**Final Appraisal: Evaluating the accuracy of forecaster and model predictions of snowfall in eastern New York and western New England using a GIS application**

*Joseph P. Villani1, Michael S. Evans1, Vasil T. Koleci1, and Charles Gant2*

*1NOAA/NWS/WFO Albany, New York*

*2NOAA/NWS WFO Morristown, Tennessee*

A collaborative project between the National Weather Service Forecast offices in Albany, New York and Morristown, Tennessee resulted in the development of a GIS-based application that produces high-resolution analyses of snowfall observations, and calculates errors and biases of corresponding gridded snowfall forecasts based on the analyses. Analyses are created from a blend of local WFO observations and the National Operational Hydrologic Remote Sensing Center (NOHRSC). This presentation summarizes the verification results combined from three winter seasons (2017-18, 2018-19 and 2019-20), examining topographical influences on patterns of observed snowfall and the accuracy and biases of various corresponding snowfall forecasts.

Patterns of observed snowfall and their relation to topography were examined by collecting data from three years of snowfall events across eastern New York and western New England. A detailed snowfall analysis was performed for each event. Composites of snowfall patterns were used to identify relationships between snowfall and various terrain features such as the Catskill and Green Mountains, and the Hudson and Mohawk Valleys. Orographic ratios were calculated for each event to quantify the impact of elevation on snowfall. Observations and short-range model forecasts of environmental characteristics such as wind, temperature and stability were utilized to determine how these factors affect the topography’s impact on snowfall distribution.

Snowfall observations from our detailed analyses were compared to short-range forecasts of snow depth change from the 3 km NAM and HRRR, and snowfall from the National Weather Service’s National Digital Forecast DataBase, to determine how well these forecasts account for terrain effects. Forecast errors were related to wind, temperature and stability to see whether these factors had an impact on the overall quality of the forecasts, as well as the forecasts ability to account for the effects of terrain. Results showed a consistent negative bias (forecast too low) for both the HRRR and 3km NAM, although placement and magnitude of forecast errors varied based on different environmental characteristics. NDFD forecasts displayed a mix of positive and negative bias, but with lower magnitudes compared to the high-resolution model guidance.