Impact of flow dependency in deterministic analysis and forecast

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Abstract:

Variational methods used in operational data assimilation systems are moving from static, climatological representation of the background error covariance to day-to-day varying ensemble-based flow-dependent errors. The National Center for Medium Range Weather Forecasting (NCMRWF) NCMRWF adapted UK Met Office's Unified Model and its Hybrid 4D-Var data assimilation system, which is a combination of 4D-Var and Ensemble Transform Kalman Filter (ETKF). NCMRWF operationally runs an ensemble prediction system (NEPS) based on NCMRWF's Unified Model (NCUM). NCUM combines the climatological errors with the flow dependent errors from 23 members of NEPS. In this an attempt has been made to quantify the impact of flow dependent background errors in the NCUM analysis and forecast fields. Two model configurations, the existing NCUM operational data assimilation system (Hybrid 4D-Var) is considered as the experiment run and the other one which includes only the climatological background errors is considered as the control run. Global atmospheric analysis is produced at 00, 06, 12 and 18 UTC from 20 -31 January 2020 and 5- day forecasts are generated based on 00 UTC initial condition of each day. Impact of flow dependent errors in the analysis increment, analysis and forecast of mass and wind fields are analyzed. Analysis increments produce a moist, cool and calm atmosphere in the experiment run compared to the control, due to the flow dependent background errors.