The formation of multiple prefrontal squall lines and the impact of NEXRAD radial winds in a WRF simulation

H. Karan (1), P. Fitzpatrick (1), C.M. Hill (1), Y. Li (1), Q. Xiao (2), E. Lim (2), and J. Sun (2)

(1) Geosystems Research Institute, Mississippi State University, Stennis Space Center, MS, 39532, USA, (2) National Center for Atmospheric Research, Boulder, CO, 80307-3000, USA

A detailed analysis of convective initiations associated with a primary squall line and a secondary squall line, which formed ahead of the primary squall line, is presented. The impact of the assimilation of radial wind data from multiple WSR-88D sites in a squall line simulation is examined. Two different convective initiation mechanisms contributed to the formations of the two squall lines: the excitation of small gravity waves by an apparent atmospheric bore emanating from the cold front, and lower tropospheric trough, respectively. The Weather Research Forecasting model (WRF) and its three-dimensional data assimilation system (3DVAR) are used to determine the qualitative and quantitative differences in assimilating Global Telecommunication System (GTS) data , Soil Climate Analysis Network (SCAN) data, and radial wind data from nine WSR-88D sites. The assimilation/forecast cycling experiment using NEXRAD data on a 3-hourly basis, along with GTS and SCAN data, captures smaller scale features embedded in the squall line system. Additionally, the assimilation of NEXRAD data also improves the timing and positioning of the convective initiation of the secondary squall line.