A Study on Convective Modes Associated with Tornadoes in Central New York and Northeast Pennsylvania

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Between August 2000 and May 2011, WFO Binghamton‟s county warning area (CWA) experienced 52 tornadoes. This study examines the environments associated with these events, with a focus on how these environments vary by convective storm mode. The study began by identifying the most common convective storm modes associated with tornadoes within the CWA based on radar reflectivity. Supercells produced the majority of tornadoes and Quasi-Linear Convective Systems (QLCS) produced the second largest number of tornadoes. To gain a better understanding of the environments that favored different modes, synoptic and mesoscale environments were analyzed. Composite maps for each convective mode revealed several key differences in the synoptic-scale environments associated with supercells and QLCSs. Utilizing archived Rapid Update Cycle (RUC) model analyses, the study identified mesoscale parameters associated with each tornado. These parameters were grouped by convective mode to develop statistics on the mesoscale environments associated with each mode. Supercells were associated with moderate surface based instability and vertical wind shear, while QLCSs occurred in environments with low instability and high wind shear. Events with unverified tornado warnings (null events) were also analyzed to identify mesoscale environments where tornadoes may be less likely to form. Results showed that supercells in environments with weak 0-1 km bulk shear, as well as weak 0-3 km and 0-1 km storm-relative helicity, were more likely to produce null events.

The second half of this study involved analyzing radar data for different convective modes. Utilizing the Rotational Velocity (VR) - Shear tool in the **Advanced Weather Interactive Processing System (AWIPS),** rotational velocity and shear values were collected for tornadic and null events. GR2Analyst was also used to collect Normalized Rotation (NROT) data. Results showed that the characteristics of rotation prior to a tornado varied greatly based on the convective mode. These results were combined with environmental characteristics to create nomograms which are intended to aid forecasters with storm analysis and issuing tornado warnings.