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Experiments with EOF-Based Perturbation Methods and Their Impact on the CPTEC/INPE Ensemble Prediction System

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ABSTRACT

The impact of modifications of the perturbation method based on empirical orthogonal functions (EOFs) used operationally upon the ensemble prediction system (EPS) at the Center for Weather Prediction and Climate Studies/National Institute for Space Research (CPTEC/INPE) is evaluated. The main changes proposed in this study are to apply the EOF method to perturb the midlatitudes, apply additional perturbations to the surface pressure (P) and specific humidity (Q) fields, and compute regional perturbations over South America. The impact of these modifications in the characteristics of the initial perturbations and in the quality of the EPS forecasts is investigated. The EPS forecasts are evaluated through average statistical scores over the period 15 December 2004–15 February 2005. The statistical scores used in the evaluation are pattern anomaly correlation, root-mean-square error, ensemble spread, Brier skill score, and perturbation versus error correlation analysis (PECA). Results indicate that with the inclusion of perturbations on P and Q , EOF-based perturbations acquire a more baroclinic structure. It is also observed that the simultaneous application of additional perturbations both in the extratropics and to the P and Q fields improves the performance of CPTEC EPS and enhances the quality of forecast perturbations. Moreover, regional EOF-based perturbations computed over South America have positive impact on the ensemble forecasts over the target region.