



NCAR

# NCAR Research on Thunderstorm Analysis & Nowcasting

James Pinto & Wiebke Deierling

Lead Project Scientists

NCAR / Research Applications Laboratory

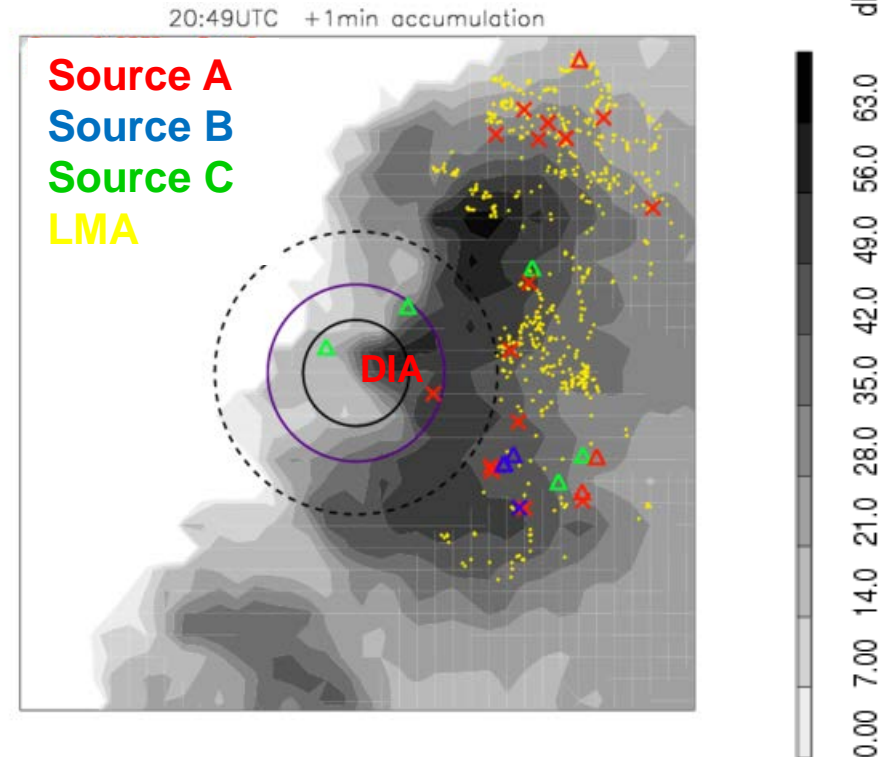
Disclaimer: This research is in response to requirements and funding by the Federal Aviation Administration (FAA). The views expressed are those of the authors and do not necessarily represent the official policy or position of the FAA.

# 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



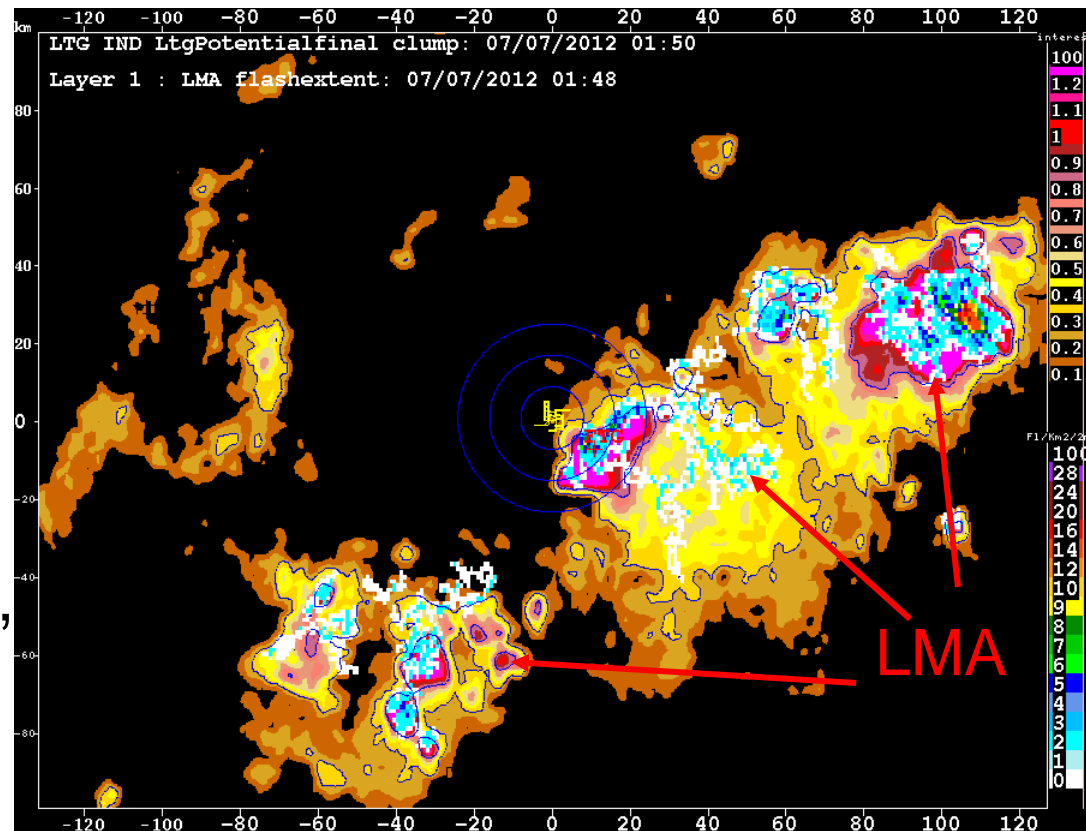
“Lightning Truth Field” from Colorado Lightning Mapping Array (LMA) recently installed by New Mexico Tech University

# Probabilistic Lightning Nowcasts

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

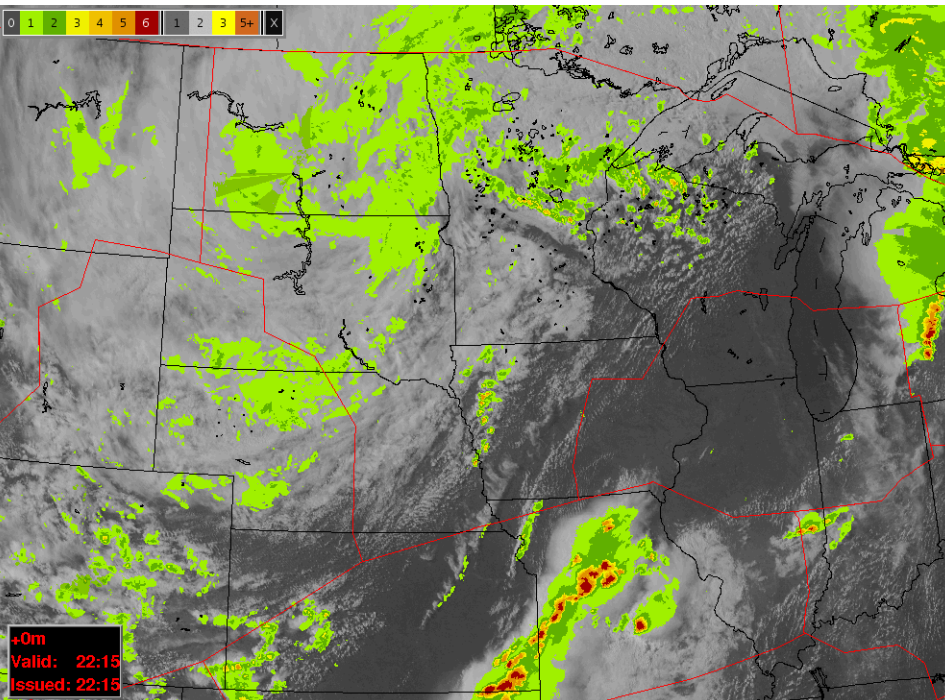
Valid 30 min into future

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

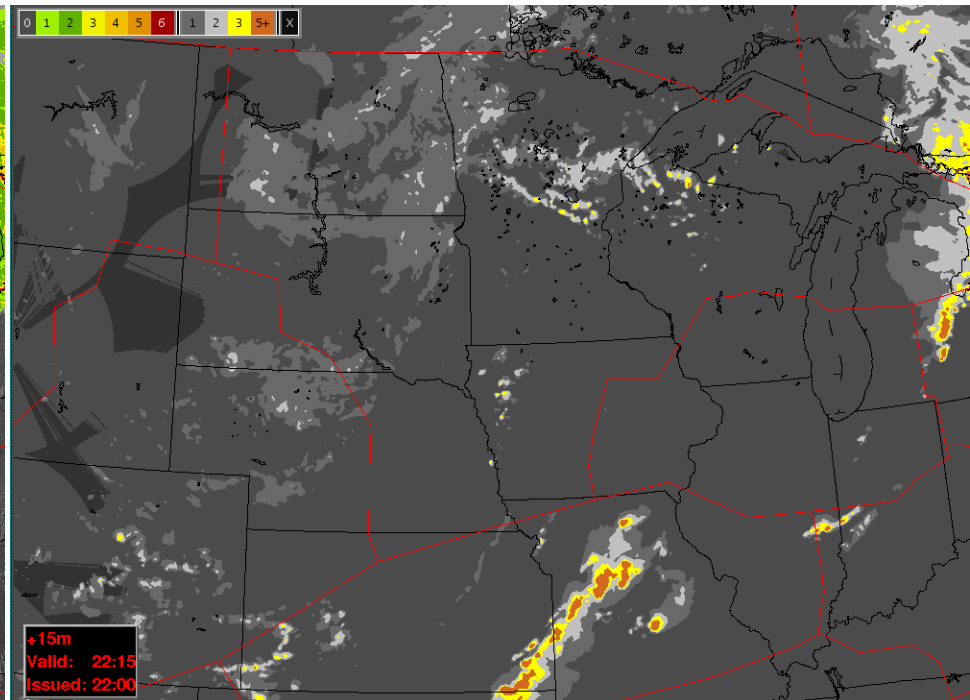


# Storm Initiation Prediction

Satellite and VIL from MIT-LL CIWS



MIT-LL CIWS Extrapolation Forecast



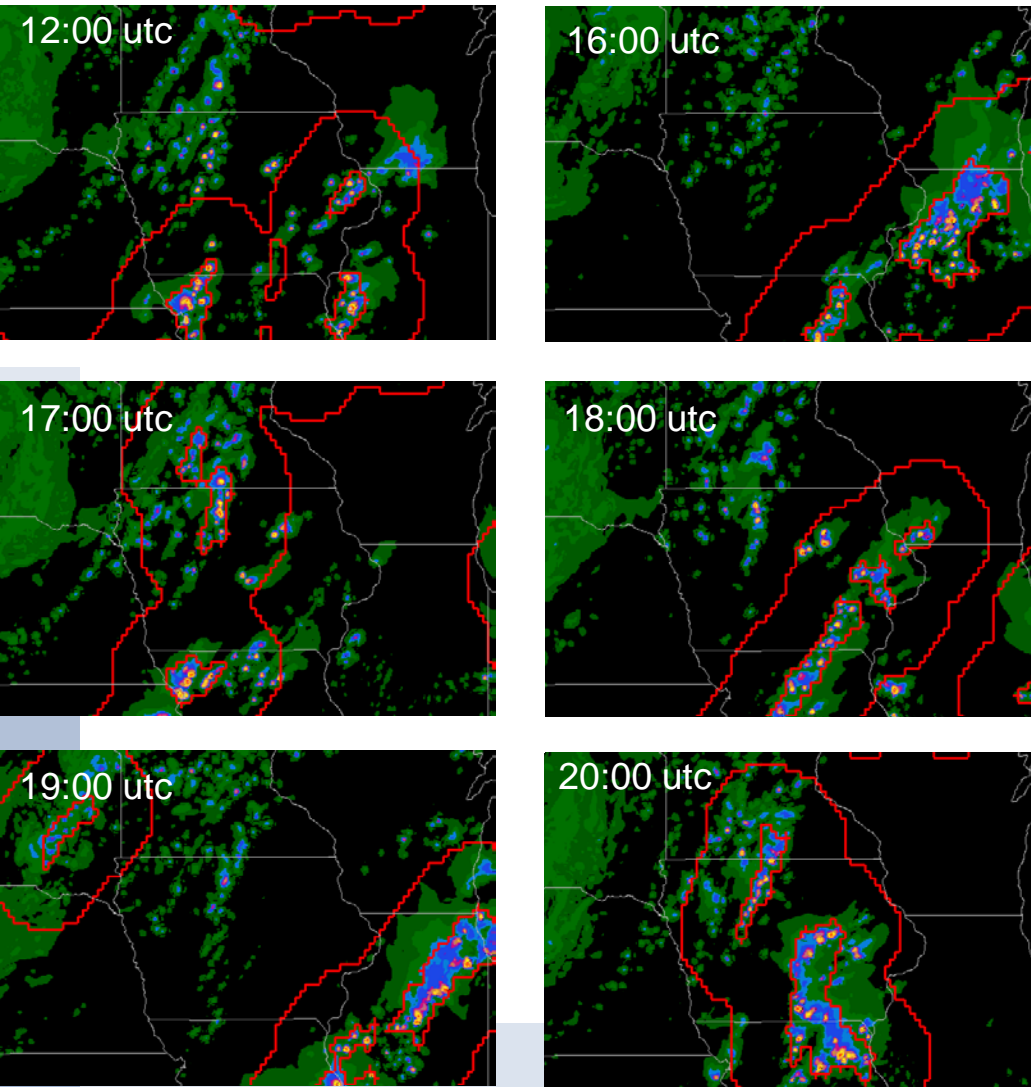
- 2 hour movie of obs VIL satellite imagery shows rapid storm initiation and growth to over 100 km in length over Iowa
- 2 hour loop for extrapolation forecast does well with existing storms
- But, does not give indication of new storm formation.....

# High Resolution Ensemble Model Post-processing for CI Prediction

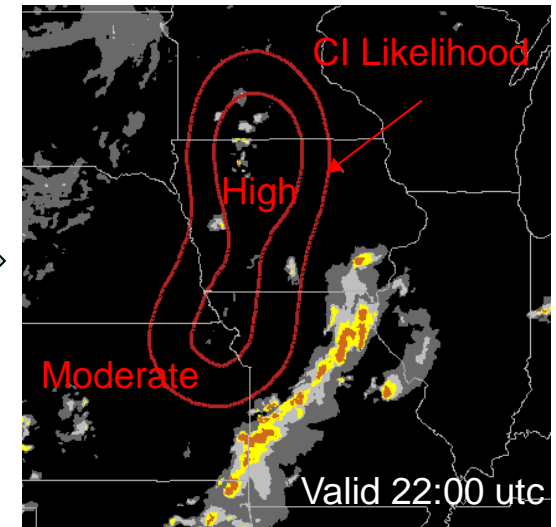


NCAR

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

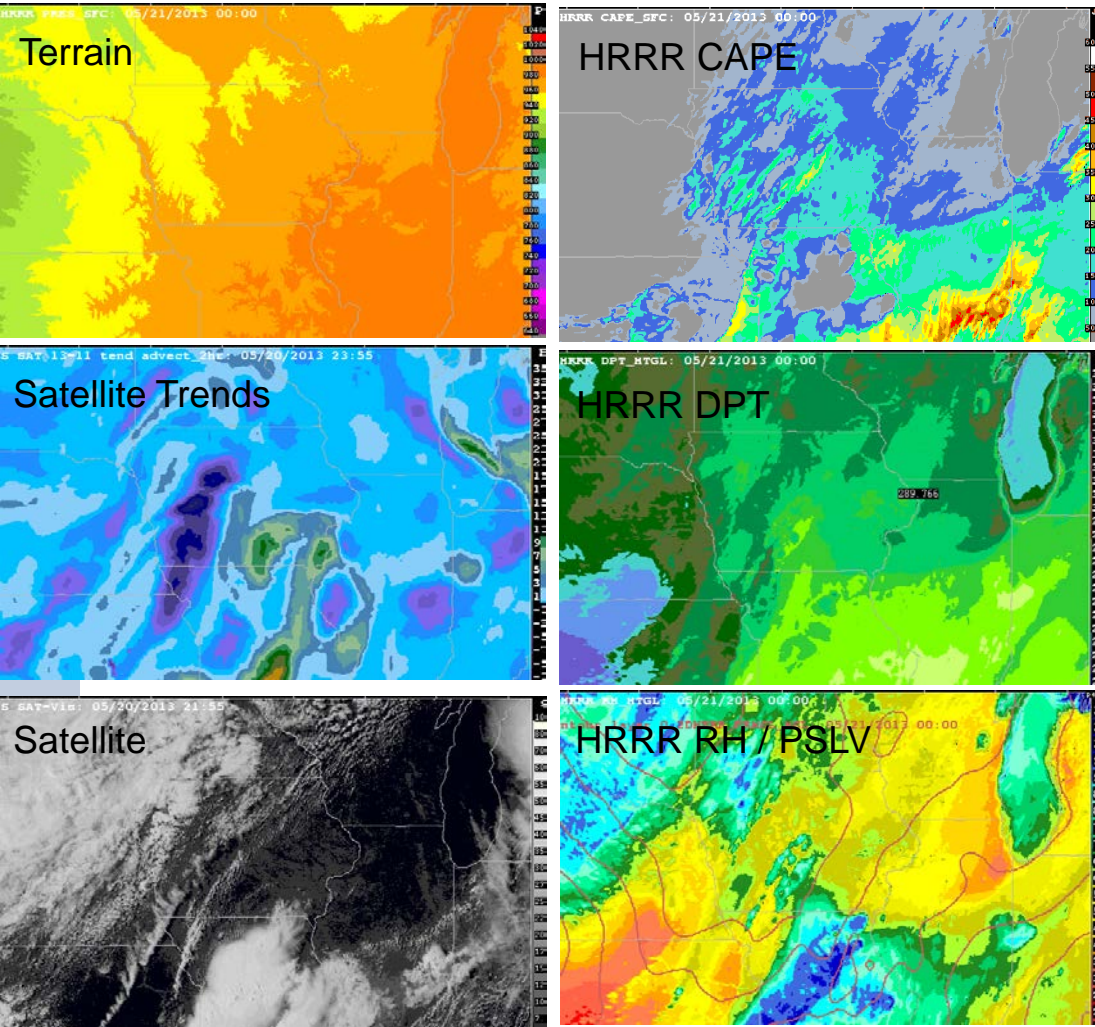


HRRR Ensemble Storm  
Initiation Likelihood and  
Extrapolation Forecasts

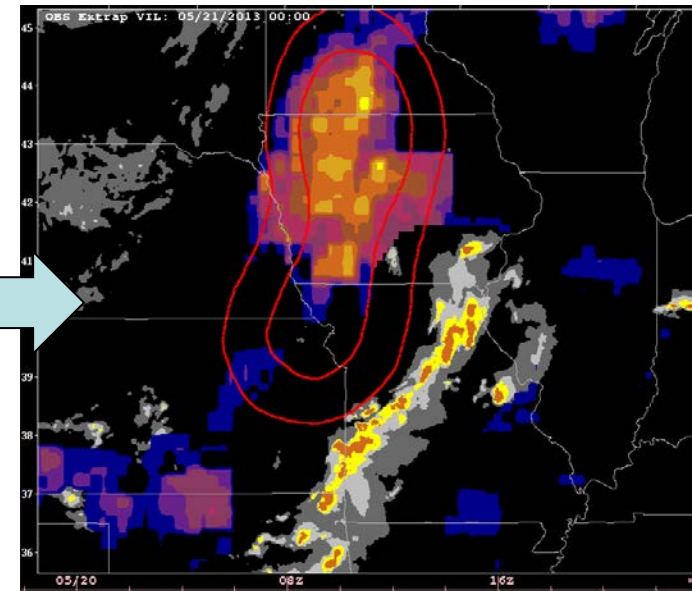


# Data Fusion to Predict Storm Initiation

NCAR



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

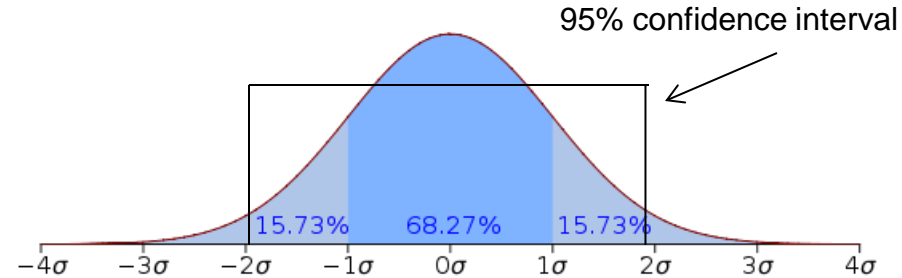




# Extras

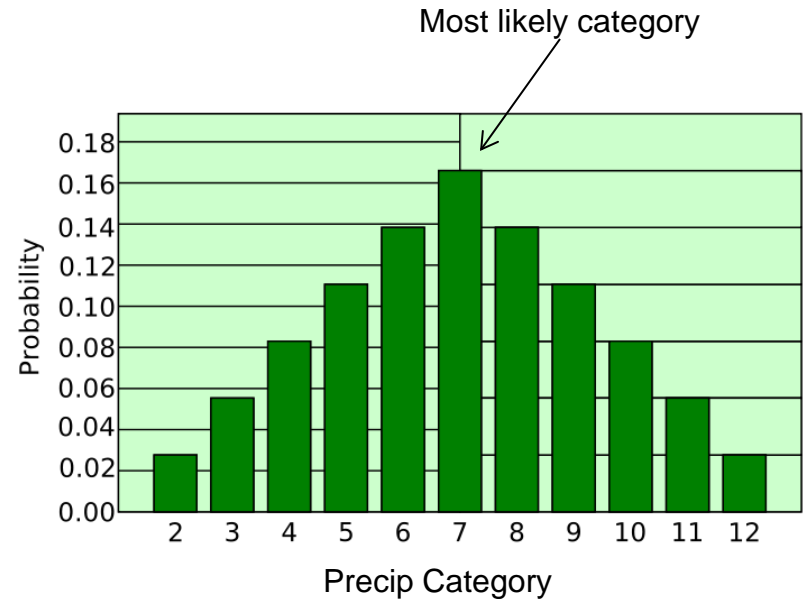
# Conveying Uncertainty

- **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.



$P(7) = 16\% \rightarrow 0.1-0.2$  in 3 hr period