

High-Resolution Wind Retrieval in the Lower Troposphere with CASA DFW Urban Radar Network

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With the current S-band National Weather Service (NWS) Weather Surveillance Radar – 1988 Doppler (WSR-88DP) network, we can not observe the lower troposphere, where many hazardous weather events occur, due to the effect of *Earth's* curvature. In order to overcome the fundamental coverage limitations of WSR-88DP network, the National Science Foundation Engineering Research Center (NSF-ERC) for Collaborative Adaptive Sensing of the Atmosphere (CASA) has proposed a new weather sensing paradigm by deploying dense network of shorter-range, low-power X-band dual-polarization radars. The topology of CASA network allows for high-resolution observations of the first 2 km of the troposphere and also provides large areas of overlapping coverage, which is ideal for dual- and multi-Doppler retrievals. The high spatial-temporal-resolution observations and multi-disciplinary research during the Integrative Project 1 (IP1) test bed has demonstrated the viability of CASA concept.

Since 2012, CASA has initiated the efforts to create its first urban radar remote sensing network in Dallas-Fort Worth (DFW) area. Close to the “Tornado Alley”, DFW experiences a wide range of natural weather hazards such as high winds and tornadoes. Taking advantage of the dual-Doppler coverage in the CASA DFW urban radar network, a real-time dual-Doppler system has been developed to retrieve immediate low-level three-dimensional wind fields within thunderstorms. This real-time system consists of a network of short range X-band radars and a standard S-band NWS radar. This paper will present the scanning subsystem and dual-Doppler retrieval subsystem developed for DFW Metroplex. Sample radar observations at lower troposphere will be shown. The high-resolution vector wind products retrieved for several high wind and tornado events will be presented. In addition, the high wind and tornado reports from local NWS office are used to demonstrate the performance of the retrieved wind products based for CASA DFW radar network.

