

Assimilation of Aircraft Reconnaissance Data within the NCEP operational HWRf Regional One-Way Hybrid Data Assimilation System

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NCEP operational Hurricane Weather Research and Forecast (HWRf) model is traditionally run with an advanced vortex initialization scheme developed at EMC to represent the storm location, intensity and structure based on the information provided by NHC for each storm at every 6-hr interval. Except for the initial cycle, HWRf runs in cycled mode where the 6-hr forecast vortex from previous cycle is modified/adjusted to match the observed parameters. For cold start, a composite storm is used to represent the initial vortex. Although operational HWRf uses GSI based regional data assimilation system, no inner-core observations were assimilated due to several constraints imposed by the DA system and discontinuous observations. Initial efforts in assimilating conventional and satellite datasets as well as the Tail Doppler Radar (TDR) data from NOAA-P3s near the storm's core and its environment using conventional 3DVar (GSI) system revealed negative impact on track and intensity forecasts.

The global modeling system at NCEP (GFS) was upgraded in May 2012 with more advanced EnKF/3DVAR hybrid data assimilation system within the GSI framework. This infrastructure enabled the HWRf team to experiment a more economical one-way hybrid approach to assimilate the TDR data within the HWRf modeling system in real-time. Experimental results run in real-time during the 2012 hurricane season have shown significant positive impact on intensity forecasts for the 19 P3 missions flown. Retrospective testing of assimilation of aircraft recon observations for the past five hurricane seasons (2008-2012) indicated much improved intensity forecasts from TDR only data assimilation. Based on these encouraging results, the TDR DA capability is now included into operations for the 2013 hurricane season.

This presentation will discuss the methodology, results from recon data impact experiments, and future efforts to improve the inner core data assimilation procedures in the operational HWRf modeling system.