Constraining Storm-Scale Ensemble Forecasts of Convective Initiation with Dense Surface Observations

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Efforts to increase forecast accuracy and lead-time for convective storms are hampered by an inability to adequately capture storm-scale processes that lead to convective initiation (CI). The potential contributions of dense networks of standard surface observations to this problem will be discussed. A series of idealized simulations of 21 environments where CI can occur due to boundary-layer processes alone are performed to isolate storm-scale CI processes from larger meso- or synoptic-scale forcing. Ensemble simulations of CI in these environments are examined to identify common features in standard surface fields prior to CI. The horizontal scales and magnitudes of these features as well as correlation length scales throughout the CI process suggest surface observation densities of less than 4 km between observations could capture the observed features. Observing system simulation experiments (OSSEs) are performed with simulations of one of these environments. In these OSSEs, skillful storm-scale forecasts of CI are possible when simulated observations from a sufficiently dense surface observing network are assimilated. However, skill is only possible in forecasts initiated within one hour prior to the onset of precipitation in the developing storms. Additional aspects of convective-scale data assimilation are considered, particularly with regard to maintaining adequate ensemble spread and the structure of the assimilation increments. Finally, we briefly consider one candidate dense surface observation network---smartphone pressure observations---to assess the quality of these observations and their utility for this problem.

This seminar will be webcast live at:
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Thursday, 1 December 2016, 3:30 PM
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