Convective Research for Operational Forecasting and Training – Severe Initiation Matrix Evaluation for Operational Now-casting

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Purpose:

To represent the occurrence and distribution of severe storms according to the type of day and the prevailing synoptic patterns to assist forecasters of the Mid-Atlantic region to predict when and under what favorable conditions should a specific region be threatened by severe activity.

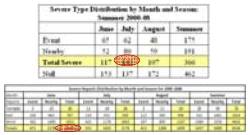
Methodology:

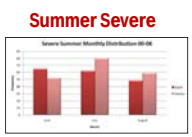
Data consisted of classified report point data of tornado, hail, or wind observations for New Jersey and the surrounding states of Pennsylvania, New York, Maryland, Delaware, and Connecticut. The attributes that were associated with data were the time, county, state, latitude, and longitude of each report type observation of tornado, hail, and wind. The data were obtained from the years of 2000-2008 (9-year dataset) for the summer months of June, July, and August from the SPC's NWS Local Storms database. Data was dependent on the time of the report and were only obtained for observations made from 12Z to 00Z to only account for diurnal effects. The associated upper air 500mb flow and surface feature for each day were obtained from the Students Partnering with Faculty (SpF) research base which were evaluated from the HPC's Daily Weather Map. The options available were to observe a flow using an 8-point compass and whether a surface feature was influenced by high pressure, low pressure, cold front, warm front, occluded front, trough, or stationary front. Geographic Information Systems (GIS) and NOAA's Earth System Research Laboratory composite mapping were used to display the severe observations and attributable atmospheric conditions of geopotential height at 500mb, omega at 700mb, precipitable water at the surface given a day's classifications.

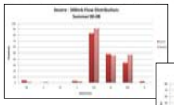
Severe Weather Report Classifications

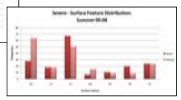
Depending on the location of the report due to the county and state attributes, the data was classified into two categories. If the report data had even one observation with a county and state within the Philadelphia or New York CWA as predefined by the NWS then it was classified as an "event" day. If the report data has no observations in either of these CWA's, but where within the states obtained then it was classified as a "nearby" day. The criteria for severe observations submitted to the SPC consist of either a tornado sighting, hail at least 0.75 inches in diameter or larger, and/or wind gusts to 58 miles per hour or greater.

Severe Weather Statistics

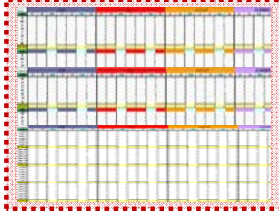








Severe Matrices



Convection Initiation Radar Classification (SpF)

Event – cells found after 12UTC
Contaminate - cells found before or at 12UTC

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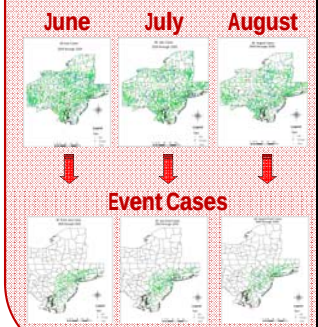
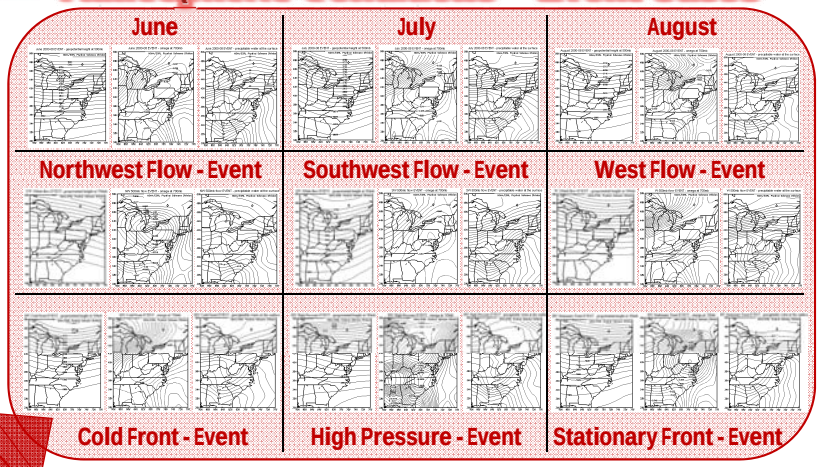
Severe Classification

ES- Event Severe
EN – Event Nearby
ENS – Event Non-Severe
CS – Contaminate Severe
CN – Contaminate Nearby
CNS – Contaminate Non -Severe
NN – Null Nearby

GIS Mapping – Severe Cases



Atmospheric Conditions – Event Cases



Initial Findings

Initial findings indicate that July had the most days active in severe and had the most severe observations (mostly being "nearby"). However, monthly distribution exhibits a decline in "event" days from June to August and a July peak of 80 out of 191 days in "nearby" days. In report type analysis, June had the most severe observations as well as the most "nearby" observations and July had the most "event" observations. For initial 12Z 500mb flow and surface feature GIS analysis, Southwest, Northwest, and West flow as well as Cold Front, High Pressure, and Stationary Front surface features were most prevalent for the severe classification regions. For a July "event", there were distinct tornado outbreaks in Long Island and Northeast of NYC. Generally, "event" observations exemplified a lack of activity in southeastern side of the NJ coast and hail activity in the southern tip of NJ for Cold Front and Southwest flow. In addition, both Cold Front and Southwest flow exhibit tornado outbreaks in Long Island, NY.

The composite maps exhibit distinct differences depending on the month and dominate 500mb flow and surface feature. For example, July "event" geopotential height exemplifies a defined trough and August "event" omega of -0.04 clearly dominating both the event region and nearby region of Pennsylvania. In addition, Southwest "event" omega is lower and concentrated in central Pennsylvania. Further analysis is needed to make clear distinctions between the atmospheric variables of each of the dominating 500mb flows and surface features.

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