

A Review of Storm Type and Radar Characteristics of Iowa Tornadic Thunderstorms

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ABSTRACT

The development of Doppler Radar gave warning meteorologists the ability to monitor for rotation within thunderstorms. The initial Weather Surveillance Radar 1988 Doppler mesocyclone detection algorithm (MDA) was designed for supercellular tornadoes and had difficulty detecting smaller scale circulations. Further research revealed that low topped supercells produced tornadoes with mesocyclones that were more narrow and more shallow than typical supercells. The MDA was updated in Build 9, to expand the range of mesocyclones detected to include low topped supercellular structures. Numerous thunderstorms, however, produce tornadoes with shallow low level meso vortices or other characteristics that are atypical of supercell environments. Warning meteorologist are expected to rely on their radar interrogation skills and knowledge of the near storm environment (NSE) to make critical warning decisions.

This research focuses on radar signatures associated with tornadoes that occurred across Iowa from 2004-2009. The vast majority of these tornadoes were produced by supercells. These supercells could be divided into three categories, classic, high precipitation (HP) and low topped. Quasi Linear Convective Systems (QLCS) are a fourth storm type that was a primary producer of tornadoes during this period. Each of these storm types produced tornadoes with unique radar characteristics. By learning radar signature characteristics and understanding what storm type can be expected for a given near storm environment, the warning meteorologist should be able to more quickly identify storm type. As an extension, once storm type is known, the warning meteorologist should be able to anticipate what characteristics are likely to produce tornadoes and adjust warning thresholds.