Development and Verification of a Sub-Regional WRF Ensemble for Lake Effect Snow Forecasting

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The causes of lake effect snow (LES) bands are widely known and understood. Regional models are capable of forecasting the conditions conducive to the formation of LES bands. However, the details related to the timing of heavy snow and the locations most likely to receive heavy snow are often elusive. In an attempt to improve LES band forecasts downwind of Lakes Erie and Ontario, a regional ensemble forecast system has been developed using the workstation Weather Research and Forecast Environmental Modeling System (WRF-EMS) at National Weather Service forecast offices surrounding the eastern Great Lakes. The WRF members are set up over a common domain with varied model cores, model physics, and initial conditions to create a diverse set of ensemble forecasts that will provide forecasters with probabilistic LES band guidance, allowing for a measure of forecast confidence in addition to most/least likely outcomes.

All members are run with a 12-km horizontal grid spacing for 24 hours over a domain intended to capture not only Lakes Erie and Ontario, but also the potential upstream influence of Lake Huron to the west. One advantage of running the WRF locally is that hourly output is accessible by forecasters, whereas the operational guidance produced by the National Centers for Environmental Prediction is only available in 3-hour increments. This facilitates the examination of hourly data and the ability to ensemble hourly forecasts to time the onset and identify areas expected to be impacted by LES bands. Locally generated operational products include hourly accumulated precipitation and the probability of exceeding discrete precipitation accumulation thresholds in 1, 3, 6, 12, and 24 hour increments.

In this presentation, output from the ensemble will be examined for the LES event of 10 February 2008. It will be shown that particular members of the ensemble exhibited a significant southward bias of the forecast LES band position, consistent with previous research. Reasoning for this bias, as well as implications for using such forecasts in an ensemble framework, will also be discussed.