Severe Convection Group

The Severe Convection group's primary focus is to develop new science and technology that improves the detection and short-term forecasting of severe convective weather threats. The group works closely with a wide variety of partners, including researchers at multiple institutions, National Weather Service forecasters, emergency managers, and private sector entities. Some of group's current areas of research include:

FACETs / Probabilistic Hazard Information: is a proposed next-generation severe weather watch and warning framework that is modern, flexible, and designed to communicate clear and simple hazardous weather information to serve the public. Probabilistic Hazard Information (PHI) is rapidly updating probabilistic guidance for severe weather threats that can be used to give very precise guidance about when and where events are likely to occur based on a mixture of real time data, historical statistics, model guidance, and forecaster input.

Multi-Radar Multi-Sensor (MRMS) system / Warning Decision Support System II: The MRMS system was developed to produce severe weather and precipitation products with improved decision-making capability for severe weather forecasts and warnings, hydrology, aviation, and numerical weather prediction. These automated algorithms quickly and intelligently integrate data streams from multiple radars, surface and upper air observations, lightning detection systems, and satellite and forecast models. The system is in use by the National Weather Service as well as in the private industry and broadcast meteorology.

Data Mining and Machine Learning: The Multi-Year Reanalysis of Remotely Sensed Storms (MYRORSS) project is one of the primary inputs to the guidance generated for FACETs. It will include over two decades worth of high resolution MRMS, model, lightning, and other observations to create both historical information and real-time storm guidance based on statistical and machine learning methods.

Hazardous Weather Testbed (HWT) Experimental Warning Program (EWP): The HWT EWP mission is to improve the nation's hazardous weather warning services by bringing together forecasters, researchers, trainers, technology specialists, and other stakeholders to test and evaluate new techniques, applications, observing platforms, and technologies. The annual Spring Experiment provides forecasters with a first-hand look at the latest research concepts and products, and immerses research scientists in the challenges, needs, and constraints of front-line forecasters. The EWP helps transition severe weather research and technology to improve the Weather Forecast Office's severe weather warnings for hail, wind and tornadoes. The EWP tests research concepts and technology specifically aimed at short-fused warnings of severe convective weather.

Radar Applications for Severe Weather Detection: Weather radar data is usually the most valuable source of information about ongoing severe convective storm events. The Severe Convective group works on improvements to both data quality and algorithms for severe weather detection for the WSR-88D network and other radar systems.
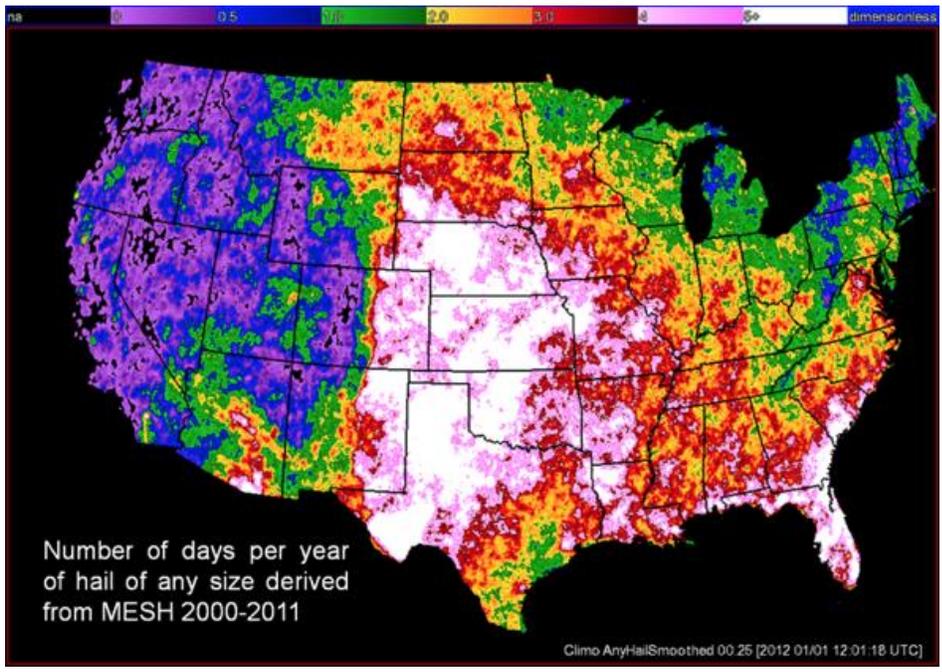
An example of data from the MYRORSS project that shows the annual number of hail days based on MRMS data during a twelve year period.
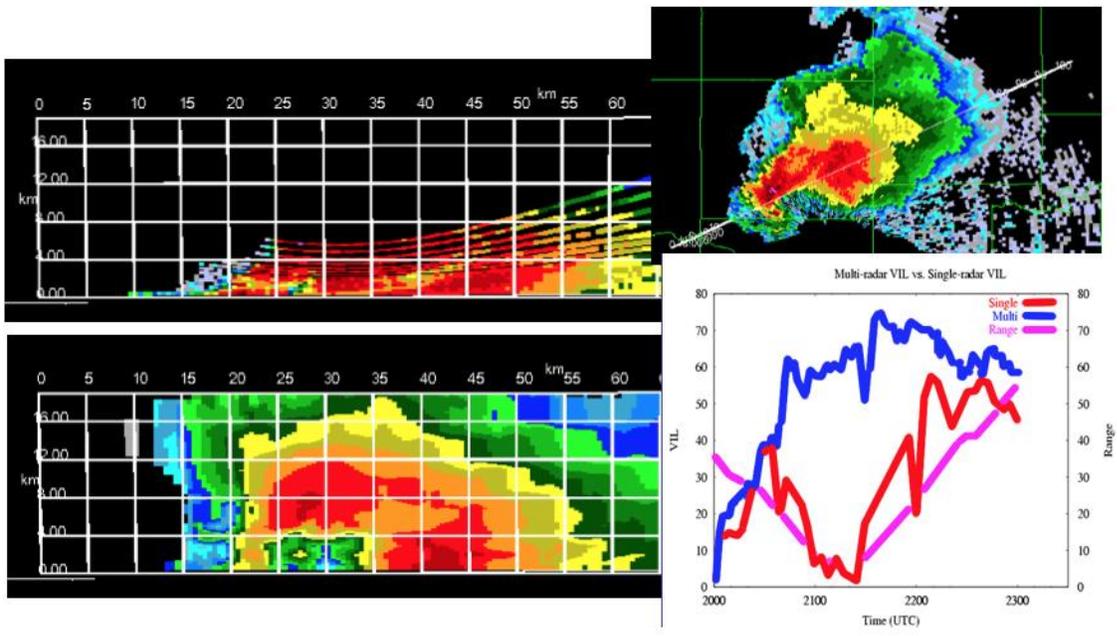
A vertical cross-section through radar reflectivity (top right) as seen with a single radar (top-left) and in the MRMS system (bottom left) that blends data from multiple radars. The graph at the lower right shows the under sampled single-radar Vertically Integrated Liquid (VIL) values for a storm moving over the radar in red, while the MRMS values for the same storm are shown in blue.

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