

## EASTERN REGION TECHNICAL ATTACHMENT

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AN ANALYSIS OF SEVERE WEATHER IN THE DELAWARE VALLEY  
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On Sunday, July 17, 1988, a severe weather episode occurred in the Delaware Valley. A small tornado touched down in Pottstown, PA, tearing a roof from a house. Winds gusted to 63 mph at Reading, PA, and to 58 mph at Wilmington (severe reports, Figure 1). Dozens of reports of downed trees and power outages were received. On the bright side, the storms brought the first significant rains to Wilmington in almost two months.

## THE SYNOPTIC PATTERN

During the afternoon of the 17th, a surface trough stretched along the eastern slopes of the Appalachian mountains from Pennsylvania into Virginia (Figure 2). High temperatures that day reached or exceeded 100 degrees at many stations east of the mountains. Dewpoints during the early afternoon ranged through the 70s to 80 at Wilmington. Dover AFB recorded a high dew point of 82 at 12 noon and 1 pm EDT.

Guidance showed that dry air would be feeding into the area at the 700 millibar level. Weak positive vorticity advection was indicated between 12z and 00z. Morning soundings at IAD and ACY were quite unstable with Lifted Indices of -6 and -4 respectively. Many of the elements were coming together to produce severe weather.

## MESOANALYSIS

The Southern Region ADAP program used in AFOS proved invaluable in pinpointing areas that would be most likely to be affected by severe thunderstorms. In fact, it was this data that allowed the office here in Wilmington to issue an SPS at 120 pm that afternoon indicating that the area was at risk of high winds in thunderstorms. This represented a lead time of roughly 5 hours.

Runs of the program showed the area under greatest risk was southern New Jersey, southeastern Pennsylvania and northern Delaware. The surface altimeter change chart indicated greatest pressure falls in that area (Figure 3). The mixing ratio analysis had a fairly good moisture gradient over the area with a max value of +20 in Delaware, near DOV and its 82 dewpoint (Figure 4). The calculated Lifted Indices showed a maximum value of -15 in central Delaware for a parcel lifted to 300 millibars (Figure 5). The Shulhan Spot index was also right on the money (Figure 6). The heaviest storms occurred in the gradient northwest of the maximum Shulhan values. Activity diminished considerably once storms passed across the high values.

## CONCLUSIONS

The use of the ADAP program is moving the NWS into a new and improved era in severe weather prediction. All of the data gave an early indication of severe weather potential in the Delaware Valley. The data also allowed staff, at least at this office, to have more confidence in the warnings and statements that were issued that day.

A special thanks to the radar crew at ACY. Frequent calls regarding thunderstorm measurements proved quite useful. Measurements of the storm that passed through northern Delaware showed a peak top of 65000 feet, a VIP 5 level to 41000, and a VIP 6 level to 31000.



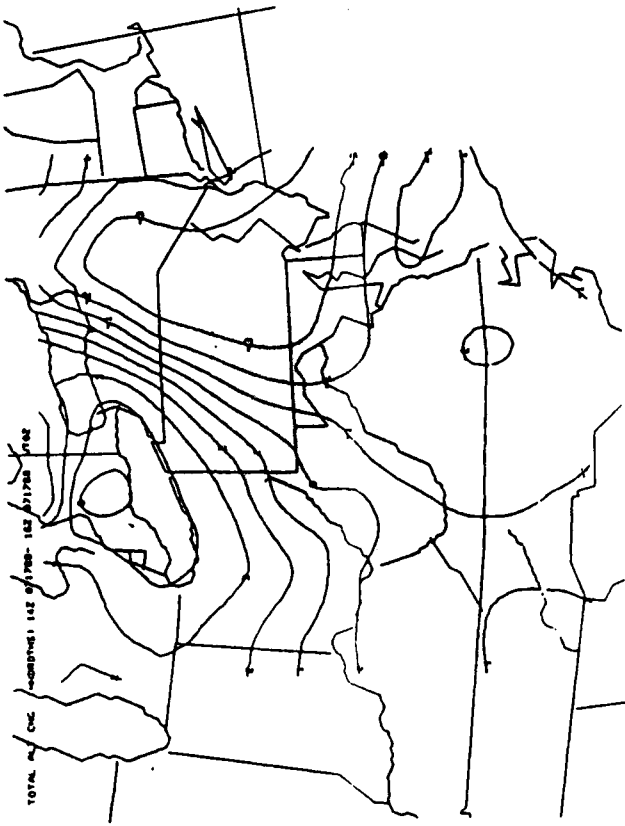


FIGURE 3  
ALTIMETER CHANGE 14Z-16Z

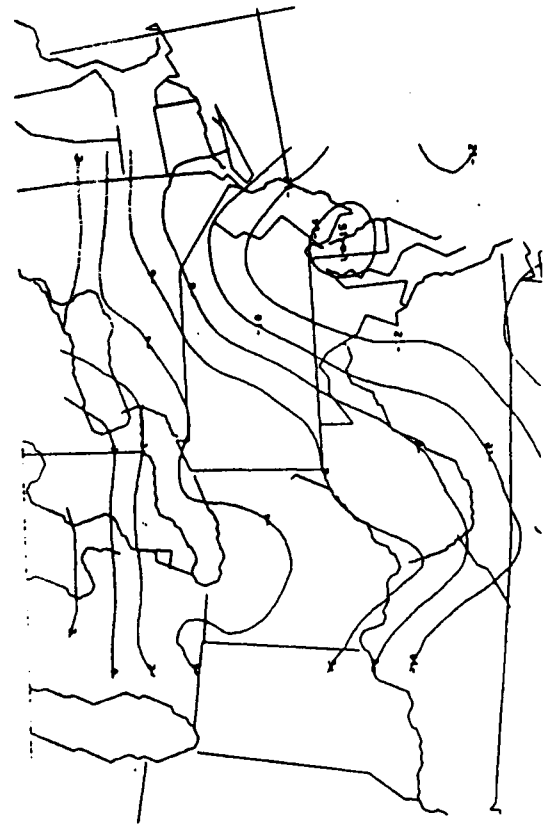


FIGURE 5 - LIFTED INDEX TO 300 MB  
18Z

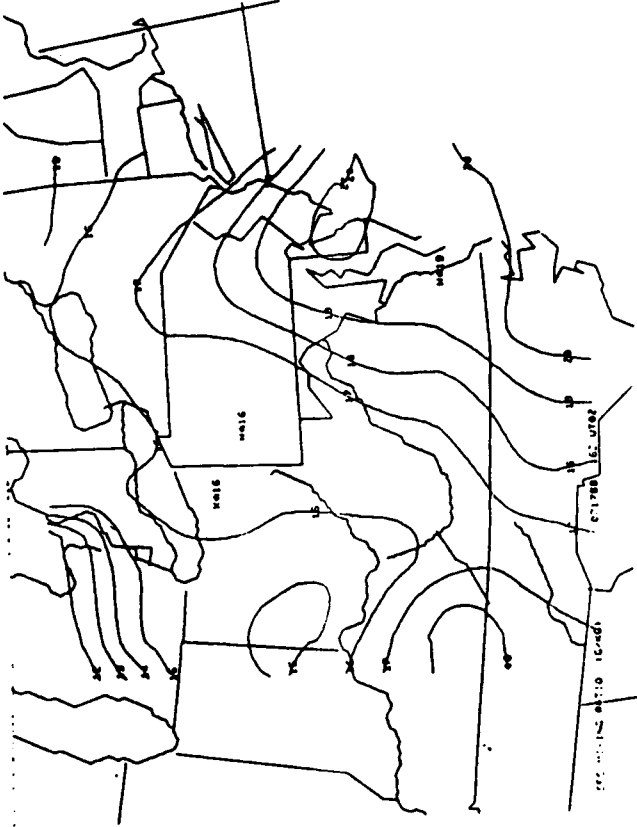


FIGURE 4  
SURFACE MIXING RATIO 16Z

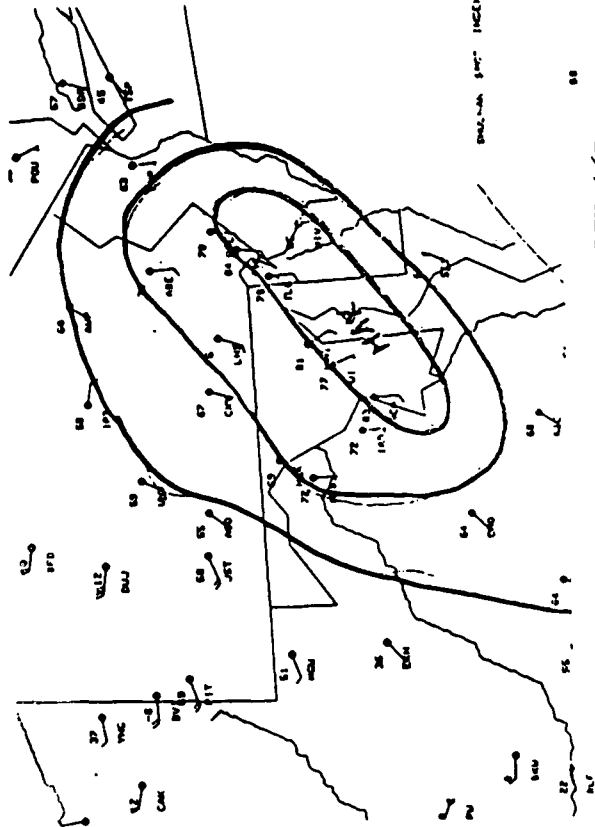


FIGURE 6 - SHULMAN SPOT INDEX 16Z