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NCEP's Multi-scale Eulerian NMMB model

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The work on the unified Non-hydrostatic Multi-scale Model (NMMB) has continued at NCEP. The model dynamics preserve a number of important properties of differential operators and conserve a variety of basic and derived first order and quadratic quantities. Conservation of energy and enstrophy in case of nondivergent flow improves the accuracy of nonlinear dynamics. The formulation of the nonhydrostatic dynamics avoids overspecification of the vertical velocity. The global version is run on the latitude-longitude grid, and the regional version uses rotated latitude-longitude grid in order to reduce variation of the grid size. On the global scales, polar filter selectively slows down the waves that would otherwise be unstable. The physical package was developed from the WRF NMM's physics. The NCEP's Global Forecasting System (GFS) physics is also available.

The regional version is run operationally as the main deterministic North American short-range forecasting model and in a number of other applications. The global NMMB also has been run over the last few years experimentally in order to assess its capabilities and develop it further. Generally, the performance of the global NMMB in medium range weather forecasting has been comparable to that of other major medium range forecasting systems, and its computational efficiency satisfies and exceeds the current and projected operational requirements.

The recent developmental effort has been focused on the improvement of interaction between clouds and radiation. With the new approach, the clouds are represented directly by optical properties of their microphysics species, and not by bulk cloud properties derived from cloud cover estimated using empirical formulas. Initial difficulties encountered with the ice phase showed sensitivity to the choice of the microphysics scheme and have been largely resolved.

A number of initial data conversion algorithms, resolution settings and physical parameterization sensitivity studies have been carried out as well. The latest results will be presented and discussed.