DIRECT ASSIMILATION OF ALL-SKY SEVIRI IR10.8 RADIANCES IN TC CORE AREA USING AN ENSEMBLE-BASED DATA ASSIMILATION METHOD

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In view of the growing interests in the direct assimilation of cloud and precipitation- affected satellite radiances, the effects of hourly updated hybrid variational/ensemble data assimilation system (HVEDAS) with all-sky IR10.8 radiances collected from the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) instrument, is investigated for the developing stage of Hurricane Fred (2009). In this study, the Maximum Likelihood Ensemble Filter (MLEF) developed at Colorado State University is applied to a modified version of the NOAA's operational Hurricane WRF (HWRF, 2011) system to directly assimilate all-sky satellite observations in TC core area with 9-km horizontal grid spacing. Other NOAA codes include: (i) Gridpoint Statistical Interpolation (GSI) forward model, and (ii) Community Radiative Transfer Model (CRTM).

A data pre-processing procedure is applied to the all-sky IR10.8 to minimize the differences between model and observations. Verification against a control run and independent observations indicates a positive effect of the cloud information assimilated into the model, especially on the amount and distribution of the cloud ice water content. The case studies show that the pattern and location of the forecast clouds have been noticeably improved with cloudy IR10.8 radiance assimilation that featured clusters of convection in TC eyewall. Results imply that the higher model top, careful bias correction and quality control each play a role in shortening the period of the initial convection spinup as well as placing storms closer to observations. Some examples of all-sky radiance assimilation will be discussed.