Development of Central Weather Bureau Octahedral reduced Gaussian grid Global Forecast System

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Abstract

Since 2018, Central Weather Bureau devoted to develop the next generation high resolution model so called CWBGFS $T_{Co}639L72$. We already upgraded the model dynamic core to Semi-Lagrangian by using Non-iteration Dimensional-split Semi-Lagrangian (NDSL) method and applied Octahedral reduced Gaussian grid as the grid system. This is not only reducing the utilization of computational resource, but also providing more stable results. $T_{Co}639L72$ had been selected to be the operational global forecast model with off-line run (the initial condition is provided by T511L60) in early 2020. However, we still working on model improvement and development of data assimilation system to make global forecast system more complete.

The first thing we try to do is replaced orographic gravity wave drag scheme Palmer (1986) by Kim and Arakawa (1995) to consider mountain blocking effect. The second one is tuning the critical relative humidity (RHc) and autoconversion of ice to snow, because model is too dry at low level and too wet over tropopause. The result of one month free run experiment shows that these two changes have significant positive impact on anomaly correlation coefficient (ACC) and root mean square error (RMSE) of all variables. Furthermore, we already build up update cycle process of $T_{Co}639L72$ by using GSI 3DVar based hybrid ensemble-variational data assimilation system, which developed by National Centers for Environmental Prediction (NCEP), but still need some tuning for better performance. The purpose of using our own data assimilation system for $T_{Co}639L72$ is to provide the most suitable initial condition and then improve the accuracy for numerical weather prediction. The evaluation of the next generation CWBGFS $T_{Co}639L72$ will be provided.

Keywords: Global Forecast System, Octahedral reduced Gaussian grid, Semi-Lagrangian, Gridpoint Statistical Interpolation (GSI)