

Aviation Forecasting – Works in Progress

NCVF – Ceiling & Visibility

CoSPA – Storm Prediction

A Joint Effort Among:

MIT Lincoln Laboratory

NCAR – National Center for Atmospheric Research

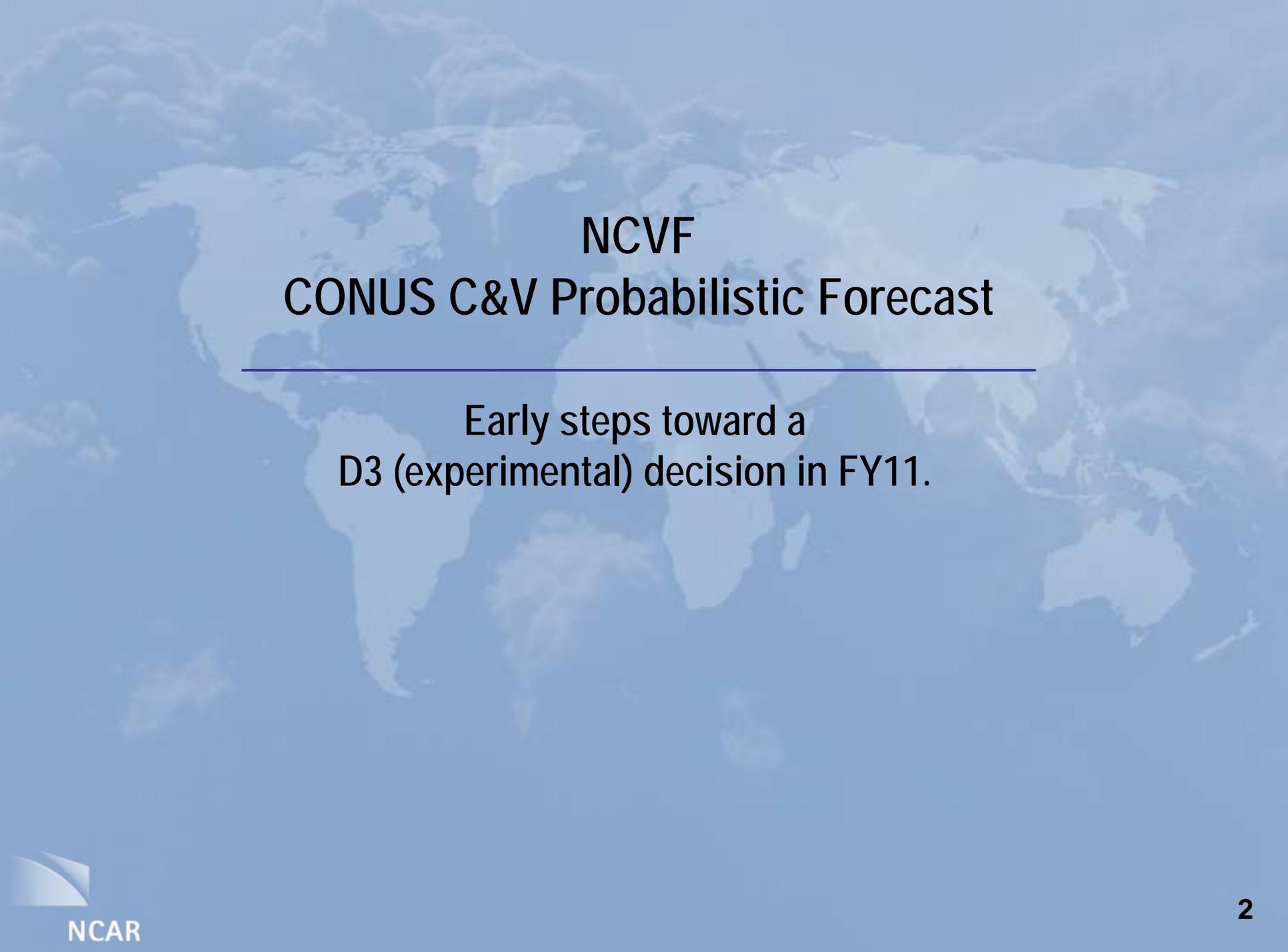
NOAA/ESRL Global Systems Division

Funded by FAA's Aviation Weather Research Program

Paul Herzegh, NCAR

22 April 2009





NCVF CONUS C&V Probabilistic Forecast

Early steps toward a
D3 (experimental) decision in FY11.

NCVF – The CONUS C&V Probabilistic Forecast

Motivation

- FAA desire for automated guidance products. Ideally.. 'first-guess' TAFs
- NextGen desire for probabilistic forecasts.

Current Status

- FY09 first year for probabilistic development. No results yet.

Planned Capabilities

- Consolidates NWP, MOS, & observations-based methods.
- 1-12 hr forecasts initially; Later extended toward 24-30 hours.
- Rapid updating; Major refresh hourly; Minor refresh 15-min.
- 0-hr 'current diagnosis' - probabilistic C&V in observation gap areas.
 - Will use previous 1-hr Prob Forecast info in gap areas.
 - Will be constrained to match obs at observing points.
 - Will be future replacement to today's Analysis product (NCVA).

Good Assets to Work With

Assets Available Now

- The foundation – probabilistic skill from LAMP.
- RUC (WRF/RR) – radar, sat, METAR assimilation; Hourly updating.
- Poor man's RUC ensemble – the 'time-lagged' ensemble.
- Hi-res modeling – e.g. HRRR @ 3km, later 2km. (East US domain)
- CoSPA – 0 to 8 hr storm forecasting thru combined extrapolation & NWP.
- SREF Avn ensemble – reformulated by June '09 .. ?
- Obs-based statistical fcst trained for each METAR site.
- Obs-based fog guidance – UPS or other.

May Be Available Later

- 2012 6-member RR 'true' ensemble.
- Possible MSC/Canada WIND-3 analog forecast algorithm.

Where are we starting?

Select Initial Fcst Components

- LAMP
- RUC time-lagged ensembles
- HRRR time-lagged ensembles
- CoSPA storm forecast
- Obs-based statistical methods – probabilistic.

Validate & Compare Them (now)

- What is the skill of the ensembles? ... Unknown yet.
- What are strengths/weaknesses of each comp.? Regime, seasonal, diurnal...

Blend... to combine skill.

- Start with LAMP & RUC time-lagged ensemble.
- Blend method?... needs experimentation. Possibilities include:
 - Performance-weighted avg of LAMP & RUC probability density functions?
 - A regression method trained via past data?
 - Expect blend to be customized to each site, each forecast init & duration.

Will you see some early results?

AMS Aviation Conf – next January.

- Reporting on validation / comparison findings.
- Reporting on first trials in blending LAMP, RUC, perhaps obs-based method.

And if we can stay on track...

- FY11 D3 'Experimental' evaluation / decision.
- FY13 D4 'Operational' evaluation / decision



A light blue world map is centered in the background of the slide. The text "Next Topic – Storm Forecasting" is overlaid in the center of the map.

Next Topic – Storm Forecasting

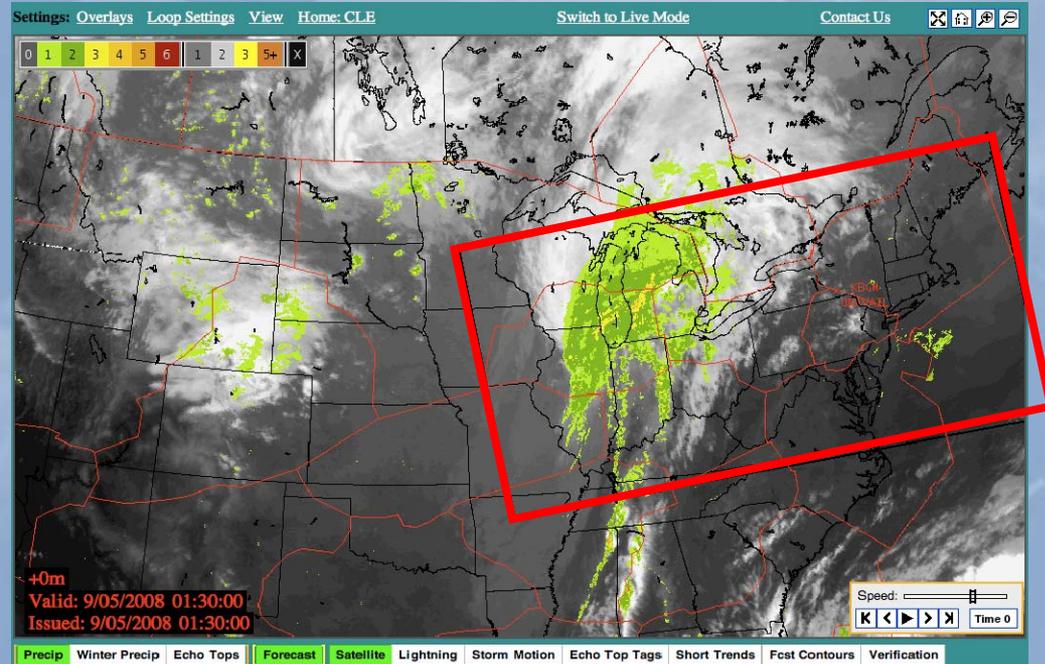
Collaborative Storm Prediction for Aviation (CoSPA)

Goal

- Consolidate a plethora of different convective & winter weather forecast products into a single prediction system for aviation that builds upon best available techniques & algorithms
- Collaborative effort between MIT/LL (lead), NCAR/RAL, & NOAA/GSD

Major Focus Areas

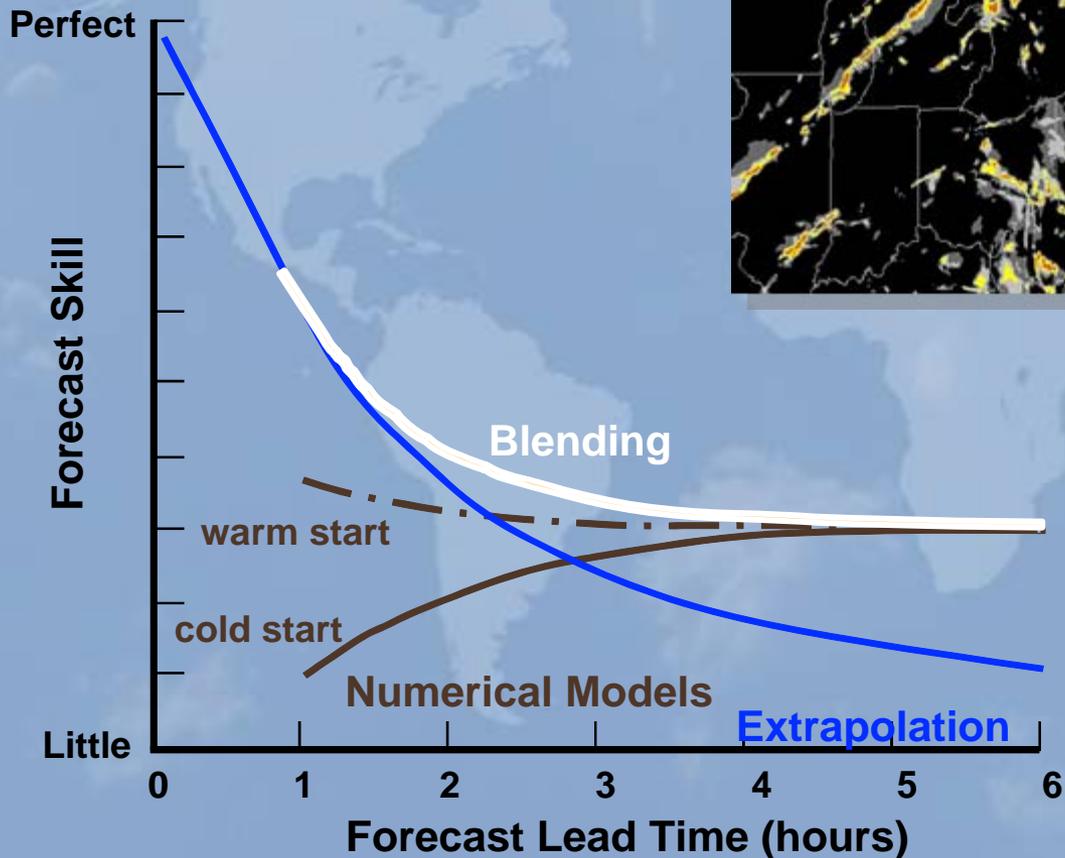
- Blending of extrapolation & NWP forecasts
- Numerical modeling & data assimilation
- Forecast uncertainty
- User interaction



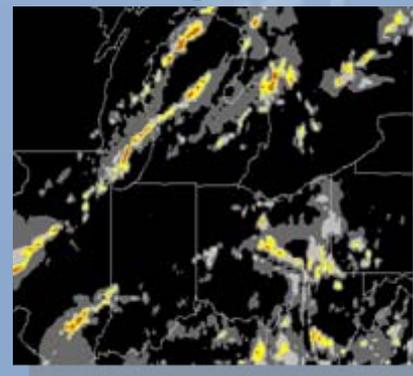
- Monitoring past 6 hours (CONUS)
- Forecasting 0-2 hours (CONUS)
- Forecasting 2-6 hours (HRRR, red box)

Strategy: Multiple Forecast Methods

Extrapolation – MIT/LL NWP – NOAA/ESRL



Blending - NCAR



Extrapolation (full CONUS) Blend of Extrapolation & HRRR (HRRR domain)

Time Series View

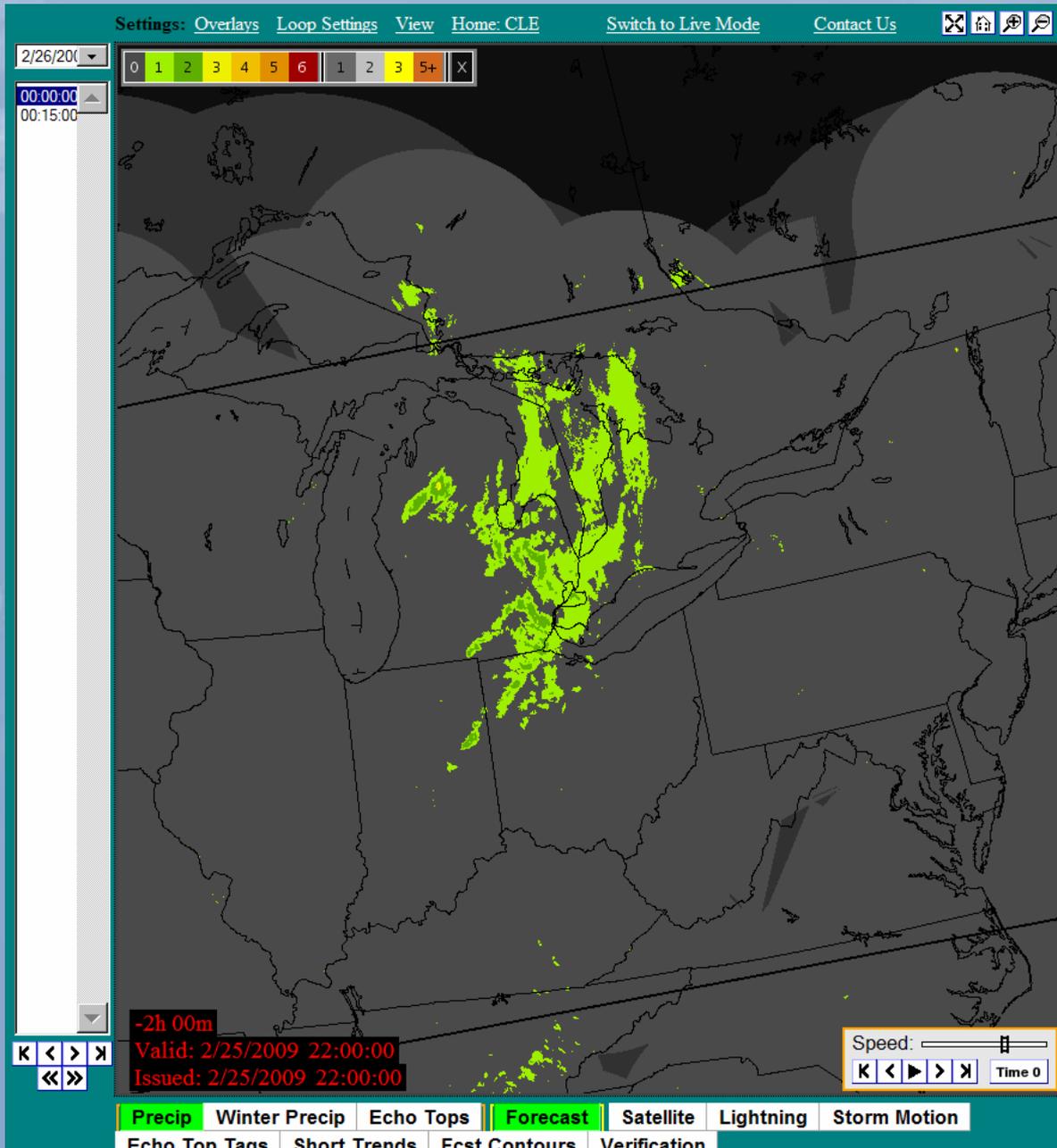
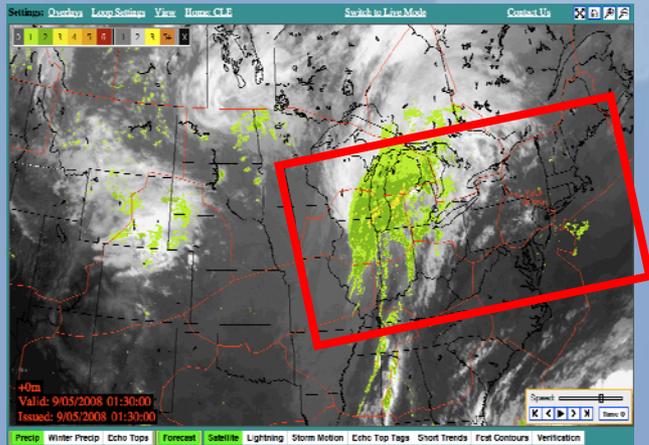
25 Feb 09

Radar Obs of
VIL – Vertically integrated
liquid water equivalent.

3 Frames -2h to present

2 Frames 1h extrap fcsts

4 Frames 1h blended fcsts



Time Series View

25 Feb 09

Radar Obs of
VIL – Vertically integrated
liquid water equivalent.

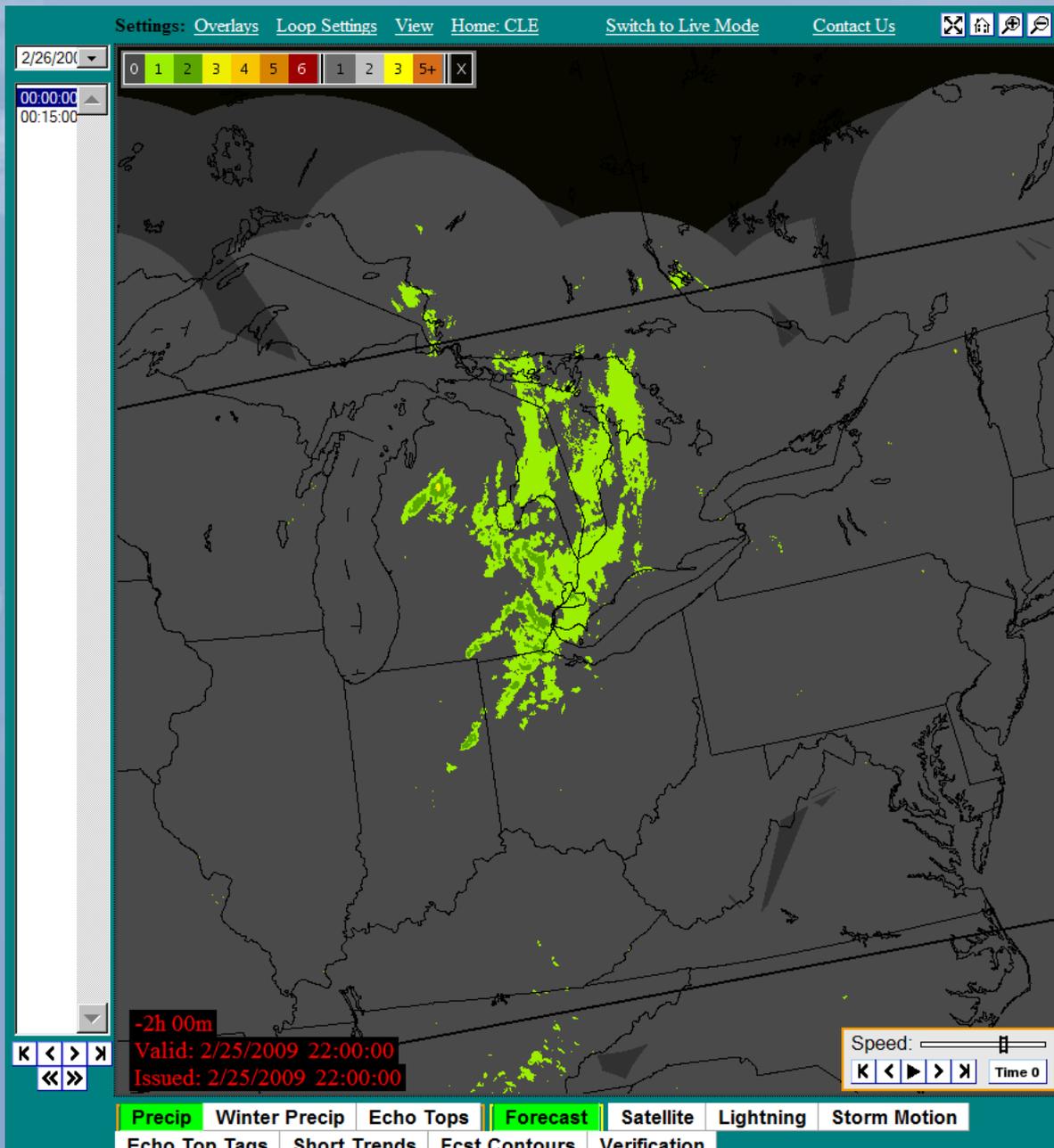
3 Frames -2h to present

2 Frames 1h extrap fcsts

4 Frames 1h blended fcsts

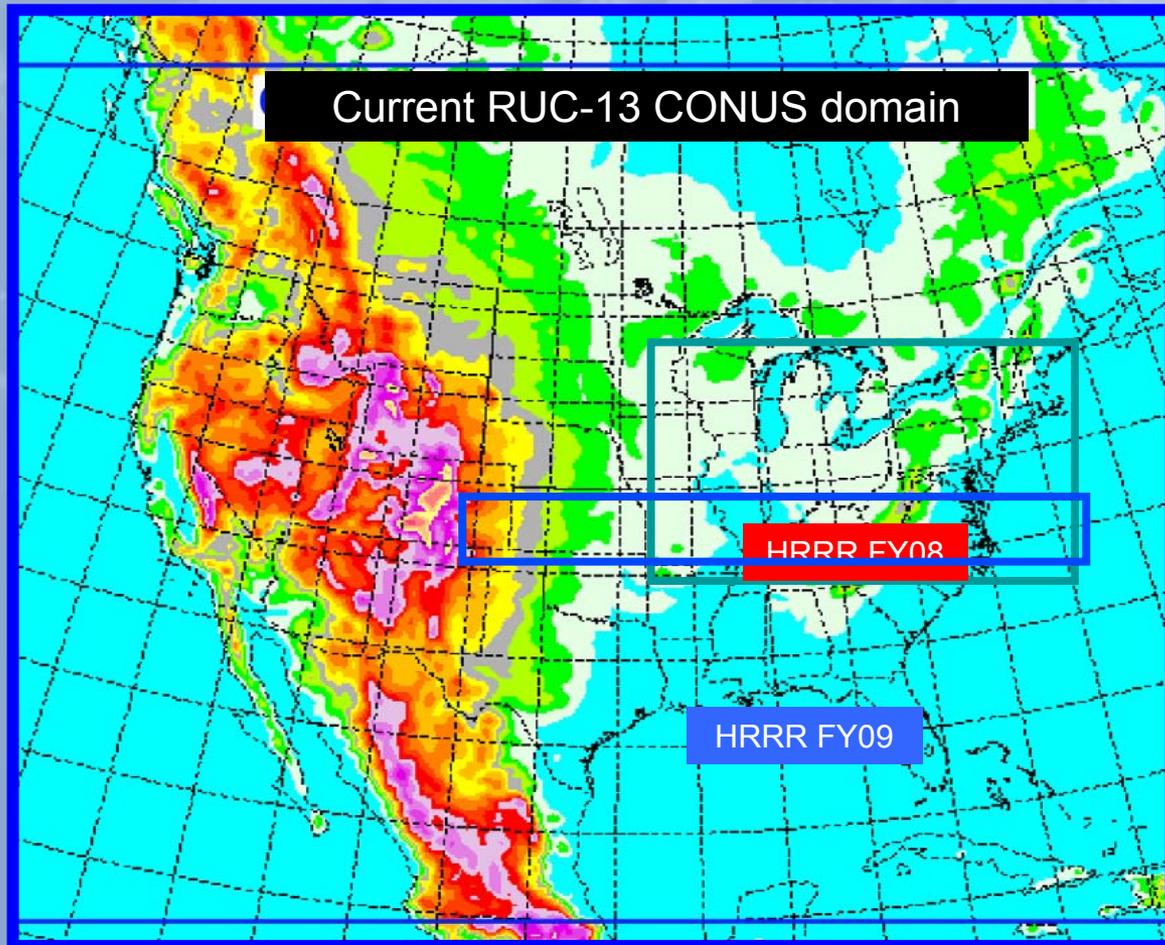
Other Capabilities

- Overlay Radar Validation
- Highlight 15 min growth/decay trends
- Echo tops
- Lightning
- Satellite imagery
- Archive mode



NWP Support for CoSPA

High Resolution Rapid Refresh (HRRR)



FY08

- Special 15 min output freq
- 3 hour latency
- Did not have dedicated resources
- Small domain hindered simulation particularly S&W

FY09

- Dedicated resources
- Improved reliability
- 15 min echo tops
- Expanded domain should improve performance and eliminate edge effects.

Demonstration Plans 2009

For Summer 2009

- Add blended forecasts of Echo Tops
- Extend VIL and Echo Tops to 8 hrs (across HRRR domain)
- Feed to FAA Operations (Command Center) for evaluation.
- Updates every 15 mins
- Coverage: 0-2 Hour CONUS
2-8 Hour HRRR Domain



Contacts

- Dr. Matthias Steiner (NCAR) msteiner@ucar.edu
- Dr. Marilyn Wolfson (MIT/LL) wolfson@ll.mit.edu
- Dr. Stan Benjamin (NOAA/ESRL) stan.benjamin@noaa.gov



That's it.