P24   Initial assessment of the GSI-based 4D hybrid Ensemble-Variational Data Assimilation and its application for regional forecasts.

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In collaboration of the NOAA's Global Systems Division (GSD) of the Earth System Research Laboratory (ESRL), the Developmental Testbed Center (DTC) conducted initial assessment of the Gridpoint Statistical Interpolation (GSI)-based four dimensional hybrid ensemble-variational (4D Hybrid EnVar) data assimilation method. In addition to the three dimensional hybrid ensemble-variational method (3D Hybrid EnVar), which combines the static background error (BE) information from the climatology and the flow dependent background error information from the ensembles at the analysis time, the 4D hybrid EnVar method applies the ensembles at different forecast times within the analysis time window and therefore provides time-variant ensemble covariance information. This time-variant flow dependent information, together with the static BE, provides information about the background at different time levels and therefore a more accurate match between the background and the observations.

This work applied the 4D hybrid EnVar method for regional application on the 13km domain of the Rapid Refresh system at the National Center for Environmental Prediction (NCEP). Different from the operational Rapid Refresh, the continental-scale NOAA hourly-updated assimilation/modeling system, this work started with applying ensembles of three time levels (-3, 0 and +3 hours from the analysis time) in the 4D hybrid EnVar method and compared the GSI analysis and WRF forecasts with the other two sets of experiments: 1) three dimensional variational (3DVAR) data assimilation; and 2) 3D hybrid EnVar data assimilation. Diagnostics are produced to examine the performance of the 4D hybrid EnVar method and initial assessments of its impact on regional forecasts will be presented.