Impact and Verification of Microphysical Parameterizations on Supercell Thunderstorm Cold Pools using WRF/DART EnKF Data Assimilation Experiments

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An ongoing study is considering the ability of numerical weather prediction microphysical parameterizations to properly simulate supercell cold pools. Inaccuracies in these parameterizations have led typically to an overestimation of high-level clouds, precipitation amounts, and magnitude of evaporative cooling, which impact the evolution and strength of the supercell cold pool. Real data simulations using WRF/DART and assimilating WSR-88D and mobile radar radial velocity data onto a 1 km domain every two minutes were conducted. The EnKF technique was used in order to minimize the initial condition error and otherwise best produce the observed atmospheric state, allowing for a focus on errors attributed to bulk microphysical parameterizations.

This study investigates two cases from the Verification of the Origins of Rotation in Tornadoes Experiment 2 (VORTEX2) using two different microphysical parameterizations (Milbrandt-Yau and Morrison) to determine which of these sophisticated two moment bulk parameterizations produce the most realistic cold pools. Using in-situ observations collected during these cases it is possible to verify the supercell cold pool at a high temporal and spatial scale, allowing for detailed investigation as to why one parameterization is producing a better cold pool in a portion of the supercell. Droplet breakup and fall speed of particles seems to be a major contributor to the differences in the cold pools from the simulations. Presented will be the verification results of both cases and physical explanation as to why the Morrison parameterization is performing better in the forward flank compared to the Milbrandt-Yau parameterization. In addition, preliminary investigation and results into a multiparameter EnKF ensemble will be discussed.