

MRI Rapid-Scan and Super-Resolution Observations in severe storms: Recent Progress and Future Plans

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In this presentation, we will introduce the recent progress, present examples, and future plans of rapid-scan and super-resolution observations in severe storms of the Meteorological Research Institute (MRI).

1. A linear array of pressure and wind sensors for high resolution in situ measurements in winter tornadoes

In order to improve our understanding of near-surface tornadic features, we developed a linear array of wind and pressure sensors (LAWPS) for high resolution in situ measurements in winter tornado cores. The pressure and wind sensors were deployed along a 1.2km-long linear array that is located parallel to and about 100m from the shoreline. Wind data are obtained using 12 two-dimensional fast-response ultrasonic anemometers placed at a height of 5 m at intervals of 100 m. Pressure data are obtained using 25 barometers placed at a height of 50cm at intervals of 50m. The pressure ports are designed and loaded to the barometers to reduce the dynamic pressure associated with wind and turbulence. In this presentation, the system overview and the measurement technique will be described, as well as some examples of actual winter tornado observations of the system and X-band Doppler radar simultaneously.

2. An X-band phased array Doppler radar for the research of severe storms

Many severe storms evolve on time scales shorter than that resolved by conventional mechanically scanning radar systems. MRI has a new project of development of severe storm observations and detections from a phased array radar. The azimuth scan is similar to the conventional scan with a mechanically rotating antenna and at a variable rate between 1- 6 rpm. 128 slotted waveguide array elements fixed above the antenna panel produce transmit beam and an electronic elevation scanning will be performed. With the electronic elevation and mechanical azimuth scanning, the radar can observe the entire sky in less than a minute. Such high temporal resolution sampling will be expected to provide a realistic structure of rapidly evolving storm. In this presentation, some basic characteristics of the radar and a brief description of future tasks for detection and prediction of severe storms will be presented.

Keywords: tornado, rapid-scan and super-resolution observations, phased array radar