6A.4 Sensitivity of short-term QPF to radar data assimilation and model resolution: A case study on the Great Colorado Flood of September 2013

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The unprecedented heavy precipitation and flood event that occurred along the Rocky Mountain Front Range during the week of 11-15 September claimed 10 lives and caused an estimated over $2 billion dollars in damages to private and public properties. While flash flooding in response to locally heavy rainfall in mountain canyons is not uncommon in this region, many characteristics, such as the long duration of heavy rainfall and the widespread spatial extent of flooding were exceptional. Although most operational models were able to provide useful guidance to the event, especially in a large-scale sense, they had difficulties to forecast the intense convective systems with correct timing and location. In this study, we investigate whether the rapid updated analyses through the assimilation of Doppler radar radial velocity and reflectivity can improve the short-term quantitative precipitation prediction (QPF). Our emphasis will be on the intense flood period on 11 September 2013 that presents mesoscale features through the interaction with the steep Front Range terrain. The study uses WRF (Weather Research and Forecasting) model's variational data assimilation system WRFDA that includes both 3DVar (3-Dimensional Variational) and 4DVar (4-Dimensional Variational) schemes. The impact of the radar data assimilation will be examined using both schemes and their results will be compared with each other and with a 3DVar control run that is cycled 3-hourly but without the assimilation of radar observations. Our preliminary results obtained so far have shown clear positive impact. The physical reasons that result in the improved QPF will be investigated and presented in the conference. We will also present experiments with varied model resolutions.