

Potential Role of Dual-polarization X-band Radar in Hydrological Applications

Haonan Chen* and V. Chandrasekar

Colorado State University, Fort Collins, Colorado, USA

Compared with the National Weather Service (NWS) Weather Surveillance Radar-1988 Doppler (WSR-88D) network, the X-band weather radar network developed by National Science Foundation Engineering Research Center (NSF-ERC) for Collaborative Adaptive Sensing of the Atmosphere (CASA) has greatly improved the remote sensing of weather in the lower atmosphere. Quantitative Precipitation Estimation (QPE) is one of the important goals of this meteorological radar network and it is also serving as an important tool to monitor rainfall intensity and total rainfall amount. A K_{dp} -based rainfall algorithm was developed using the measurements of K_{dp} values from the dual-polarization radars in CASA network to provide high spatial and temporal resolution rainfall estimates. In addition, a Fourier-space, linear system-based nowcasting method was implemented to use these rainfall estimates as input to generate short-term forecasts of rainfall. Incorporating distributed hydrological models, the high resolution precipitation estimation and nowcasting results in CASA can lead to significant improvement in urban flood warnings and advisories resulting in substantial savings of life and property.

This paper first presents a brief overview of the CASA QPE and nowcasting systems. Then, potentials of the CASA dual-polarization X-band radar network in hydrological applications are focused on by analyzing the QPE and nowcasting products using the networked radar data collected in IP-1 test bed in southwestern Oklahoma. The great performance of CASA QPE and short-term QPF system in Oklahoma test bed encourages this networked radar rainfall methodology to be implemented in the populous Dallas-Fort Worth (DFW) metropolitan area for urban flash flood monitoring and mitigation. A brief description about the DFW urban demonstration network will also be given in this talk.