Method and progress to improve predictions of convective storm initiation in the 1-6 hour timeframe

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Despite extensive previous research on nowcasting convective storm initiation (CI) the key factors involved in the CI process are not well understood, making for the 1-6 hour forecasting of CI very challenging on space and time scales of interest for societal needs (10's of km, 30 min). CI is defined as a ≥35 dBZ intensity radar echo at the surface or at the –10° C level. Forecasting of thunderstorms in such short timeframes by numerical weather prediction models often suffers due to model "spin-up," forcing a heavy reliance on extrapolation of real-time observations. Yet, the >1-6 h timeframe is beyond when extrapolation techniques typically work well for predicting thunderstorm development. Previous studies have indicated that the CI process is a combined interaction of the mesoscale and synoptic scale settings, mesoscale processes, as well as land-surface processes and orography that dictate boundary layer formation and local convergent circulations and moisture distributions. Through use of a training database of CI and non-CI events, operated on by a number of machine learning statistical methods, an algorithm that provides 65-70% skill in forecasting CI has been developed. Other work on the assimilation of GOES-R CI fields into the High Resolution Rapid Refresh (HRRR) model will also be discussed. The outcome of this project will include both a 30-min update ~5 km resolution gridded product that provide significantly improved prediction accuracy for CI within the 1-4 h timeframe, along with improved HRRR model forecasts of convective storms. Plans are to demonstrate the 1-4 hour probabilistic and gridded CI forecasts to National Weather Service forecasters, using existing collaboration with NASA's Short-term Prediction Research and Transition (SPoRT) Center.