Improving Numerical Modeling of Winter Storms: Investigation of the October 2009 Red Lake Snow Event

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ABSTRACT

Winter storms in the upper Midwest, both large-scale and more localized, affect people every year. Lake effect snow is an important feature that cannot be overlooked regarding these winter storms, especially with the large amount of lakes in northern Minnesota and eastern North Dakota, but forecasting these small-scale lake effect snow events can be quite difficult. High resolution numerical modeling was used to investigate a small-scale lake effect snow event that occurred downwind of Red Lake in Minnesota on October 12th, 2009. The event was simulated with the Weather Research and Forecasting (WRF) model with lateral forcing from the NWS NAM forecast. The snow event was shown to be resolved in simulations with 4-km horizontal resolution. Further, four microphysical parameterizations and six initialization times were tested to understand the sensitivity of the snow event to these parameters. In the microphysical parameterization test runs, the simulations using the Goddard microphysical scheme and the Morrison microphysical scheme most closely matched observations based on the amount and location of the precipitation. To test initialization times, simulation start times varied between 11 October 2009 at 06:00:00Z and 12 October at 12:00:00Z, at increments of 6 hours. The model simulation initialized at 18:00:00Z on October 11th more closely matched observations than simulations initialized at other times. Much can be gained from these model simulations in regards to forecasting small-scale lake effect snow events in the upper Midwest, yet further model simulations with higher horizontal resolution would be crucial in gaining a better understanding of this event and to help meteorologists forecast future events like the Red Lake snow event.