

High-resolution Radar-based QPE and Flash Flood Forecasting for Dallas-Fort Worth Metroplex

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Abstract. Flooding is one of the most catastrophic disasters in the world. Accurate radar-based rainfall estimation for flash flood forecasting in small, urban catchments is an important accomplishment of the National Science Foundation Engineering Research Center (NSF-ERC) for Collaborative Adaptive Sensing of the Atmosphere (CASA). Since spring 2012, CASA has been transformed from a research to operational demonstration emphasis, and has started the development of Dallas-Fort Worth (DFW) urban remote sensing network. The DFW network consists of 8 dual-polarization X-band weather radars covering most of the 6.5 million people in this region. It is expected to be an ideal development platform for quantitative precipitation estimation (QPE), quantitative precipitation forecast (QPF), and accurate hydrologic response. This paper will first present a brief overview of the current development of CASA DFW urban radar network. The QPE methodology for CASA X-band radars will then be described and evaluated in depth. The high spatial and temporal resolution CASA QPE products can serve as a reliable data input for distributed hydrological models. In this study, the Research Distributed Hydrologic Model (RDHM) developed by the National Weather Services (NWS) Office of Hydrologic Development (OHD) is used by incorporating the heat transfer (HT) dynamics with the Sacramento soil moisture accounting model (SAC) to simulate rainfall-runoff and channel routing models for routing streamflow. The prototype flash flood forecasting system under development for the City of Fort Worth that utilizes CASA rainfall products will also be presented. The CASA QPE and streamflow simulation products are evaluated using rainfall gauge and water level data obtained from the Cities of Fort Worth and Grand Prairie.