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Doppler wind analysis and assimilation via 3DVAR using simulated observations of the planned CASA network and WSR-88D radars

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A new National Science Foundation Engineering Research Center, the Center for Collaborative Adaptive Sensing of the Atmosphere (CASA), was established in 2003 to develop low-cost, high spatial density and dynamically adaptive networks of Doppler radars for sensing the lower atmosphere. The first test bed to be deployed in Oklahoma named IP1-A will consist of four scanning polarimetric Doppler radars located on average 30 km apart with ranges of the same distance. The network was designed to maximize dual-Doppler wind coverage and at certain parts of the network, triple Doppler wind coverage is also available.

In this study, a three-dimensional variational (3DVAR) analysis system is adapted to perform multiple Doppler wind analysis for CASA radars, together with data available from the Oklahoma City (KTLX) and Fredrick, Oklahoma (KFRD) WSR-88D radars. The KTLX and KFRD radars provide coverage at the upper levels, and are located respectively to the northeast and southwest of and about an equal distance from the CASA network. The analyzed winds are then fed into a storm-scale numerical weather prediction (NWP) model, through intermittent assimilation cycles, at frequencies comparable to that of volume scans. The impact of the wind observations on the analysis of convective storms and the subsequent forecast will be assessed. It is also our plan to feed the analyzed winds into severe weather, such as tornado, detection algorithms and to assess the benefit of using analyzed 3D winds.

Before the actual CASA radar data are available, we test the above system using simu-

lated data, sampled from model-simulated thunderstorms. Experiments are performed in which the CASA radar data are collected using different scanning strategies, including different spatial and temporal resolutions and scanning modes, with a goal of determining the optimal scanning strategies within the current analysis and assimilation framework.