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The 45 Days CWBGFS Ensemble Prediction System Based on Singular Vectors

The Taiwan Central Weather Bureau global forecast system (CWBGFS) has provided 45 days 20 ensemble member prediction on resolution T319L60 model since 1 July 2017. The ensemble perturbations are given by singular vectors which are calculated from northern and southern hemisphere (20N/S~80N/S) domain total energy norm separately. Moreover, the Stochastically Perturbed Parameterization Tendency (SPPT) process is added in this ensemble prediction system from 19 July 2018. Next, the proper amplitude of initial perturbations are testing and more tropical domain singular vectors are considering in this system for fulfilling the week 3-4 forecast around Taiwan area.

The initial singular vector perturbation structures are similar to ECMWF's perturbation structures. The perturbations always are located in jet entrance areas and the perturbations easily get the mean flow energy to grow. Somehow this process will change the cyclone genesis patterns and the storm track positions. So, the ensemble members have the significant spread and the different behaviors with deterministic forecast. So far, the spread of CWBGFS ensemble prediction system are similar to ECMWF's result, but the root mean square errors are even bigger. This implies the spreads may be not enough. On the one hand, the key issue is that we should improve CWBGFS model, and on the other hand the composition of ensemble perturbation and other methods like the SPPT processes should be considered. The composition of the different singular vectors to cover the horizontal domain homogeneously or making the tropical singular vector and extratropical singular vector work well is the next step important job.

The preliminary downscaling analysis is achieved for long term week 3-4 downtown specific area prediction. The long term ensemble prediction system seems to catch the significant circulation pattern changing like cold surge or low frequency pattern. The novel downscaling methods are studying such as machine learning or neural network for expanding the usage of the ensemble prediction system.

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