Storm Precipitation Analysis System (SPAS)

Applied Weather Associates, LLC and Metstat, Inc.

Applied Weather Associates, LLC and Metstat, Inc. have teamed to produce a state-of-the-art storm centered depth area duration (DAD) analysis system called the Storm Precipitation Analysis System (SPAS). SPAS produces a comprehensive analysis of extreme storms for a variety of hydrologic uses. The analysis system uses the latest advancements of Geographic Information Systems (GISs) to produce hourly rainfall maps/grids, total storm precipitation map/grid, mass curves for any location, reliable DAD results and more! Based on the same basic approach used by the National Weather Bureau (currently the National Weather Service), SPAS output has achieved a level of consistency between the newly analyzed storms and the hundreds of historic storms previously analyzed. The multi-faceted SPAS process includes:

- **Identification and definition of storm**, area, duration and time.
- **Development of storm precipitation database** using our comprehensive in-house National Climatic Data Center (NCDC) databases of hourly, daily and supplemental weather observations.
- **Conversion all daily data into estimated hourly precipitation** using surrounding hourly recording sites to define the temporal (hourly) distribution of precipitation at each daily station. See Figure 1.

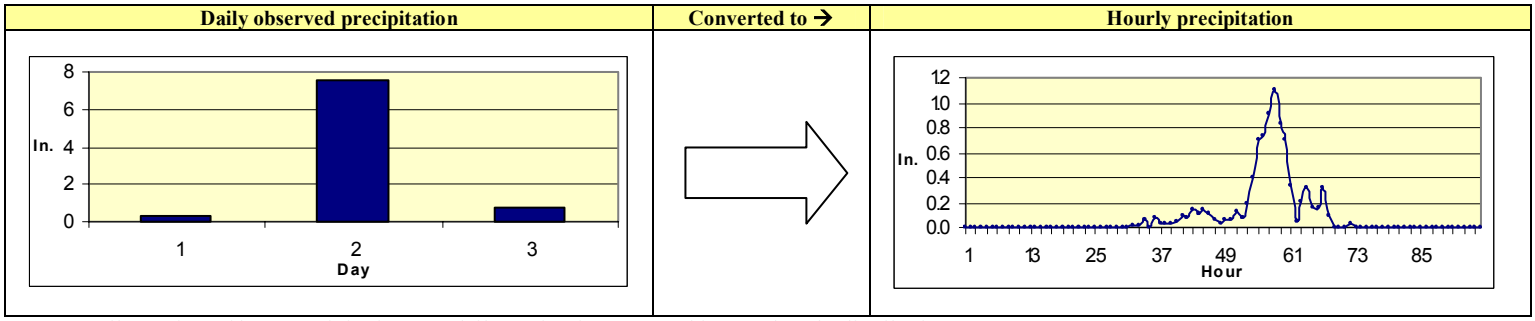

Figure 1. Illustration of how precipitation at a daily station is converted into an hourly distribution.

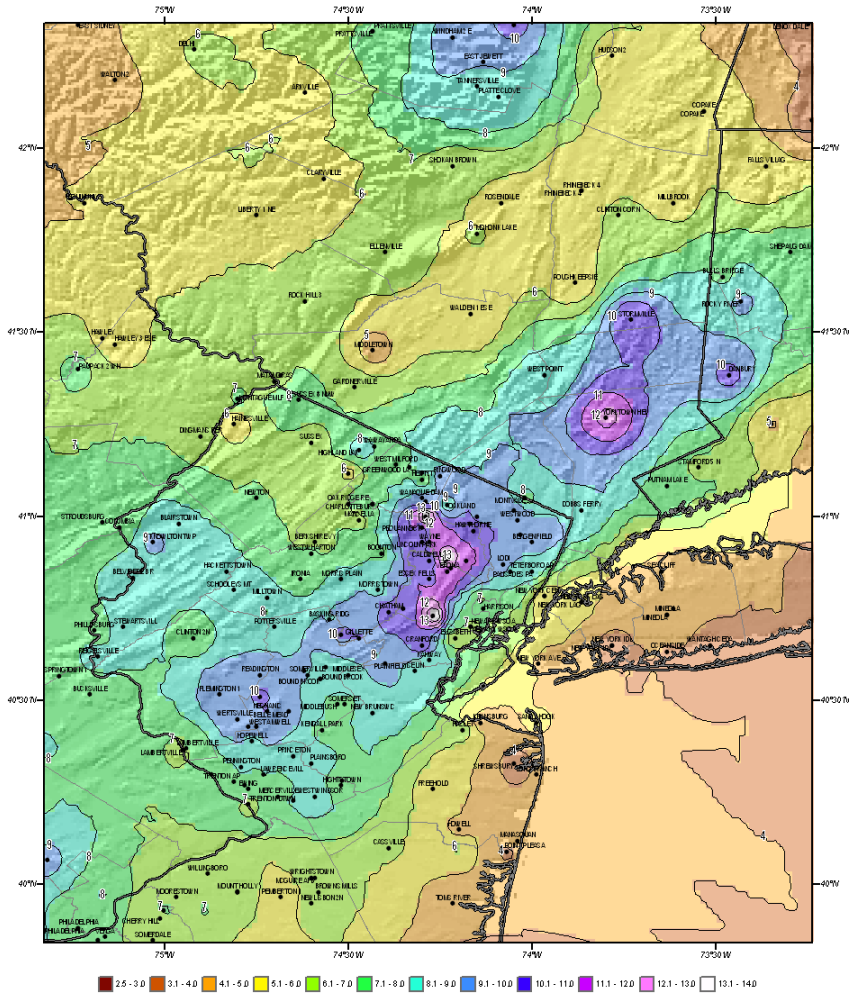

Figure 2. Total storm precipitation in inches map for the mid-Atlantic during the period September 14-18, 1999 (hurricane Floyd).

- **Create of mass curves** to identify erroneous data and evaluate the temporal characteristics of the storm. See Figure 3.
- **Create high-resolution hourly precipitation grids** in a GIS. Base maps are applied by relating the hourly precipitation grids to an independent variable, such as mean annual precipitation, mean monthly precipitation, actual monthly precipitation (e.g. September 1999), elevation or NEXRAD radar estimated rainfall to increase the accuracy of the spatial interpolation at ungauged locations.
- **Compute storm-centered Depth Area Duration (DAD) tables**. See Figures 4 and 5.
- Produce additional output:
  - **total storm isohyetal analysis** (see Figure 2)
  - **hourly isohyetal analyses**
  - comprehensive **station list,** including station density stats
  - Quality control report
  - **customized output**, for example storm animations

The SPAS software has been thoroughly tested using both theoretical storms and previously analyzed historic storms. The DADs produced by SPAS were equal to the truth analysis for the theoretical storms and were within 5% of the published NWS DAD results for the historic storms analyzed (Westfield, MA 1955 and Ritter, IA 1953).

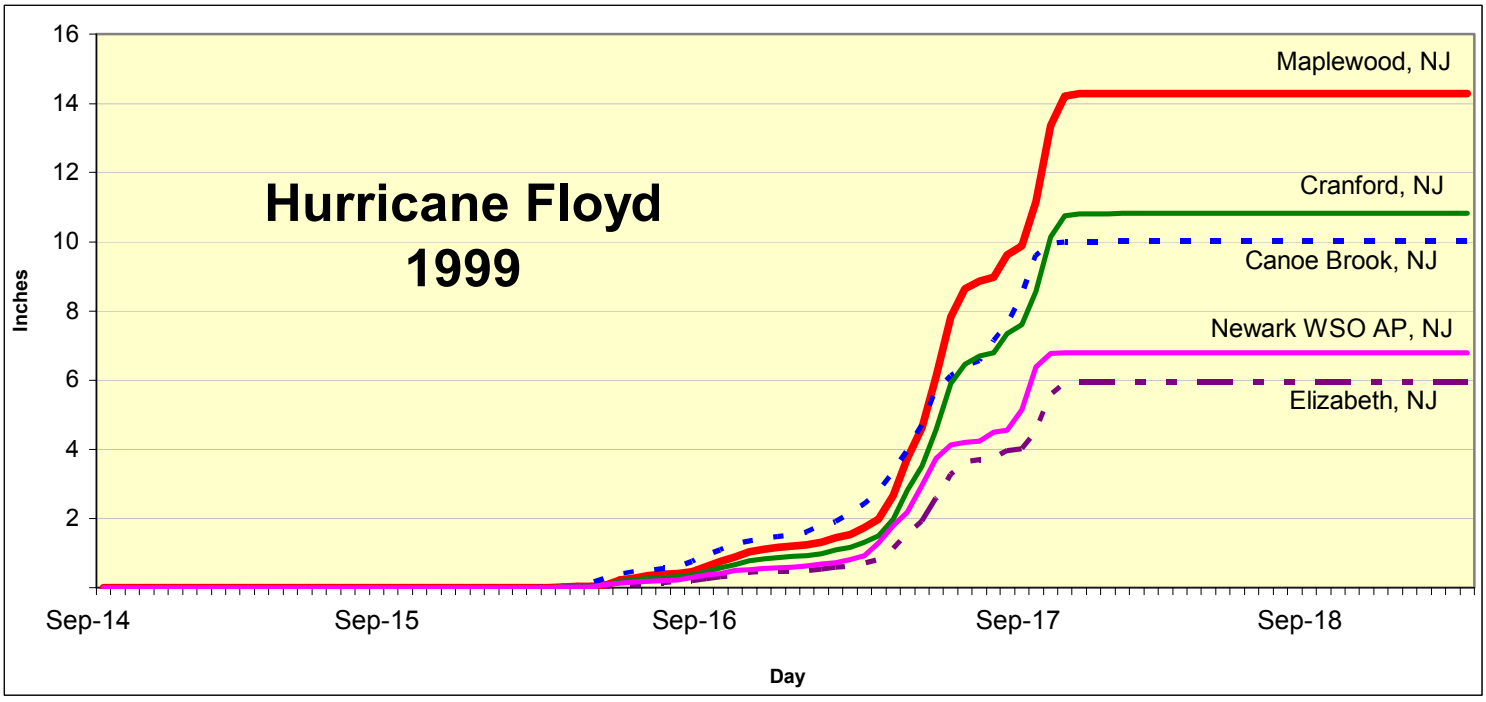

Figure 3. Storm center mass curve for precipitation associated with hurricane Floyd (September 14-18, 1999) in New Jersey.

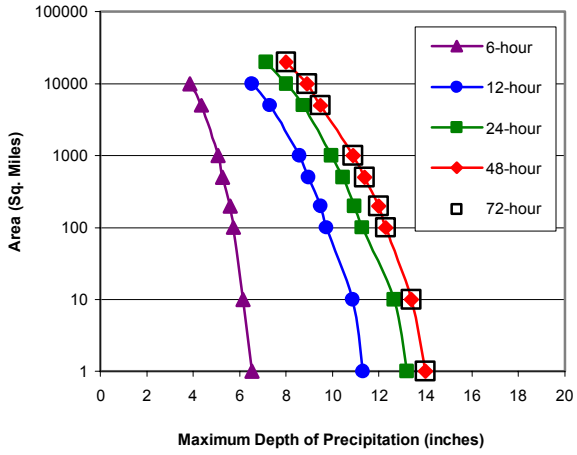

Figure 4. Depth area duration graph of depth of precipitation associated with the New Jersey rainfall from hurricane Floyd (September 14-18, 1999).

Area	Duration (hours)				
(sq. mi.)	6	12	24	48	72
1	6.5	11.3	13.2	14.0	14.0
10	6.1	10.9	12.7	13.4	13.4
100	5.7	9.8	11.3	12.3	12.3
200	5.6	9.5	11.0	12.0	12.0
500	5.3	9.0	10.5	11.4	11.4
1000	5.1	8.6	10.0	10.9	10.9
5000	4.4	7.3	8.8	9.5	9.5
10000	3.9	6.5	8.0	8.9	8.9
20000	3.3	5.6	7.1	8.0	8.0

Figure 5. DAD table for the New Jersey rainfall from hurricane Floyd (September 14-18, 1999).

For more information about the **Storm Precipitation Analysis System (SPAS)**, please contact:

Ed Tomlinson, PhD, Chief Meteorologist
Applied Weather Associates
PO Box 680
Monument, CO 80132
awai@adelphia.net
(719) 488-9117
(413) 410-8509 Fax
(719) 650-3522 Cell

Tye W. Parzybok, Chief Meteorologist
Metstat, Inc.
4764 Shavano Drive
Windsor, CO 80550
tyep@metstat.com
www.metstat.com
(970) 686-1253
(208) 728-7256 Fax
(970) 227-4559 Cell