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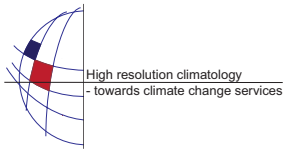

Evolution of the Canadian regional ensemble prediction system

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A regional ensemble prediction system (REPS) over North America is expected to become operational at the Canadian Meteorological Centre (CMC) in late 2010 or early 2011.

Different configurations of the REPS have already been tested and verified at different locations and time periods. The system was used during the Beijing 2008 summer Olympics and for the North American domain with a focus over southern British Columbia, Canada, during the 2010 Vancouver Olympics. It will also provide forecasts for tropical storms and hurricanes for the Haïti area during the summer and autumn of 2010.

The Canadian Global Environmental Multiscale (GEM) model has been designed with the possibility to be run as a limited area model (GEM-LAM). The Canadian REPS is composed of 20 members running the GEM-LAM at a near 33 km grid spacing and with the same physical parameterizations as those present in the operational global deterministic prediction system at CMC.

Two initial perturbation strategies (moist targeted singular vectors [SV] and the ensemble Kalman filter [EnKF]), as well as two stochastic methods for perturbations of parameterizations were verified against surface and upper air (rawinsondes) observations during summer and winter periods to determine which system has the best forecast abilities.

For the SV-based REPS, 20 initial conditions (IC) are generated using a targeted SV perturbation method. These ICs are then used to run 20 global GEMs that will provide the lateral boundary conditions (LBCs) for each GEM-LAM.

For the EnKF-based REPS, the 20 LBCs are built by downscaling the 20 members of the Canadian global ensemble prediction system (GEPS) to the resolution of the REPS.

Verifications indicate that the EnKF approach gives better skill for summer and winter periods. The skill difference between the two systems comes mainly from the reliability attribute (smaller bias and reduced under-dispersion).

Stochastic perturbations on model physical tendencies and on physical parameters were both tested. These two perturbation methods show a significant improvement in the reliability skill but tend to slightly degrade the resolution. Nevertheless, both systems show an overall improvement in the skill. The physical tendencies perturbation method showed the best scores and was chosen.

Research to improve the system using surface parameter perturbations is presently ongoing. Initial results show improved skill for surface during the summer season when perturbations are done on fields related to the land surface scheme such as the albedo, soil temperature and moisture.