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Impact of assimilation of observations into the MASS and MM5 models short-range forecast

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The use of moisture enhancement of the initial model states from radar and satellite data has been documented previously to improve short-range forecast of relative humidity and precipitation patterns. In this study two different assimilation methods were tested: the MASS synthetic relative humidity s cheme (SynRH) and the Local Analysis and Prediction System (LAPS).

The MASS SynRH allows for enhancement of the relative humidity analysis from manually digitized radar (MDR) data, satellite imagery and visual observations of clouds (surface observation). LAPS, which was developed at the NOOA Forecasting System Laboratory, produces three dimensional cloud field including all microphysical species from several sources. The LAPS analysis is used to initialize the local-scale, high-resolution model MM5. Two case studies are used to show the impact of different methods of data assimilation. In both cases three simulations using the MASS and MM5 models were used with a coarse grid (36 km) and two nested grids (12 km) and (4 km).

In this work we have employed the nudging four-dimensional data assimilation (4DDA) method with 3h update cycle in the MM5 model and the Incremental Analysis Update (IAU) technique with a nested grid (12 km) in the MASS model. The IAU uses the analysis increments as constant forcings in the model's prognostic equations over a 3-hour period finishing at the analysis time. The results show a high positive impact on the precipitation field a few hours after the analysis time.