Real-time data assimilation for tropical cyclone prediction with WRF/DART

Ryan Torn (SUNY Albany), Steven Cavallo (NCAR),
Chris Snyder (NCAR; presenting)

During the 2009 and 2010 hurricane seasons, an ensemble Kalman filter (EnKF) provided real-time analyses for high-resolution hurricane forecasts using the Weather Research and Forecasting model (WRF). The EnKF, which is based on the Data Assimilation Research Testbed (DART), employs a domain extending from the tips of Europe and Africa across the Atlantic to the California coast and assimilates conventional observations, atmospheric motion vectors and the advisory positions and intensities of all storms classified as tropical depressions or stronger. The EnKF produced credible analyses of all hurricanes in both years. The system cycled continuously (i.e., without restarting from a global analysis from an operational center) for 3 months in both years and displayed no appreciable drift, despite not assimilating satellite radiances, even over the tropical Atlantic. In addition, the analyses exhibit notably realistic vortex structures, including the vortex size and tilt with height. This vortex structure is not assumed a priori as in many other initialization schemes for hurricanes but arises naturally through the short-range forecasts used in the assimilation.