FORECASTING THE INLAND EXTENT OF LAKE EFFECT SNOW BANDS DOWNWIND OF LAKE ONTARIO

ABSTRACT

Determining the inland extent (IE) of lake effect snow (LES) is an ongoing operational forecasting challenge at the Albany (ALY) and Binghamton (BGM) National Weather Service (NWS) forecast offices, and several other NWS forecast offices in the Great Lakes region. Assuming favorable conditions for development of LES, determining how far inland snow bands will extend is critical to forecasters making decisions supporting the NWS watch/warning/advisory program and resulting Impact-based Decision Support Services (IDSS; Uccellini 2015).

This research sought to identify which atmospheric parameters commonly have the greatest influence on how far inland LES bands travel, and develop forecasting techniques to assist meteorologists. Single band LES events from the 2006-2009 winter seasons were examined downwind of Lake Ontario. The inland extent (IE) of LES bands was measured over the duration of each event and broken into quartiles. The quartiles were used to create categories for IE (short, moderate, and long). Several parameters were analyzed, using statistical correlations at data points within, and just outside of LES bands. Box-and-whisker plots were constructed for individual parameters relative to each IE category.

The most strongly correlated parameters to IE included existence of a multi-lake/upstream moisture source connection (MLC), mixed-layer (ML) stability (represented by lake-air temperature differentials), 0-1 km bulk shear, and mean ML wind speed. LES bands featuring a MLC showed a greater tendency to progress farther inland, compared to those without. A predictive equation for forecasting IE of LES downwind of Lake Ontario was developed using a Principle Component Analysis (PCA) and multiple linear regression.