30	24.89	25.21	25.58	25.67	25.77	25.77
500	3.39	6.46	7.77	9.95	11.64	14.86	16.66	18.81	21.07	24.55	24.80	25.12	25.31	25.41	25.41
1,000	2.71	5.22	6.08	7.90	9.21	12.20	14.19	17.47	19.49	22.93	23.32	23.57	23.81	23.98	23.98
2,000	2.21	3.98	4.87	6.74	7.70	10.32	12.49	16.03	17.64	20.40	20.41	21.43	21.90	22.19	22.19
5,000	1.32	2.37	3.06	4.30	5.83	7.89	9.64	12.83	14.25	17.10	17.42	17.49	17.49	19.37	19.37
10,000	0.91	1.59	2.34	3.32	4.69	5.34	6.78	9.38	10.89	14.20	15.08	16.51	16.72	16.88	16.88
20,000	0.47	0.73	1.41	1.75	3.26	4.18	4.89	6.32	7.94	10.56	12.78	13.48	13.68	13.89	13.89
50,000	0.17	0.46	0.59	1.00	1.50	1.72	2.14	2.79	3.25	6.39	6.80	8.41	8.67	9.07	9.07
81,682	0.17	0.28	0.42	0.64	1.04	1.44	1.69	2.43	2.98	4.20	5.32	5.74	6.03	6.15	6.15



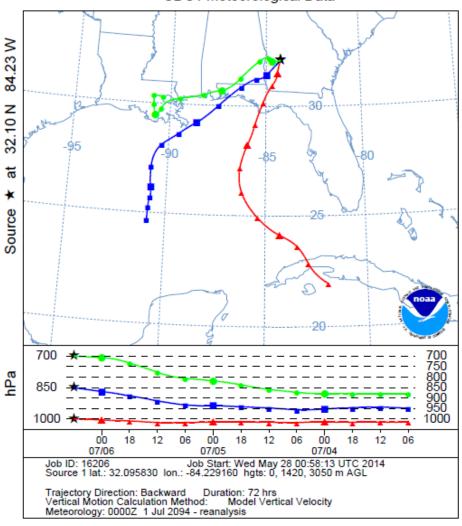




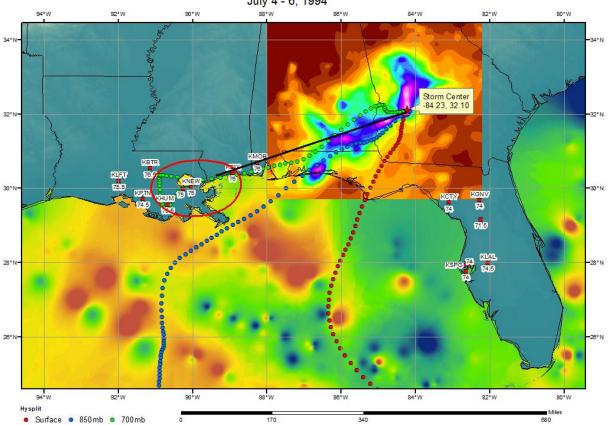
Total Storm (216-hr) Precipitation (inches)
June 30 - July 8, 1994



NOAA HYSPLIT MODEL
Backward trajectories ending at 0600 UTC 06 Jul 94
CDC1 Meteorological Data



# SPAS 1317 Americas, GA Storm Analysis July 4 - 6, 1994



## Storm Precipitation Analysis System (SPAS) For Storm #1373 SPAS-NEXRAD Analysis

General Storm Location: Tennessee Valley

**Storm Dates**: August 25 – 28, 1995

**Event**: Tropical Storm Remnant-Tropical Storm Jerry

**DAD Zone 1** 

Latitude: 34.8550

**Longitude**: -82.2250

Max. Grid Rainfall Amount: 19.99"

Max. Observed Rainfall Amount: 20.00" at Pelham, SC

Number of Stations: 485 (207 Daily, 60 Hourly, 7 Hourly Pseudo, 208 Supplemental, and 3

Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: Mean annual maximum 48-hour precipitation associated with TSRs

Spatial resolution: 0.3876

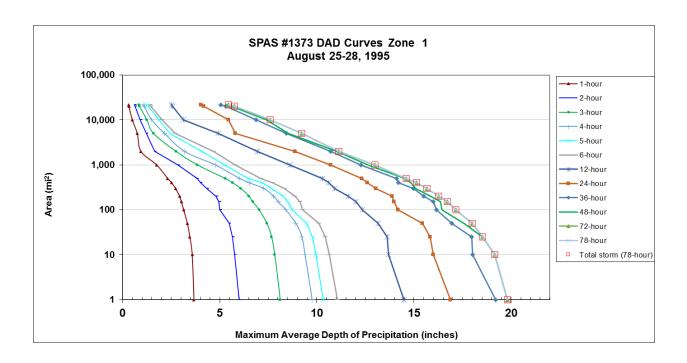
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

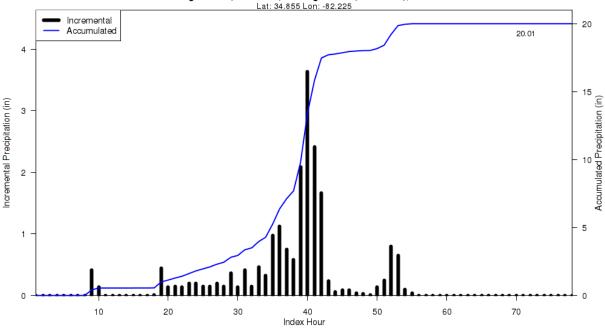
Reliability of results: Two-hundred eight supplemental stations were added to ensure data consistency. Due to the amount and integrity of the data, one supplemental estimated station was added based off of a storm report mentioning twenty inches of precipitation falling during the event of Tropical Storm Jerry in Pelham, SC. The actual report is located in the storm report section later in this document. No additional timing information was available for the Pelham, SC report. To constrain the supplemental estimated station precipitation, two additional supplemental estimated stations were added. With the density of stations available and the consistency of the resulting SPAS analysis to the various reports, this analysis is deemed quite reliable.

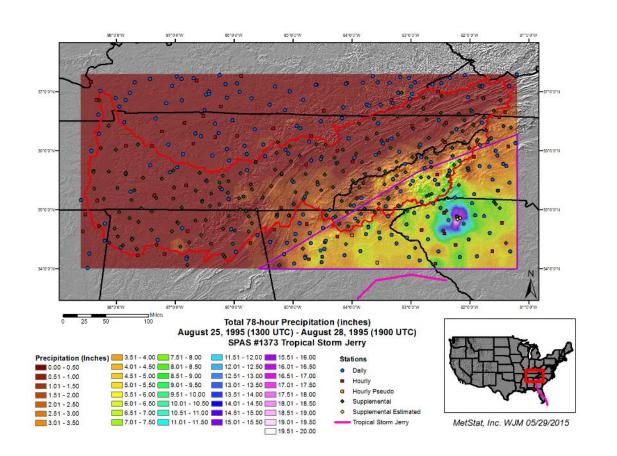
Storm Name:		3-TS Jerry i	n SC			~ ·			T.1.		
Storm Date:	8/25-28/19			,	;	Storm A	Adjustn	nent for	· Virginia	a	
AWA Analysis Date	11/14/201	5				I					
Temporal Transpos	ition Date	15-Aug									
		Lat	Long			Moisture l	nflow Dire	ction	SSE@475	miles	
Storm Center Locat	ion	34.86 N	82.23 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep SST Loc	ation	29.00 N	78.00 W			Storm Cen	ter Elevatio	on	800	feet	
Transposition SST I	ocation					Storm Ana	lysis Durati	ion	24	hours	
Basin Location						Effective B	arrier Hei	ght	N/A	feet	
The st	orm represen	tative SST is	82.5 F	with to	tal precipital	ole water abo	ve sea level	of		4.00	inches.
	in-place maxi		85.5 F		• •		ve sea level			4.48	inches.
	sitioned maxi		0.0				ve sea level			#N/A	inches.
	n-place storm		800		ch subtracts			precipitable	water at	82.5 F	menes.
	n-place storm		800		ch subtracts	0.30		precipitable		85.5 F	
	position basin		N/A		ch subtracts	X.XX		precipitable		0.0	
The inflow barrie			N/A		ch subtracts	X.XX		precipitable		0.0	
The lillow burit	i) ousin ele vai	ion neight is	10/11	reet will	en suotructs	жж	menes of	precipitable	water at	0.0	
The	in-place storr	n maximizati	on factor is	1.12		Notes: Storm	representative	SST value w	as based on SST	values for	
	insposition/el						•		LIT trajectory da		
The tra		rier adjustme		-		-	-		e did not vary me		
	THE Dat	iioi aajustiit	JII 14C (OI 18	1111/71		degree over a	large area an	d was as close	est to the storm c	enter.	
	The t	otal adjustme	ent factor is	#N/A							
	THE	otar aajastiin	one ructor is	1111/12							
Observed Storm De	nth.Area.Du	ration									
Justi ved Storini De	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hour
1 sq mile	<del>~~~~</del> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	6.0	8.1	9.8	10.3	11.1	14.5	16.9	19.2	19.8	19.8
10 sq mile	<del></del>	5.8	7.8	9.4	10.0	10.6	13.7	16.0	18.0	19.2	19.2
100 sq mile	<del>~~-</del> }~~~~~~	5.0	7.0	8.4	8.7	9.3	12.3	14.2	16.2	16.4	17.2
200 sq mile	<del>}</del>	4.8	6.5	7.8	8.3	8.9	11.6	13.9	15.5	15.9	16.3
500 sq mile	<del>~~~</del> }~~~~~~~~~~	3.8	5.3	6.0	6.4	7.1	10.3	12.3	14.1	14.6	14.6
1000 sq mile		2.8	3.9	4.8	5.3	5.8	8.6	10.7	12.3	12.7	13.0
2000 sq mile	<del>~~~</del> }~~~~~~~~~	1.6	2.8	3.2	4.1	4.7	6.9	8.9	10.7	11.0	11.1
5000 sq mile	<del></del>	1.2	1.6	2.2	2.4	2.7	4.9	5.8	8.4	8.5	9.2
10000 sq mile		0.9	1.3	1.5	1.9	2.0	3.1	5.4	6.9	7.4	7.6
20000 sq mile	<del></del> }	0.6	0.9	1.1	1.3	1.4	2.6	4.2	5.3	5.6	5.8
20000 34 1111	0.0	0.0	0.0	1.1	110	27	2.0	7.2	0.0	2.0	2.0
Storm or	Storm Center	Name		SPAS 1373	3-TS Jerry i	n SC					
Storm Da	ite(s)			8/25-28/19	95						
Storm Ty	ре			TS Jerry re	mnants						
Storm Lo	cation			34.86 N	82.23 W						
Storm Ce	nter Elevation	1		800							
Precipita	tion Total & I	Ouration		19.8 inches	in 72 hours						
Storm Re	presentative S	TZ		82.5 F	24						<b>-</b>
	presentative S				78.00 W						
Maximur		200000000		85.5 F	. 0.00 11						
	Inflow Vecto	r		SSE@475							
	Maximization			1.12							İ
	Transposition			15-Aug							-
	ition SST Loc										
-	ition Maximu			#N/A							
	ition Adjustm Basin Elevatio										l
				N/A	-					-	l
	Elevation in Ba	4S1II		N/A							
	arrier Height	4		N/A #N/A							<b></b>
	djustment Fac			_							-
Im . 1 4 1	ustment Facto	or		#N/A							I

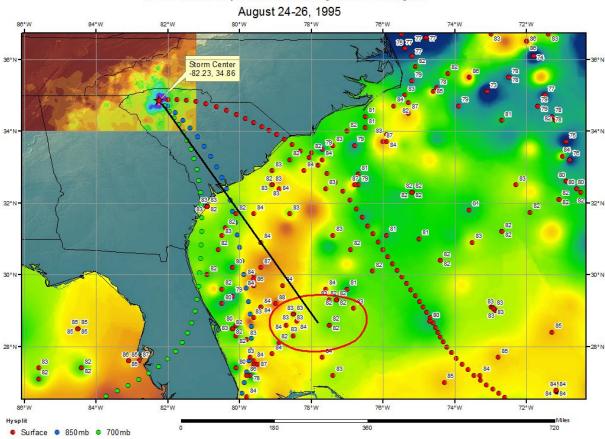
		Sto	rm 1373	- Augu	ıst 25 (1	300 UT	C) - Au	gust 28	(1800 l	JTC), 19	995	-	
					•		-	IPITATIO	•				
Araa (m;²)						Du	ration (hou	urs)					
Area (mi ² )	1	2	3	4	5	6	12	24	36	48	72	78	Total
0.4	3.67	6.04	8.12	9.79	10.36	11.11	14.53	17.05	19.41	20.01	20.01	20.01	20.01
1	3.67	6.01	8.11	9.75	10.33	11.06	14.48	16.88	19.21	19.81	19.81	19.81	19.81
10	3.58	5.76	7.83	9.39	9.95	10.64	13.70	15.99	18.03	19.16	19.16	19.16	19.16
25	3.46	5.66	7.67	9.23	9.78	10.44	13.63	15.83	17.97	18.54	18.54	18.54	18.54
50	3.33	5.48	7.43	8.92	9.47	10.10	13.16	15.43	16.94	17.59	18.00	18.00	18.00
100	3.14	5.00	7.03	8.40	8.73	9.27	12.33	14.18	16.15	16.43	17.16	17.16	17.16
150	3.02	4.96	6.70	8.02	8.51	9.12	12.01	13.96	15.99	16.37	16.71	16.71	16.71
200	2.93	4.82	6.51	7.77	8.27	8.87	11.63	13.88	15.51	15.86	16.28	16.28	16.28
300	2.72	4.33	6.09	7.27	7.66	8.34	10.92	13.05	14.97	15.09	15.67	15.67	15.67
400	2.52	4.01	5.66	6.52	7.21	7.72	10.61	12.60	14.20	14.83	15.13	15.13	15.13
500	2.32	3.83	5.28	6.02	6.44	7.13	10.30	12.32	14.11	14.56	14.59	14.59	14.59
1,000	1.75	2.84	3.85	4.77	5.25	5.79	8.61	10.72	12.28	12.65	13.00	13.00	13.00
2,000	0.94	1.64	2.75	3.19	4.07	4.69	6.94	8.88	10.72	11.03	11.14	11.14	11.14
5,000	0.75	1.22	1.59	2.16	2.44	2.70	4.92	5.80	8.42	8.53	9.22	9.22	9.22
10,000	0.50	0.91	1.25	1.50	1.87	2.03	3.12	5.44	6.88	7.41	7.60	7.60	7.60
20,000	0.32	0.64	0.87	1.12	1.31	1.44	2.57	4.18	5.32	5.60	5.76	5.76	5.76
21,604	0.31	0.60	0.84	1.05	1.23	1.42	2.53	4.03	5.05	5.33	5.46	5.46	5.46



#### SPAS 1373 Storm Center Mass Curve Zone 1 August 25 (1300UTC) to August 28 (1800UTC), 1995







SPAS 1373 Tropical Storm Jerry Storm Analysis

### Storm Precipitation Analysis System (SPAS) For Storm #1552 SPAS-NEXRAD Analysis

General Storm Location: Eastern Seaboard

Storm Dates: September 13, 1999 – September 17, 1999

**Event**: Hurricane Floyd

**DAD Zone 1** 

**Latitude**: 34.005

**Longitude**: -77.9950

Max. Grid Rainfall Amount: 24.30"

Max. Observed Rainfall Amount: 24.06" at Southport 5 N, NC

DAD Zone 2

Latitude: 37.2750

**Longitude**: -76.5550

Max. Grid Rainfall Amount: 19.22"

Max. Observed Rainfall Amount: 18.13" at Yorktown, VA

DAD Zone 3

**Latitude**: 40.9950

**Longitude**: -74.2850

Max. Grid Rainfall Amount: 14.62"

Max. Observed Rainfall Amount: 14.45" at Pompton Lake, NJ

DAD Zone 4

Latitude: 42.2950

**Longitude**: -74.0050

Max. Grid Rainfall Amount: 11.71"

Max. Observed Rainfall Amount: 11.74" at Cairo, NY

Number of Stations: 974 (430 Daily, 97 Hourly, 46 Hourly Pseudo, 1 Hourly Estimated Pseudo, 397

Supplemental, and 3 Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: Continental United States 2-year 24-hour basemap (conus_0002y24h)

Spatial resolution: 0.3736

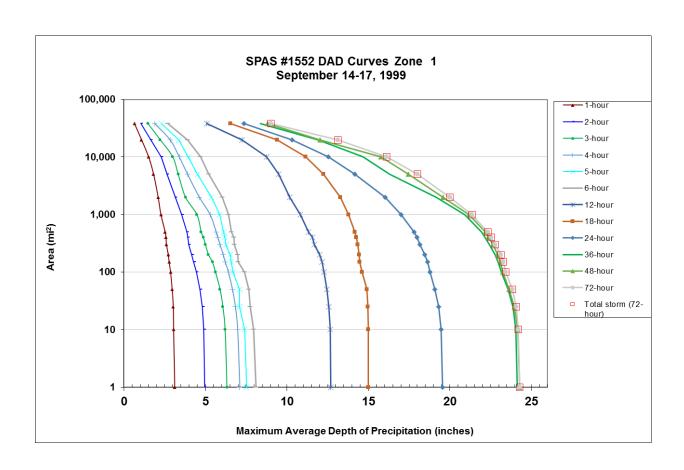
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

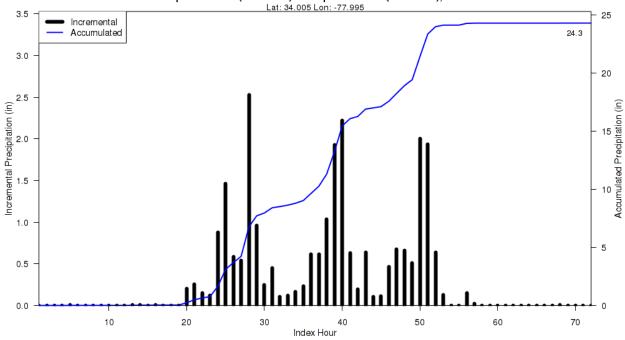
Reliability of results: 397 supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Many of these stations were incorporated from previous analyses of Hurricane Floyd (SPAS storms 1002 and 1012) along with other storm data reports. Due to the orientation and integrity of the station data, three additional stations were incorporated. Lack of hourly stations in east central North Carolina forced the creation of a radar estimated hourly pseudo station to assist in timing and intensity. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is deemed quite reliable.

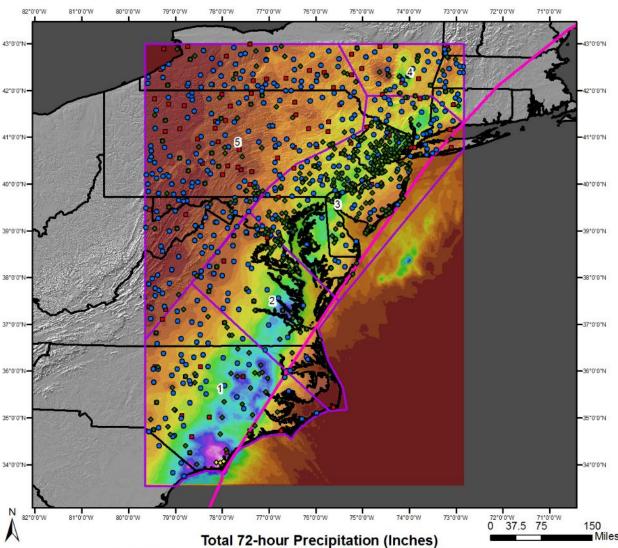
Storm Name:	SPAS 1552	2 - Southpor	t 5 N. NC								
Storm Date:	9/13-17/19		1011,110		S	torm A	diustm	ent for	Virgini	ล	
AWA Analysis Date					b	.01111 /1	ajustiii	ciit ioi	v II SIII	•	
Temporal Transpos	ition Date	1-Sep									
		Lat	Long			Moisture	Inflow Dire	ection	NE @ 350	miles	
Storm Center Loca	tion	34.01 N	77.99 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep SST Loc		35.00 N	72.00 W				iter Elevati		0	feet	
Transposition SST		33.0014	72.00 11				dysis Dura		24	hours	
Basin Location	Location						Barrier Hei		N/A	feet	
								8	14/11		
The ste	orm representa	ative SST is	78.0 F	with to	tal precipita	ble water ab	ove sea leve	el of		3.29	inches
	in-place maxii		82.0 F		tal precipita					3.92	inches
	sitioned maxii		0.0		tal precipita				·	#N/A	inches
	-place storm		0		ch subtracts			precipitabl	e water at	78.0 F	
	-place storm		0	feet whi	ch subtracts	0.00		precipitabl		82.0 F	
The transp	osition basin	elevation at	N/A	feet whi	ch subtracts	x.xx		precipitabl		0.0	
The inflow barries			N/A	feet whi	ch subtracts	x.xx		precipitabl		0.0	
<u> </u>											
The i	n-place storm	maximizatio	on factor is	1.19		Notes:					Ì
	sposition/ele					1					
	•	ier adjustme		-		1					
	The to	tal adjustme	nt factor is	#N/A							
					_	_					
Observe	d Storm Dept	th-Area-Du	ration								
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours		
	1 sq mile	3.1	8.1	12.7	15.0	19.6	24.2	24.3	24.3	***************************************	
	10 sq miles	3.1	8.0	12.7	15.0	19.5	24.1	24.2	24.2		
***************************************	100 sq miles	2.9	7.4	12.3	14.6	18.8	23.2	23.2	23.4		
	200 sq miles	2.7	7.0	12.0	14.4	18.5	22.8	22.9	23.1		
	500 sq miles	2.5	6.6	11.3	14.2	17.8	22.0	22.2	22.3		
1	000 sq miles	2.3	6.4	10.8	13.8	17.0	20.9	21.2	21.4		
2	2000 sq miles	2.1	6.0	10.2	13.3	16.0	19.2	19.6	20.0		
5	000 sq miles	1.8	5.2	9.5	12.3	14.2	16.3	17.4	18.0		
10	0000 sq miles	1.5	4.7	8.8	11.2	12.5	14.7	15.8	16.1		
20	0000 sq miles	1.1	3.9	7.2	9.4	10.3	11.9	12.1	13.2		
Storm or	Storm Center	Name		SPAS 155	2 - Southpo	rt 5 N, NC					
Storm Da	ate(s)			9/13-17/19							
Storm Ty	ре			Hurricane	Floyd						
Storm Lo	ocation			34.01 N	77.99 W						
	enter Elevation			0					ļ		
Precipita	tion Total & I	Ouration		24.30 inch	es in 72 hou	rs					1
									ļ		1
	presentative S			78.0 F	24						
	presentative S	ST Location	1	35.00 N	72.00 W						
Maximur				82.0 F							1
	Inflow Vecto			NE @ 350							1
In-place	Maximization	Factor		1.19							<del> </del>
		<u> </u>		1.0	-				-		-
	Transposition			1-Sep							1
	ition SST Loc								-		1
	ition Maximu			#NT/ A					-		1
	ition Adjustme			#N/A					-		1
	Basin Elevatio			N/A							1
	Elevation in Ba	asın		N/A					-		1
	arrier Height	40.0		N/A #N/A	-				-		-
	djustment Fac								-		1
Total Adj	ustment Facto	r		#N/A							<u> </u>

		Storm 1		eptemb							, 1999		
			MAX	(IMUM A	<b>VERAGE</b>	DEPTH (	OF PREC	CIPITATIO	ON (INCH	ES)			
Area (mi²)						Du	ration (hou	urs)					
Alea (IIII )	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.4	3.15	4.97	6.33	7.11	7.54	8.12	12.75	15.31	19.57	24.16	24.29	24.30	24.30
1	3.12	4.97	6.32	7.11	7.53	8.11	12.69	15.00	19.56	24.15	24.28	24.30	24.30
10	3.05	4.91	6.21	6.98	7.40	7.96	12.65	14.99	19.47	24.05	24.17	24.21	24.21
25	3.03	4.81	6.07	6.84	7.10	7.76	12.58	14.96	19.32	23.88	23.97	24.07	24.07
50	2.96	4.67	5.90	6.66	7.09	7.65	12.46	14.92	19.07	23.59	23.65	23.83	23.83
100	2.86	4.45	5.62	6.41	6.69	7.40	12.29	14.60	18.79	23.15	23.24	23.44	23.44
150	2.77	4.28	5.43	6.22	6.59	7.02	12.15	14.47	18.63	22.96	23.09	23.28	23.28
200	2.72	4.17	5.19	6.09	6.51	6.99	12.00	14.44	18.46	22.78	22.94	23.12	23.12
300	2.61	3.97	5.00	5.90	6.26	6.77	11.68	14.36	18.16	22.42	22.67	22.79	22.79
400	2.58	3.91	4.88	5.76	6.19	6.76	11.56	14.27	17.99	22.17	22.36	22.54	22.54
500	2.53	3.86	4.74	5.66	6.12	6.59	11.33	14.16	17.81	21.95	22.20	22.33	22.33
1,000	2.27	3.55	4.48	5.29	5.86	6.43	10.82	13.79	17.02	20.90	21.18	21.37	21.37
2,000	2.10	3.15	3.78	4.63	5.36	6.03	10.18	13.28	16.03	19.16	19.59	20.00	20.00
5,000	1.82	2.64	3.33	3.91	4.52	5.20	9.49	12.25	14.18	16.30	17.44	18.03	18.03
10,000	1.52	2.29	3.00	3.40	3.96	4.71	8.76	11.16	12.54	14.68	15.78	16.11	16.11
20,000	1.08	1.64	2.23	2.83	3.37	3.92	7.24	9.41	10.32	11.92	12.05	13.15	13.15
38,002	0.65	1.05	1.48	1.90	2.32	2.69	5.10	6.55	7.37	8.36	8.82	9.02	9.02



#### SPAS 1552 Storm Center Mass Curve Zone 1 September 14 (0500UTC) to September 17 (0400UTC), 1999 Lat: 34.005 Lon: -77.995

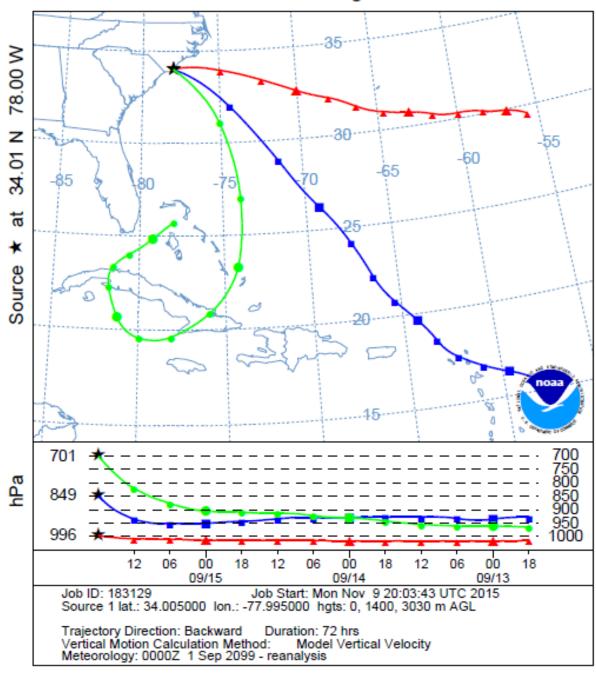


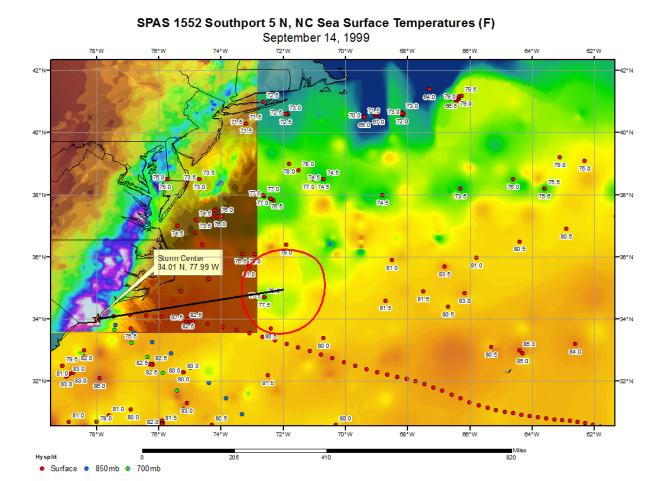


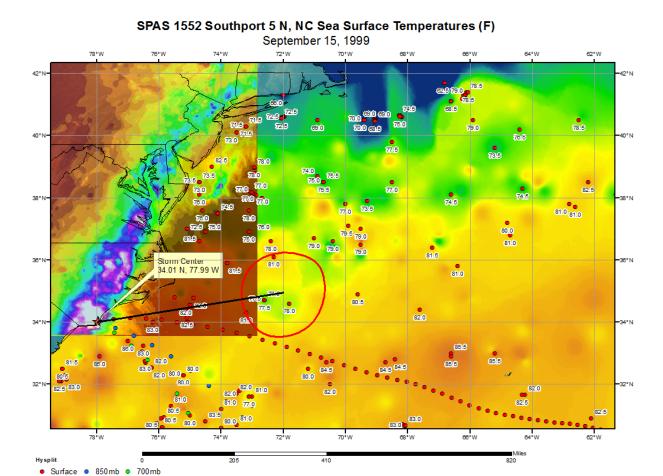
September 14, 1999 0500 UTC - September 17, 1999 0500 UTC SPAS #1552 - Hurricane Floyd



# NOAA HYSPLIT MODEL Backward trajectories ending at 1800 UTC 15 Sep 99 CDC1 Meteorological Data







### Storm Precipitation Analysis System (SPAS) For Storm #1552 SPAS-NEXRAD Analysis

General Storm Location: Eastern Seaboard

Storm Dates: September 13, 1999 – September 17, 1999

**Event**: Hurricane Floyd

**DAD Zone 1** 

**Latitude**: 34.005

**Longitude**: -77.9950

Max. Grid Rainfall Amount: 24.30"

Max. Observed Rainfall Amount: 24.06" at Southport 5 N, NC

DAD Zone 2

Latitude: 37.2750

**Longitude**: -76.5550

Max. Grid Rainfall Amount: 19.22"

Max. Observed Rainfall Amount: 18.13" at Yorktown, VA

DAD Zone 3

**Latitude**: 40.9950

**Longitude**: -74.2850

Max. Grid Rainfall Amount: 14.62"

Max. Observed Rainfall Amount: 14.45" at Pompton Lake, NJ

DAD Zone 4

Latitude: 42.2950

**Longitude**: -74.0050

Max. Grid Rainfall Amount: 11.71"

Max. Observed Rainfall Amount: 11.74" at Cairo, NY

Number of Stations: 974 (430 Daily, 97 Hourly, 46 Hourly Pseudo, 1 Hourly Estimated Pseudo, 397

Supplemental, and 3 Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: Continental United States 2-year 24-hour basemap (conus_0002y24h)

Spatial resolution: 0.3736

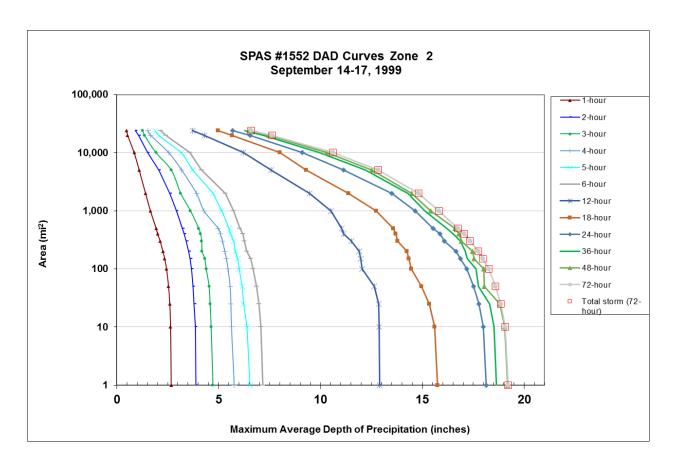
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

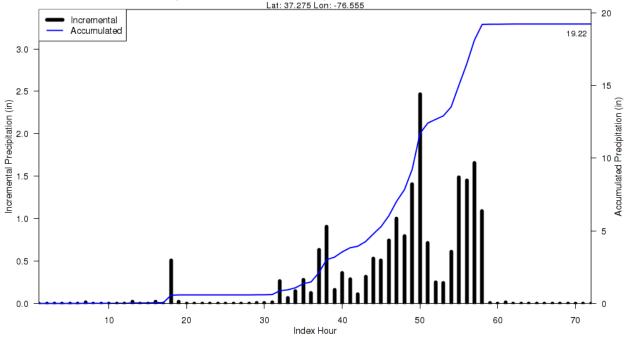
Reliability of results: 397 supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Many of these stations were incorporated from previous analyses of Hurricane Floyd (SPAS storms 1002 and 1012) along with other storm data reports. Due to the orientation and integrity of the station data, three additional stations were incorporated. Lack of hourly stations in east central North Carolina forced the creation of a radar estimated hourly pseudo station to assist in timing and intensity. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is deemed quite reliable.

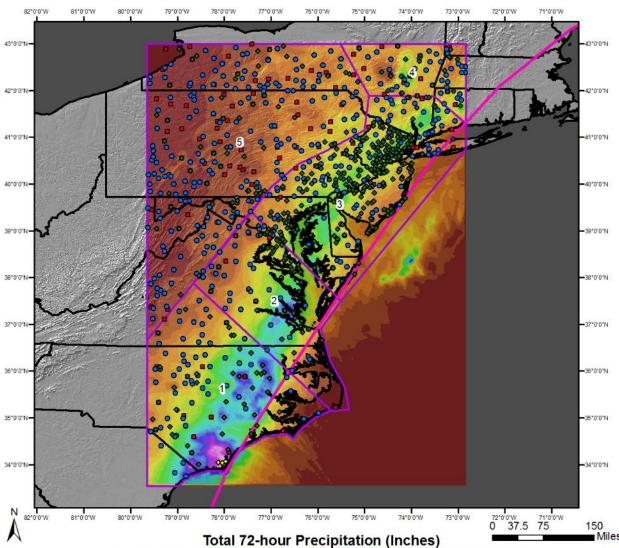
Storm Name:	<del></del>	2 - Yorktow	n, VA - Zoı		a		1	4.6	<b>T</b> 70 0		
Storm Date: AWA Analysis Date	9/13-17/19				S	torm A	djustm	ent for	Virgin	ıa	
·											
Temporal Transpos	tion Date	1-Sep	· ·			N7 . 4	ra D:	4.	CE 6 200		
G. G		Lat	Long				Inflow Dire		SE @ 300	miles	
Storm Center Locat		37.28 N	76.56 W				rage Elevat		N/A	feet	
Storm Rep SST Loc		35.00 N	72.00 W				iter Elevati		0	feet	
Transposition SST I	ocation						dysis Durat		24	hours	
Basin Location						Enecuve 1	Barrier Hei	gnt	N/A	feet	
77		····· COT:	70 A E		.1	1.1	1	1 - 6		2.20	1
	rm representa n-place maxir		78.0 F 82.0 F				ove sea leve ove sea leve			3.29	inches.
	itioned maxir		0.0				ove sea leve			#N/A	inches.
•	-place storm		0.0		ch subtracts	0.00		precipitabl	a water of	78.0 F	menes.
	-place storm (		0		ch subtracts	0.00		precipitable		82.0 F	
	osition basin		N/A		ch subtracts	x.xx		precipitabl		0.0	
The inflow barrier			N/A		ch subtracts	X.XX		precipitable		0.0	
The fill ow builter	Casin Cic valle	IIV 15III 13	11/12	100t Willi	suctincts	ААА	menes 01	precipitator	c maior at	0.0	
The i	n-place storm	maximizatio	on factor is	1.19	1	Notes:					1
	sposition/ele			#N/A							
The trui		ier adjustme		-							
	THE OUIT	aajubiille	14010113								
	The to	tal adjustme	nt factor is	#N/A							
		<b>,</b>			•						
Observe	l Storm Dept	th-Area-Du	ration								İ
***************************************		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours		
	1 sq mile	2.7	7.2	12.9	15.8	18.1	18.6	19.2	19.2		
	10 sq miles	2.6	7.1	12.9	15.6	18.0	18.5	19.0	19.1		
	100 sq miles	2.4	6.7	12.0	14.5	17.2	17.6	18.0	18.3		
	200 sq miles	2.3	6.4	11.9	14.2	16.7	17.1	17.5	17.8		
	500 sq miles	1.9	6.1	11.1	13.6	15.5	16.2	16.6	16.8		
1	000 sq miles	1.7	5.7	10.5	12.7	14.6	15.1	15.4	15.8		
2	000 sq miles	1.4	5.3	9.5	11.4	13.5	14.3	14.5	14.8		
	000 sq miles	1.1	4.2	7.6	9.3	11.1	12.2	12.5	12.8		
	000 sq miles	0.9	3.6	6.2	8.0	9.1	9.9	10.3	10.6		
20	000 sq miles	0.5	2.4	4.3	5.7	6.5	7.2	7.5	7.6		<u> </u>
											4
	Storm Center	Name			2 - Yorktow	n, VA - Zoı	ne 2		ļ		
Storm Da				9/13-17/19							
Storm Ty				Hurricane							
Storm Lo				37.28 N	76.56 W						1
	nter Elevation			0	. 50:						-
Precipita	ion Total & D	Juration		19.22 inch	es in 72 hou	rs					
C4 D :	nuacantation (	CT		79 A E	2.4						1
	presentative S		•	78.0 F	24						1
Maximun	presentative S	DOLL LOCATION	1	35.00 N 82.0 F	72.00 W						1
	Inflow Vector	r		SE @ 300							
	Maximization			1.19							1
III-place I	- IuaiiiizatiOli	1 40 101		1.17							1
Temporal	Transposition	n Date		1-Sep							1
	tion SST Loca			- 20p							1
	tion Maximu										1
	tion Adjustme			#N/A							
	Basin Elevatio			N/A							
	levation in Ba			N/A							
U	rrier Height			N/A							
	djustment Fac	tor		#N/A							
	ustment Facto			#N/A							

		Storm '		eptemb					-		, 1999				
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)  Duration (hours)														
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	Total		
0.4	2.67	3.90	4.73	5.76	6.54	7.18	13.20	15.76	18.14	18.65	19.19	19.22	19.22		
1	2.67	3.89	4.72	5.76	6.54	7.18	12.90	15.75	18.13	18.64	19.18	19.21	19.21		
10	2.64	3.86	4.63	5.63	6.40	7.07	12.88	15.61	18.00	18.51	19.04	19.07	19.07		
25	2.60	3.80	4.58	5.60	6.22	6.97	12.85	15.34	17.77	18.30	18.81	18.84	18.84		
50	2.54	3.74	4.53	5.56	6.16	6.86	12.64	14.96	17.52	17.76	18.05	18.58	18.58		
100	2.44	3.66	4.39	5.46	6.00	6.69	12.04	14.45	17.17	17.63	18.02	18.26	18.26		
150	2.35	3.60	4.32	5.38	5.95	6.57	11.97	14.34	16.87	17.21	17.53	17.96	17.96		
200	2.26	3.53	4.19	5.30	5.82	6.38	11.90	14.23	16.65	17.10	17.47	17.75	17.75		
300	2.13	3.41	4.17	5.19	5.74	6.25	11.51	13.79	16.08	16.87	16.91	17.35	17.35		
400	2.00	3.30	4.11	5.08	5.59	6.18	11.13	13.68	15.87	16.52	16.80	17.06	17.06		
500	1.93	3.22	4.02	4.98	5.52	6.05	11.05	13.57	15.54	16.19	16.61	16.76	16.76		
1,000	1.65	2.92	3.62	4.28	5.15	5.73	10.51	12.74	14.64	15.13	15.42	15.82	15.82		
2,000	1.41	2.60	3.14	3.91	4.73	5.34	9.47	11.38	13.50	14.30	14.49	14.81	14.81		
5,000	1.10	2.06	2.68	3.19	3.74	4.16	7.58	9.29	11.14	12.20	12.53	12.83	12.83		
10,000	0.85	1.51	1.93	2.55	3.19	3.59	6.21	8.00	9.11	9.93	10.31	10.60	10.60		
20,000	0.53	1.07	1.36	1.66	2.05	2.41	4.30	5.67	6.54	7.22	7.47	7.62	7.62		
23,887	0.48	0.92	1.27	1.52	1.88	2.16	3.72	4.98	5.68	6.28	6.49	6.60	6.60		



#### SPAS 1552 Storm Center Mass Curve Zone 2 September 14 (0500UTC) to September 17 (0400UTC), 1999 Lat: 37.275 Lon: -76.555

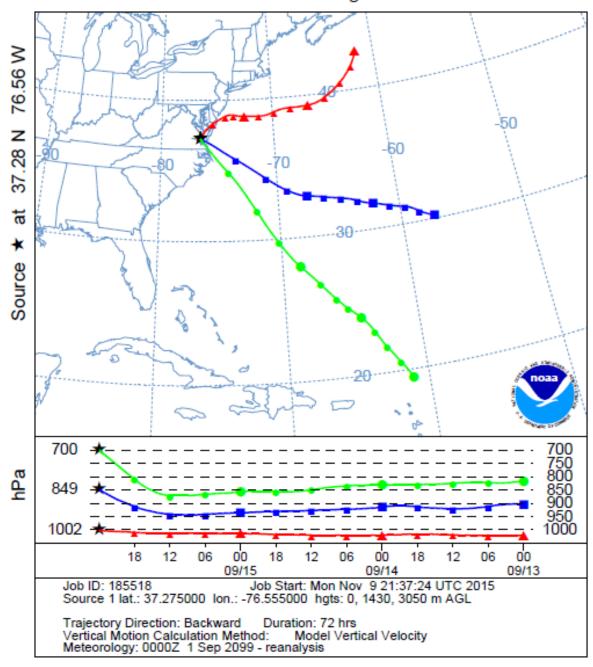


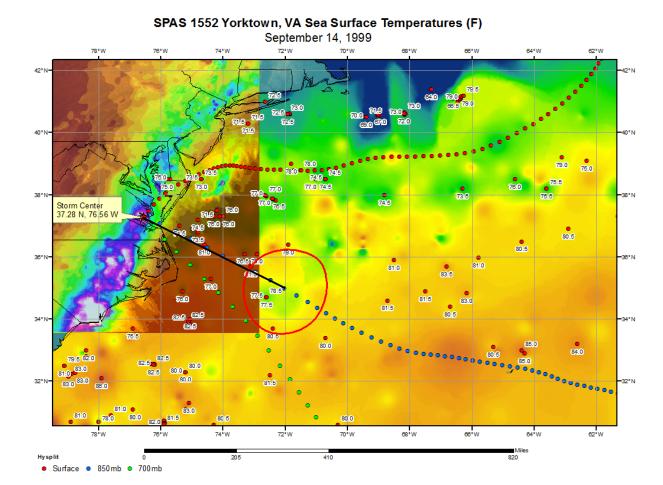


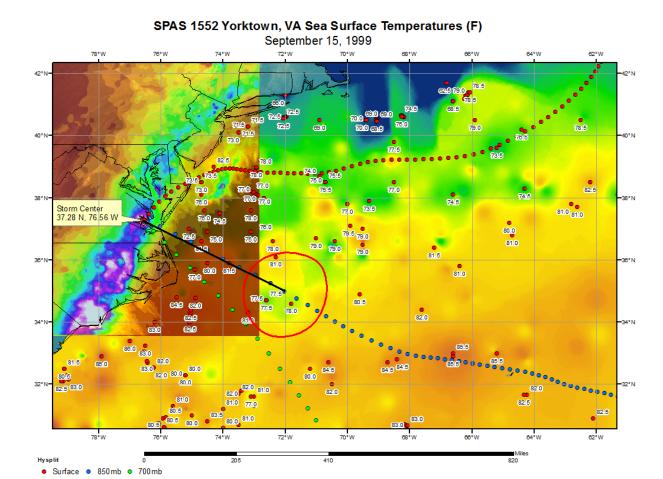
September 14, 1999 0500 UTC - September 17, 1999 0500 UTC SPAS #1552 - Hurricane Floyd



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 16 Sep 99
CDC1 Meteorological Data







### Storm Precipitation Analysis System (SPAS) For Storm #1552 SPAS-NEXRAD Analysis

General Storm Location: Eastern Seaboard

Storm Dates: September 13, 1999 – September 17, 1999

**Event**: Hurricane Floyd

**DAD Zone 1** 

**Latitude**: 34.005

Longitude: -77.9950

Max. Grid Rainfall Amount: 24.30"

Max. Observed Rainfall Amount: 24.06" at Southport 5 N, NC

DAD Zone 2

Latitude: 37.2750

**Longitude**: -76.5550

Max. Grid Rainfall Amount: 19.22"

Max. Observed Rainfall Amount: 18.13" at Yorktown, VA

DAD Zone 3

**Latitude**: 40.9950

**Longitude**: -74.2850

Max. Grid Rainfall Amount: 14.62"

Max. Observed Rainfall Amount: 14.45" at Pompton Lake, NJ

DAD Zone 4

Latitude: 42.2950

**Longitude**: -74.0050

Max. Grid Rainfall Amount: 11.71"

Max. Observed Rainfall Amount: 11.74" at Cairo, NY

Number of Stations: 974 (430 Daily, 97 Hourly, 46 Hourly Pseudo, 1 Hourly Estimated Pseudo, 397

Supplemental, and 3 Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: Continental United States 2-year 24-hour basemap (conus_0002y24h)

Spatial resolution: 0.3736

Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

Reliability of results: 397 supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Many of these stations

were incorporated from previous analyses of Hurricane Floyd (SPAS storms 1002 and 1012) along with other storm data reports. Due to the orientation and integrity of the station data, three additional stations

were incorporated. Lack of hourly stations in east central North Carolina forced the creation of a radar

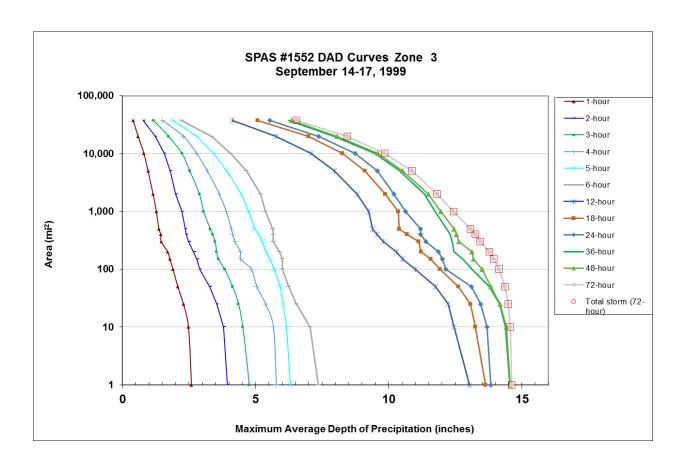
estimated hourly pseudo station to assist in timing and intensity. With the density of stations available for

this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is

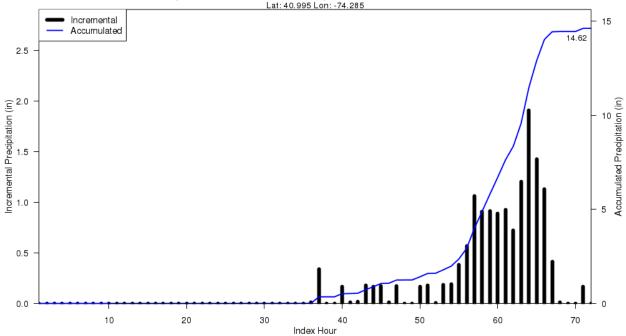
deemed quite reliable

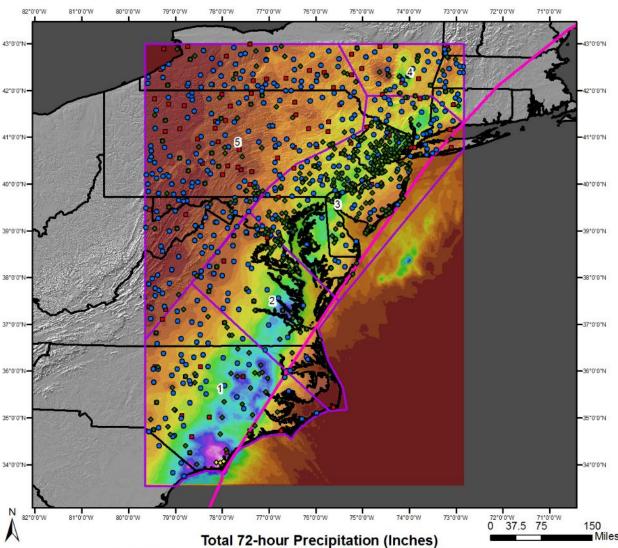
Storm Name:	SPAS 1552	2 - Pomptor	Lake, NJ								
Storm Date:	9/13-17/19	)99			S	torm A	diustm	ent for	Virgini	ia	
AWA Analysis Date:	11/14/201	5			~		J		8		
Temporal Transposi	tion Date	1-Sep									
		Lat	Long			Moisture	Inflow Dire	ection	SE @ 345	miles	
Storm Center Locati	on	40.99 N	74.29 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep SST Loca		36.33 N	72.00 W				iter Elevati		200	feet	
Fransposition SST L		30.33 11	7 2.00 YY				dysis Dura		24	hours	
Basin Location	ocation						Barrier Hei		N/A	feet	
Justin Location						Effective	Jaillet He	giit	IVA	Teet	
The stor	m representa	otivo CCT io	77.5 F	with to	tal precipita	hla watar ah	1	1 of		3.22	inches.
	n-place maxii		81.0 F		tal precipita					3.76	inches.
The transposi	_		0.0		tal precipita					#N/A	inches.
•	place storm		200		ch subtracts	1		precipitabl	a water of	77.5 F	menes.
	place storm		200		ch subtracts	0.06		precipitabl		81.0 F	
	sition basin		N/A		ch subtracts			precipitabl		0.0	
						X.XX					
The inflow barrier/	basın elevati	on neight is	N/A	reet whi	ch subtracts	X.XX	inches of	precipitabl	e water at	0.0	
			c :	4	1	Natas					
	-place storm			1.17		Notes:					
The trans	position/ele			#N/A							
	The barr	ier adjustme	nt factor is	#N/A							
				F							
	The to	otal adjustme	nt factor is	#N/A	<u> </u>	<u> </u>					1
Observed	Storm Dept	th-Area-Du	ration								
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours		
	1 sq mile	2.6	7.4	13.0	13.6	13.8	14.5	14.6	14.6		
	10 sq miles	2.5	7.1	12.5	13.3	13.7	14.4	14.4	14.6		
	00 sq miles	1.9	6.0	11.0	11.9	12.2	13.1	13.5	14.1	***************************************	
***************************************	200 sq miles	1.7	5.9	10.3	11.2	11.9	12.5	13.1	13.8		
***************************************	500 sq miles	1.4	5.6	9.4	10.4	11.2	12.2	12.5	13.1		**
***************************************	000 sq miles	1.3	5.4	9.2	10.4	10.6	11.8	12.0	12.4		
***************************************	000 sq miles	1.2	5.2	8.8	9.9	10.2	11.4	11.5	11.8	***************************************	***
***************************************	000 sq miles	1.0	4.7	8.0	9.1	9.6	10.4	10.5	10.9		
	000 sq miles	0.8	4.1	7.1	8.3	8.7	9.5	9.6	9.8		
***************************************	000 sq miles	0.6	3.4	5.8	7.0	7.4	8.0	8.1	8.4		-
		0.0							1		
Storm or S	Storm Center	Nomo		SDAC 155	2 - Pompton	n Loko NI	Zono 3				1
		Name		9/13-17/19		ii Lake, Nj	- Zone 3				
Storm Dat				Hurricane							1
Storm Typ Storm Loc				40.99 N	74.29 W						1
				200	14.29 W						1
	ter Elevation				es in 72 hou						1
Precipitat	on Total & D	Juration		14.02 Inch	es III / 2 nou	118					1
C4 D .	resentative S	CCT		77.5 E	2.4						-
				77.5 F	24				-		1
	oresentative S	SSI Location	n	36.33 N	72.00 W						-
Maximum				81.0 F							1
	Inflow Vecto			SE @ 345							1
In-place N	Iaximization	ractor		1.17							1
				1.0							-
	Transposition			1-Sep							-
	ion SST Loc										1
	ion Maximui										1
	ion Adjustme			#N/A					ļ		
	asin Elevatio			N/A							
	evation in Ba	asin		N/A							1
	rier Height			N/A							
	ljustment Fac			#N/A							1
	stment Facto	)r		#N/A							1

		Storm '		eptemb							, 1999				
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)  Duration (hours)														
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	Total		
0.4	2.59	3.96	4.77	5.79	6.43	7.37	13.05	13.66	13.84	14.61	14.62	14.62	14.62		
1	2.59	3.95	4.76	5.78	6.31	7.35	13.03	13.63	13.83	14.54	14.57	14.61	14.61		
10	2.48	3.80	4.52	5.67	6.17	7.05	12.46	13.26	13.69	14.39	14.42	14.57	14.57		
25	2.29	3.54	4.36	5.38	6.03	6.53	12.23	13.07	13.45	14.16	14.19	14.49	14.49		
50	2.08	3.27	4.14	5.05	5.92	6.25	11.76	12.61	13.10	13.78	13.84	14.37	14.37		
100	1.90	2.90	3.84	4.84	5.70	6.00	10.99	11.93	12.15	13.12	13.51	14.14	14.14		
150	1.78	2.80	3.60	4.44	5.55	6.00	10.52	11.57	12.02	12.78	13.18	13.95	13.95		
200	1.70	2.67	3.54	4.43	5.40	5.90	10.29	11.21	11.87	12.46	13.12	13.78	13.78		
300	1.46	2.49	3.48	4.23	5.26	5.66	9.80	11.12	11.40	12.37	12.63	13.43	13.43		
400	1.44	2.39	3.38	4.14	5.12	5.66	9.56	10.69	11.20	12.31	12.54	13.25	13.25		
500	1.37	2.35	3.30	4.09	4.96	5.64	9.40	10.40	11.20	12.18	12.45	13.07	13.07		
1,000	1.27	2.23	3.05	3.90	4.75	5.37	9.24	10.35	10.63	11.75	11.96	12.44	12.44		
2,000	1.15	2.00	2.89	3.64	4.47	5.19	8.82	9.87	10.20	11.35	11.49	11.81	11.81		
5,000	0.96	1.79	2.53	3.19	3.92	4.67	7.96	9.11	9.57	10.42	10.52	10.87	10.87		
10,000	0.81	1.57	2.24	2.79	3.43	4.06	7.08	8.27	8.74	9.48	9.60	9.84	9.84		
20,000	0.59	1.23	1.73	2.29	2.80	3.35	5.77	7.00	7.38	7.96	8.06	8.44	8.44		
37,519	0.40	0.78	1.17	1.51	1.88	2.22	4.13	5.08	5.53	6.24	6.35	6.53	6.53		



### SPAS 1552 Storm Center Mass Curve Zone 3 September 14 (0500UTC) to September 17 (0400UTC), 1999 Lat: 40.995 Lon: -74.285

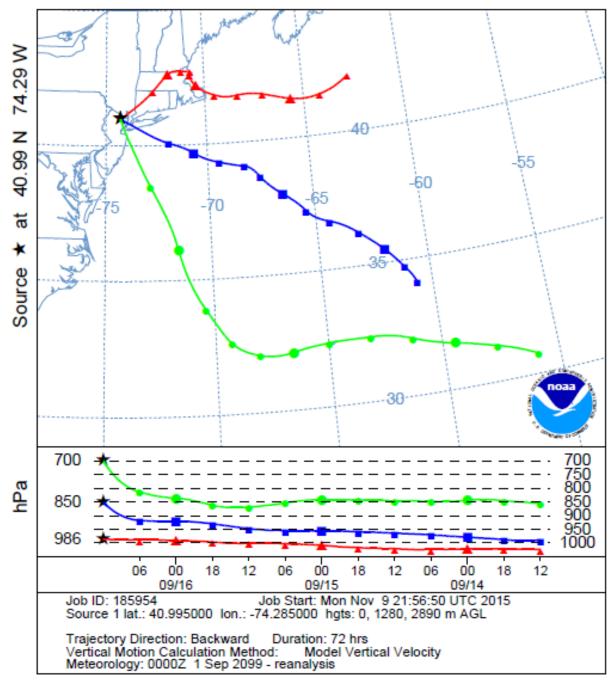


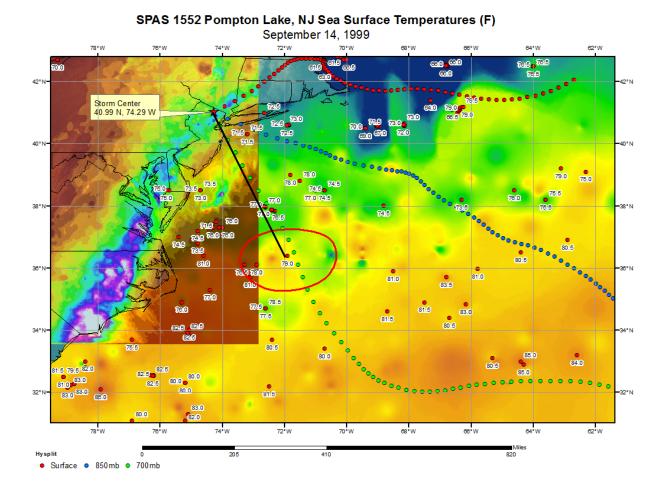


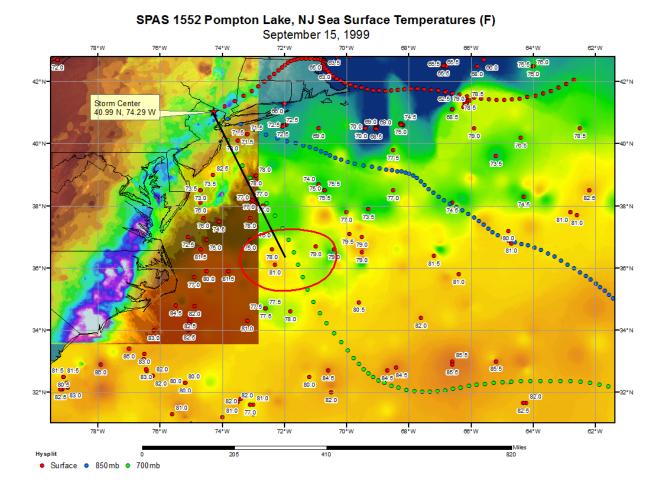
September 14, 1999 0500 UTC - September 17, 1999 0500 UTC SPAS #1552 - Hurricane Floyd



NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 16 Sep 99
CDC1 Meteorological Data







## Storm Precipitation Analysis System (SPAS) For Storm #1552 SPAS-NEXRAD Analysis

General Storm Location: Eastern Seaboard

Storm Dates: September 13, 1999 – September 17, 1999

Event: Hurricane Floyd

**DAD Zone 1** 

**Latitude**: 34.005

**Longitude**: -77.9950

Max. Grid Rainfall Amount: 24.30"

Max. Observed Rainfall Amount: 24.06" at Southport 5 N, NC

DAD Zone 2

Latitude: 37.2750

**Longitude**: -76.5550

Max. Grid Rainfall Amount: 19.22"

Max. Observed Rainfall Amount: 18.13" at Yorktown, VA

DAD Zone 3

**Latitude**: 40.9950

**Longitude**: -74.2850

Max. Grid Rainfall Amount: 14.62"

Max. Observed Rainfall Amount: 14.45" at Pompton Lake, NJ

DAD Zone 4

Latitude: 42.2950

**Longitude**: -74.0050

Max. Grid Rainfall Amount: 11.71"

Max. Observed Rainfall Amount: 11.74" at Cairo, NY

Number of Stations: 974 (430 Daily, 97 Hourly, 46 Hourly Pseudo, 1 Hourly Estimated Pseudo, 397

Supplemental, and 3 Supplemental Estimated)

SPAS Version: 10.0

Base Map Used: Continental United States 2-year 24-hour basemap (conus_0002y24h)

Spatial resolution: 0.3736

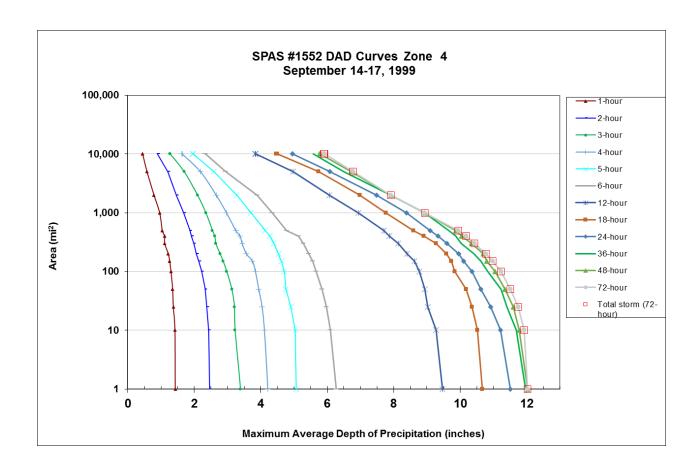
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

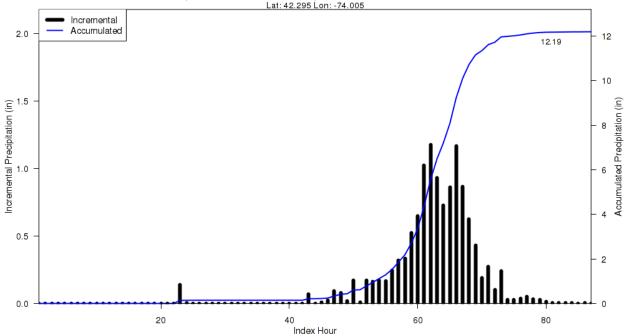
Reliability of results: 397 supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Many of these stations were incorporated from previous analyses of Hurricane Floyd (SPAS storms 1002 and 1012) along with other storm data reports. Due to the orientation and integrity of the station data, three additional stations were incorporated. Lack of hourly stations in east central North Carolina forced the creation of a radar estimated hourly pseudo station to assist in timing and intensity. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is deemed quite reliable

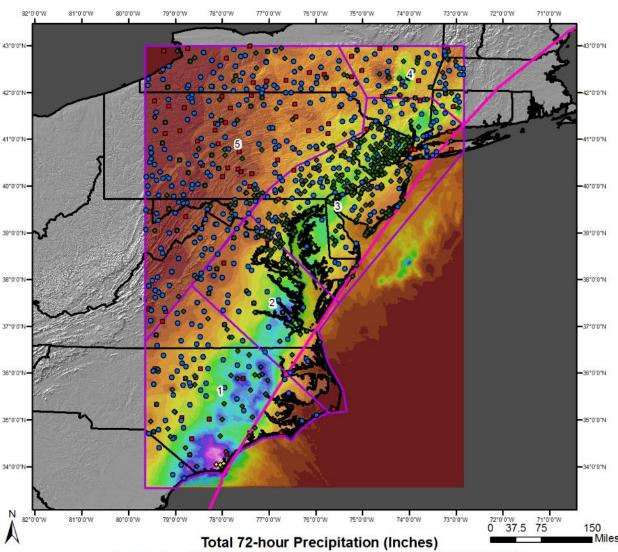
Storm Name:	SPAS 1552	2 - Cairo, N	Y - Zone 4								
Storm Date:	9/13-17/19	99			S	torm A	diustm	ent for	Virgini	ia	
AWA Analysis Date:	11/14/201	5									
Temporal Transposi	tion Date	1-Sep									
		Lat	Long			Moisture 1	Inflow Dire	ection	SE @ 300	miles	
Storm Center Locati	ion	42.30 N	74.01 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep SST Loca	tion	36.33 N	72.00 W			Storm Cer	nter Elevati	on	500	feet	
Transposition SST L							lysis Dura		24	hours	
Basin Location							Barrier Hei		N/A	feet	
The stor	rm represent	ative SST is	77.5 F	with to	tal precipita	ble water ab	ove sea leve	el of		3.22	inches.
	n-place maxii		81.0 F	with to	tal precipita	ble water ab	ove sea leve	el of		3.76	inches.
The transpos	itioned maxii	num SST is	0.0	with to	tal precipita	ble water ab	ove sea leve	el of		#N/A	inches.
The in-	place storm	elevation is	500	feet whi	ch subtracts	0.14	inches of	precipitabl	e water at	77.5 F	
The in-	place storm	elevation is	500	feet whi	ch subtracts	0.15	inches of	precipitabl	e water at	81.0 F	
The transpo	sition basin	elevation at	N/A	feet whi	ch subtracts	x.xx	inches of	precipitabl	e water at	0.0	
The inflow barrier/	basin elevati	on height is	N/A	feet whi	ch subtracts	x.xx	inches of	precipitabl	e water at	0.0	
The in	-place storm	maximizati	on factor is	1.17		Notes:					
	sposition/ele			#N/A							
	The barr	ier adjustme	ent factor is	#N/A							
	The to	tal adjustme	ent factor is	#N/A							
-											
Observed	Storm Dept	th-Area-Du	ration								
		1 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours		
	1 sq mile	1.4	6.3	9.5	10.7	11.5	12.0	12.0	12.0		
***************************************	10 sq miles	1.4	6.1	9.3	10.5	11.2	11.7	11.8	11.9		
***************************************	100 sq miles	1.3	5.7	8.8	9.8	10.4	10.8	11.1	11.2	***************************************	***
***************************************	200 sq miles	1.2	5.5	8.4	9.6	10.0	10.4	10.7	10.8		
***************************************	500 sq miles	1.0	4.8	7.7	8.6	9.1	9.7	9.9	9.9		
***************************************	000 sq miles	1.0	4.4	6.9	7.8	8.4	8.9	8.9	8.9		
***************************************	000 sq miles	0.8	3.9	6.1	7.0	7.5	7.9	7.9	7.9		
***************************************	000 sq miles	0.6	3.0	5.0	5.7	6.1	6.5	6.7	6.8		
	000 sq miles	0.5	2.3	3.8	4.5	5.0	5.6	5.8	5.9		
***************************************	065 sq miles	0.5	2.3	3.8	4.5	5.0	5.6	5.8	5.9		-
100	Joe sq IIIIes	0.2		0.10					0.0		
Storm or	Storm Center	Nama		SDAS 155	2 - Cairo, N	V - 70ne 4					1
Storm Dat		Ivanic		9/13-17/19		1 - Zonc 4					
Storm Typ				Hurricane							1
Storm Loc				42.30 N	74.01 W						1
	nter Elevation	1		500	, T.U1 W				<del>                                     </del>		1
	ion Total & I				es in 72 hou	rs					1
1 recipitat	on roun & L			, 1 111011	25 111 / 2 1100						1
Storm Rei	oresentative S	SST		77.5 F	24						1
	oresentative S		n	36.33 N	72.00 W						1
Maximum		, I Locallo		81.0 F	, 2.00 11						
	Inflow Vecto	r		SE @ 300							
	faximization			1.17							1
III place iv		- 20101		_,_,							
	Transposition	n Date		1-Sep							
Temporal				- ~~p							1
	ion SST Loc				-						1
Transposit	tion SST Loc										1
Transposit Transposit	ion Maximu	m SST		#N/A							
Transposit Transposit Transposit	ion Maximu ion Adjustm	m SST ent Factor		#N/A N/A							
Transposit Transposit Transposit Average B	ion Maximu ion Adjustmo asin Elevatio	m SST ent Factor on		N/A							
Transposit Transposit Transposit Average B Highest E	tion Maximum tion Adjustma asin Elevation levation in Ba	m SST ent Factor on		N/A N/A							
Transposit Transposit Transposit Average B Highest E Inflow Bar	ion Maximu ion Adjustmo asin Elevatio	m SST ent Factor on asin		N/A							

		Storm '	1552 - S	eptemb	er 14 (0	500 UT	C) - Se	ptembe	r 17 (04	00 UTC	), 1999		
			MAX	(IMUM A	VERAGE	DEPTH (	OF PREC	IPITATIO	ON (INCH	ES)			
Araa (m;2)						Du	ration (hou	urs)					
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	72	Total
0.4	1.48	2.47	3.41	4.21	5.22	6.29	9.49	10.75	11.52	11.98	12.04	12.19	12.19
1	1.43	2.46	3.39	4.21	5.07	6.27	9.47	10.66	11.50	11.96	12.02	12.02	12.02
10	1.42	2.43	3.23	4.11	5.04	6.09	9.28	10.52	11.21	11.69	11.77	11.92	11.92
25	1.37	2.38	3.21	4.04	4.91	5.98	9.02	10.36	10.91	11.40	11.59	11.75	11.75
50	1.35	2.33	3.13	3.94	4.75	5.84	8.94	10.17	10.62	11.22	11.34	11.51	11.51
100	1.30	2.22	2.98	3.84	4.71	5.67	8.77	9.84	10.35	10.82	11.05	11.22	11.22
150	1.26	2.14	2.87	3.75	4.63	5.56	8.63	9.73	10.10	10.62	10.80	10.98	10.98
200	1.22	2.07	2.78	3.57	4.54	5.45	8.40	9.58	9.96	10.42	10.70	10.77	10.77
300	1.11	1.99	2.65	3.44	4.40	5.28	8.13	9.27	9.60	10.03	10.34	10.43	10.43
400	1.11	1.92	2.62	3.38	4.28	5.13	7.87	8.90	9.34	9.86	10.04	10.18	10.18
500	1.04	1.87	2.55	3.25	4.13	4.78	7.71	8.59	9.09	9.66	9.86	9.94	9.94
1,000	0.96	1.68	2.35	2.97	3.70	4.35	6.94	7.77	8.38	8.94	8.94	8.94	8.94
2,000	0.79	1.46	2.10	2.66	3.27	3.89	6.06	6.98	7.49	7.91	7.91	7.91	7.91
5,000	0.58	1.21	1.70	2.19	2.59	2.95	4.97	5.74	6.08	6.50	6.72	6.77	6.77
10,000	0.45	0.90	1.28	1.64	1.97	2.34	3.84	4.49	4.95	5.58	5.79	5.91	5.91
10,065	0.45	0.89	1.27	1.63	1.96	2.33	3.83	4.47	4.95	5.57	5.77	5.90	5.90



### SPAS 1552 Storm Center Mass Curve Zone 4 September 14 (5UTC) to September 17 (1500UTC), 1999 Lat: 42.295 Lon: -74.005

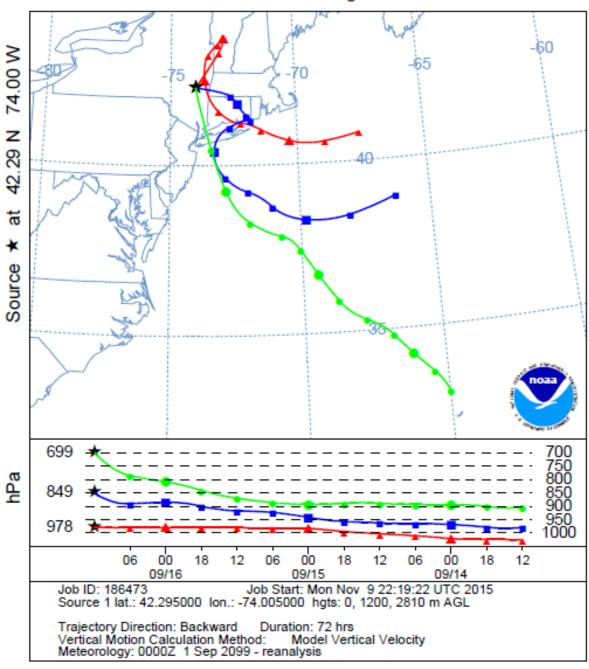




September 14, 1999 0500 UTC - September 17, 1999 0500 UTC SPAS #1552 - Hurricane Floyd



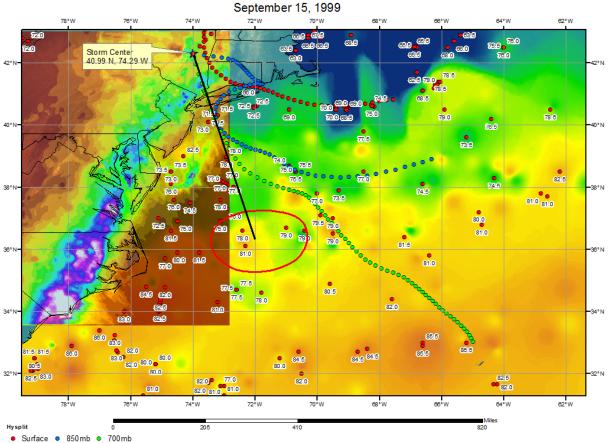
NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 16 Sep 99
CDC1 Meteorological Data



### SPAS 1552 Cairo, NY Sea Surface Temperatures (F) September 14, 1999 62°W 78°W Storm Center 40.99 N, 74.29 W 42° N 40°N-80.5 80.5 36°N 83.5 <u>826</u> 826 80.5 80:0 85.0 85.0 84.0 82.5 82.5 82.5 80.0 80.0 81.5 79.5 82.0 81.0 83.0 83.0 83.0 88.0 78°W 74°W 72°W 70°W 68°W 68°W 62°W Miles 820 Hysplit

Surface • 850mb • 700mb

### SPAS 1552 Cairo, NY Sea Surface Temperatures (F)



## Storm Precipitation Analysis System (SPAS) For Storm #1198 SPAS-NEXRAD Analysis

*** This is an updated version, original was completed 2/14/2011. Updated version was used because need 30-min precipitation data for hydrologic model calibration. SPAS versions had been updated since previous SPAS 1198 deliverables, could not get SPAS code to match the original deliverables so used the latest version of SPAS.

General Storm Location: New England and adjacent portions of Canada

Storm Dates: September 15-19, 1999 (remnants of Hurricane Floyd)

**Event**: Hurricane remnants

**DAD Zone 1** 

Latitude: 44.26

Longitude: -71.34

Max. Grid Rainfall Amount: 9.50"

Max. Observed Rainfall Amount: 9.54" at Mt. Washington, NH and 8.25" at Pinkham Notch, NH

**DAD Zone 2** 

Latitude: 44.53

Longitude: -72.81

Max. Grid Rainfall Amount: 11.66"

Max. Observed Rainfall Amount: 11.35" at Mt Mansfield, VT

Number of Stations: 312 (215 Daily, 32 Hourly, 17 Hourly Pseudo, 1 Hourly Estimated, 42

Supplemental, and 5 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM September Precipitation

Spatial resolution: 36 seconds (~0.34 sq-mi)

Radar Included: Yes

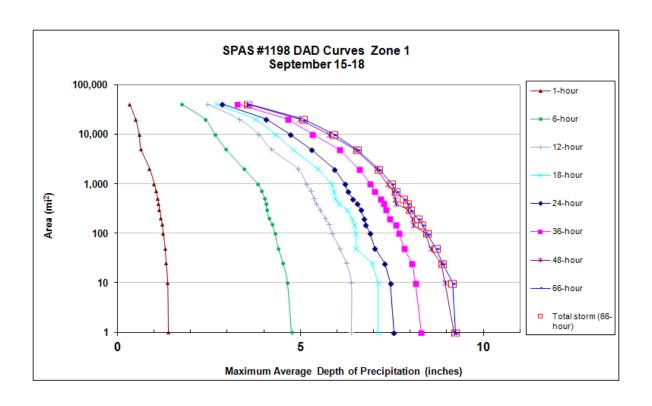
Depth-Area-Duration (DAD) analysis: Yes*

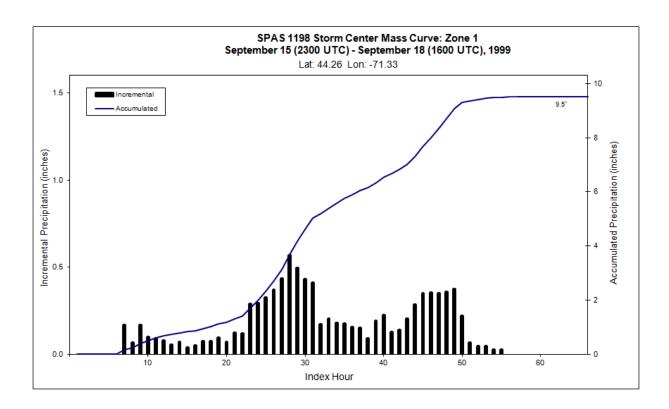
* The DAD zone excludes all areas >4000 feet since these orographically enhanced areas are NOT transpositional to Brassua, ME.

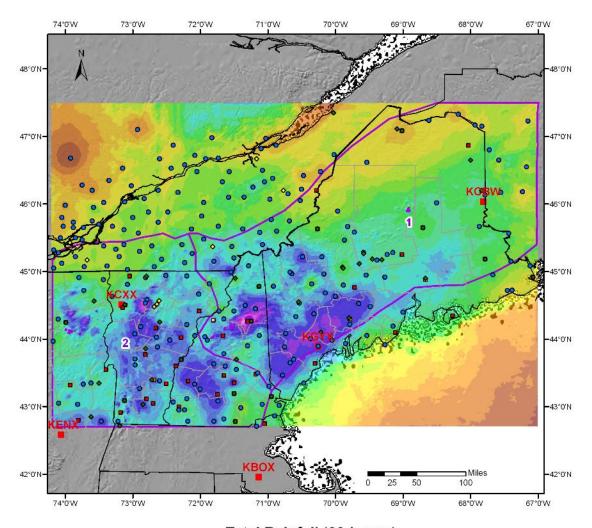
G. N											
Storm Name:		h, NH SPAS 11	198 DAD Zone 1		C.	ho A	J: ~4	f	<b>T</b> 7::	_	
Storm Date: AWA Analysis Date:	9/15-18/19				31	torm A	ajustm	ent for	Virgini	a	
•	*										1
Temporal Transposi	tion Date	1-Sep	T			3.7	Inflow Dire	-4	SE @ 475	*1	
G. G. T. 1		Lat	Long							miles	
Storm Center Locati		44.26 N	71.34 W				rage Elevat		N/A	feet	
Storm Rep SST Loca		39.00 N	65.50 W				nter Elevati		3,400	feet	
Transposition SST L Basin Location	ocation						alysis Dura		24	hours feet	
basin Location						Effective	Barrier Hei	gnı	N/A	Teet	
TI		··· CCT	75 A E	24	al precipitab	1	1 1	. C		2.05	1
	m representa		75.0 F 79.0 F		<u> </u>					2.85 3.44	inches
The transposi	n-place maxir		0.0 F		al precipitab al precipitab					#N/A	inches
•	place storm		3,400		ai precipitat ch subtracts			or precipitabl	o water at	75.0 F	inches
	place storm		3,400		ch subtracts			precipitabl		79.0 F	
	sition basin		N/A		ch subtracts			precipitabl		0.0	
The inflow barrier/			N/A		ch subtracts			precipitabl		0.0	
The initiow buriety	ousin ele van	on neight is	14/11	WIII	en suotructs	жа	menes of	ргестрицы	e water at	0.0	
The in	n-place storn	n maximizati	ion factor is	1.23	1	Notes: SST va	lues on Septem	ber 14-15 with	guidance from H	YSPLIT	
	sposition/ele			#N/A		backward traje					
The train			ent factor is	#N/A		-					
	The bar	aajustiii	-14 14CtO1 15	111/12							
	The to	otal adiustm	ent factor is	#N/A							
	THE I										4
Observed	Storm Dept	h. Area-Du	ration								
Observed	Storm Dept	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		-
	10 sq miles	4.6	6.4	7.1	7.5	9.0	9.2	9.2	9.2		1
	00 sq miles	4.3	5.9	6.5	6.9	8.4	8.5	8.5	8.5		1
***************************************	200 sq miles	4.1	5.7	6.4	6.7	8.1	8.2	8.2	8.2		
***************************************	500 sq miles	4.0	5.4	6.0	6.4	7.6	7.8	7.8	7.8		****
WCOOCOOCOOCOOCOOCOOCOOCOOCOOCOOCOOCOOCOO	000 sq miles	3.8	5.2	5.9	6.2	7.4	7.5	7,5	7.5		
***************************************	000 sq miles	3.5	4.9	5.5	5.9	7.1	7.1	7.1	7.1		
	000 sq miles	3.0	4.2	4.8	5.3	6.5	6.6	6.6	6.6		1
	000 sq miles	2.7	3.9	4.3	4.7	5.8	5.9	5.9	5.9		1
	000 sq miles	2.4	3.3	3.8	4.1	5.0	5.1	5.1	5.1		1
***************************************	195 sq miles	1.8	2.5	2.7	2.9	3.5	3.6	3.6	3.6		Ĭ
Storm or S	Storm Center	Name		Pinkham N	otch, NH S	PAS 1198 D	AD Zone 1				
Storm Dat	e(s)			9/15-18/199							
Storm Typ	e			Remnants o	f Hurricane	Floyd					
Storm Loc	ation			44.26 N	71.34 W						
Storm Cer	ter Elevation	1		3400							
Precipitati	on Total & D	Ouration		10.55 inche	s in 66 hour	s at point					
	resentative S			75.0 F							
	resentative S	SST Location	n	39.00 N	65.50 W		Aug	Sept			1
Maximum				79.0 F			79.5	78			1
	Inflow Vector			SE @ 475							4
In-place M	Iaximization	Factor		1.23							1
											4
	Transposition			1-Sep							4—
	ion SST Loca										4
	ion Maximui										1
	ion Adjustme			#N/A							1
	asin Elevatio			N/A							1
	evation in Ba	asin		N/A							4
	rier Height			N/A							4
	ljustment Fac			#N/A							-
Total Adju	stment Facto	r		#N/A							

Storm 1198 - September 15 (2300 UTC) - September 18 (1600 UTC), 1999 MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

				Du	ration (ho	urs)			
Area (mi²)	1	6	12	18	24	36	48	66	Total
0	1.42	4.85	6.6	7.35	7.78	8.54	9.48	9.5	9.50
1	1.39	4.75	6.39	7.13	7.56	8.3	9.2	9.24	9.24
10	1.37	4.64	6.39	7.13	7.46	8.14	8.95	9.16	9.16
25	1.33	4.52	6.25	6.96	7.3	8.05	8.84	8.89	8.89
50	1.3	4.39	6.07	6.52	7.03	7.83	8.56	8.71	8.71
100	1.25	4.3	5.87	6.52	6.9	7.7	8.41	8.46	8.46
150	1.22	4.22	5.78	6.47	6.79	7.61	8.08	8.33	8.33
200	1.19	4.14	5.68	6.41	6.74	7.44	8.05	8.21	8.21
300	1.15	4.08	5.54	6.28	6.65	7.34	7.94	8.02	8.02
400	1.12	4.05	5.43	6.05	6.56	7.27	7.61	7.92	7.92
500	1.1	4.02	5.37	5.96	6.44	7.19	7.59	7.82	7.82
715	1.05	3.94	5.29	5.92	6.3	7.02	7.54	7.61	7.61
1,000	1	3.83	5.16	5.85	6.22	6.91	7.37	7.5	7.50
2,000	0.88	3.45	4.93	5.48	5.93	6.61	7.08	7.14	7.14
5,000	0.64	2.96	4.2	4.8	5.3	6.07	6.51	6.55	6.55
10,000	0.59	2.66	3.86	4.32	4.72	5.33	5.78	5.91	5.91
20,000	0.49	2.39	3.33	3.78	4.07	4.66	4.96	5.08	5.08
40,495	0.33	1.75	2.46	2.7	2.87	3.28	3.54	3.57	3.57



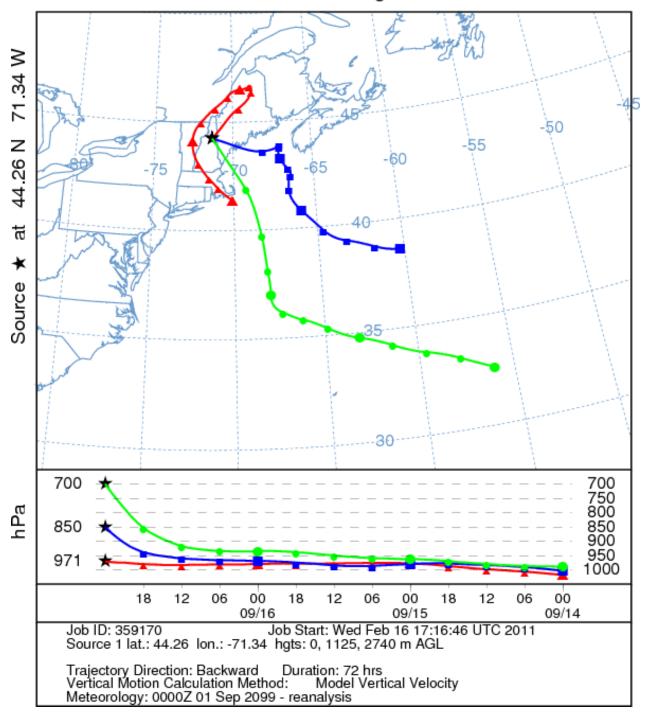




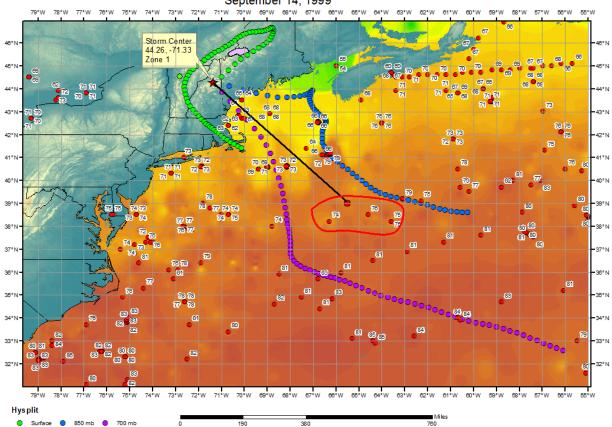
Total Rainfall (66-hours) 09/15/1999 2300 - 09/18/1999 1600 UTC SPAS #1198 - Remnants of Hurricane Floyd

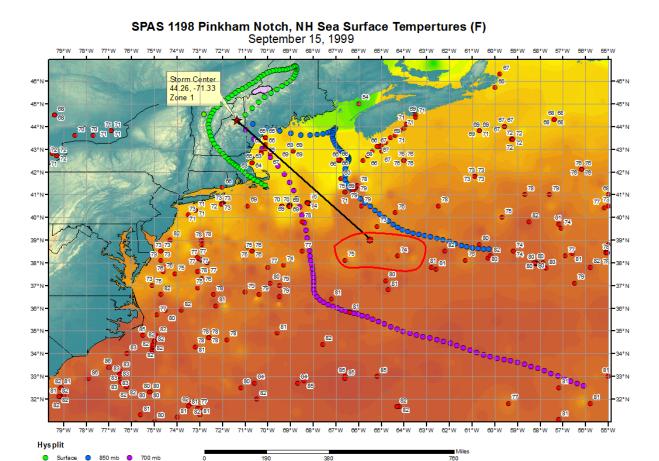


# NOAA HYSPLIT MODEL Backward trajectories ending at 0000 UTC 17 Sep 99 CDC1 Meteorological Data



#### SPAS 1198 Pinkham Notch, NH Sea Surface Tempertures (F) September 14, 1999





## Storm Precipitation Analysis System (SPAS) For Storm #1198 SPAS-NEXRAD Analysis

*** This is an updated version, original was completed 2/14/2011. Updated version was used because need 30-min precipitation data for hydrologic model calibration. SPAS versions had been updated since previous SPAS 1198 deliverables, could not get SPAS code to match the original deliverables so used the latest version of SPAS.

General Storm Location: New England and adjacent portions of Canada

Storm Dates: September 15-19, 1999 (remnants of Hurricane Floyd)

**Event**: Hurricane remnants

**DAD Zone 1** 

Latitude: 44.26

Longitude: -71.34

Max. Grid Rainfall Amount: 9.50"

Max. Observed Rainfall Amount: 9.54" at Mt. Washington, NH and 8.25" at Pinkham Notch, NH

**DAD Zone 2** 

Latitude: 44.53

Longitude: -72.81

Max. Grid Rainfall Amount: 11.66"

Max. Observed Rainfall Amount: 11.35" at Mt Mansfield, VT

Number of Stations: 312 (215 Daily, 32 Hourly, 17 Hourly Pseudo, 1 Hourly Estimated, 42

Supplemental, and 5 Supplemental Estimated)

SPAS Version: 8.5

Base Map Used: Mean (1971-2000) PRISM September Precipitation

Spatial resolution: 36 seconds (~0.34 sq-mi)

Radar Included: Yes

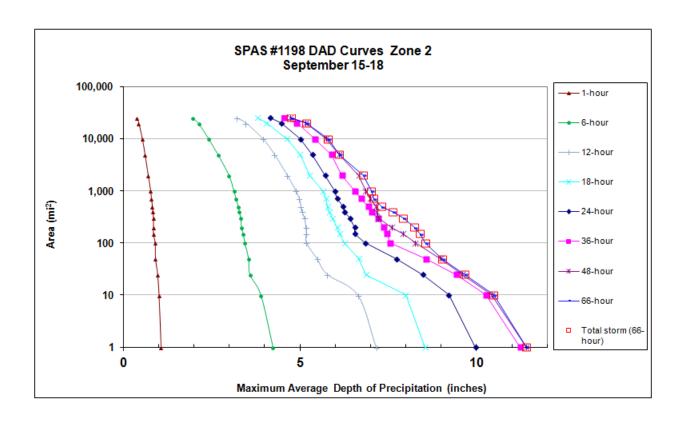
Depth-Area-Duration (DAD) analysis: Yes*

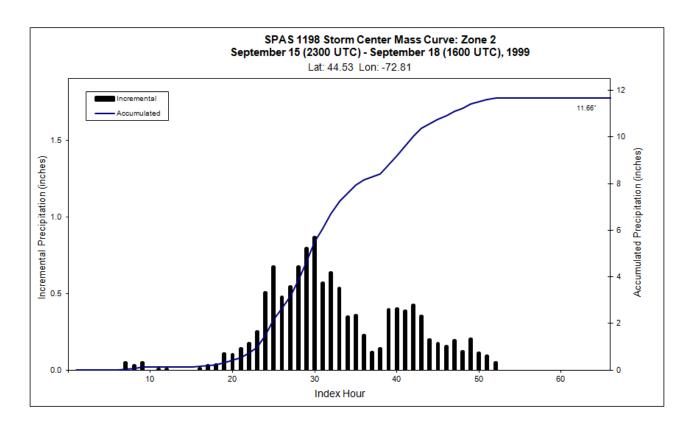
* The DAD zone excludes all areas >4000 feet since these orographically enhanced areas are NOT transpositional to Brassua, ME.

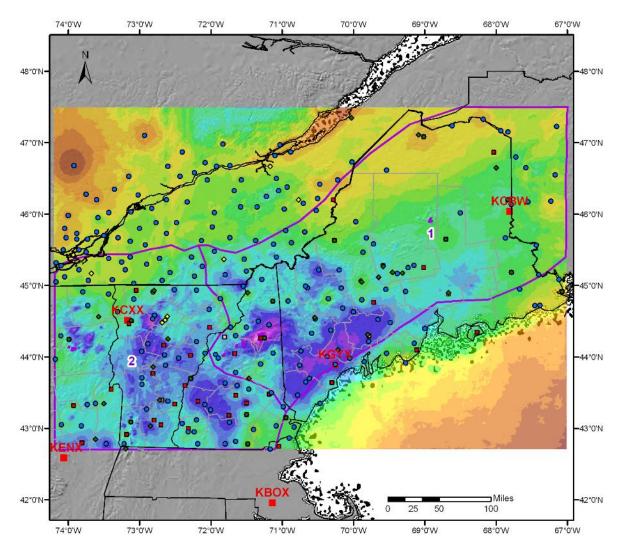
Gr. N	CD 4 C 4 1 0 C	2. 24.24	C 11 Y/D Y								
Storm Name: Storm Date:	9/15-18/19	8 - Mt Mans	sneid, VI I		Q4	owm A	lingtme	nt for	Vincini		
AWA Analysis Date:					Si	orm Ac	ıjusıme	ent for	Virginia	d	
											1
Temporal Transposit	ion Date	1-Sep				20.1	Y 41 - 101		GT. O. 505	.,	
		Lat	Long				Inflow Dire		SE @ 535	miles	
Storm Center Locati		44.53 N	72.81 W				rage Elevat		N/A	feet	-
Storm Rep SST Loca		39.00 N	65.50 W				nter Elevati		3,000	feet	
Transposition SST L	ocation						alysis Dura		24	hours	
Basin Location						Effective 1	Barrier Hei	ght	N/A	feet	
The stor	m representa	ative SST is	75.0 F	with total	l precipitable	e water abov	e sea level o	of		2.85	inches
	-place maxir		79.0 F	with total	l precipitable	e water abov	e sea level o	of		3.44	inches
The transposi			0.0		l precipitable					#N/A	inches
	place storm		3,000	whi	ch subtracts			precipitabl		75.0 F	
	place storm		3,000	whi	ch subtracts	0.90	inches of	precipitabl	e water at	79.0 F	
The transpo	sition basin	elevation at	N/A	whi	ch subtracts	X.XX	inches of	precipitabl	e water at	0.0	
The inflow barrier/	basin elevatio	on height is	N/A	whi	ch subtracts	X.XX	inches of	precipitabl	e water at	0.0	
						_					
The in-	-place storm	maximizati	on factor is	1.23				ber 14-15 with	guidance from H	YSPLIT	
The trans	position/ele	vation to bas	sin factor is	#N/A		backward traje	ectory.				
	The barr	ier adjustme	ent factor is	#N/A							
	The to	tal adjustme	ent factor is	#N/A							
					_						
Observed	Storm Dept	th-Area-Du	ration								
		6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	3.9	6.7	8.0	9.2	10.4	10.5	10.5	10.5		1
***************************************	00 sq miles	3.4	5.2	6.3	6.9	8.3	8.6	8.6	8.6		1
	00 sq miles	3.3	5.2	6.1	6.6	7.6	8.2	8.2	8.2		1
	00 sq miles	3.3	5.0	5.8	6.2	7.2	7.3	7.3	7.3		-
***************************************	00 sq miles	3.1	4.9	5.6	6.0	6.9	7.0	7.0	7.0		
	00 sq miles	3.0	4.6	5.3	5.7	6.7	6.8	6.8	6.8		
	00 sq miles	2.7	4.3	5.0	5.3	6.1	6.1	6.1	6.1		
***************************************	00 sq miles	2.4	4.0	4.6	5.0	5.7	5.8	5.8	5.8		1
	00 sq miles	2.1	3.5	4.1	4.5	5.2	5.2	5.2	5.2		1
	91 sq miles	2.0	3.2	3.8	4.2	4.7	4.8	4.8	4.8		
-	1										1
Storm or S	torm Center	Name		SPAS 1198 -	Mt Manefi	eld VT DA	D Zone 2				1
Storm Date		Tame		9/15-18/199		(iu, vi Di	D Zone 2				1
Storm Typ				Remnants of		lovd					1
Storm Loc				44.53 N	72.81 W	.oyu					1
	ter Elevation	1		3,000	72.01 W						1
	on Total & D			11.35 inches	in 66 hours	at noint					1
1 recipitati	on rotal & L	on an OH		11.55 menes	in oo nours	ш рош					1
Storm Ren	resentative S	SST		75.0 F							1
	resentative S		n	39.00 N	65.50 W		Aug	Sept			1
Maximum		J. J. L.OCALIO		79.0 F	33.30 W		79.5	78			1
	nflow Vector	r		SE @ 535			, ,	, 0			1
	aximization			1.23							1
III-place W		. 40101									1
Temporal 7	   Transposition	n Date		1-Sep			-				1
	ion SST Loc			Гъср							1
	ion Maximu										1
	ion Maximui			#N/A							1
	asin Elevatio			M/A							1
	evation in Ba			N/A							1
		a5111					-				1
	rier Height	ton		N/A							┨
	justment Fac			#N/A							1
Total Adju	stment Facto	or		#N/A							

Storm 1198 - September 15 (2300 UTC) - September 18 (1600 UTC), 1999
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)

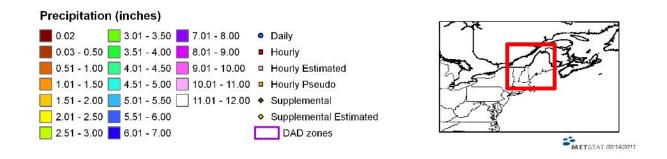
	MAXIMOM AVERAGE BEI 111 OF TREGIT TATION (INCIDED)												
				Du	ration (ho	urs)							
Area (mi²)	1	6	12	18	24	36	48	66	Total				
0.30	1.09	4.31	7.35	8.74	10.2	11.52	11.66	11.66	11.66				
1	1.07	4.23	7.17	8.55	9.96	11.24	11.41	11.41	11.41				
10	1.01	3.89	6.65	7.99	9.21	10.26	10.43	10.48	10.48				
25	0.97	3.58	5.78	6.87	8.48	9.42	9.6	9.67	9.67				
50	0.91	3.54	5.49	6.66	7.72	8.56	8.98	9.02	9.02				
100	0.9	3.44	5.19	6.25	6.85	7.55	8.27	8.55	8.55				
150	0.85	3.39	5.18	6.12	6.55	7.47	7.93	8.4	8.40				
200	0.85	3.34	5.17	6.06	6.55	7.38	7.6	8.24	8.24				
300	0.85	3.32	5.13	5.92	6.42	7.21	7.22	7.93	7.93				
400	0.83	3.28	5.06	5.82	6.25	7.03	7.18	7.62	7.62				
500	0.82	3.25	5.03	5.78	6.22	6.93	7.16	7.31	7.31				
715	0.79	3.19	4.98	5.73	6.06	6.73	6.99	7.09	7.09				
1,000	0.77	3.13	4.89	5.64	5.98	6.55	6.87	7.02	7.02				
2,000	0.7	2.99	4.64	5.27	5.72	6.19	6.67	6.79	6.79				
5,000	0.61	2.68	4.28	5	5.34	5.89	6.11	6.12	6.12				
10,000	0.53	2.42	3.95	4.63	5.01	5.42	5.74	5.79	5.79				
20,000	0.43	2.13	3.47	4.05	4.46	4.91	5.16	5.17	5.17				
25,191	0.38	1.96	3.21	3.8	4.16	4.55	4.74	4.75	4.75				



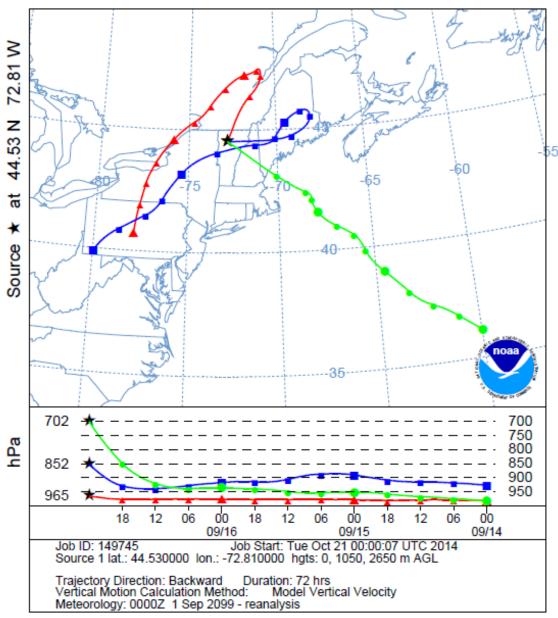




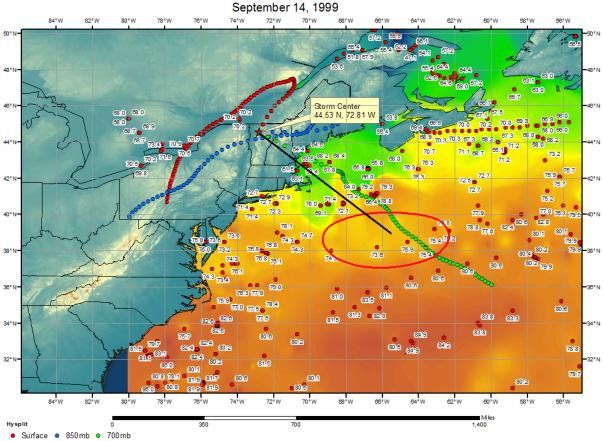
Total Rainfall (66-hours) 09/15/1999 2300 - 09/18/1999 1600 UTC SPAS #1198 - Remnants of Hurricane Floyd



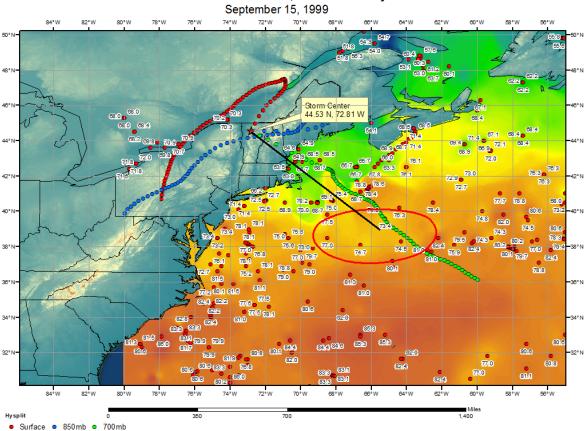
NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 17 Sep 99
CDC1 Meteorological Data



### SPAS 1198 Mt. Mansfield, VT Storm Analysis



## SPAS 1198 Mt. Mansfield, VT Storm Analysis



### Storm Precipitation Analysis System (SPAS) For Storm #1535 SPAS Analysis

General Storm Location: Mid-Atlantic States – Hurricane Isabel

Storm Dates: September 17 – September 20, 2003

**Event**: Hurricane Isabel

**DAD Zone 1** 

Latitude: 35.8625

**Longitude**: -76.5042

Max. Grid Rainfall Amount: 7.96"

Max. Observed Rainfall Amount: 7.75" at Edenton, NC

**DAD Zone 2** 

Latitude: 37.9125

Longitude: -79.0292

Max. Grid Rainfall Amount: 20.22"

Max. Observed Rainfall Amount: 20.20" at Upper Sherando, VA

Number of Stations: 1085 (681 Daily, 157 Hourly, 51 Hourly Pseudo, and 196 Supplemental)

SPAS Version: 10.0

Basemap: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2606

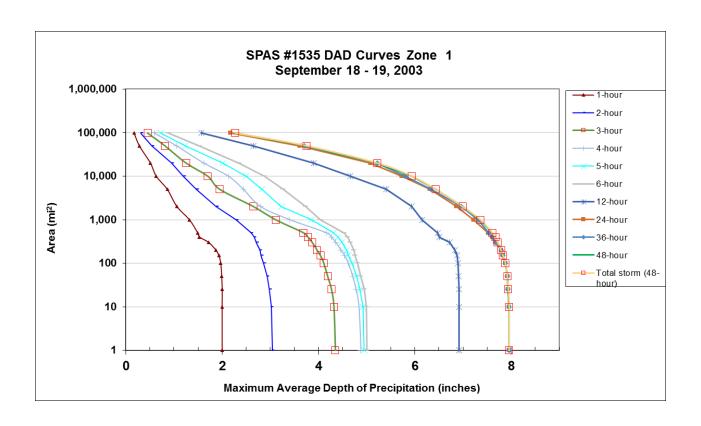
Radar Included: Yes

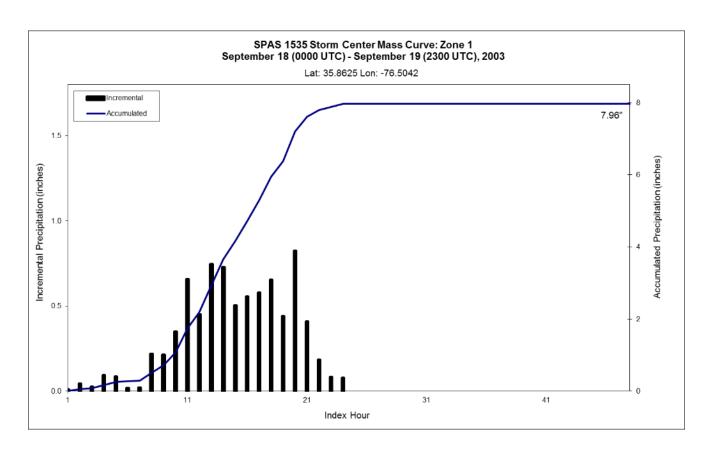
Depth-Area-Duration (DAD) analysis: Yes

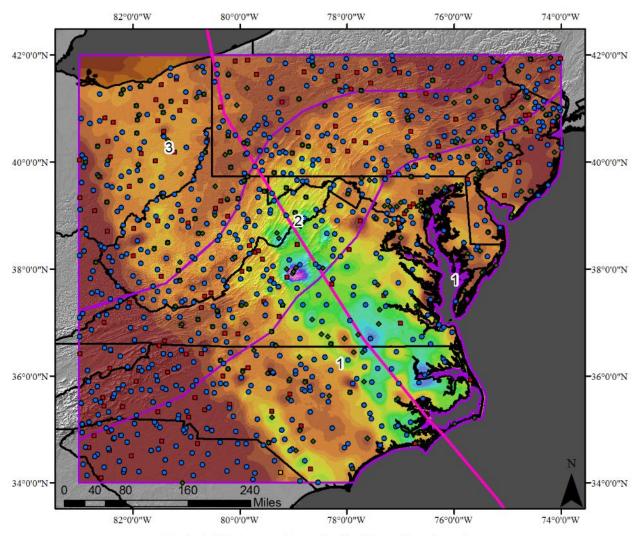
Reliability of results: One Hundred ninety-six supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Due to the orientation and integrity of the station and radar data, these stations were retained to depict the storm precipitation pattern and intensity. A radar beam blockage mask was applied for regions of the storm domain where radar coverage was not available along with blocked radar beams from the Appalachian Mountains. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is deemed quite reliable.

Storm Name: Storm Date:	SPAS 1535 - I										
	9/17-20/2003		Zone 1		C	torm /	dinetr	ant for	Virgini	9	
AWA Analysis Date:					L.	tol III F	aujusui	icht 101	v II giiii	а	
Temporal Transposi		3-Sep									
Mother	tion Date	Lat	Long			Maistuna	Inflow Dire	otion	E @ 340	miles	
Storm Center Locat		35.86 N	76.50 W				rage Elevati		N/A	feet	
Storm Rep Dew Poi		36.5 N	70.5 W				nter Elevati		0	feet	
Transposition Dew 1	Point Location						alysis Durat		24	hours	
Basin Location						Eпесиve	Barrier Hei	gnt	N/A	feet	
			00.77					2		2.00	
	m representative		80.5 F		tal precipitab					3.68	inches.
	-place maximum	•	82.0 F		tal precipitab					3.92	inches.
•	The transpositioned maximum dev		0.0		tal precipitab					#N/A	inches.
	he in-place storn		0		ich subtracts			f precipitable		80.5 F	
	he in-place storn		0		ich subtracts	0.00		f precipitable		82.0 F	
	ansposition basii		N/A		ich subtracts			f precipitable		0.0	
The inflow ba	rrier/basin eleva	tion height is	N/A	wh	ich subtracts	X.XX	inches o	f precipitable	e water at	0.0	
					_						
	The in-place sto			1.07					35. Storm repre		
Т	he transposition/			#N/A		SS1 value w September 1		axımum 24-nr a	average SST va	llues on	
	The b	oarrier adjustn	nent factor is	#N/A		september 1	0, 2003.				
	The	e total adjustn	nent factor is	#N/A							<u> </u>
Observed	l Storm Depth-A	Area-Duratio	n			ç			.,	y	.,
		1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hours
	1 sq miles	3.2	6.5	8.7	10.3	12.0	13.6	19.1	20.2	20.2	20.2
	10 sq miles	3.1	6.2	8.5	10.0	11.6	13.1	18.5	19.5	19.5	19.5
	100 sq miles	2.3	4.5	6.2	7.4	8.4	9.2	13.3	14.5	14.5	14.5
	200 sq miles	1.9	3.6	5.2	6.2	7.1	7.7	10.7	12.1	12.3	12.4
	Father	1.5	2.8	3.8	4.5	5.2	5.8	8.3	10.1	10.1	10.2
	1000 sq miles	1.1	2.3	2.8	3.5	3.9	4.1	7.0	8.0	8.0	8.3
,	2000 sq miles	0.9	2.0	2.6	3.2	3.6	3.8	5.3	6.2	7.3	7.4
	5000 sq miles	0.6	1.4	1.9	2.3	2.7	2.8	5.1	5.6	5.8	5.9
	10000 sq miles	0.5	0.9	1.4	1.9	2.2	2.5	3.6	3.8	4.9	5.0
	20000 sq miles	0.3	0.6	0.9	1.2	1.4	1.5	2.9	3.6	3.6	3.8
***************************************	50000 sq miles	0.2	0.3	0.5	0.7	0.8	0.9	1.4	2.1	2.4	2.5
	71968 sq miles	0.1	0.3	0.4	0.5	0.6	0.7	1.3	1.6	1.6	1.7
	Storm Center Na	me			5 - Edenton,	NC_Zone 1					
Storm Da				9/17-20/20							
Storm Typ				Hurricane							
Storm Lo				35.86 N	76.50 W						
	nter Elevation			0	1 6 2-	0.1505					ł
Precipitat	ion Total & Dura	ation (10 sq m	1)	7.96" in 48	hrs from SPA	AS 1535	-				
		T		00.55	2.1						<del> </del>
	presentative Dev			80.5 F	24		1.	G .			1
	presentative Dev	Point Location	on	36.5 N	70.5 W		Aug	Sept			1
	Dew Point			82.0 F	-		84	83			1
	Inflow Vector			E @ 340							
In-place N	Maximization Fac	tor		1.07							1
	m			2.0							1
	Transposition (I			3-Sep			-				-
	tion Dew Point I										
	tion Maximum D			#NT/A			-				-
	tion Adjustment	ractor		#N/A							-
	Basin Elevation			N/A							1
	levation in Basin	l		N/A							1
	rrier Height			N/A							1
	djustment Factor			#N/A							1
Total Adjı	ustment Factor			#N/A							

	Storm	1535- S	eptemb	er 18 (0	000 UT	C) - Sep	tember	19 (230	0 UTC)	, 2003	
		MAX	IMUM A	/ERAGE	DEPTH (	OF PREC	IPITATIO	N (INCH	ES)		
Auga (mai2)					Dui	ration (hou	ırs)				
Area (mi²)	1	2	3	4	5	6	12	24	36	48	Total
0.3	2.00	3.06	4.35	4.88	4.98	5.08	7.13	7.96	7.96	7.96	7.96
1	2.00	3.04	4.35	4.88	4.95	5.01	6.92	7.96	7.96	7.96	7.96
10	2.00	3.02	4.32	4.84	4.92	4.99	6.92	7.96	7.96	7.96	7.96
25	2.00	2.98	4.27	4.78	4.86	4.95	6.92	7.94	7.94	7.94	7.94
50	1.99	2.93	4.19	4.71	4.79	4.88	6.91	7.92	7.92	7.92	7.92
100	1.97	2.86	4.11	4.62	4.70	4.81	6.90	7.88	7.88	7.88	7.88
150	1.93	2.81	4.04	4.54	4.62	4.76	6.88	7.83	7.83	7.83	7.83
200	1.87	2.78	3.97	4.47	4.58	4.73	6.83	7.79	7.79	7.79	7.79
300	1.72	2.71	3.87	4.36	4.49	4.66	6.72	7.67	7.67	7.72	7.72
400	1.53	2.66	3.78	4.27	4.40	4.60	6.51	7.61	7.61	7.67	7.67
500	1.49	2.60	3.69	4.17	4.31	4.53	6.47	7.52	7.54	7.61	7.61
1,000	1.32	2.29	3.11	3.41	3.85	4.04	6.15	7.22	7.32	7.36	7.36
2,000	1.06	1.88	2.65	2.80	3.23	3.73	5.93	6.86	6.96	6.99	6.99
5,000	0.86	1.47	1.95	2.44	2.83	3.27	5.40	6.31	6.34	6.43	6.43
10,000	0.63	1.20	1.70	2.13	2.50	2.88	4.66	5.73	5.79	5.94	5.94
20,000	0.51	0.95	1.25	1.62	2.01	2.35	3.90	5.08	5.22	5.22	5.22
50,000	0.28	0.54	0.81	1.05	1.23	1.52	2.65	3.61	3.71	3.75	3.75
98,195	0.17	0.31	0.45	0.59	0.73	0.88	1.57	2.17	2.26	2.27	2.27



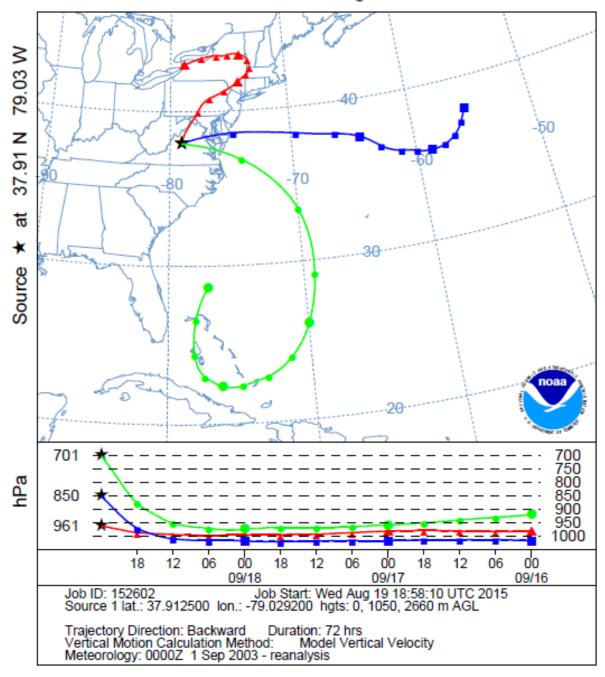


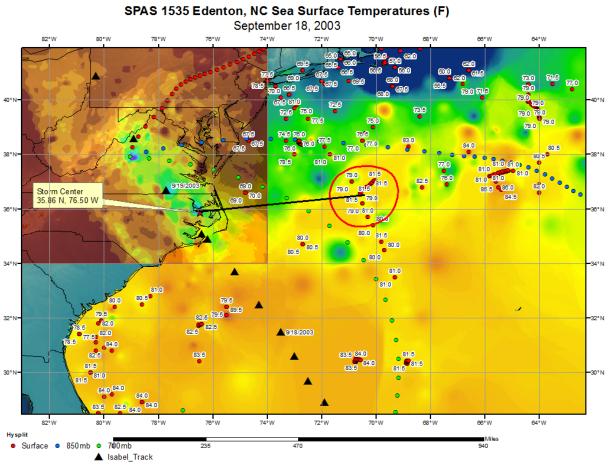


Total 48-hour Precipitation (Inches)
September 18, 2003 0000 UTC - September 20, 2003 0000 UTC
SPAS #1535-Hurricane Isabel



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 19 Sep 03
CDC1 Meteorological Data





### Storm Precipitation Analysis System (SPAS) For Storm #1535 SPAS Analysis

General Storm Location: Mid-Atlantic States – Hurricane Isabel

Storm Dates: September 17 – September 20, 2003

**Event**: Hurricane Isabel

**DAD Zone 1** 

Latitude: 35.8625

**Longitude**: -76.5042

Max. Grid Rainfall Amount: 7.96"

Max. Observed Rainfall Amount: 7.75" at Edenton, NC

DAD Zone 2

Latitude: 37.9125

**Longitude**: -79.0292

Max. Grid Rainfall Amount: 20.22"

Max. Observed Rainfall Amount: 20.20" at Upper Sherando, VA

Number of Stations: 1085 (681 Daily, 157 Hourly, 51 Hourly Pseudo, and 196 Supplemental)

SPAS Version: 10.0

Basemap: Mean annual maximum 48-hour precipitation associated with MLCs

Spatial resolution: 0.2606

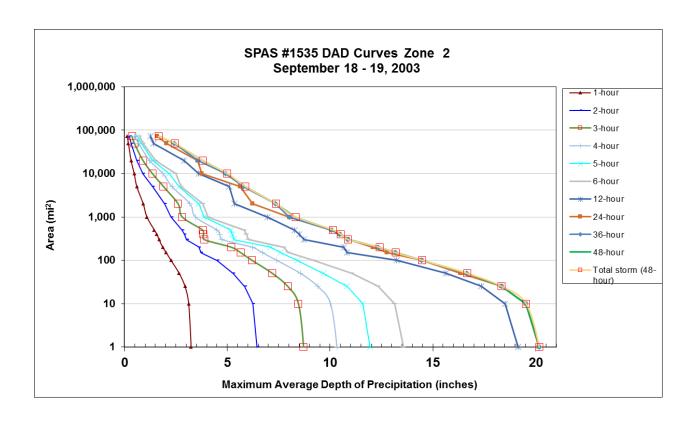
Radar Included: Yes

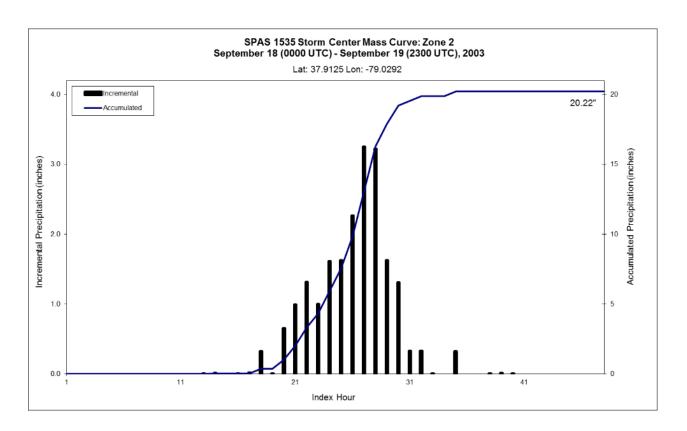
Depth-Area-Duration (DAD) analysis: Yes

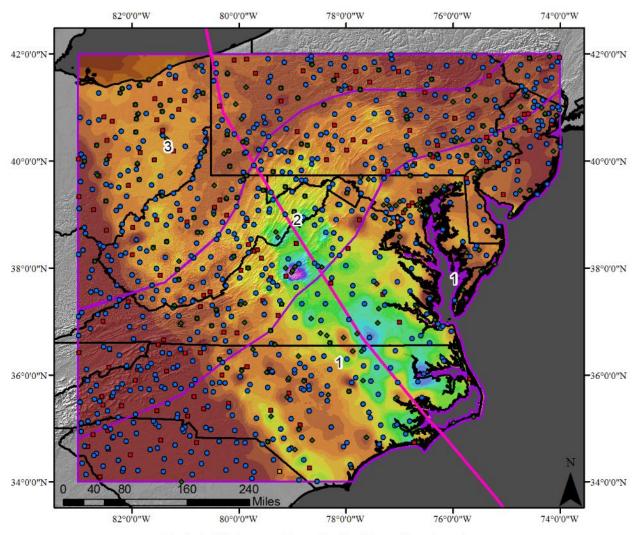
Reliability of results: One Hundred ninety-six supplemental stations were added to ensure the data matches what can actually occur and that the data more closely resemble reports from this storm. Due to the orientation and integrity of the station and radar data, these stations were retained to depict the storm precipitation pattern and intensity. A radar beam blockage mask was applied for regions of the storm domain where radar coverage was not available along with blocked radar beams from the Appalachian Mountains. With the density of stations available for this storm and with how closely the resulting SPAS analysis was to the storm data report, this analysis is deemed quite reliable.

Storm Name:	SPAS 1535 - I	Upper Sheran	lo, VA_Zone 2								
Storm Date:	9/17-20/2003	оррег опетил	, ,,,		•	Storm A	dingtr	ent for	Virgini	9	
AWA Analysis Date:				•	L.	, tol III A	Lujusiii	iciit ioi	v II giiii	а	
·		2 5									
Temporal Transposit	ion Date	3-Sep				34 14 3	r a D:	4.	E @ 400	*1	
Mother		Lat	Long				Inflow Dire		E @ 480	miles	
Storm Center Locati	on	37.91 N	79.03 W			Basin Ave	rage Elevat	ion	N/A	feet	
Storm Rep Dew Poin	t Location	36.5 N	70.5 W			Storm Cer	nter Elevati	on	3,100	feet	
Transposition Dew P	oint Location					Storm Ana	dysis Durat	ion	24	hours	
Basin Location						Effective I	Barrier Hei	ght	N/A	feet	
The storn	n representative	dew point is	80.5 F	with to	tal precipitab	le water abo	ve sea level	of		3.68	inches.
	olace maximum		82.0 F		tal precipitab					3.92	inches.
	oned maximum		0.0		tal precipitab					#N/A	inches.
•	e in-place storn	•	3,100		ich subtracts	0.86		of precipitable	e water at	80.5 F	inches.
	in-place storn		3,100		ich subtracts	0.89		of precipitable		82.0 F	
	nsposition basis		N/A		ich subtracts	X.XX		of precipitable		0.0	
	•		N/A							0.0	
The inflow bar	rier/basin eleva	tion neight is	IN/A	WI	ich subtracts	X,XX	menes c	of precipitable	e water at	0.0	
				1							
			zation factor is					from SPAS 153			
	The transpositi			-				aximum 24-hr a	average SST va	aues on	
	Tì	ne barrier adjus	tment factor is	#N/A		September 18	6, 2005.				
		The total adjus	tment factor is	#N/A							
Observed	Storm Depth-A	Area-Duration									
(		1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	24 Hours	36 Hours	48 Hou
***************************************	1 sq miles	3.2	6.5	8.7	10.3	12.0	13.6	19.1	20.2	20.2	20.2
,	10 sq miles	3.1	6.2	8.5	10.0	11.6	13.1	18.5	19.5	19.5	19.5
·	100 sq miles	2.3	4.5	6.2	7.4	8.4	9.2	13.3	14.5	14.5	14.5
	200 sq miles	1.9	3.6	5.2	6.2	7.1	7.7	10.7	12.1	12.3	12.4
		1.5	2.8	3.8	4.5	5.2	5.8	8.3	10.1	10.1	10.2
	500 sq miles			·	~ <del>}</del> ~~~~	<del> </del>	·	~ <del> </del> ~~~~		<del></del>	<del></del>
	1000 sq miles	1.1	2.3	2.8	3.5	3.9	4.1	7.0	8.0	8.0	8.3
	2000 sq miles	0.9	2.0	2.6	3.2	3.6	3.8	5.3	6.2	7.3	7.4
***************************************	5000 sq miles	0.6	1.4	1.9	2.3	2.7	2.8	5.1	5.6	5.8	5.9
***************************************	0000 sq miles	0.5	0.9	1.4	1.9	2.2	2.5	3.6	3.8	4.9	5.0
	0000 sq miles	0.3	0.6	0.9	1.2	1.4	1.5	2.9	3.6	3.6	3.8
	0000 sq miles	0.2	0.3	0.5	0.7	0.8	0.9	1.4	2.1	2.4	2.5
7	1968 sq miles	0.1	0.3	0.4	0.5	0.6	0.7	1.3	1.6	1.6	1.7
Storm or S	orm Center Na	ime		SPAS 153:	5 - Upper Sh	erando, VA	Zone 2				
Storm Date				9/17-20/20							
Storm Type				Hurricane							Î
Storm Loc				37.91 N	79.03 W						ſ
	er Elevation			3.100	1,2,2,0,0,11						
	on Total & Dura	ation (10 sa mi	)	- /	8hrs from SP	AS 1535					1
1 recipitati	10.00 & Dul	(10 34 III	,	20.22 III 4	J.11 J 11 O 111 J 1	. 20 1000					1
Storm Pon	esentative Dev	Point		80.5 F	24						1
	esentative Dev		n	36.5 N	70.5 W		Aug	Sept			
Maximum 1		v i Olin LOCALIO	11	82.0 F	70.5 W		84	83			
							04	0.0			l
	nflow Vector			E @ 480							<b>!</b>
In-place M	aximization Fac	tor		1.07							<b>!</b>
_					-			-			<b></b>
	ransposition (I			3-Sep	-			-			
	on Dew Point I										ļ
	on Maximum D										
	on Adjustment	Factor		#N/A							ļ
Transpositi		1		N/A							
	sin Elevation										
Transpositi Average Ba	sın Elevatıon evation in Basin	i		N/A							
Transpositi Average Ba	vation in Basin			N/A N/A							
Transpositi Average Ba Highest Eld Inflow Barr	vation in Basin										

	Storm	1535- S	eptemb	er 18 (0	000 UT	C) - Sep	tember	19 (230	00 UTC)	, 2003					
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Auga (m:2)					Dui	ration (hou	ırs)								
Area (mi²)	1	2	3	4	5	6	12	24	36	48	Total				
0.3	3.25	6.47	8.73	10.36	11.98	13.59	19.19	20.20	20.22	20.22	20.22				
1	3.24	6.45	8.71	10.33	11.95	13.56	19.14	20.15	20.17	20.17	20.17				
10	3.12	6.24	8.46	10.02	11.59	13.14	18.52	19.52	19.53	19.53	19.53				
25	2.94	5.85	7.94	9.40	10.83	12.34	17.36	18.34	18.35	18.35	18.35				
50	2.66	5.28	7.19	8.56	9.68	11.05	15.63	16.34	16.64	16.67	16.67				
100	2.26	4.51	6.20	7.40	8.42	9.17	13.25	14.45	14.46	14.48	14.48				
150	2.03	3.71	5.65	6.71	7.60	7.98	10.83	12.77	13.16	13.18	13.18				
200	1.86	3.62	5.20	6.22	7.09	7.74	10.68	12.09	12.33	12.40	12.40				
300	1.68	3.02	3.88	4.75	5.33	6.02	8.73	10.87	10.87	10.88	10.88				
400	1.57	2.91	3.84	4.63	5.24	5.92	8.50	10.47	10.47	10.51	10.51				
500	1.45	2.80	3.80	4.50	5.16	5.83	8.27	10.06	10.06	10.15	10.15				
1,000	1.09	2.26	2.81	3.45	3.87	4.07	6.96	8.03	8.03	8.33	8.33				
2,000	0.91	1.95	2.61	3.19	3.62	3.82	5.34	6.24	7.34	7.36	7.36				
5,000	0.60	1.37	1.90	2.31	2.65	2.76	5.10	5.62	5.77	5.89	5.89				
10,000	0.47	0.89	1.36	1.87	2.18	2.50	3.62	3.77	4.92	5.00	5.00				
20,000	0.32	0.60	0.90	1.22	1.37	1.51	2.89	3.57	3.59	3.80	3.80				
50,000	0.19	0.32	0.48	0.68	0.81	0.90	1.41	2.05	2.43	2.45	2.45				
71,968	0.13	0.25	0.37	0.49	0.61	0.73	1.27	1.58	1.64	1.66	1.66				



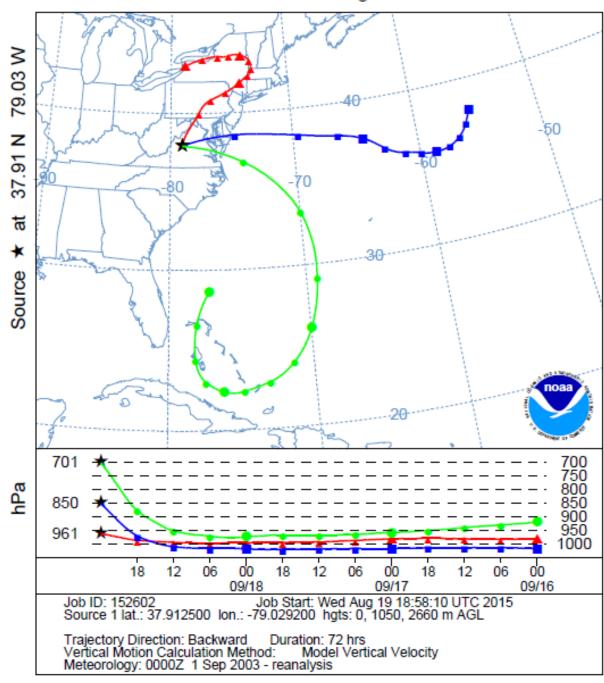


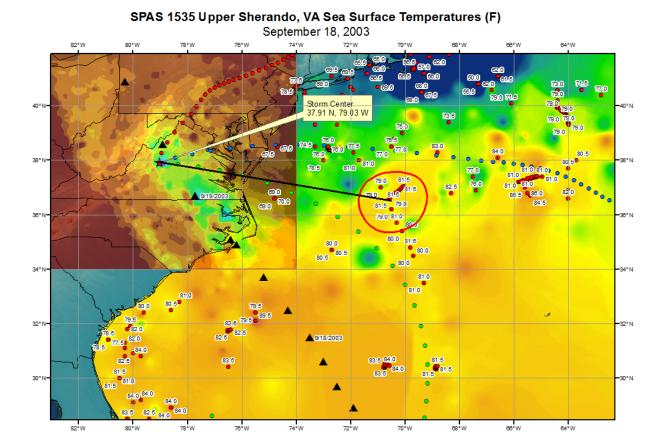


Total 48-hour Precipitation (Inches)
September 18, 2003 0000 UTC - September 20, 2003 0000 UTC
SPAS #1535-Hurricane Isabel



NOAA HYSPLIT MODEL
Backward trajectories ending at 0000 UTC 19 Sep 03
CDC1 Meteorological Data





Hysplit

• Surface • 850 mb • 700 mb

▲ Isabel_Track

### Storm Precipitation Analysis System (SPAS) For Storm #1551 SPAS Analysis

General Storm Location: Virginia, North Carolina, Maryland

Storm Dates: August 30-31, 2004

Event: Convective/Remnants of Hurricane Gaston

**DAD Zone 1** 

**Latitude**: 37.705

Longitude: -77.375

Max. Grid Rainfall Amount: 14.38"

Max. Observed Rainfall Amount: 12.60" at Richmond, VA

Number of Stations: 199 (108 Daily, 46 Hourly, 14 Hourly Pseudo, 1 Hourly Estimated Pseudo and 30

Supplemental)

SPAS Version: 10.0

Basemap: us_ppt_in_map_1961_1990_usda_northamerica

Spatial resolution: 00:00:36

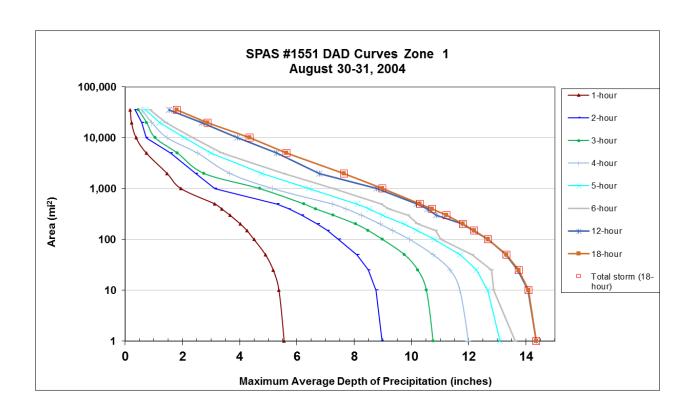
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

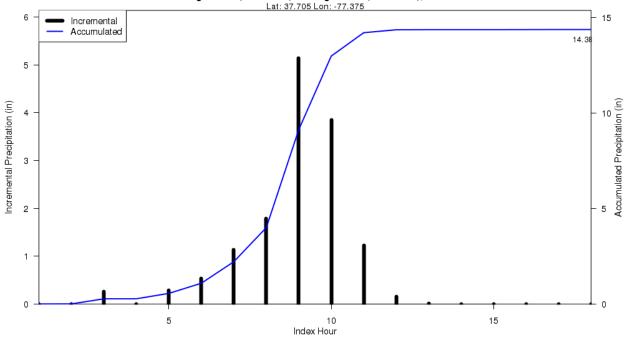
Reliability of results: This analysis was based on several hourly data, daily data, supplemental station data and one hourly estimated pseudo station. We have a good degree of confidence for the station based storm total results. The spatial pattern is dependent on the (us_ppt_in_map_1961_1990_usda_northamerica). The radar data was also excellent with very little beam blockage. There is a high degree of confidence with the timing based on the several hourly and hourly pseudo stations. Some daily stations were moved to supplemental due to timing issues or removed due to erroneous storm precipitation observations. A couple hourly stations were changed to hourly pseudo stations due to values being too low (affecting the integrity of the spatial pattern) when compared to nearby hourly stations. Additional details can be found in the "read me 1551.txt" file.

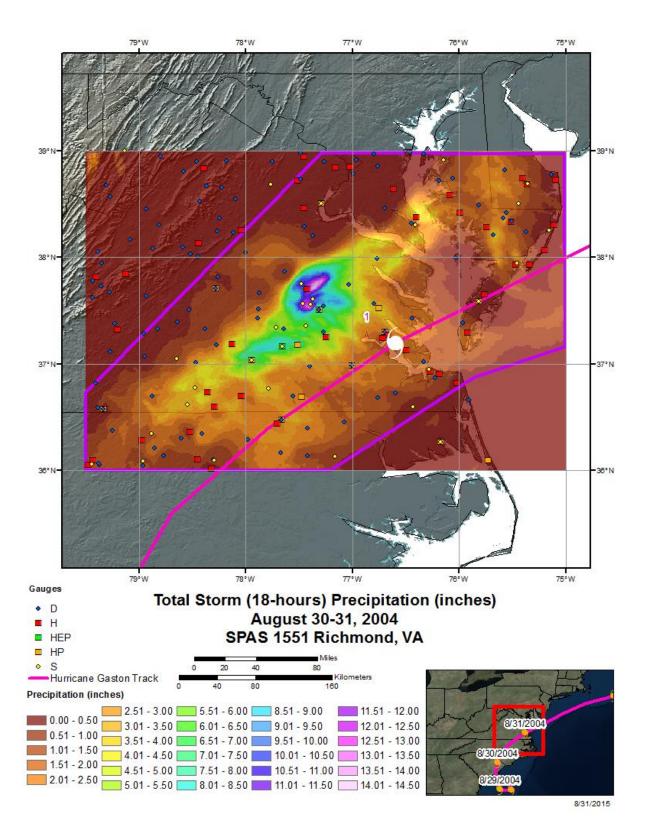
Storm Name:	SDAS 1551	-Richmond	I WA								
Storm Date:	8/30-31/20		I, VA		C	town A	dingtm	ant far	Virgini	0	
	11/14/2015			1	S.	torm A	ajusun	ent ioi	v II giiii	a	
•	×										
Temporal Transposit	on Date	15-Aug Lat	Long			Moisturo	Inflow Dire	etion	SE@340	miles	
Stanna Cantan I acati			77.38 W								
Storm Center Location		37.71 N					rage Elevati		N/A 200	feet	
Storm Rep SST Locat		34.75 N	72.50 W				ter Elevati			feet	
Transposition SST Lo Basin Location	cation						dysis Durat Barrier Hei		6	hours feet	
Dasin Location						Effective I	barrier nei	gnı	N/A	Teet	
The etc.		-4: CCT:-	81.0 F		4-1	.1	1 1	- £		3.76	inches.
	rm represent n-place maxii		82.5 F		tal precipital tal precipital					4.00	inches.
The transpos	•		0.0		tal precipital					#N/A	inches.
	place storm		200		ich subtracts	0.06	1	f precipitable	water at	81.0 F	menes.
	place storm		200		ich subtracts	0.06		f precipitable f precipitable		82.5 F	
	osition basin		N/A		ich subtracts	X.XX		f precipitable		0.0	
The inflow barrier/			N/A		ich subtracts	X.XX		f precipitable		0.0	
The millow barrier/	busin cic vati	On neight is	14/11	reet win	ien subtracts	Анда	menes of	precipitation	water at	0.0	
The in	n-place storm	mavimizeti	on factor is	1.065		Notes: Storm	representative	SST value w	as based on SS	T values for	1
	sposition/ele			#N/A			1		SPLIT trajecto		-
me tran	•	rier adjustme		V					nperature did n		
	THE DALL	ici aujustilit	.m. 1act01 18	π1 <b>V//Δ</b>			,	-	s as closest to	•	-
	The to	otal adjustme	ent factor is	#N/A		center.					
	IIIC ((	.aa aajustiik	1actor 15	1111/12		· · · · · · · · · · · · · · · · · · ·					1
Ohearwad	Storm Dept	h. Area-Dur	eation								
Observed	otorin Depti	1 Hour	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours		
	1 sq miles	5.6	9.0	10.8	12.0	13.1	13.6	14.4	14.4		
	10 sq miles	5.4	8.8	10.5	11.7	12.7	12.9	14.1	14.1		
1	00 sq miles	4.5	7.5	9.0	9.9	10.8	11.0	12.7	12.7		
	200 sq miles	4.0	6.7	8.1	8.9	9.8	10.2	11.8	11.8		
***************************************	600 sq miles	3.1	5.3	6.2	7.2	8.1	8.9	10.2	10.3		
***************************************	000 sq miles	2.0	3.1	4.7	5.2	6.4	7.3	8.8	9.0		
	000 sq miles	1.5	2.5	2.8	3.7	4.8	5.6	6.8	7.6		
	000 sq miles	0.7	1.6	1.8	2.5	3.0	3.4	5.3	5.6		
	000 sq miles	0.4	0.7	1.1	1.5	2.1	2.4	3.9	4.4		
						Į.					
Storm or S	torm Center	Name		SPAS 155	1-Richmond	I VA					
Storm Date		1 turie		8/30-31/20		, ,,,					1
Storm Type					Remnants o	f Hurricane	Gaston				1
Storm Loc				37.71 N	77.38 W	- 110111Cuile					1
	ter Elevation			200							1
	on Total & D				es in 18 hour	'S					1
1 reespitation											1
Storm Ren	resentative S	ST		81.0 F	6						1
	resentative S		ı	34.75 N							Ī
Maximum				82.5 F							Ī
	nflow Vector			SE@340							1
	aximization I			1.06							1
											1
Temporal 7	ransposition	Date		15-Aug							1
	on SST Loca										
	on Maximun										
	on Adjustme			0.00							1
	sin Elevation			N/A							
	evation in Ba			N/A							
	rier Height			N/A							1
	ustment Fact	tor		0.00							
											-

Sto	rm 1551	- Augu	ist 30 (1	400 UT	C) - Au	gust 31	(0700 L	JTC), 20	004						
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
A = 0 ( == ;2)				Dui	ration (hou	ırs)									
Area (mi ² )	1	2	3	4	5	6	12	18	Total						
0.4	5.56	8.99	10.77	11.99	13.12	13.65	14.37	14.38	14.38						
1	5.55	8.97	10.75	11.98	13.09	13.62	14.35	14.36	14.36						
10	5.37	8.76	10.52	11.69	12.67	12.86	14.07	14.09	14.09						
25	5.17	8.49	10.22	11.35	12.26	12.80	13.71	13.74	13.74						
50	4.90	8.10	9.76	10.76	11.71	12.12	13.29	13.31	13.31						
100	4.50	7.46	8.99	9.94	10.80	11.03	12.67	12.68	12.68						
150	4.25	7.06	8.49	9.34	10.19	10.84	12.16	12.19	12.19						
200	4.03	6.72	8.06	8.91	9.75	10.21	11.78	11.80	11.80						
300	3.66	6.18	7.27	8.25	9.00	9.87	10.87	11.22	11.22						
400	3.37	5.71	6.65	7.71	8.51	9.21	10.55	10.72	10.72						
500	3.13	5.31	6.24	7.22	8.10	8.93	10.19	10.29	10.29						
1,000	1.95	3.13	4.70	5.16	6.43	7.27	8.79	8.99	8.99						
2,000	1.46	2.46	2.75	3.65	4.76	5.55	6.78	7.64	7.64						
5,000	0.74	1.59	1.83	2.53	3.01	3.37	5.29	5.63	5.63						
10,000	0.38	0.73	1.05	1.47	2.08	2.36	3.92	4.35	4.35						
20,000	0.22	0.58	0.75	0.93	1.20	1.43	2.68	2.87	2.87						
35,656	0.18	0.34	0.46	0.58	0.71	0.87	1.53	1.81	1.81						

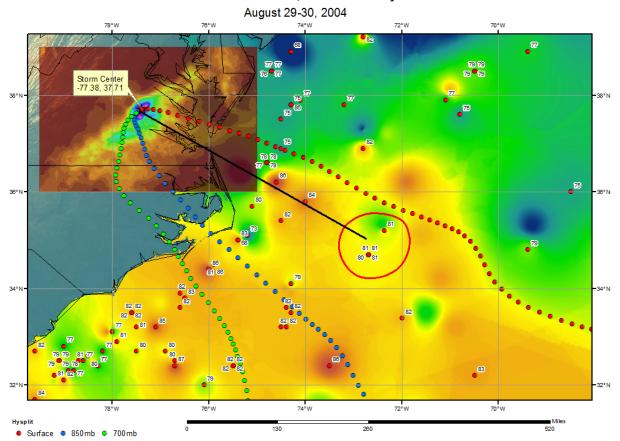


### SPAS 1551 Storm Center Mass Curve Zone 1 August 30 (1400UTC) to August 31 (0700UTC), 2004 Lat: 37.705 Lon: -77.375





### SPAS 1551 Richmond, VA Storm Analysis



### Storm Precipitation Analysis System (SPAS) For Storm #1275 SPAS Analysis

General Storm Location: Pennsylvania, West Virginia, Virginia, Ohio, New York, Kentucky

Storm Dates: September 17-19, 2004

**Event**: Hurricane Ivan

**DAD Zone 1** 

**Latitude**: 40.645

Longitude: -80.385

Max. Grid Rainfall Amount: 8.79"

Max. Observed Rainfall Amount: 8.79"

**DAD Zone 2** 

**Latitude**: 40.605

Longitude: -76.465

Max. Grid Rainfall Amount: 8.80"

Max. Observed Rainfall Amount: 8.80"

Number of Stations: 955 (550 Daily, 183 Hourly, 62 Hourly Pseudo, and 160 Supplemental)

SPAS Version: 9.5

Basemap: PRISM 30-yr Mean (1981-2010) September Precipitation

Spatial resolution: 0.01 (~ 0.40 mi²)

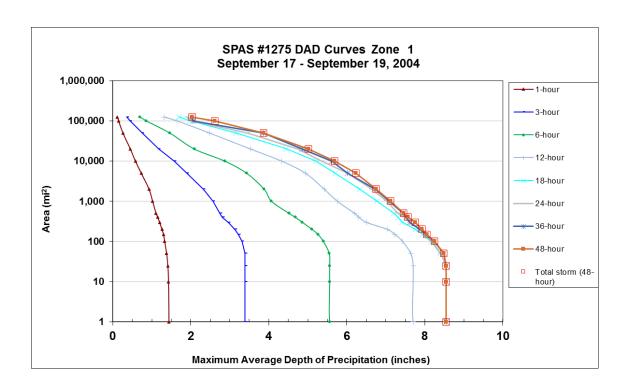
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

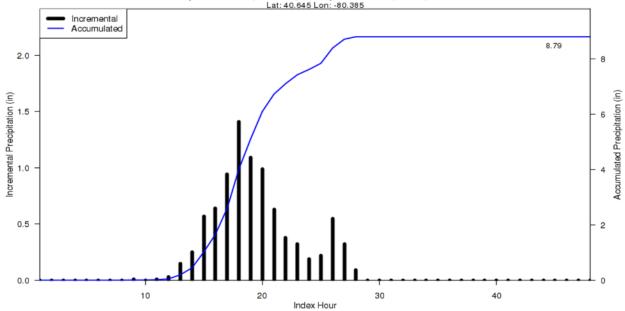
**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly and hourly pseudo stations.

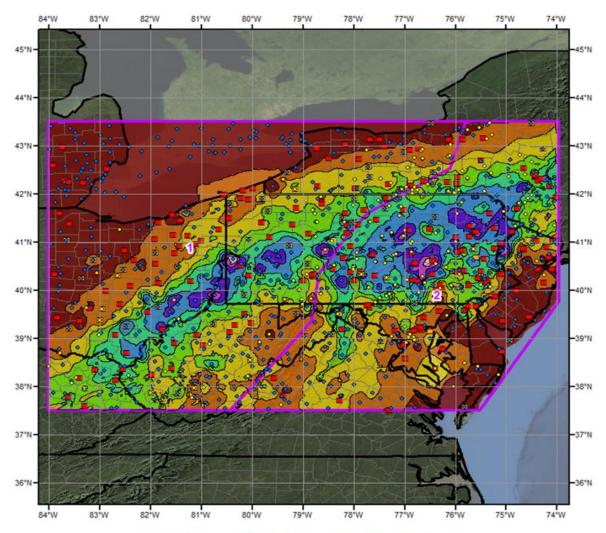
Storm Name:	SPAS 1275 - I	Montgomery	Dam, PA Z								
Storm Date:	9/17-19/2004	***************************************	emenenenenenenen		S	torm A	djustm	ent for	Virginia	ı	
WA Analysis Date:	11/14/2015								· 8		
Temporal Transpositi	on Date	1-Sep									
		Lat	Long			Moisture I	nflow Dire	ction	W @ 100	miles	
torm Center Locatio	on	40.65 N	80.39 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep Dew Poin	Location	40.64 N	82.30 W			Storm Cen	ter Elevatio	n	1,100	feet	
Transposition Dew P		.0.0.11	02100 11				lysis Durati		12	hours	
Basin Location	JIII Edeution						arrier Hei		N/A	feet	
							,	·			
The storm	representative	dew point is	72.0 F	with total	precipitable	water above	sea level of			2.47	inches.
	olace maximum	•	76.0 F		l precipitable					2.99	inches
	oned maximum	•	0.0		l precipitable					#N/A	inches
The	e in-place storm	n elevation is	1,100	wh	ich subtracts	0.25	inches o	f precipitable	e water at	72.0 F	
The	e in-place storm	n elevation is	1,100	wh	ich subtracts	0.28	inches o	f precipitable	e water at	76.0 F	
The tra	nsposition basir	n elevation at	N/A	wh	ich subtracts	x.xx	inches o	f precipitable	e water at	0.0	
The inflow barr	rier/basin elevat	ion height is	1,600	wh	ich subtracts	x,xx	inches o	f precipitable	e water at	0.0	
T	he in-place stor	m maximizati	on factor is	1.22					5 Zone 1. Use		
The	transposition/e	levation to ba	sin factor is	#N/A					KBJJ. Values		
	The ba	rrier adjustm	ent factor is	#N/A			-	nperature did i	not vary more t	han a degree	
				_		over a large a	nea.				
	The	total adjustme	ent factor is	#N/A							<u> </u>
Observed	Storm Depth-A				·	·	·	,			
		1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 sq miles	1.4	3.4	5.6	7.7	8.5	8.6	8.6	8.6	-	
	10 sq miles	1.4	3.4	5.6	7.7	8.5	8.6	8.6	8.6	-	
	100 sq miles	1.3	3.3	5.4	7.4	8.2	8.2	8.2	8.3		
	200 sq miles	1.3	3.1	5.1	7.0	7.8	7.9	7.9	7.9	-	
	500 sq miles	1.1	2.8	4.5	6.2	7.2	7.3	7.5	7.5	-	
	1000 sq miles 2000 sq miles	1.0 0.9	2.3	3.9	5.8 5.4	6.8	7.0 6.6	7.1 6.7	7.1 6.8	-	-
	5000 sq miles	0.9	1.9	3.4	4.9	5.7	6.0	6.0	6.2	-	-
***************************************	0000 sq miles	0.7	1.6	2.9	4.3	5.2	5.4	5.6	5.7	-	
***************************************	0000 sq miles	0.5	1.2	2.1	3.5	4.5	4.7	4.9	5.0		
***************************************	0000 sq miles	0.26	0.8	1.5	2.5	3.2	3.5	3.9	3.9		
	oooo sq nines ;	0.20	0.0	110	1 210		3 0.0	0.0	3.5		4
Storm or S	torm Center Na	me		SPAS 1275 -	Montgome	rv Dam PA	Zone 1				1
Storm Date		inc		9/17-19/200		1 j Dani, 1 11	ZOIL I				
Storm Type	• • • • • • • • • • • • • • • • • • • •			Hurricane Iva							t
Storm Loca				40.65 N	80.39 W						1
	er Elevation			1,100							1
	on Total & Dura	ation		8.80 Inches 4	8-hours						1
Storm Rep	resentative Dew	Point		72.0 F	12						
Storm Rep	resentative Dew	Point Locati	on	40.64 N	82.30 W			Aug	Sep		
Maximum 1				76.0 F				77.59	74.66		
	nflow Vector			W @ 100							<u> </u>
In-place M	aximization Fac	tor		1.22							
											1
	ransposition (E			1-Sep	-						1
	on Dew Point L										-
	on Maximum D			HATIA							-
	on Adjustment	Factor		#N/A							1
	sin Elevation			N/A							1
	evation in Basin			N/A							╂
Inflow Barr				N/A							-
	ustment Factor			#N/A							-
■ Total Adius	tment Factor			#N/A		Į					

Storm 1	Storm 1275 - September 17 (0100 UTC) - September 19 (0000 UTC), 2004														
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
A (:2)				Dui	ration (hou	ırs)									
Area (mi²)	1	3	6	12	18	24	36	48	Total						
0.4	1.44	3.49	5.70	7.93	8.78	8.79	8.79	8.79	8.79						
1	1.44	3.39	5.56	7.70	8.54	8.55	8.55	8.55	8.55						
10	1.43	3.39	5.56	7.70	8.54	8.55	8.55	8.55	8.55						
25	1.41	3.39	5.56	7.70	8.54	8.55	8.55	8.55	8.55						
50	1.38	3.39	5.55	7.64	8.40	8.41	8.48	8.48	8.48						
100	1.33	3.31	5.40	7.43	8.16	8.17	8.24	8.25	8.25						
150	1.30	3.22	5.26	7.23	7.94	8.02	8.02	8.05	8.05						
200	1.26	3.13	5.11	7.04	7.76	7.86	7.86	7.93	7.93						
300	1.20	2.96	4.86	6.50	7.42	7.62	7.62	7.75	7.75						
400	1.15	2.81	4.68	6.31	7.32	7.48	7.52	7.57	7.57						
500	1.11	2.75	4.52	6.20	7.21	7.31	7.45	7.46	7.46						
1,000	1.02	2.57	4.07	5.76	6.78	7.02	7.09	7.12	7.12						
2,000	0.93	2.32	3.88	5.42	6.34	6.64	6.72	6.75	6.75						
5,000	0.73	1.90	3.43	4.94	5.71	6.02	6.02	6.23	6.23						
10,000	0.58	1.58	2.87	4.33	5.22	5.35	5.61	5.68	5.68						
20,000	0.45	1.17	2.09	3.53	4.45	4.74	4.86	5.02	5.02						
50,000	0.26	0.75	1.46	2.48	3.16	3.46	3.86	3.87	3.87						
100,000	0.15	0.44	0.86	1.65	1.98	2.05	2.06	2.61	2.61						
125,829	0.12	0.36	0.70	1.31	1.70	1.91	2.03	2.03	2.03						

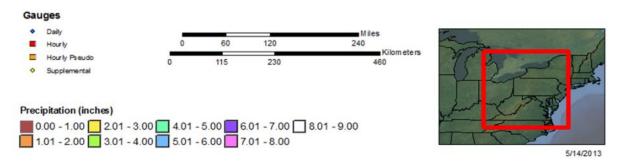


#### SPAS 1275 Storm Center Mass Curve Zone 1 September 17 (100UTC) to September 19 (0UTC), 2004 Lat: 40.645 Lon: -80.385

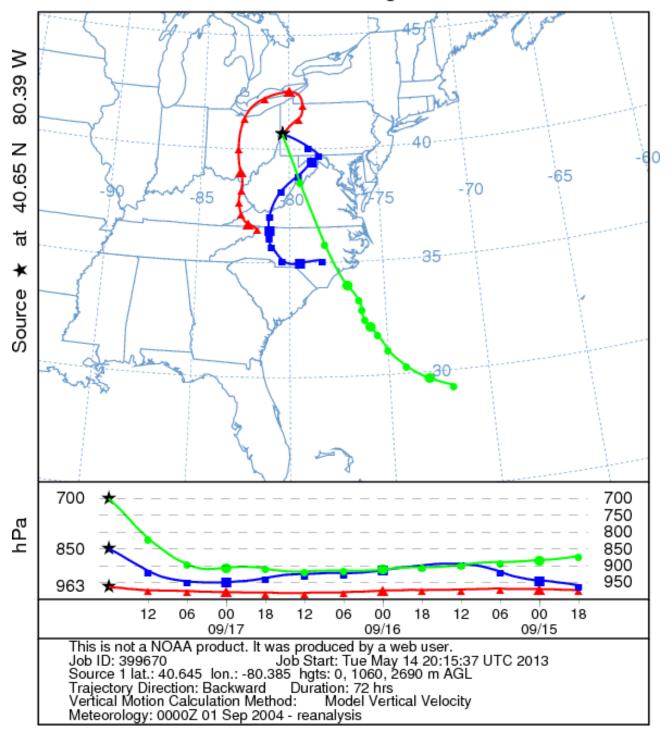




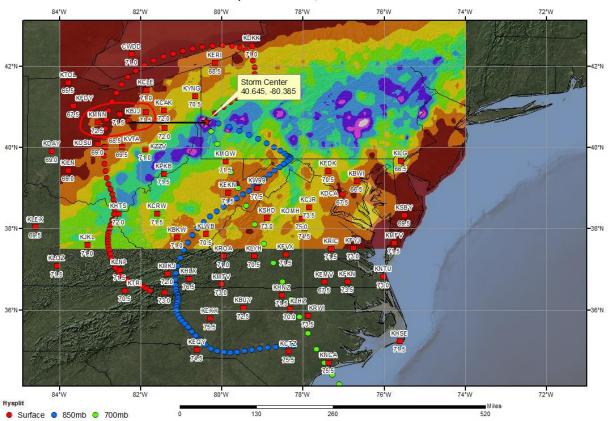
Total Storm (48-hr) Precipitation (inches)
September 17 (0100 UTC) - 19 (0000 UTC), 2004
SPAS-NEXRAD 1276



# NOAA HYSPLIT MODEL Backward trajectories ending at 1800 UTC 17 Sep 04 CDC1 Meteorological Data



## SPAS 1275 Storm Analysis September 14-17, 2004



### Storm Precipitation Analysis System (SPAS) For Storm #1275 SPAS Analysis

General Storm Location: Pennsylvania, West Virginia, Virginia, Ohio, New York, Kentucky

Storm Dates: September 17-19, 2004

**Event**: Hurricane Ivan

**DAD Zone 1** 

**Latitude**: 40.645

Longitude: -80.385

Max. Grid Rainfall Amount: 8.79"

Max. Observed Rainfall Amount: 8.79"

**DAD Zone 2** 

**Latitude**: 40.605

Longitude: -76.465

Max. Grid Rainfall Amount: 8.80"

Max. Observed Rainfall Amount: 8.80"

Number of Stations: 955 (550 Daily, 183 Hourly, 62 Hourly Pseudo, and 160 Supplemental)

SPAS Version: 9.5

Basemap: PRISM 30-yr Mean (1981-2010) September Precipitation

Spatial resolution: 0.01 (~ 0.40 mi²)

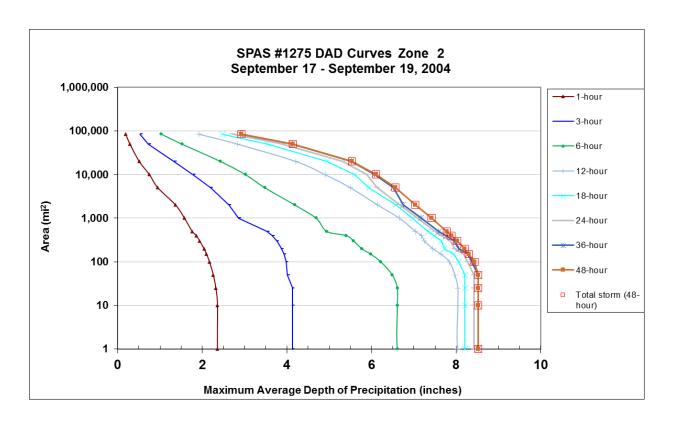
Radar Included: Yes

Depth-Area-Duration (DAD) analysis: Yes

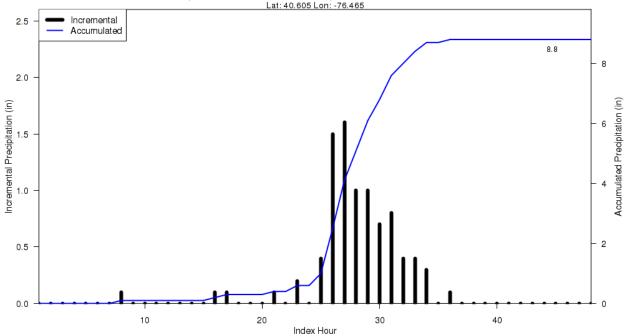
**Reliability of results:** This analysis was based on hourly data, daily data, supplemental station data and NEXRAD Radar. We have a high degree of confidence in the radar/station based storm total results, the spatial pattern is dependent on the radar data and basemap, and the timing is based on hourly and hourly pseudo stations.

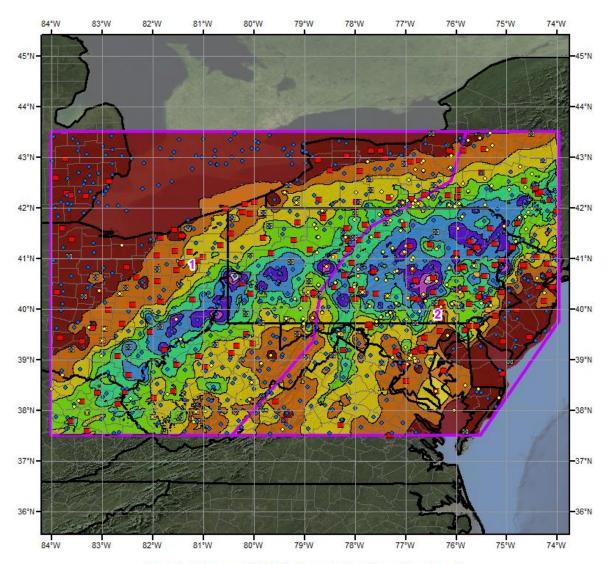
Storm Name:	SPAS 1275 - I	Montgomery	Dam, PA Z								
Storm Date:	9/17-19/2004	***************************************	annimus dan manan		S	torm A	diustm	ent for '	Virginia	ı	
AWA Analysis Date:	11/14/2015								8	-	
Temporal Transposit	ion Date	1-Sep									
·		Lat	Long			Moisture I	nflow Dire	ction	W @ 305	miles	
torm Center Location	on	40.61 N	76.47 W			Basin Aver	age Elevati	on	N/A	feet	
Storm Rep Dew Poin		40.64 N	82.30 W				ter Elevatio		1,600	feet	
Transposition Dew P		40.0411	02.50 11				lysis Durati		12	hours	
Basin Location	omi Location						arrier Hei		N/A	feet	
The storn	n representative	dew point is	72.0 F	with tota	l precipitable	water above	sea level of			2.47	inches.
	place maximum	•	76.0 F		precipitable					2.99	inches
	oned maximum	•	0.0		precipitable					#N/A	inches
•	e in-place storm	•	1,600	wh	ich subtracts	0.36	inches o	f precipitable	e water at	72.0 F	
Th	e in-place storm	n elevation is	1,600	wh	ich subtracts	0.41		f precipitable		76.0 F	
The tra	nsposition basir	n elevation at	N/A	wh	ich subtracts	x,xx	inches o	f precipitable	e water at	0.0	
The inflow bar	rier/basin elevat	tion height is	1,600	wh	ich subtracts	X,XX	inches o	f precipitable	e water at	0.0	
					_						
Т	he in-place stor	m maximizati	on factor is	1.22		Notes: DAD	values taken f	rom SPAS 127	5 Zone 2. Use	ed Td values	
	transposition/e			#N/A					KBJJ. Values		
	-	rrier adjustme		#N/A			-	nperature did i	not vary more t	han a degree	
						over a large a	rea.				
	The	total adjustme	ent factor is	#N/A							
Observed	Storm Depth-A	Area-Duratio	n								
		1 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours	72 Hours	
	1 sq miles	1.4	3.4	5.6	7.7	8.5	8.6	8.6	8.6	-	
	10 sq miles	1.4	3.4	5.6	7.7	8.5	8.6	8.6	8.6	-	
	100 sq miles	1.3	3.3	5.4	7.4	8.2	8.2	8.2	8.3		
	200 sq miles	1.3	3.1	5.1	7.0	7.8	7.9	7.9	7.9	-	
	500 sq miles	1.1	2.8	4.5	6.2	7.2	7.3	7.5	7.5	-	
	1000 sq miles	1.0	2.6	4.1	5.8	6.8	7.0	7.1	7.1	-	
	2000 sq miles	0.9	2.3	3.9	5.4	6.3	6.6	6.7	6.8	-	
	5000 sq miles	0.7	1.9	3.4	4.9	5.7	6.0	6.0	6.2	-	
***************************************	0000 sq miles	0.6	1.6	2.9	4.3	5.2	5.4	5.6	5.7	-	
***************************************	20000 sq miles	0.5	1.2 0.8	2.1 1.5	3.5 2.5	4.5 3.2	4.7 3.5	4.9 3.9	5.0 3.9	-	-
-	50000 sq miles	0.26	0.0	1.5	2.3	3.2	3.3	3.9	3.9	_	-
C+ C	t Ct N-			CD AC 1275	Mandanana	D DA	7 1				
Storm Date	torm Center Na	ille		SPAS 1275 - 9/17-19/200		ry Dain, r A	Zone 2				
Storm Type				Hurricane Iva		-					1
Storm Loc				40.61 N	76.47 W						1
	ter Elevation			1,600	70.17 11						1
	on Total & Dura	ation		8.80 Inches 4	8-hours						1
Storm Rep	resentative Dew	Point		72.0 F	12						1
	resentative Dew		on	40.64 N	82.30 W			Aug	Sep		
Maximum	Dew Point			76.0 F				77.59	74.66		
Moisture I	nflow Vector			W @ 305							
In-place M	aximization Fac	tor		1.22							
	Transposition (E			1-Sep							
	ion Dew Point L										
	ion Maximum D										
	ion Adjustment	Factor		#N/A	ļ						
	asin Elevation			N/A	ļ						
Ü	evation in Basin	1		N/A							L
	rier Height			N/A							
	justment Factor			#N/A							-
	stment Factor			#N/A							I

Storm '	1275 - S	eptemb	er 17 (0	100 UT	C) - Sep	otembe	19 (00	00 UTC	, 2004						
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
A (:2)				Du	ration (hou	ırs)									
Area (mi ² )	1	3	6	12	18	24	36	48	Total						
0.4	2.42	4.26	6.79	8.30	8.50	8.70	8.80	8.80	8.80						
1	2.36	4.13	6.61	8.04	8.21	8.42	8.52	8.52	8.52						
10	2.36	4.13	6.61	8.04	8.21	8.42	8.52	8.52	8.52						
25	2.32	4.13	6.61	8.04	8.21	8.42	8.52	8.52	8.52						
50	2.26	4.01	6.49	7.97	8.21	8.42	8.52	8.52	8.52						
100	2.17	3.98	6.22	7.84	8.06	8.27	8.37	8.44	8.44						
150	2.10	3.93	5.98	7.64	7.94	8.18	8.29	8.30	8.30						
200	2.04	3.87	5.77	7.45	7.72	7.96	8.06	8.20	8.20						
300	1.94	3.76	5.58	7.25	7.65	7.86	7.96	8.02	8.02						
400	1.86	3.65	5.40	7.18	7.48	7.66	7.76	7.89	7.89						
500	1.76	3.53	4.94	7.04	7.33	7.50	7.59	7.78	7.78						
1,000	1.58	2.86	4.69	6.66	6.97	7.08	7.17	7.42	7.42						
2,000	1.37	2.63	4.19	6.15	6.58	6.67	6.75	7.03	7.03						
5,000	0.95	2.20	3.48	5.50	5.94	6.13	6.52	6.56	6.56						
10,000	0.75	1.78	3.02	4.90	5.61	5.88	6.07	6.11	6.11						
20,000	0.51	1.34	2.43	4.21	4.96	5.31	5.52	5.54	5.54						
50,000	0.29	0.73	1.52	2.83	3.56	3.89	4.13	4.14	4.14						
84,743	0.19	0.53	1.03	1.92	2.48	2.71	2.90	2.92	2.92						

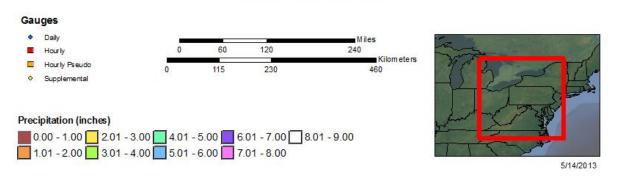




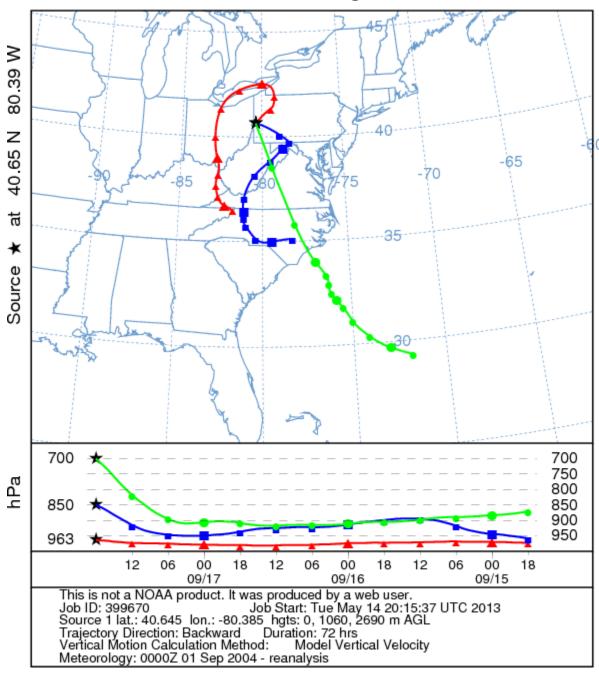




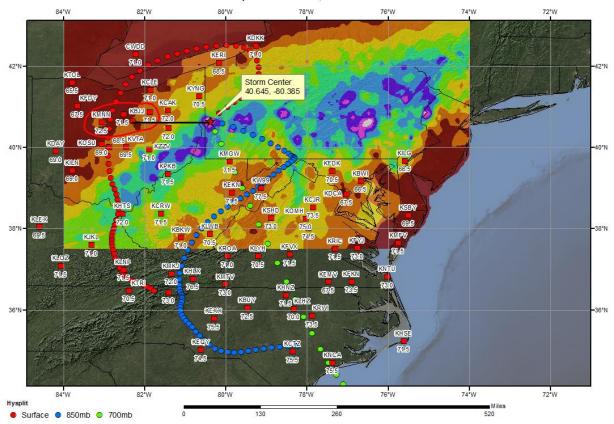
Total Storm (48-hr) Precipitation (inches)
September 17 (0100 UTC) - 19 (0000 UTC), 2004
SPAS-NEXRAD 1275



# NOAA HYSPLIT MODEL Backward trajectories ending at 1800 UTC 17 Sep 04 CDC1 Meteorological Data



## SPAS 1275 Storm Analysis September 14-17, 2004



### Storm Precipitation Analysis System (SPAS) For Storm #1526 SPAS Analysis

General Storm Location: Southeast United States

Storm Dates: June 13 - June 15, 2006

**Event**: Tropical Storm Alberto

DAD Zone 1 -

Latitude: 34.3350

Longitude: -81.0050

Max. Grid Rainfall Amount: 9.32"

Max. Observed Rainfall Amount: 8.77" at Raleigh, NC

**Number of Stations**: 1170 (718 Daily, 292 Hourly, 1 Hourly Estimated Pseudo, 50 Hourly Pseudo and 109 Supplemental) * Note: The DAD zone ** Note: Given the recentness of this storm event, daily data from our internal/NCDC-based database was not available..

SPAS Version: 10.0

Basemap: Prism Conus 2-year 24-hour climatological base map

Spatial resolution: 0.3898

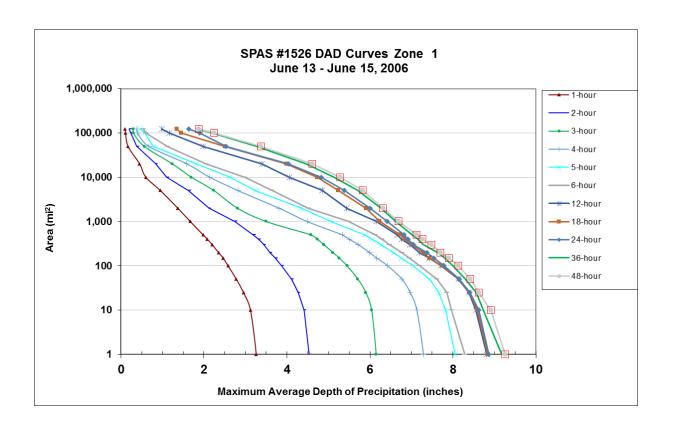
Radar Included: Yes

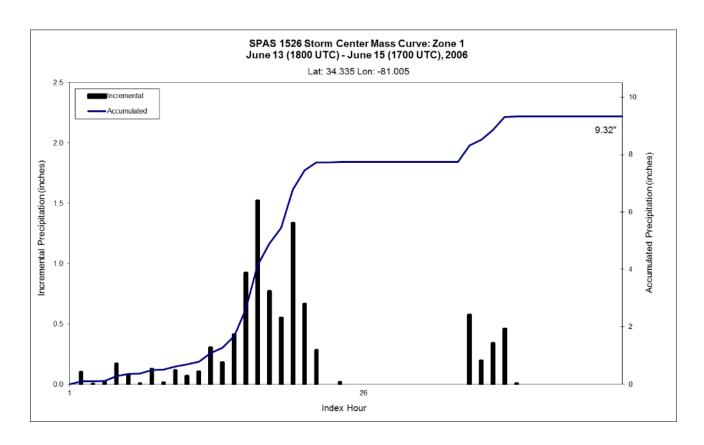
Depth-Area-Duration (DAD) analysis: Yes

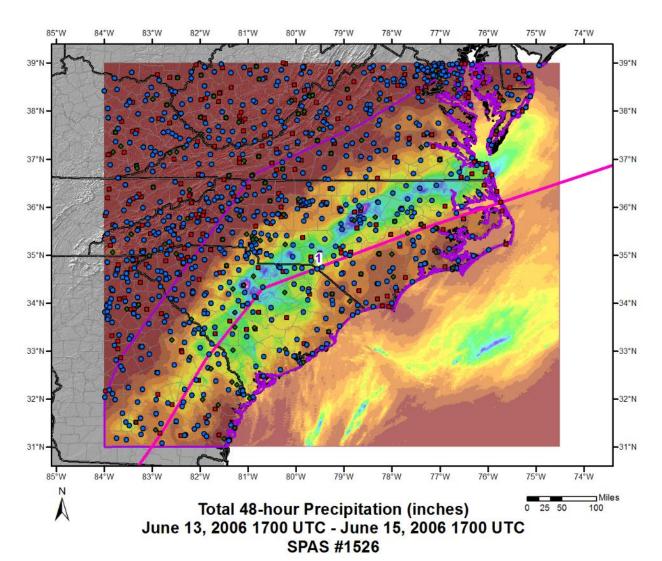
**Reliability of results:** Nearly half, or 50 of the 109, supplemental stations were co-located with hourly pseudo stations. The timing of these stations is therefore as reliable as possible. There were also 165 additional USGS daily stations incorporated, a significant contribution to the reliability and density of stations in this analysis. With the vast number of stations, the thorough inspection of data, and the precipitation totals for various periods throughout the storm being consistent with previous reports, this analysis is considered to be reliable.

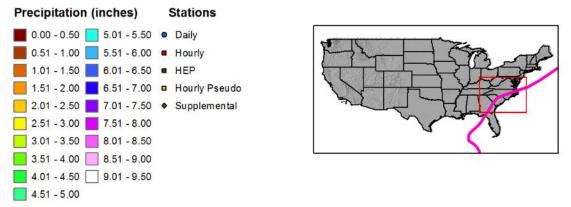
Storm Name		PAS 1526 - F					7.			<b>T</b> 70			
Storm Date:		/13-15/2006					Storm A	Adjustn	nent for	Virginia	a		
AWA Analys			20.7				ĺ	1					
Temporal Tr	ranspositio	n Date	29-Jun	T			34.1.4	. a D'	.49	CCE (2.410	- 1		
G. G.	Ŧ		Lat	Long				Inflow Dire		SSE @ 410	miles		
Storm Cente			34.34 N	81.01 W				rage Elevati		N/A	feet		
Storm Rep D			29.0 N	78.0 W				ter Elevati		500	feet		
Transpositio Basin Locati		nt Location						llysis Durat Barrier Hei		24	hours		
Dasin Locati	1011						Effective	alliel lier	gnt	N/A	feet		
	The storm r	epresentative	dew point is	81.0 F	with tot	al precipitab	le water abo	ve sea level	of		3.76	inches.	
		ce maximum		83.5 F		al precipitat					4.16	inches.	
The ti		ed maximum		0.0		al precipitab					#N/A	inches.	
	-	n-place storm		500		ch subtracts		1	f precipitable	e water at	81.0 F		
		n-place storm		500		ch subtracts	0.15		f precipitable		83.5 F		
	The trans	position basir	n elevation at	N/A	whi	ch subtracts	x.xx	inches o	f precipitable	e water at	0.0		
The in	inflow barrie	r/basin elevat	ion height is	N/A	whi	ch subtracts	x.xx	inches o	f precipitable	e water at	0.0		
		in-place stor			1.11					6. Storm repres			
	The tra	ansposition/e			#N/A			sed on maxim	um 24-hr avera	ge SST values o	n June 13,		
		The ba	rrier adjustm	ent factor is	#N/A		2006.						
			1 12 .		113714		ł						
		The	total adjustm	ent factor is	#N/A							4	
	N 1 <i>G</i> r	D	D										
	ouserved St	orm Depth-A	Area-Duratio	2 Hours	3 Hours	4 Hours	5 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	48 Hours
		1 sq miles	3.3	4.5	6.2	7.3	8.1	8.3	8.8	8.8	8.9	9.2	9.3
		10 sq miles	3.1	4.4	6.0	7.1	7.8	8.0	8.6	8.6	8.6	8.7	8.9
	1	100 sq miles	2.6	3.9	5.5	6.4	7.1	7.2	7.7	7.7	7.8	8.0	8.1
		200 sq miles	2.4	3.6	5.1	6.0	6.6	6.8	7.2	7.3	7.4	7.6	7.7
		500 sq miles	2.0	3.2	4.6	5.3	5.9	6.1	6.7	6.7	6.8	7.0	7.1
	10	000 sq miles	1.7	2.8	3.5	4.5	5.1	5.5	6.2	6.2	6.4	6.6	6.7
	20	000 sq miles	1.4	2.1	2.8	3.8	4.3	4.5	5.4	5.9	6.0	6.3	6.3
	5(	000 sq miles	1.0	1.6	2.2	2.8	3.2	3.6	4.9	5.2	5.4	5.7	5.8
		000 sq miles	0.6	1.1	1.7	2.1	2.6	3.0	4.1	4.7	4.8	5.1	5.3
		000 sq miles	0.5	0.8	1.2	1.6	1.8	2.1	3.4	4.0	4.0	4.5	4.6
_		000 sq miles	0.2	0.4	0.6	0.7	0.8	1.1	2.0	2.5	2.5	3.3	3.4
		000 sq miles	0.1	0.2	0.3	0.4	0.6	0.6	1.2	1.5	1.9	2.2	2.3
	121	118 sq miles	0.1	0.2	0.3	0.4	0.5	0.5	1.0	1.3	1.6	1.8	1.9
	. a.	G · M			CD + C + 50	D 1 1 1 1	NG	1				1	
	storm or Stor storm Date(s	rm Center Na	me		6/13-15/20	- Raleigh,	NC					-	
	storm Type	)			Tropical	00						1	
	storm Locati	on			34.34 N	81.01 W		_	1			1	
	torm Center				500	01.01 11						1	
		Total & Dura	tion (10 sq m	i)		nrs from SPA	AS 1526					1	
												1	
St	torm Repres	sentative Dew	Point		81.0 F	24							
St	torm Repres	sentative Dew	Point Locati	on	29.0 N	78.0 W		June	July				
	Aaximum De				83.5 F			82.5	84.5				
	Moisture Infl				SSE @ 410								
In	n-place Max	imization Fac	tor		1.11							<del> </del>	
	1.00	1.1 (70			20. I							1	
		nsposition (D			29-Jun							1	
		Dew Point L						-	-			1	
Ti	_	Morris										†	
Ti	ransposition	Maximum D			#N1/A				1			J	
Ti	ransposition ransposition	Adjustment			#N/A N/A								
To To A	ransposition ransposition verage Basin	n Adjustment l n Elevation	Factor		N/A								
To To A	Transposition Transposition Average Basin Highest Eleva	Adjustment In Elevation Intion in Basin	Factor		N/A N/A								
The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	ransposition ransposition Average Basin Highest Eleva nflow Barrie	Adjustment In Elevation Intion in Basin	Factor		N/A								

		Storr	n 1526 ·	June 1	3 (1800	UTC) -	June 1	5 (1700	UTC), 2	2006					
	MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)														
Auga (m:2)	Duration (hours)														
Area (mi²)	1	2	3	4	5	6	12	18	24	36	48	Total			
0.4	3.27	4.55	6.16	7.30	8.06	8.30	8.83	8.86	8.89	9.22	9.32	9.32			
1	3.26	4.54	6.15	7.29	8.05	8.29	8.82	8.84	8.87	9.18	9.26	9.26			
10	3.12	4.41	6.04	7.13	7.83	7.96	8.55	8.59	8.63	8.73	8.91	8.91			
25	2.95	4.27	5.90	6.97	7.66	7.85	8.38	8.39	8.41	8.56	8.62	8.62			
50	2.78	4.11	5.71	6.77	7.44	7.61	8.13	8.14	8.15	8.30	8.42	8.42			
100	2.58	3.87	5.45	6.43	7.05	7.19	7.71	7.73	7.78	8.00	8.13	8.13			
150	2.46	3.72	5.26	6.16	6.76	6.95	7.43	7.43	7.54	7.81	7.90	7.90			
200	2.35	3.59	5.11	5.99	6.57	6.78	7.19	7.29	7.37	7.64	7.70	7.70			
300	2.20	3.44	4.89	5.72	6.27	6.48	6.97	7.00	7.05	7.29	7.48	7.48			
400	2.08	3.31	4.73	5.50	6.05	6.29	6.76	6.85	6.92	7.16	7.27	7.27			
500	1.98	3.19	4.58	5.33	5.88	6.12	6.65	6.73	6.82	7.01	7.12	7.12			
1,000	1.67	2.75	3.50	4.49	5.06	5.48	6.15	6.23	6.41	6.62	6.69	6.69			
2,000	1.37	2.12	2.81	3.81	4.34	4.52	5.44	5.91	6.00	6.27	6.32	6.32			
5,000	0.95	1.63	2.24	2.82	3.24	3.64	4.85	5.24	5.38	5.71	5.82	5.82			
10,000	0.60	1.10	1.70	2.14	2.62	2.99	4.06	4.73	4.83	5.14	5.28	5.28			
20,000	0.45	0.83	1.24	1.59	1.81	2.05	3.40	3.99	4.04	4.47	4.61	4.61			
50,000	0.17	0.38	0.56	0.67	0.78	1.12	1.98	2.51	2.54	3.28	3.38	3.38			
100,000	0.11	0.23	0.30	0.40	0.57	0.60	1.17	1.45	1.90	2.20	2.25	2.25			
121,118	0.10	0.20	0.30	0.38	0.47	0.54	0.99	1.34	1.64	1.83	1.87	1.87			



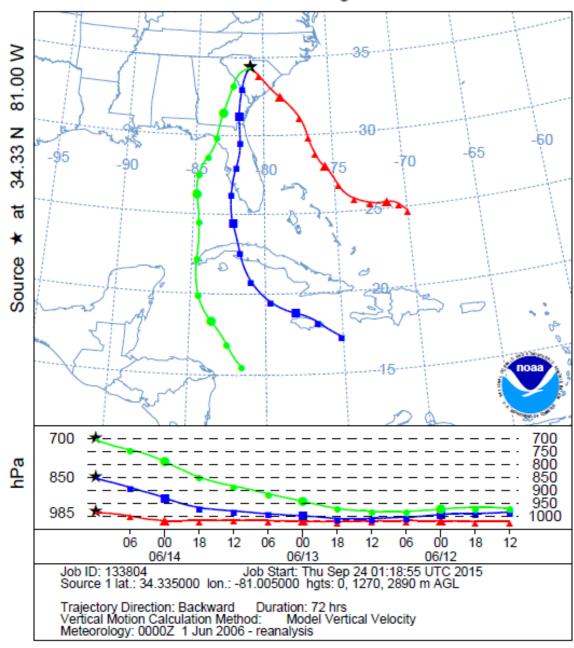


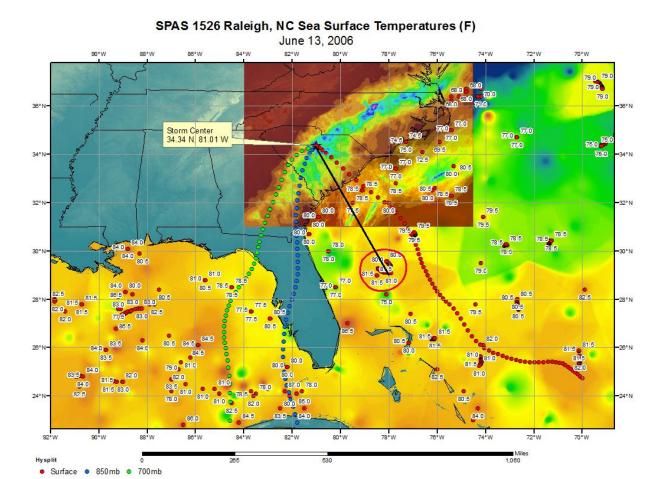




KLL 05/18/2015

NOAA HYSPLIT MODEL
Backward trajectories ending at 1200 UTC 14 Jun 06
CDC1 Meteorological Data





### Storm Precipitation Analysis System (SPAS) For Storm #1224 SPAS Analysis

**General Storm Location**: Northern New Jersey, southeastern New York, extreme eastern Pennsylvania, western Connecticut, western Massachusetts and southwestern Vermont.

**Storm Dates**: Aug. 27, 2011 12Z - Aug. 29, 2011 05Z (42-hours)

Event: Hurricane Irene

DAD Zone 1 - Catskills and portions of south-western NY

Latitude: 42.30

Longitude: -74.16

Max. Grid Rainfall Amount: 22.91"

DAD Zone 2 - Northern NJ, southern NY and CT coastline

Latitude: 41.22

Longitude: -74.17

Max. Grid Rainfall Amount: 11.74"

Max. Grid Rainfall Amount: 10.96"

* Note: The DAD zone 3 storm center is situated on the eastern boundary of the DAD zone and should be considered carefully given entire storm around the center was NOT analyzed.

**Number of Stations**: 797 (1 Daily**, 228 Hourly, 0 Hourly Estimated, 0 Hourly Estimated Pseudo, 71 Hourly Pseudo, 493 Supplemental, and 4 Supplemental Estimated) * Note: The DAD zone ** Note: Given the recentness of this storm event, daily data from our internal/NCDC-based database was not available..

SPAS Version: 9.0

Basemap: PRISM Mean (1971-2000) August precipitation

Spatial resolution: 36 seconds (~0.36 mi²)

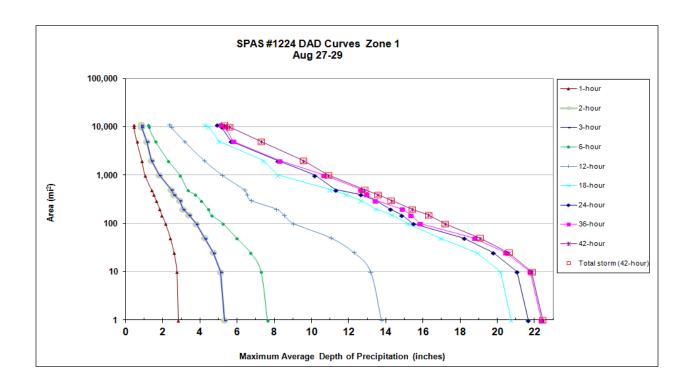
Radar Included: Yes

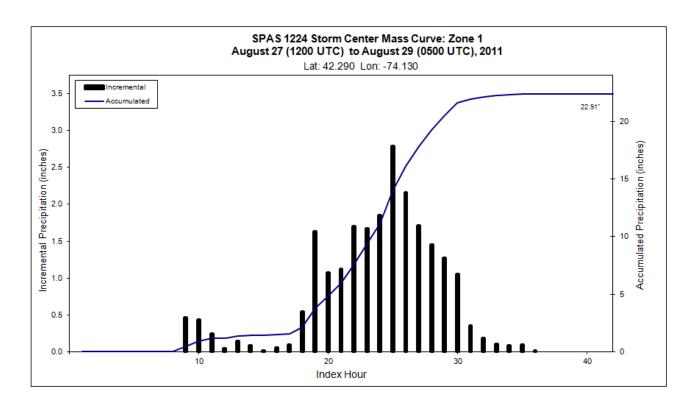
Depth-Area-Duration (DAD) analysis: Yes

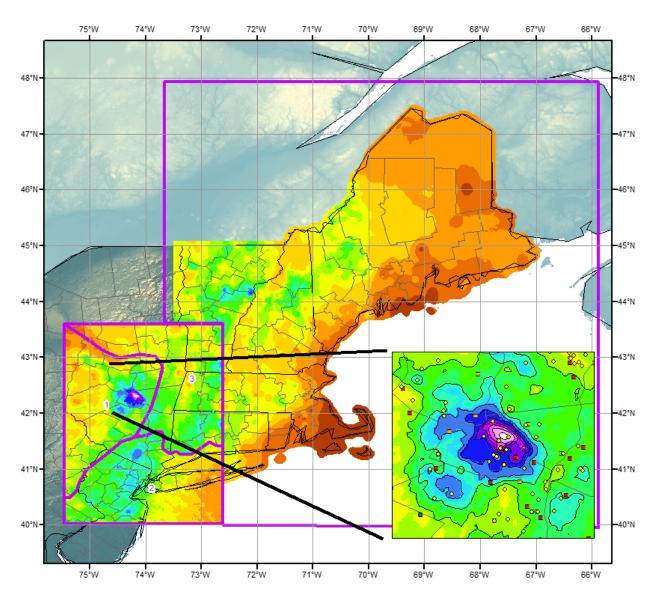
**Reliability of results:** Given the largely unblocked, clean and QC'd radar data coupled with extensive gauge data, we have a high degree of confidence in the results of this analysis.

Storm Name:	SPAS 1224	-Hurrican	e Irene AV										
Storm Date: 8/27-29/2011					Storm Adjustment for Virginia								
AWA Analysis Date:	11/14/2015	5											
Temporal Transposi	tion Date	15-Aug											
		Lat	Long			Moisture 1	Inflow Dire	ection	SSE @ 585	miles			
Storm Center Location 42.30 N		74.16 W			Basin Ave	rage Elevat	ion	N/A	feet				
Storm Rep SST Loca	tion	34.00 N	72.00 W			Storm Center Elevation			2,300	feet			
Transposition SST L	ocation					Storm Ana	lysis Durat	tion	12	hours			
Basin Location						Effective I	Barrier Hei	ght	N/A	feet			
The sto	rm representa	ative SST is	81.5 F	with tot	al precipital	ble water ab	ove sea leve	l of		3.84	inches.		
The in	n-place maxir	num SST is	83.0 F	with tot	al precipital	ole water ab	ove sea leve	l of		4.08	inches		
The transpos	itioned maxir	num SST is	0.0			ole water ab	ove sea leve	l of		#N/A	inches		
	place storm		2,300		h subtracts	0.68		precipitabl		81.5 F			
	place storm		2,300		h subtracts	0.71		precipitabl		83.0 F			
•	osition basin		N/A		h subtracts	X.XX		precipitabl		0.0			
The inflow barrier/	basin elevatio	on height is	N/A	whic	h subtracts	X.XX	inches of	precipitabl	e water at	0.0			
				1									
	place storm			1.07					oased on SST valu ck and HYSPLIT o				
The trans	position/elev			#N/A					d not vary more th				
	The barrie	er adjustme	nt factor is	#N/A		over a large ar	ea.		•	-			
	<b>—</b>	1 11 1		113.71.4									
	The tot	al adjustme	nt factor is	#N/A		L							
Observed	Storm Dept							1		1			
		1 Hours	2 Hours	3 Hours	6 Hours	12 Hours	18 Hours	24 Hours	36 Hours	42 Hours			
	1 sq miles	2.8	5.3	7.6	13.8	20.7	21.7	22.4	22.4	22.4			
	10 sq miles	2.8	5.1	7.3	13.2	20.2	21.1	21.8	21.9	21.9			
	100 sq miles	2.1	3.8	5.3	9.0	15.2	15.5	15.8	17.2	17.2			
	200 sq miles	1.8	3.1	4.4	8.1	13.5	14.2	14.9	15.4	15.4			
	500 sq miles	1.4 1.0	2.5 1.8	3.4 2.9	5.2	11.0	11.3	12.7	12.8	12.8 10.9			
***************************************	000 sq miles 000 sq miles	0.9	1.8	2.3	4.3	8.2 7.4	10.2 8.2	10.7 8.3	10.9 9.5	9.5			
***************************************	000 sq miles	0.9	1.4	2.3 1.6	3.2	5.0	5.7	5.8	7.3	7.3			
	000 sq miles	0.4	0.9	1.3	2.5	4.5	5.7	5.4	5.6	5.6			
***************************************	000 sq miles	-	-	-	-	-	-	-	-	-			
***************************************	000 sq miles	-	-	-	-	-	-	-	-	-			
300	Joo sq nines												
Storm or 9	Storm Center	Name		SPAS 1224	Hurricane	Irono AW	1 30W				1		
Storm Dat		Ivanic		8/27-29/20		II CHC AVV	3011						
Storm Typ				Hurricane									
Storm Loc					74.16 W								
	nter Elevation	1		2300	5 11								
	ion Total & D		sq mi)	22.91 inche	s in 42 hou	rs							
		, ,											
Storm Rep	oresentative S	SST		81.5 F									
	oresentative S				72.00 W		Aug						
In-place M	laximum SST	7		83.0 F			83						
Moisture	Inflow Vector	r		SSE @ 585									
In-place M	<b>I</b> aximization	Factor		1.07									
	Transposition			15-Aug									
_	tion SST Loca												
_	tion Maximur												
_	tion Adjustme			#N/A									
	asin Elevatio			N/A									
	levation in Ba	asin		N/A									
	rrier Height			N/A									
	ljustment Fac			#N/A									
Total Adju	istment Facto	r		#N/A									

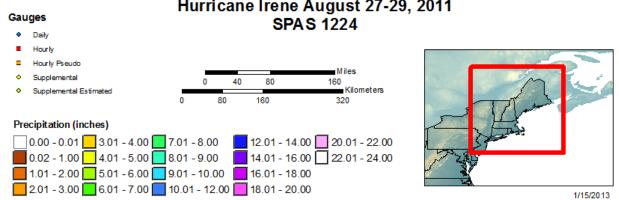
,	Storm 1224 - Aug 27 (1200 UTC) - Aug 29 (0500 UTC), 2011												
MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)													
	Duration (hours)												
Area (mi²)	1 2 3 6 12 18 24 36 42 To												
0.4	2.93	5.45	7.85	14.13	21.26	22.16	22.81	22.91	22.91	22.91			
1	2.83	5.32	7.63	13.76	20.74	21.65	22.36	22.44	22.44	22.44			
10	2.75	5.11	7.29	13.18	20.18	21.05	21.76	21.86	21.86	21.86			
25	2.59	4.72	6.72	12.27	18.91	19.78	20.45	20.6	20.6	20.60			
50	2.4	4.27	5.97	11.04	16.93	18.19	18.77	19.06	19.06	19.06			
100	2.14	3.78	5.25	9.03	15.16	15.47	15.84	17.18	17.18	17.18			
150	1.94	3.41	4.62	8.52	14.31	14.85	15.35	16.29	16.29	16.29			
200	1.83	3.08	4.44	8.1	13.46	14.23	14.87	15.39	15.39	15.39			
300	1.63	2.9	4.06	6.75	12.66	13.43	13.43	14.28	14.28	14.28			
400	1.51	2.59	3.74	6.53	11.86	12.64	12.97	13.56	13.56	13.56			
500	1.39	2.45	3.35	6.39	10.99	11.28	12.65	12.84	12.84	12.84			
1,000	1.04	1.8	2.94	5.21	8.18	10.17	10.66	10.89	10.89	10.89			
2,000	0.87	1.38	2.31	4.25	7.42	8.17	8.26	9.52	9.54	9.54			
5,000	0.6	1.14	1.63	3.19	5.04	5.66	5.78	7.27	7.28	7.28			
10,000	0.44	0.86	1.25	2.45	4.46	5.15	5.37	5.58	5.58	5.58			
11,085	0.44	0.85	1.23	2.36	4.26	4.93	5.14	5.29	5.3	5.30			



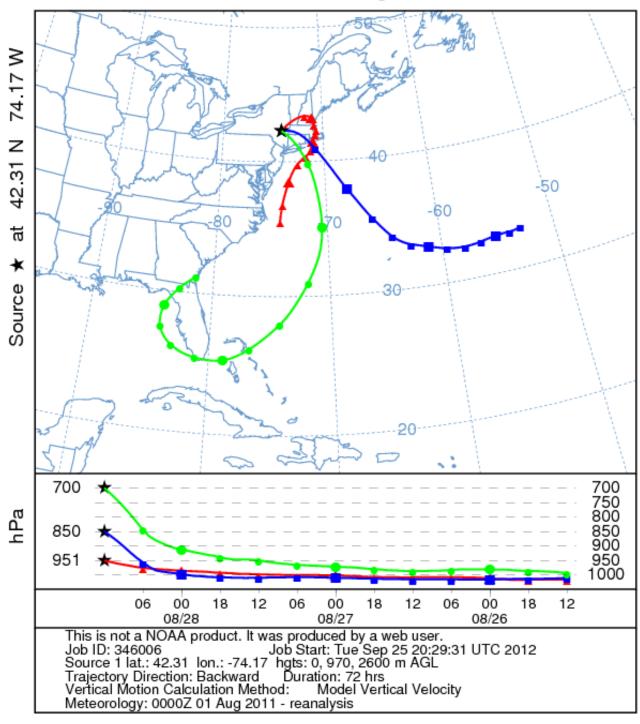




### **Total Storm Precipitation** Hurricane Irene August 27-29, 2011



# NOAA HYSPLIT MODEL Backward trajectories ending at 1200 UTC 28 Aug 11 CDC1 Meteorological Data



#### SPAS 1224 Maplecrest, NY Hurricane Irene Storm Analysis

August 27, 2011 82°W Storm Center 42.31, -74.17 42°N 42°N 40°N 78 78 82 82 81 82 81 82 82 34°N 84 83 84 ⁸⁴ 32°N 82 82 82 82 83 83 83 83 83 83 8383 88 88 82 82 82 • 82 82 82 82 83 83 83 83 85 85 85 86 82 82 62°W 74°W 72°W 68°W 08°W 60°W 58°W 58°W 70°W 64°W 52°W

Hysplit

● Surface ● 850mb ● 700mb

#### Storm Precipitation Analysis System (SPAS) For Storm #1298 SPAS Analysis

General Storm Location: Mid-Atlantic States

**Storm Dates**: September 4, 2011 – September 9, 2011 (96-hours analyzed)

**Event**: Remnants of Tropical Storm Lee

**DAD Zone 1** 

Latitude: 39.985

**Longitude**: -76.495

Max. Grid Rainfall Amount: 18.32"

Number of Stations: 3135

- 522 Daily
- 1118 Hourly
- 7 Hourly Estimated
- 0 Hourly Estimated Pseudo
- 179 Hourly Pseudo
- 1304 Supplemental
- 5 Supplemental Estimated

SPAS Version: 9.5

Base Map Used: NWS Stage 4 Storm Total Precipitation 4-km grid

Spatial resolution: 36 seconds

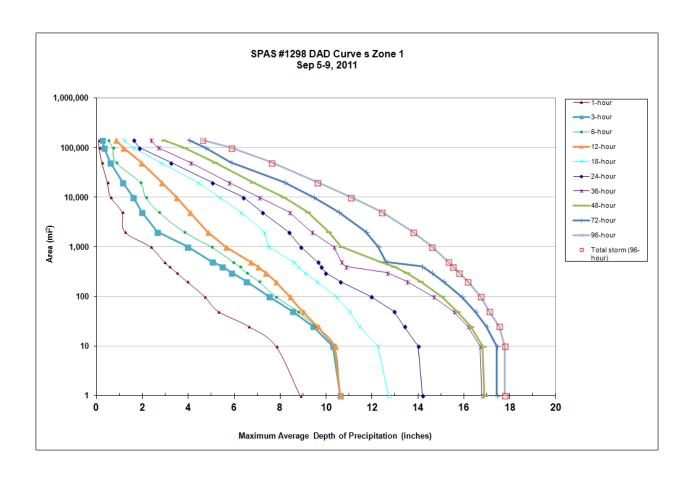
Radar Included: Yes

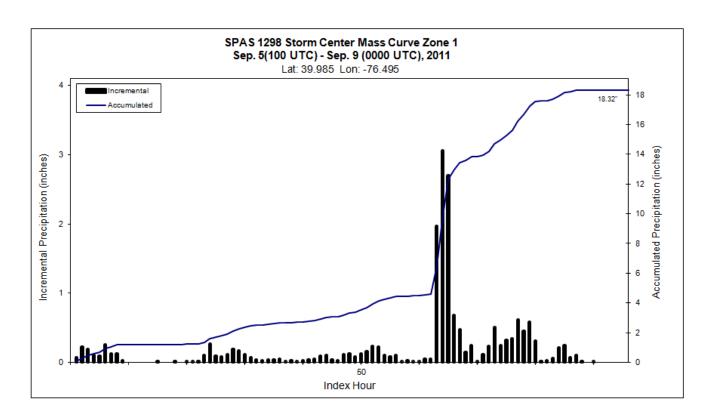
**Depth-Area-Duration (DAD) analysis:** Yes

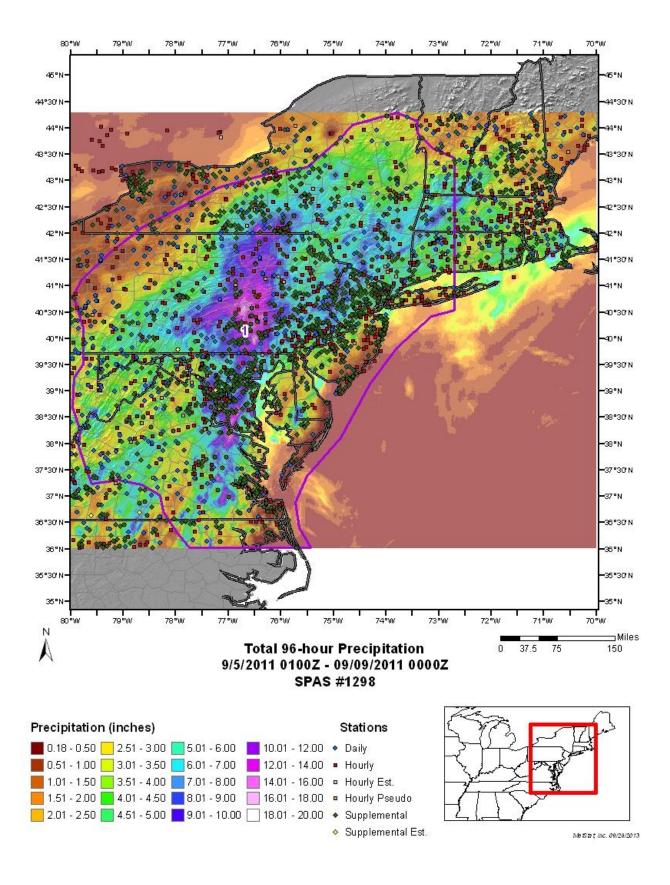
Reliability of Results: This storm was particularly difficult given large amount of data that required extensive QC. A great deal of effort was put into QCing the hourly data. When in doubt, the station was often simply removed. Fortunately, this storm occurred during the CoCoRaHS era, so it coupled with NCDC data, provided a spatially dense sample size for anchoring the precipitation magnitudes. Good radar data was also available and helped overcome the limited hourly data, particularly in areas where pseudo hourly gauges (based on the radar data and SPAS-generated ZRs) were added to the analysis. All in all, however, we are confident in the results of this analysis with the exception of areas across southeastern Virginia, where the analysis struggled with the extremely heavy rain from thunderstorms late in the analysis period occurred; less confidence also exists outside the DAD zone where radar data was less reliable. I also question some of the shortest (<3 hr) rainfalls derived by SPAS; I believe they may be too high in places.

Storm Name:	SPAS 1298 9/5-9/2011	Harrisburg-	PA					_			
Storm Date:		Storm Adjustment for Virginia									
AWA Analysis Date:	•										_
emporal Transpositi	on Date	20-Aug				M 14 T	a Di	4.	CCT: 0 700	- 11	
		Lat	Long			Moisture Inflow Direc			SSE @ 500	miles	
Storm Center Location 39.99 N		76.50 W			Basin Average Elevation			N/A	feet		
Storm Rep SST Locati		33.00 N	74.00 W			Storm Center Elevation			200	feet	
Fransposition SST Lo Basin Location	cation					Storm Analysis Duration			24	hours feet	
Dasin Location						Effective B	arrier Heig	ght	N/A	reet	
The sto	rm renreser	ntative SST is	81.5 F	with tot:	al precipitabl	e water ahov	e sea level o	f		3.84	inches.
		imum SST is	83.5 F		al precipitabl			4.16	inches		
	•	imum SST is	0.0		al precipitabl				·	#N/A	inches
		n elevation is	200		ich subtracts	0.06		f precipitabl	e water at	81.5 F	
The ir	-place storm	n elevation is	200	whi	ich subtracts	0.07	inches o	f precipitabl	e water at	83.5 F	
The transp	osition basir	n elevation at	N/A	whi	ich subtracts	x.xx	inches o	f precipitabl	e water at	0.0	
The inflow barries	/basin elevat	tion height is	N/A	whi	ich subtracts	X.XX	inches o	f precipitabl	e water at	0.0	
					-						
	-	orm maximiza		1.08					98 Zone 1. Stor		
The tr	•	elevation to b		-		representative 2011.	SS1 value w	as based on S	ST between Sep	nember 5-6,	
	The l	barrier adjustn	nent factor is	#N/A		2011.					<b>I</b>
	TI.	e total adjusts	nant factor is	#N/A							
	In	e total adjustn	nent ractor 18	#1 <b>\</b> //A	<u> </u>						4
Observed	Storm Dort	h-Area-Durat	ion								
Observed	stor iii Depti	6 Hours	12 Hours	18 Hours	24 Hours	48 Hours	72 Hours	96 Hours	120 Hours		
	10 sq miles	10.4	10.4	12.3	14.0	16.8	17.4	17.8	17.8		
	00 sq miles	7.8	8.4	10.4	12.0	15.0	15.9	16.7	16.7		_
	00 sq miles	7.1	7.8	9.6	10.6	14.1	15.1	16.2	16.2		
	00 sq miles	6.0	6.7	8.6	9.6	12.4	12.6	15.3	15.3		Ĩ
10	00 sq miles	5.0	5.6	7.5	8.9	10.7	12.3	14.6	14.6		
20	00 sq miles	3.8	4.8	7.3	8.4	10.1	11.7	13.8	13.8		
	00 sq miles	2.7	4.1	6.3	7.2	9.2	10.5	12.4	12.4		
***************************************	00 sq miles	2.2	3.5	5.4	6.4	8.1	9.4	11.1	11.1		
	00 sq miles	1.9	2.8	4.4	5.0	6.8	8.2	9.6	9.6		
	00 sq miles	0.9	1.9	2.8	3.2	5.1	5.9	7.6	7.6		
	00 sq miles	0.7 0.5	0.8	1.6	1.9 1.6	3.8	4.7 4.0	5.9 4.6	5.9		-
1418	28 sq miles	0.5	0.8	1.2	1.0	2.9	4.0	4.0	4.6		┩
Storm or St	orm Center	Nama		CDAC 1208	Harrisburg	DA		ĺ			1
Storm Date		1 VALLIC		9/5-9/2011	mai i isburg	-1 A					1
Storm Type	` '			Tropical Sto	rm Lee						1
Storm Loca				39.99 N	76.50 W						1
	er Elevation			200							1
	n Total & D	uration		18.32 Inches	s 96-hours						
		STLocation		81.5 F	24						1
		ST Location		33.00 N	74.00 W			Aug	Sep		1
Maximum S				83.5 F				83.50	83.00		4
	flow Vector			SSE @ 500							-
In-place Ma	aximization I	actor		1.08							-
Tamporal T	ransposition	(Date)		20-Aug							1
	on SST Loca			20-Aug							1
	on Maximum										1
	on Adjustme			#N/A							1
	Average Basin Elevation			N/A							1
	vation in Ba			N/A							1
Inflow Barr				N/A							
Barrier Adj	ustment Fact	tor		#N/A							
Total Adjus	tment Factor	r 💮		#N/A							

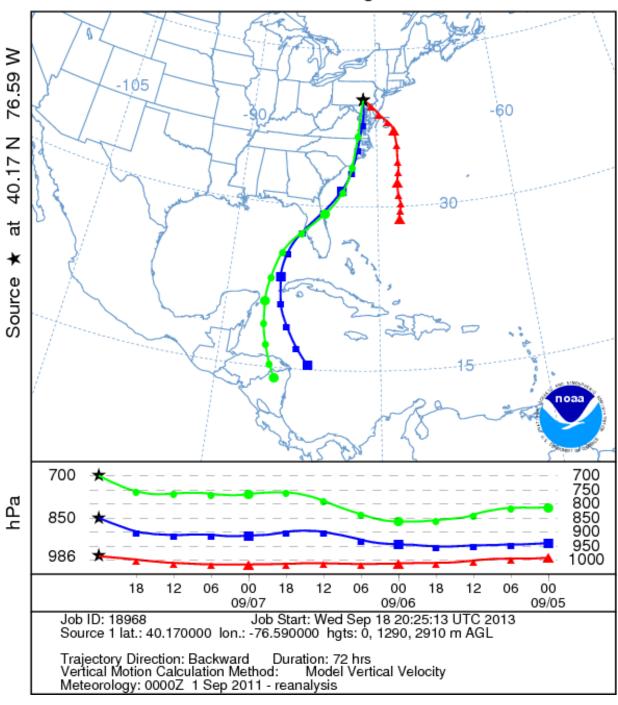
	Storm 1298 - Sep. 5 (0100 UTC) - Sep. 9 (0000 UTC), 2011  MAXIMUM AVERAGE DEPTH OF PRECIPITATION (INCHES)												
		MAXIMU	JM AVEF	RAGE DE	EPTH OF	PRECIF	OITATIO	N (INCHE	ES)				
	Duration (hours)												
Area (mi²)	1	3	6	12	18	24	36	48	72	96	Total		
0.4	9.45	10.84	10.9	10.9	13	14.57	17.38	17.48	17.95	18.32	18.32		
1	8.87	10.61	10.63	10.63	12.71	14.19	16.78	16.9	17.43	17.79	17.79		
10	7.81	10.3	10.38	10.38	12.25	14	16.7	16.82	17.43	17.79	17.79		
25	6.61	9.44	9.55	9.63	11.44	13.4	16.17	16.3	16.97	17.53	17.53		
50	5.3	8.55	8.77	8.98	11.01	12.96	15.54	15.71	16.5	17.1	17.10		
100	4.7	7.51	7.81	8.42	10.44	11.95	14.66	15.03	15.89	16.73	16.73		
200	3.93	6.51	7.08	7.8	9.58	10.6	13.51	14.09	15.1	16.17	16.17		
300	3.49	5.87	6.53	7.35	9.08	9.96	12.64	13.48	14.58	15.79	15.79		
400	3.17	5.46	6.24	7.02	8.77	9.78	10.83	12.93	14.16	15.51	15.51		
500	2.94	5.05	5.95	6.71	8.58	9.63	10.66	12.38	12.62	15.33	15.33		
1,000	2.34	3.96	5	5.61	7.49	8.89	10.32	10.65	12.25	14.6	14.60		
2,000	1.23	2.64	3.82	4.83	7.29	8.36	9.35	10.1	11.73	13.78	13.78		
5,000	1.11	1.98	2.72	4.05	6.27	7.2	8.39	9.18	10.54	12.43	12.43		
10,000	0.61	1.59	2.15	3.47	5.35	6.38	7.07	8.13	9.43	11.07	11.07		
20,000	0.47	1.13	1.9	2.82	4.4	5.02	5.75	6.78	8.17	9.62	9.62		
50,000	0.23	0.59	0.86	1.93	2.79	3.23	4.07	5.14	5.86	7.62	7.62		
100,000	0.11	0.33	0.71	1.15	1.58	1.86	2.68	3.81	4.71	5.86	5.86		
141,828	0.09	0.26	0.5	0.84	1.2	1.61	2.35	2.92	4.02	4.62	4.62		



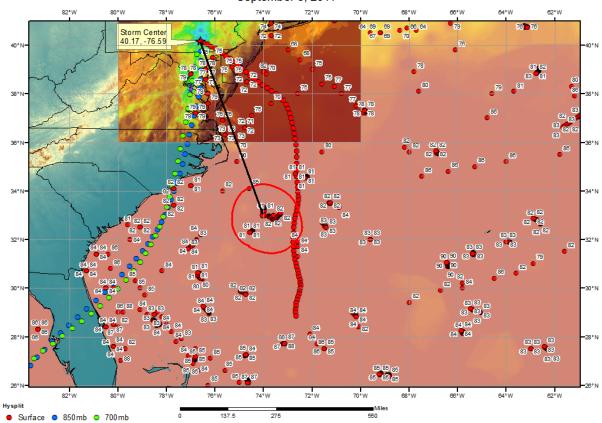




## NOAA HYSPLIT MODEL Backward trajectories ending at 0000 UTC 08 Sep 11 CDC1 Meteorological Data



### SPAS 1298 Harrisburg, PA Tropical Storm Lee Storm Analysis September 5, 2011



#### SPAS 1298 Harrisburg, PA Tropical Storm Lee Storm Analysis September 6, 2011

