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# Updated analysis of nocturnal convection initiation using convective-scale data assimilation of observations collected during PECAN

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Nocturnal convection initiation (CI) processes differ from daytime CI owing to stabilization of the boundary layer; thus, nocturnal convection is generally assumed to be elevated in nature. This research explores improvements in mesoscale details of the environments and triggering mechanisms associated with nocturnal CI that occurred during the Plains Elevated Convection at Night (PECAN) experiment, which took place during Jun-Jul of 2015 on the U.S. central plains. During one event, CI was observed with mobile radars, sondes, profilers, aircraft, and mesonets on 24 June 2015 in eastern Nebraska, in which southerly Gulf of Mexico flow, aided by a moderate low level jet, was lifted along a warm front located in northern Kansas. The goal of this project is to provide the most detailed set of four-dimensional gridded kinematic and thermodynamic analyses possible for examination of processes triggering nocturnal CI, including localized details of the stability and shear in the surrounding environment. Preliminary results from this work were presented at the 2017 European Severe Storms Conference. Since that time, efforts have been revised to account for errors in the initialization and maintenance of ensemble spread in our analyses, correcting possible suboptimal treatment of observations. This presentation advances previous results by assessing the impact of high-density research instrument arrays upon the mesoscale environment and numerical analyses of convection initiation.

Assimilation of routine surface, sounding, and commercial aircraft observations produce convection that most closely resembles the observed storms. Assimilation of the PECAN sounding array tended to over-produce convection in most ensemble members, especially when their prescribed observation error is decreased. This appears to be a result of increased low- through mid-level moisture when soundings are assimilated. Convection in these ensembles is at least clustered in realistic geographical locations. However, assimilation of the PECAN vertical profiler network tended to produce convection along the entire span of the warm front, even where it is not observed. This is a result of heavily increased horizontal convergence along the leading edge of the low level jet, which eagerly triggers CI. Assimilation of large quantities of radar radial velocity data produced spurious convection associated with erroneous bands of horizontal convergence, disrupting the realistic structure of the main CI triggering mechanism. Parcel trajectory analysis will further illustrate mesoscale differences among the ensembles and physical mechanisms dictating the location and timing of nocturnal CI.