Real-time Mesoscale Ensemble Forecasting in the Pacific Northwest

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In January 2000, short range ensemble forecasts (SREF) were added to the suite of products produced in the Pacific Northwest MM5 Mesoscale Numerical Forecast system at the University of Washington. The consortium of local, state and federal agencies that is supporting this weather forecasting system wishes to explore: whether or not mesoscale ensembles are of value in regions of large orographic influence and weak convection, the skill of the ensemble mean versus individual ensemble members, the meaning of the ensemble spread, and the utility of the ensembles in producing probabilistic forecasts.

At present, the ensemble system consists of five members and the ensemble mean. Each of the members is using the same 36 and 12 km domains (figure 1) and MM5 configuration

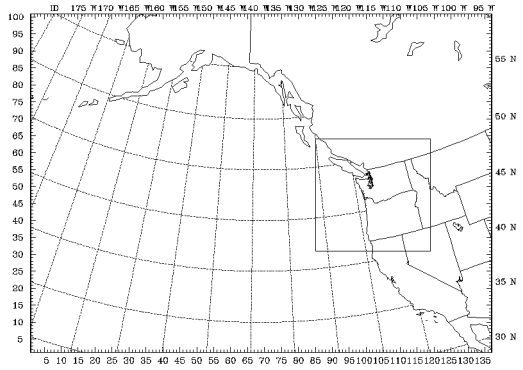

Figure 1

as the Northwest real-time MM5. Forecasts out to 48 hours are generated with the 00 UTC forecast cycle using initial and boundary conditions from the NGM, ETA, and AVN models from NCEP, the Global Environmental Multiscale model from the Canadian Meteorological Center (CMCGEM), and the Navy Operational Global Atmospheric Prediction System (NOGAPS) model from the Fleet Numerical Meteorology and Oceanography Center (FNMOC). Variations in data assimilation techniques and data cutoff times result in variable initializations, and model differences generate varying boundary conditions for these ensemble runs.

Output from the ensemble members is posted on the Web in real time (see URL above). Graphical output for each member and the mean includes horizontal plots at standard levels of common variables, such as sea-level pressure with near-surface winds, three-hour precipitation, 500 mb heights and vorticity, and 850 mb temperatures. Horizontal plots of the ensemble mean overlaid with the standard deviation of the ensemble are produced for similar fields over both domains. Additionally, summary graphs are generated of the spread of the ensemble members over each domain.

Verification statistics of the performance of the ensemble members for January through the present are also posted on the Web. Statistics for two-meter temperature, vector wind difference, and sea-level pressure are calculated at observation locations throughout the 12 km domain (point verification) rather than model grid points (analysis verification). Results, so far, indicate that the long-term ensemble mean root mean square (RMS) errors are lower than the individual ensemble members for surface winds, while the RMS scores for the other fields are not significantly improved.

Evaluation of the mesoscale SREF system continues on a daily basis with future work focused on adding members that have differing physics and moisture parameterizations. Additionally, we will be assessing the ability of the ensemble to capture the forecast variability.