Characteristics of Initial perturbation growth rate in the regional ensemble prediction system of GRAPES

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Abstract

Based on GRAPES-REPS (Global and Regional Assimilation and Prediction Enhanced System-Regional Ensemble Prediction System) model and ETKF (Ensemble Transform Kalman Filter) initial perturbation method, The ensemble forecast experiments of 10km and 15km horizontal resolution model are conducted from 1 to 15 JUN 2015, By analyzing ETKF characteristics of initial perturbation components、variance accuracy、kinetic energy spectrum、perturbation energy evolution、daily variation and ensemble spread、root mean square error, We reveal characteristics of initial perturbation structures and its growth rate in the regional ensemble prediction system of GRAPES-REPS. The preliminary experimental results indicate: 1) ETKF initial ensemble perturbations maintain the even distribution to the orthogonal and uncorrelated ensemble directions, And meanwhile parameter values and inflation factor of ETKF component have well stability. 2) The perturbation field derived from ETKF initial perturbation schemes is mainly large-scale with a flow dependent structure, The internal perturbation energy and the kinetic perturbation energy are the prevailing perturbation energy in low and high levels, respectively. In addition, the ensemble perturbation can effectively capture the structure of forecast error. 3)The total energy of initial perturbations and ensemble spread can keep appropriate growth rate in all forecast lead times, However, The growth rate of ensemble spread is lower than that of root mean square error, In conclusion, There exits problems of insufficient ensemble spread. 4) The increase of horizontal resolution can increase the large-scale perturbation spectrum energy of mid and high levels, It can also attribute to improve ensemble forecast results of isobaric and near surface elements, such as temperature and wind. It is worth pointing out that the internal perturbation energy in low levels of GRAPES-REPS exits obvious diurnal variation characteristics, especially centered on Qinghai Tibet Plateau, The needs for further exploring the rationality of initial perturbation structure in Qinghai Tibet Plateau remain.