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Conference on European Tornadoes and Severe Storms

# The National Severe Storms Laboratory Severe Weather Detection Algorithms

*Greg Stumpf*

For the past two decades, the National Severe Storms Laboratory (NSSL), in partnership with the National Weather Service (NWS), has developed a suite of severe weather detection algorithms. Algorithm development began in the 1970s as the first research Doppler weather radars were being used to detect severe storms in Central Oklahoma. This applied research led to the eventual development of the WSR-88D network of Doppler radars in the U.S., and its associated severe weather algorithm package. These algorithms are designed to provide guidance information to the NWS forecasters when issuing severe weather warnings.

The NSSL has developed algorithms to detect and track storm cells, to diagnose their potential to produce hail (both using probabilities and by estimating hail size), to detect and diagnose rotation in thunderstorms (mesocyclones and tornadic vortex signatures) for their capability to produce tornadoes and other severe weather, and to predict and detect severe downburst winds. The algorithm development process includes input from basic and applied research, incorporation of advanced statistical techniques and image processing, evaluation, and finally, technology transfer to the end users.

The development of these algorithms accelerated during the decade of the 1990s as the WSR-88D radar network was deployed across the U.S. The nearly-continuous collection of nationwide radar data, coupled with advances in computing power and data storage, allowed for a greater understanding of storm types from a variety of environments, and how these vary by region. There exists the opportunity to use these algorithms as a baseline to evolve from a nationwide

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(United States) understanding of storm types to a worldwide understanding. We will discuss potential applications of the algorithms in Europe.

The NSSL evaluates the algorithms by running them on a variety of storm cases collected across the U.S. The NSSL also conducts real-time testing of the algorithms in actual severe weather warning operational settings. The vehicle for algorithm testing has been NSSL's Warning Decision Support System (WDSS). This system has been deployed to 20 different NWS offices across the U.S. over the last 5 years. WDSS testing encourages user feedback on the algorithms and displays, and allows for continued enhancement prior to the incorporation of the algorithms onto the operational WSR-88D system. More recently, real-time testing of NSSL's severe weather algorithms is now being conducted outside of the U.S. (e.g., in support of the 2000 Summer Olympics in Sydney Austrailia), and opportunities might exist for testing in Europe as well.