The Colorado Flood of 2013: Radar rainfall estimation, mesoscale wind analysis and nowcasting implications

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During the period of 9-16 September 2013, a large area of unprecedented very heavy rainfall, with local amounts exceeding 450 mm, fell over a broad region of the Colorado Front Range foothills and adjacent plains. The most intense, widespread and persistent rainfall along the Front Range occurred in a 24 hr period. Severe flooding of many regional river systems as well as localized flash flooding, landslides and debris flows claimed 10 lives and caused an estimated 2+ billion dollars in damage.

The rainfall was dominated by relatively small rain drops due to the more tropical nature of the large scale weather conditions which was in mark contrast to the typical high plains continental environment of Colorado. As a result typical continental radar rainfall rate relationships drastically underestimated the rainfall.

Operational and research polarimetric radars, surface stations and disdrometers provided excellent coverage of the event allowing for high resolution observations of the evolving fields of rain, wind and precipitation microphysics. The talk will describe a) the performance of a variety of single and dual polarization rainfall estimation relationships, b) wind analysis from the Variational Doppler Radar Analysis System (VDRAS) which shows the strong surface convergence and corresponding increased mid-level vertical motions together with upslope flow that were responsible for the heaviest rainfall, c) comparison of nowcasts by radar echo extrapolation, high resolution numerical weather forecasts (WRF) with and without radar data assimilation and implications for nowcasting.