NCAR Research on Thunderstorm Analysis & Nowcasting

James Pinto & Wiebke Deierling
Lead Project Scientists
NCAR / Research Applications Laboratory

Disclaimer: This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.
Research in Thunderstorm Prediction at NCAR

- Lightning Detection and Nowcasting
- Predicting initiation of large convective storms
  - High Resolution Ensemble Post-processing
  - Data Fusion Techniques
Lightning Detection Uncertainties

“Lightning Truth Field” from Colorado Lightning Mapping Array (LMA) recently installed by New Mexico Tech University
Probabilistic Lightning Nowcasts

Nowcast utilizes WSR-88D radar data to monitor radar reflectivity characteristics above the freezing level.

Valid 30 min into future

Forecasts lightning in cores, anvil, initiation and mature phases of convection.
Storm Initiation Prediction

- 2 hour movie of obs VIL satellite imagery shows rapid storm initiation and growth to over 100 km in length over Iowa

- 2 hour loop for extrapolation forecast does well with existing storms
- But, does not give indication of new storm formation.....
High Resolution Ensemble Model
Post-processing for CI Prediction

NOAA/GSD HRRR forecasts from different issue times valid at 22:00 UTC

12:00 utc
16:00 utc
17:00 utc
18:00 utc
19:00 utc
20:00 utc

HRRR Ensemble Storm Initiation Likelihood and Extrapolation Forecasts

CI Likelihood
Moderate
High
Valid 22:00 utc
Data Fusion to Predict Storm Initiation

Satellite Trends

Terrain

HRRR CAPE

HRRR DPT

HRRR RH / PSLV

Statistical Data Mining using Decision Trees
Summary Points

• Be aware that there are uncertainties in observations and nowcasts.

• Focus of work in RAL on quantifying uncertainty in short term prediction of convection and its characteristics
Extras
Conveying Uncertainty

- **Confidence** is generally described as the level of certainty that a hypothesis or prediction is correct.

  Statistical definition – “The **Confidence Interval** provides a range of values that bracket the mean outcome at a given level of certainty.”

- **Probability** is the likelihood that an uncertain event will occur.

  P(7) = 16% -> 0.1-0.2” in 3 hr period