



**HIGHLY LOCALIZED BANDED SNOW –
FEB 11, 2006 : REVIEW OF THE FORECAST
PROCESS FOR A MISSED EVENT**

**15th Annual Joint U.S./Canadian Great Lakes
Operational Meteorology Workshop**

Thursday, October 26, 2006

Ed Shimon

National Weather Service

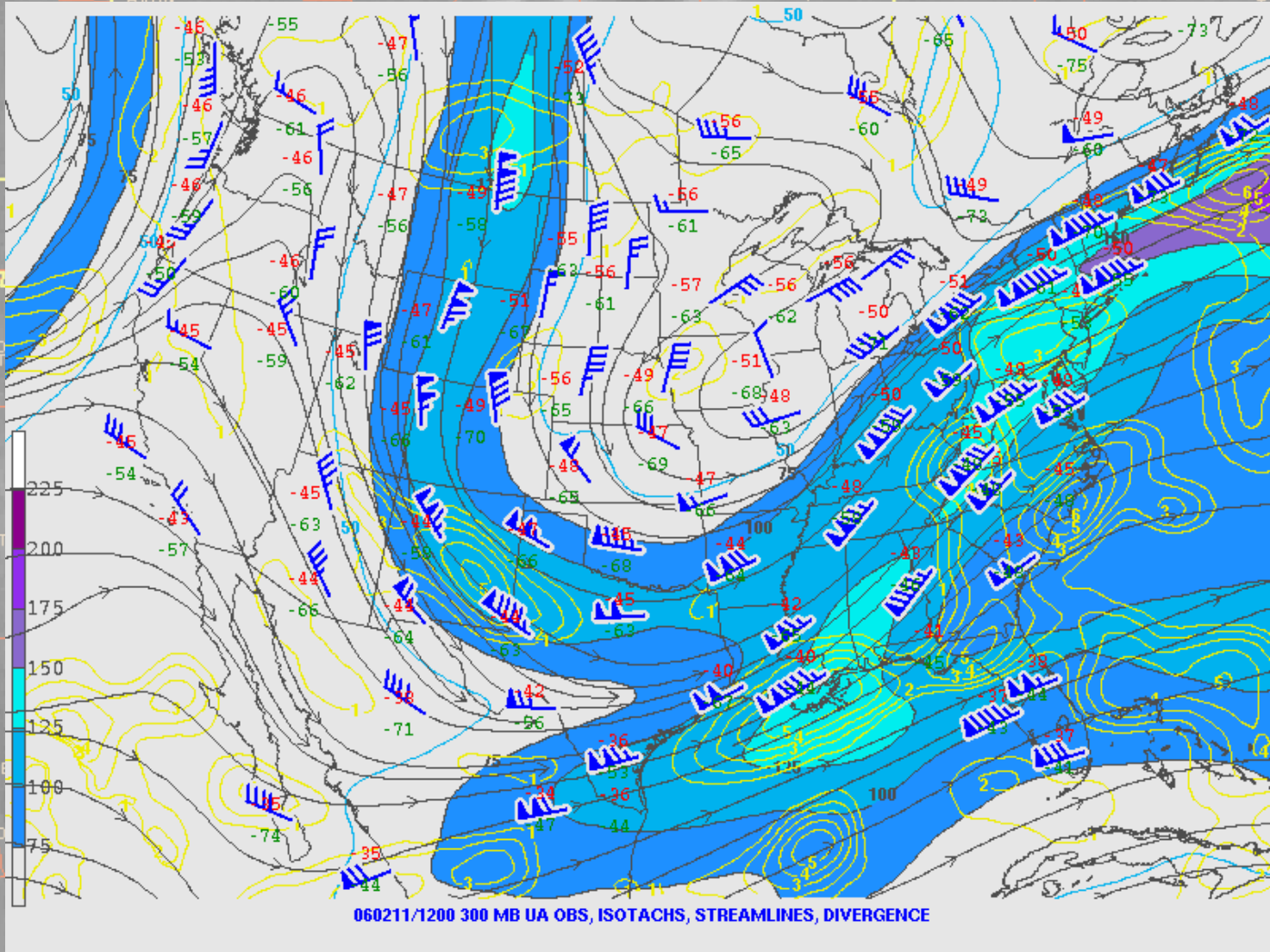


Overview

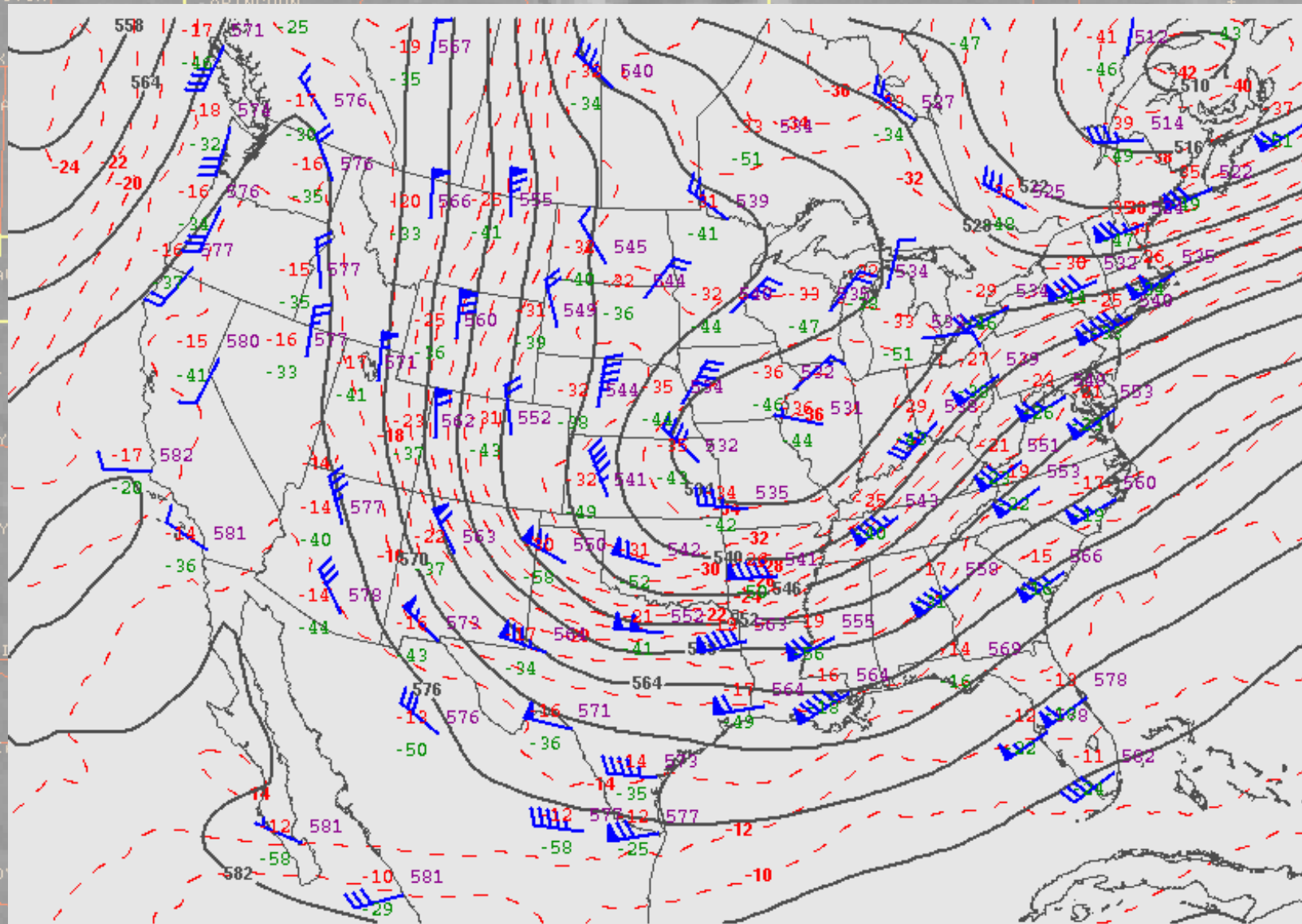
- Synoptic setting
- Forecast tools available that night
- Forecast progression
- Radar review
- Banded snow checklist
- Model analysis
- Summary

Synoptic Overview – 300 mb

Feb 11 12z (Beginning of event)

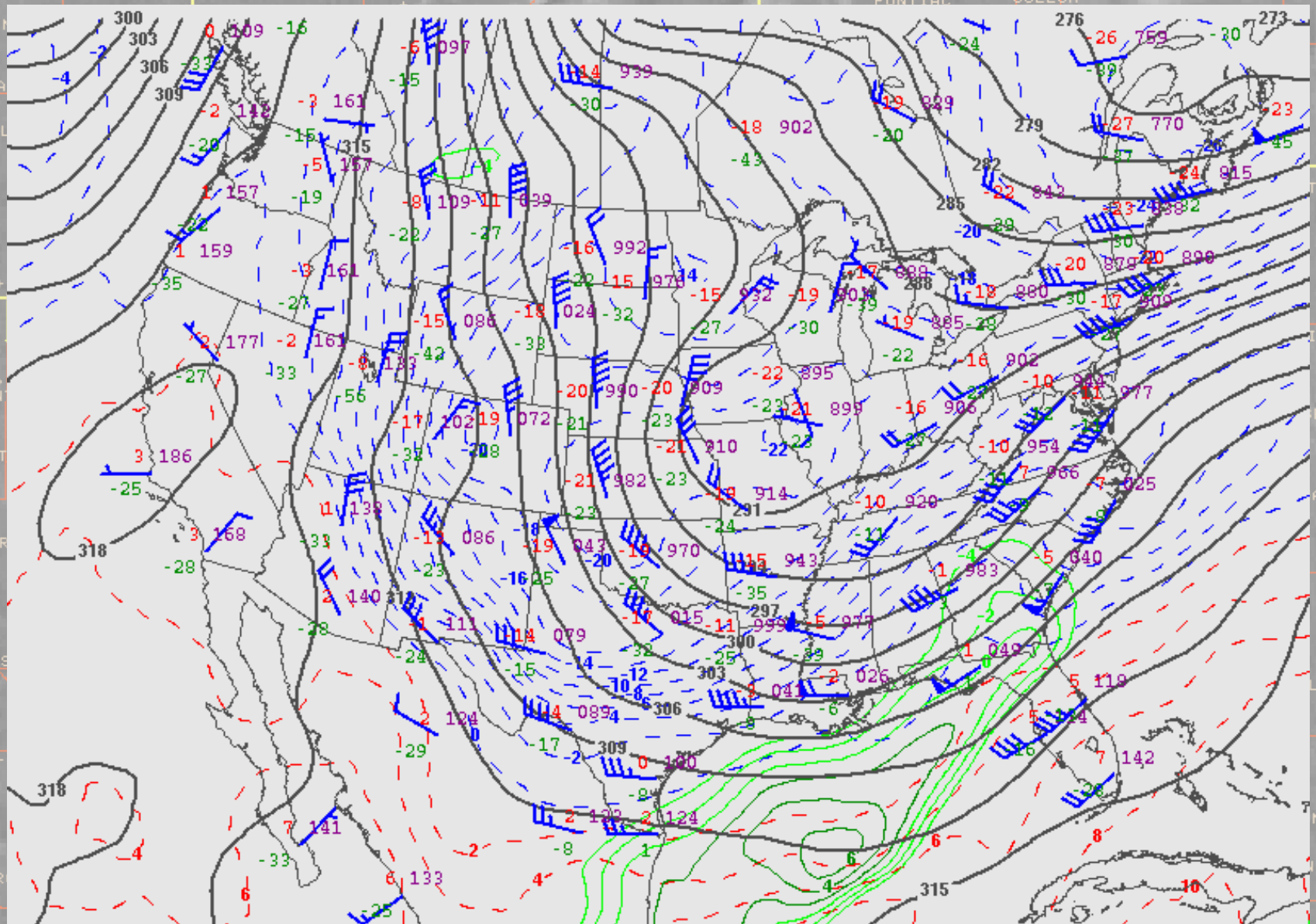


500 mb – Feb 11, 12z



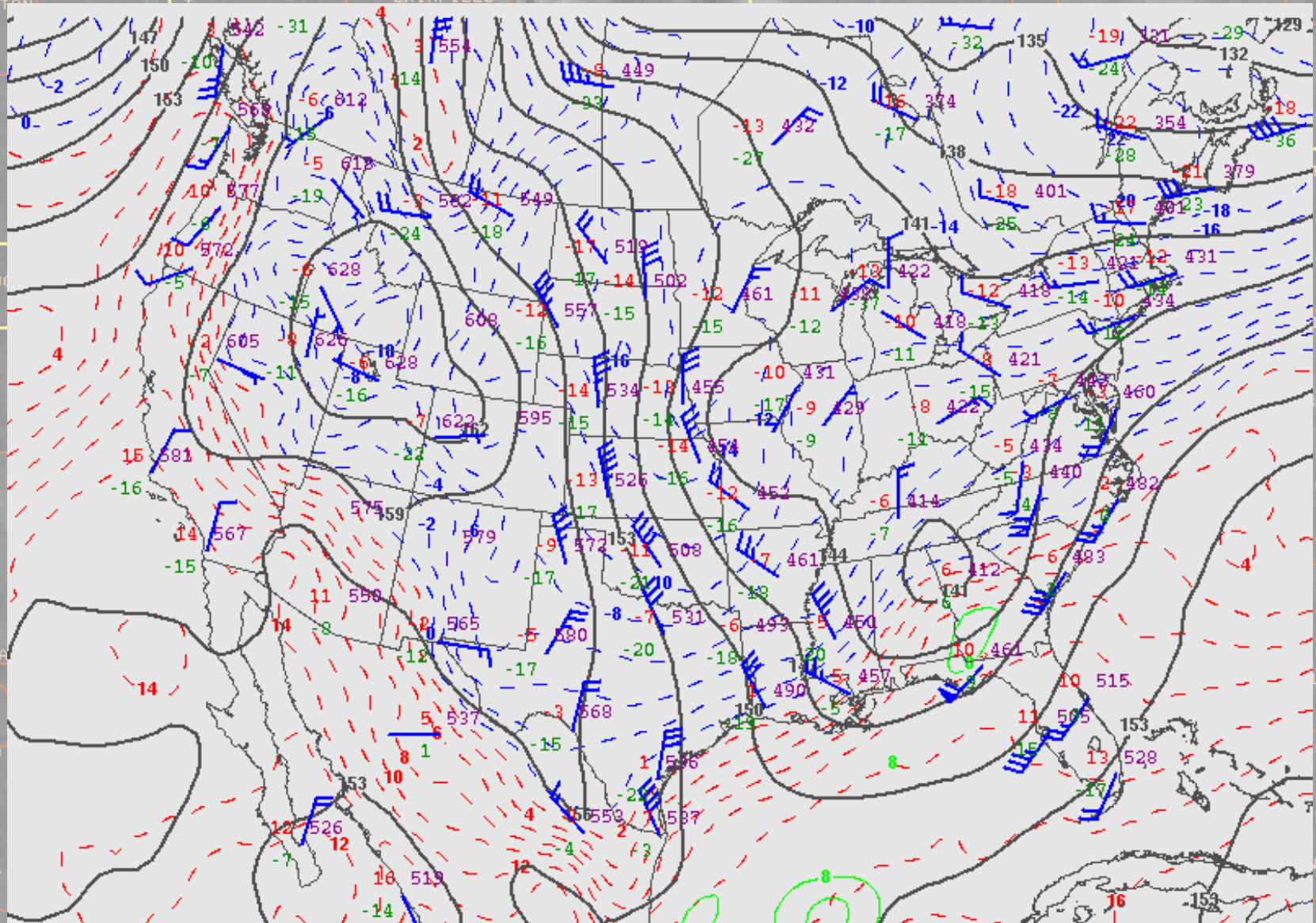
060211/1200 500 MB UA OBS, HGHTS, and TEMPS

700 mb – Feb 11, 12z



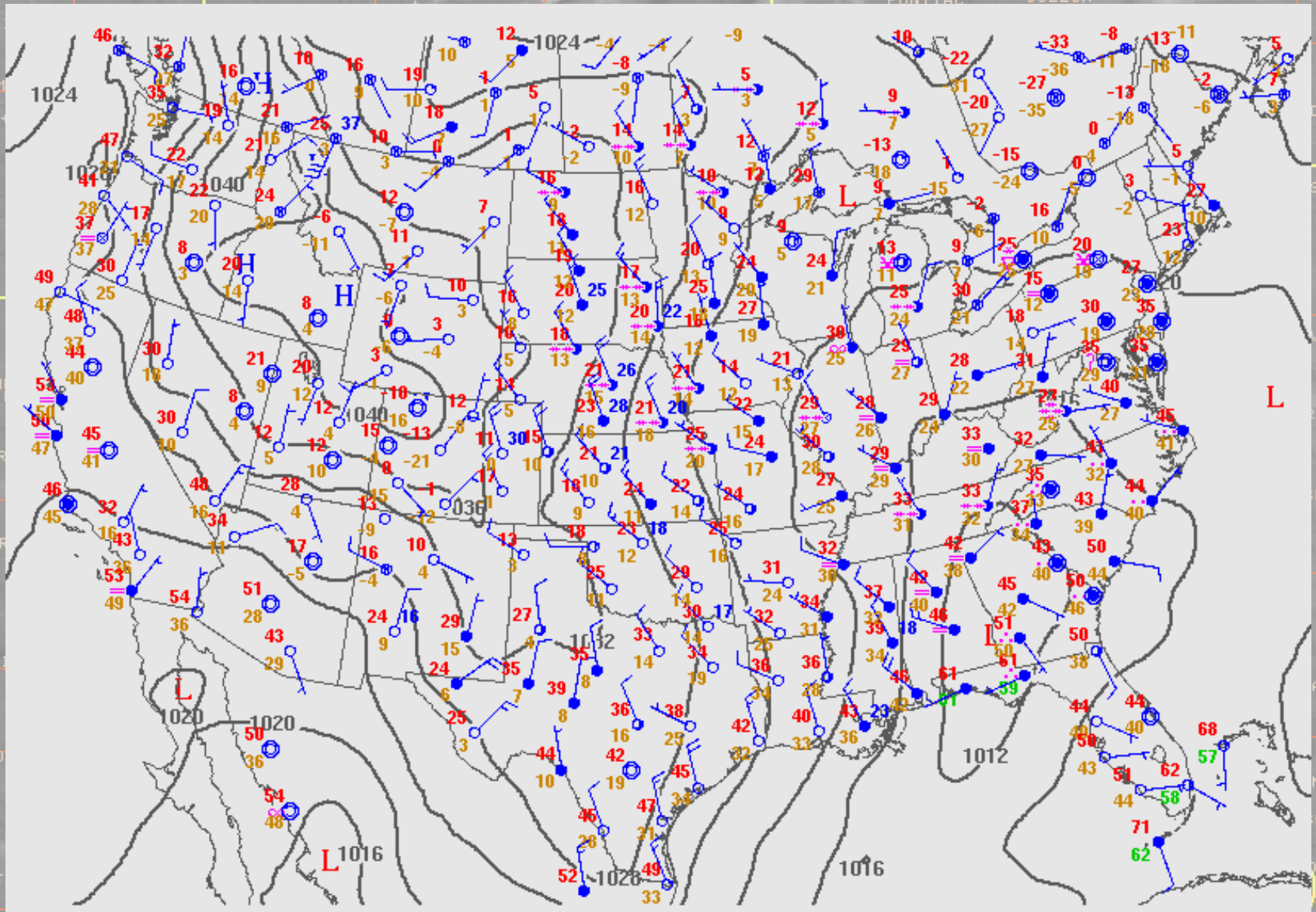
060211/1200 700 MB UA OBS, HGHTS, TEMPS, Td>=-4

850 mb – Feb 11, 12z



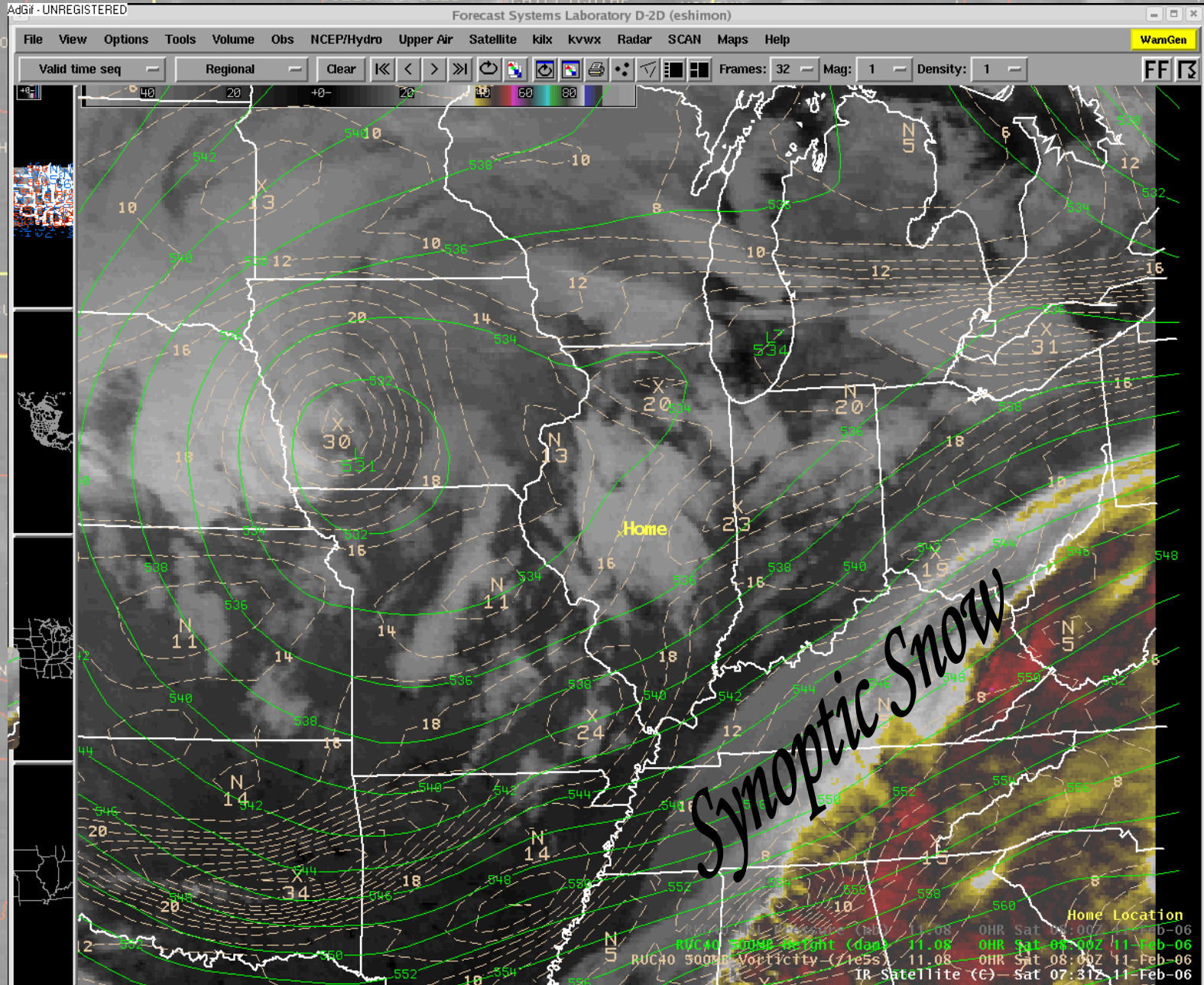
060211/1200 850 MB UA OBS, HGHTS, TEMPS, Td>=8

Surface – Feb 11, 12z



060211/1200 Surface OA Pressure and Obs
Weather, Temp, Dwpt, Gusts

IR Sat – 500 Ht/Vort 07z-10z

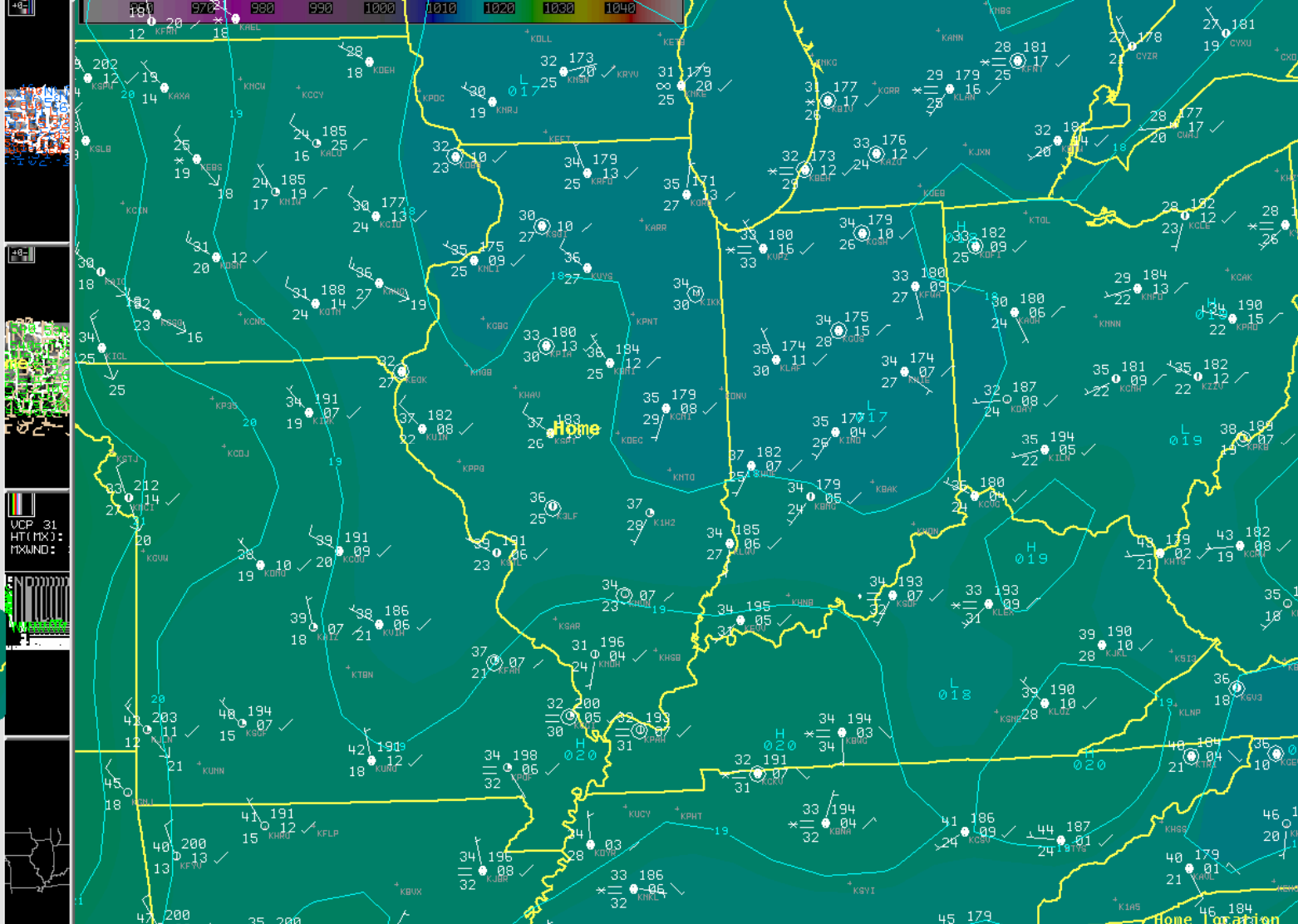


MSLP 00Z - 10Z

Forecast Systems Laboratory D-2D (eshimon)

File View Options Tools Volume Obs NCEP/Hydro Upper Air Satellite Kilx kvwx Radar SCAN Maps Help WanGen

Valid time seq Regional Clear Frames: 32 Mag: 1 Density: 1 FF



UCP 31
HT (PX):
TKWIND:
END

MSAS NWS MSLP (mb) 11.00 OHR Sat 00:00Z 21-Feb-06
MSAS NWS MSLP (mb) 11.00 OHR Sat 00:00Z 21-Feb-06
MFTAR Sat 00:00Z 21-Feb-06

GFS80 FEB11 00Z RUN

MSLP / 1000-500 RH / 850-500 Omega

AdGif - UNREGISTERED

Forecast Systems Laboratory D-2D (eshimon)

File View Options Tools Volume Obs NCEP/Hydro Upper Air Satellite kilx kvwx Radar SCAN Maps Help

WarnGen

Valid time seq

Regional

Clear

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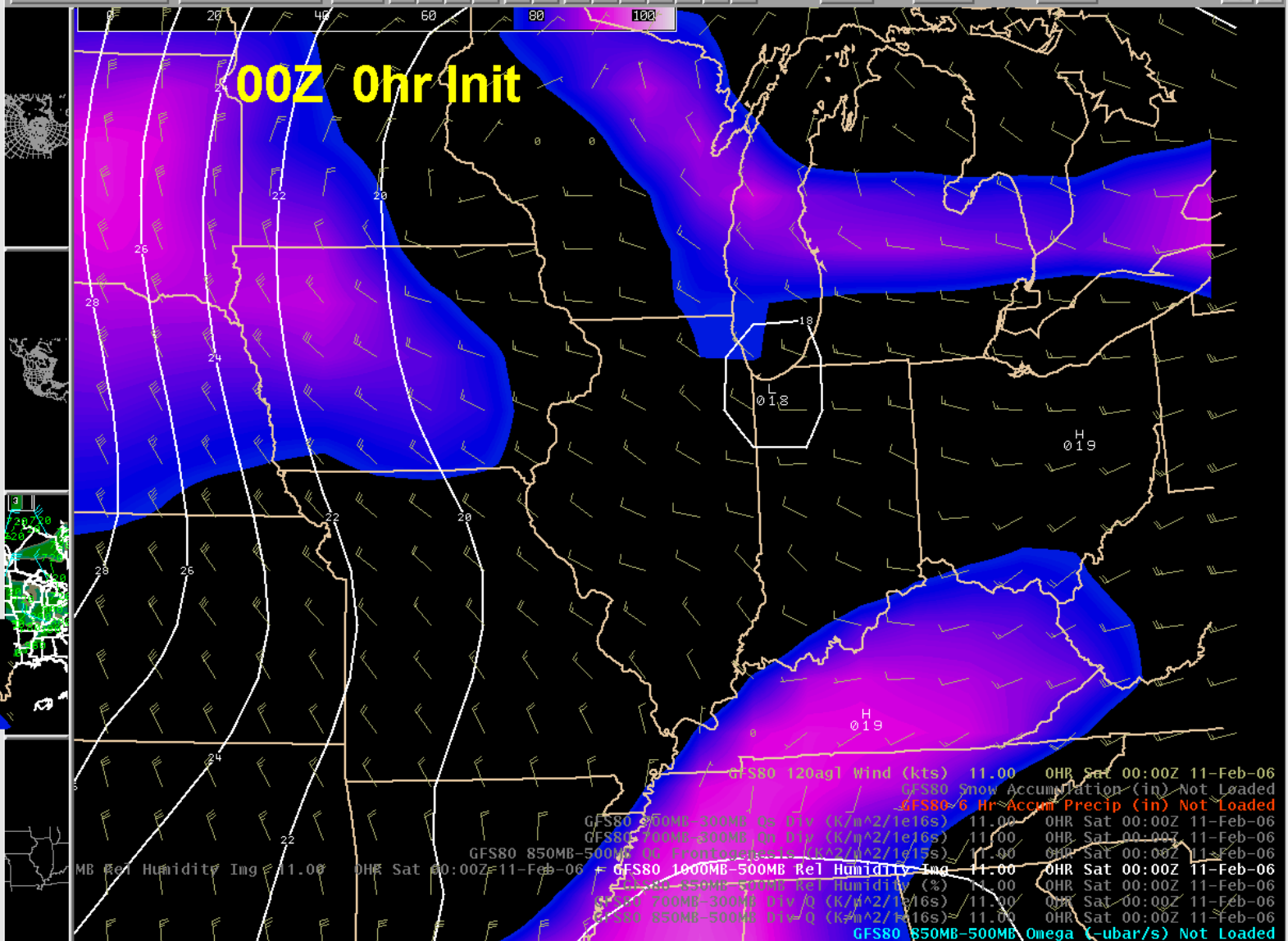
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NAM80 MSLP / 1000-500 RH / 850-500 Omega

AdGif - UNREGISTERED Forecast Systems Laboratory D-2D (eshimon)

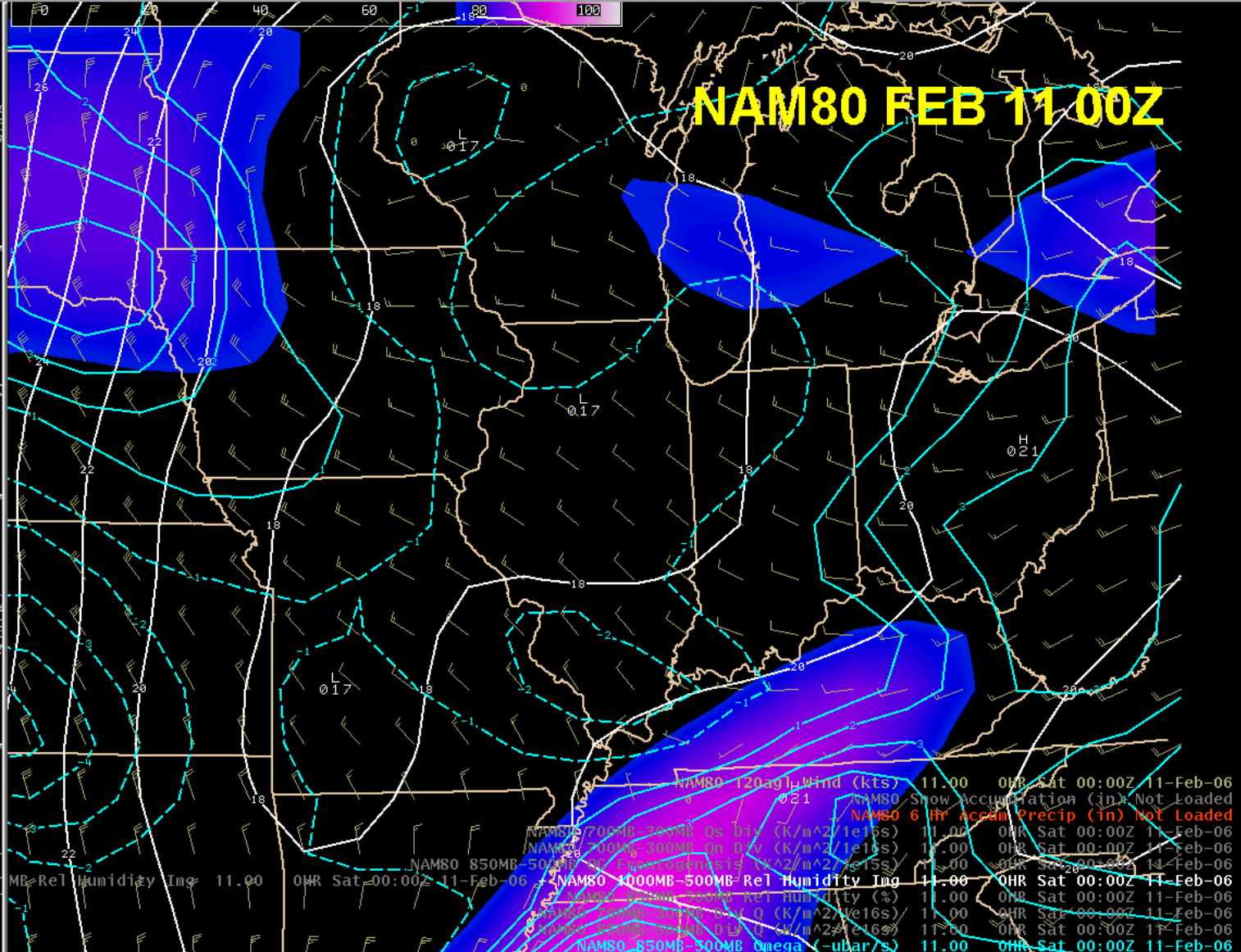
File View Options Tools Volume Obs NCEP/Hydro Upper Air Satellite Kilx kvwx Radar SCAN Maps Help

WarnGen

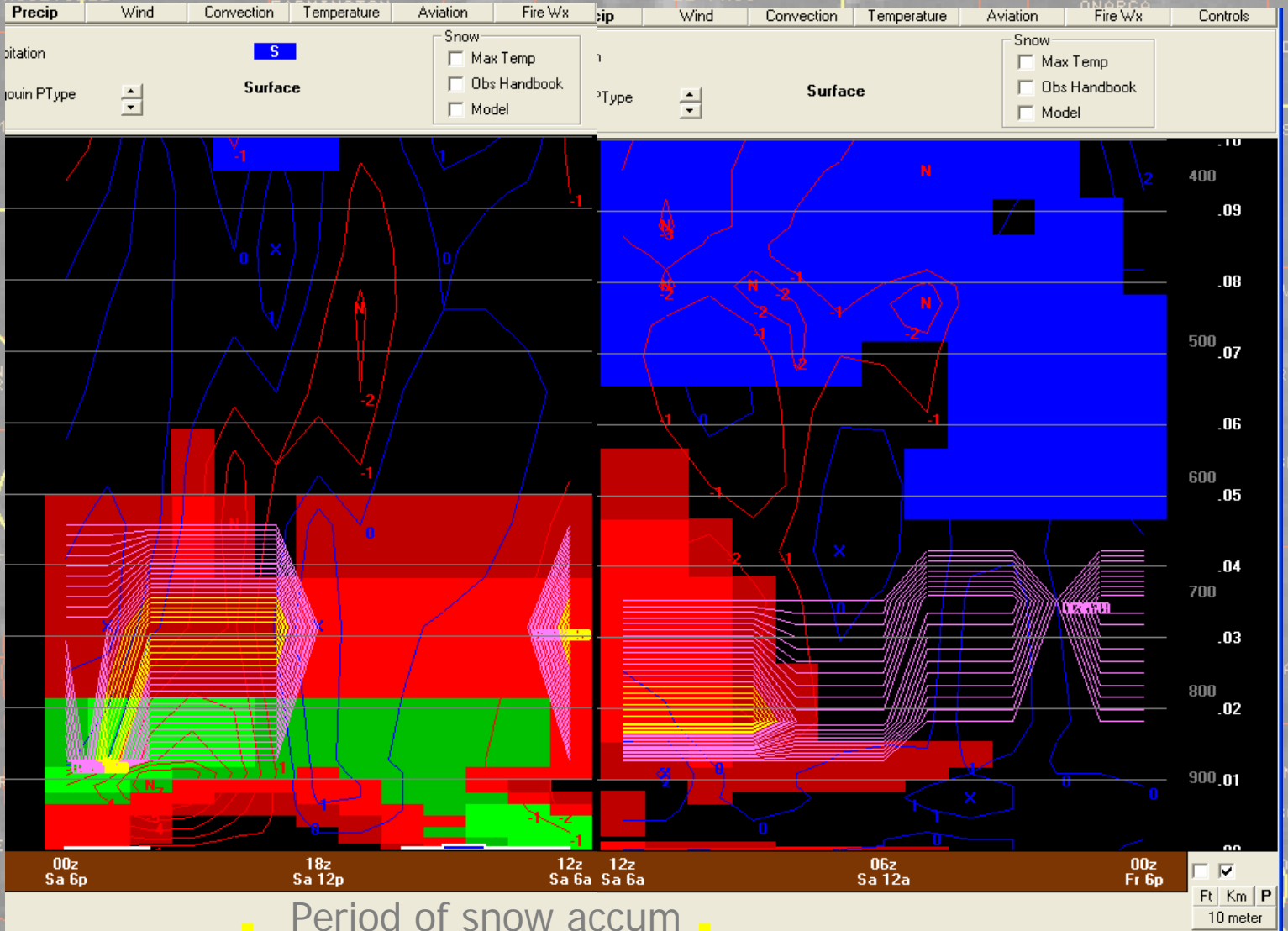
Valid time seq Regional Clear <> >> << <<< >>> <><> <><><> <><><><> Frames: 21 Mag: 1 Density: 1

FF

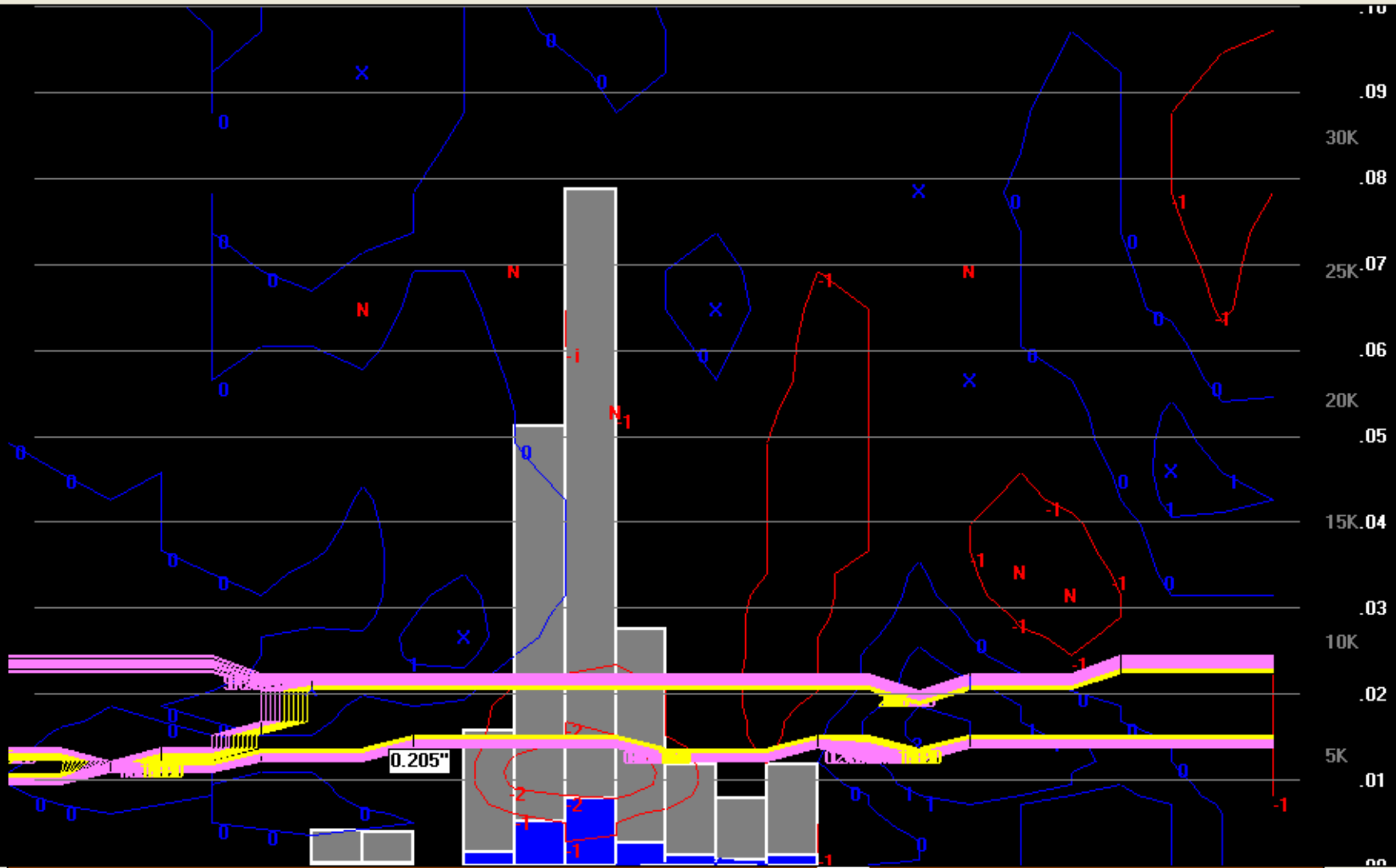
NAM80 FEB 11 00Z



SPI 00z and 12z RUC

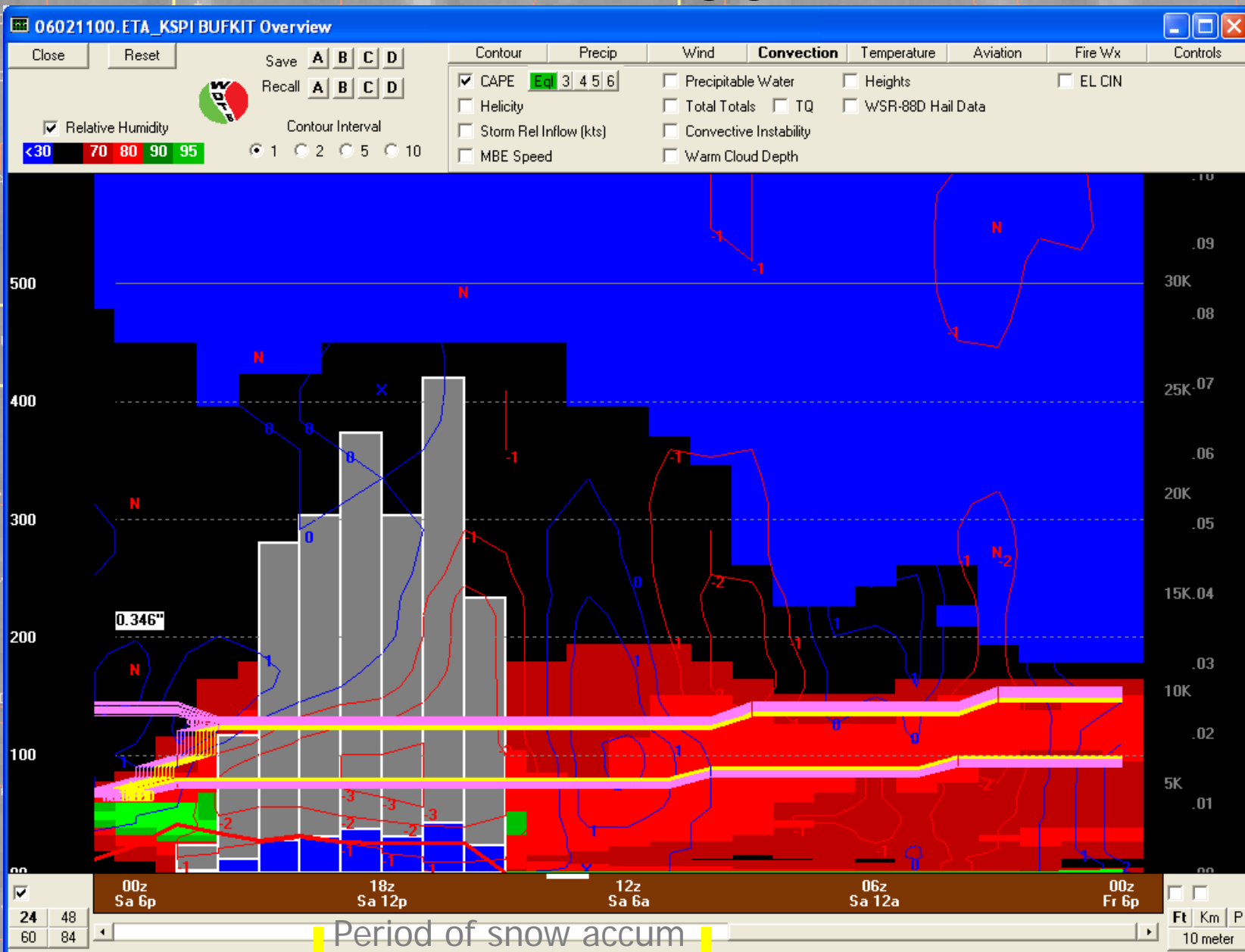


Meso-NAM 06Z FEB 11

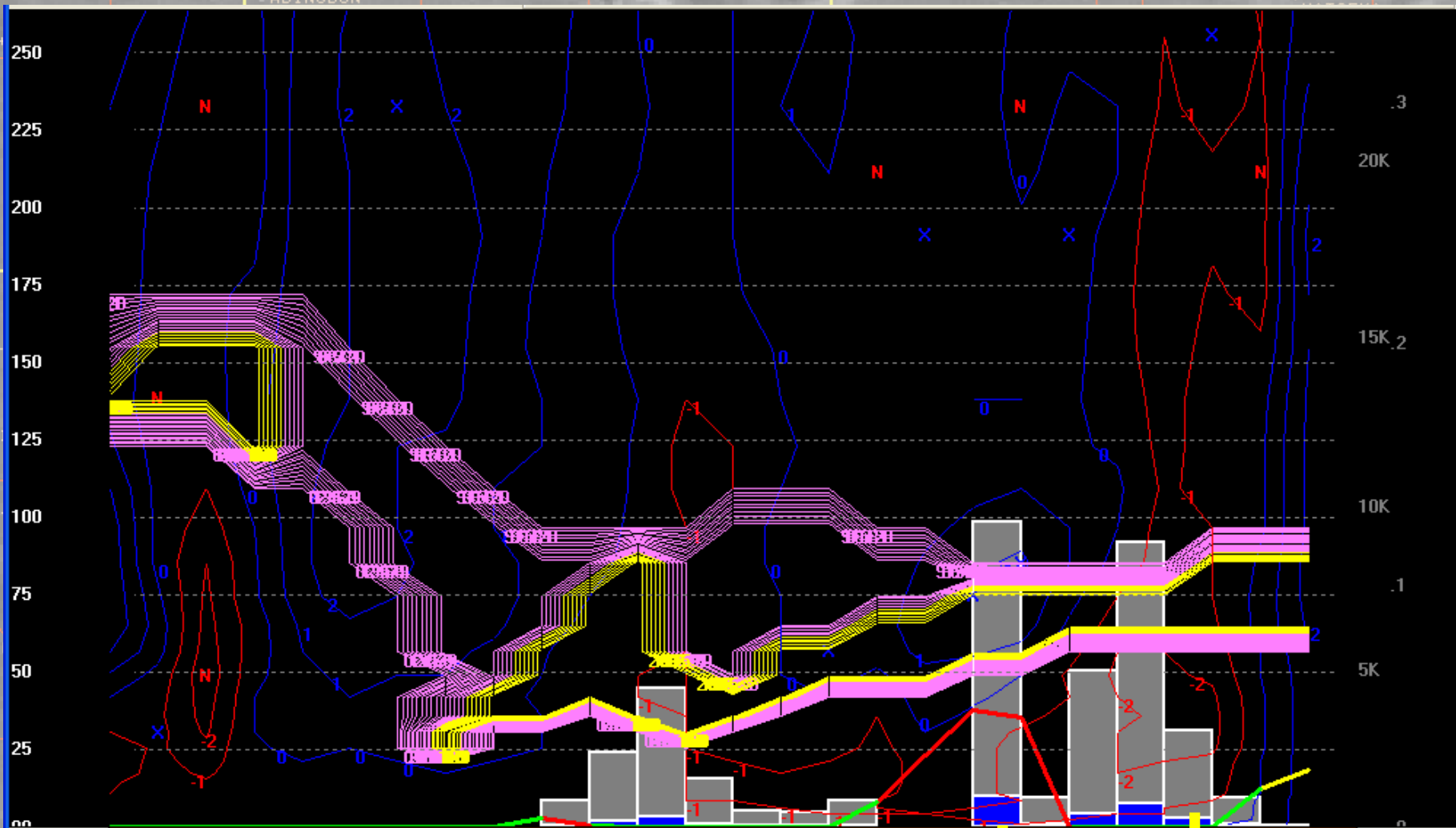


24	48	06z Su 12a	00z Sa 6p	18z Sa 12p	12z Sa 6a	06z Sa 12a	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
60	84	Period of snow accum					Ft Km P	<input type="checkbox"/>	<input checked="" type="checkbox"/>
							10 meter		

NAM - 00Z



GFS 11 FEB 00Z RUN

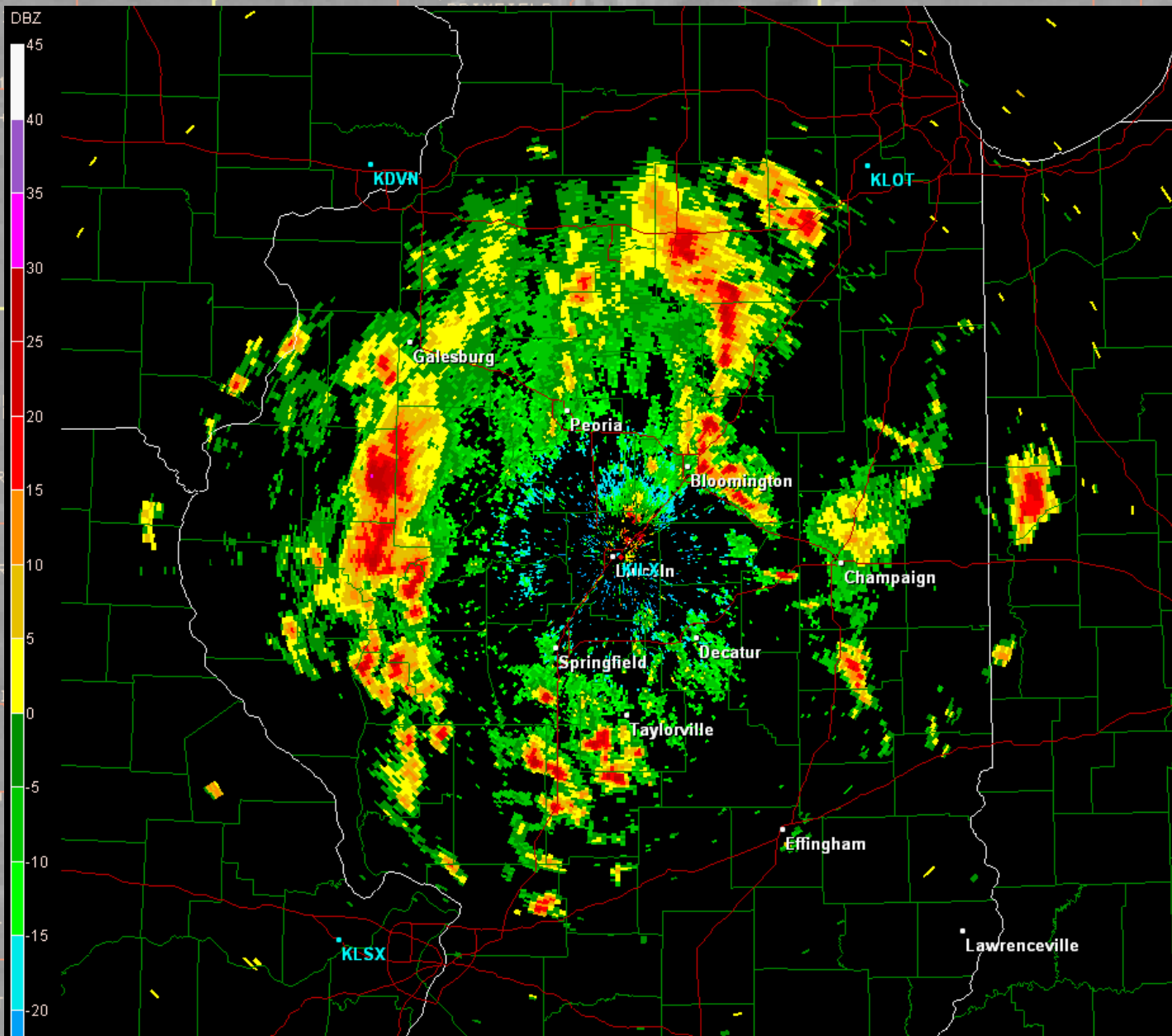


<input checked="" type="checkbox"/>	00z Mo 6p	12z Mo 6a	00z Su 6p	12z Su 6a	00z Sa 6p	12z Sa 6a	00z Fr 6p
72	120						
168	180						

Period of snow accum

Ft Km P 10 meter

Feb 11 - 03z to 09z



Site: KILX
VST: 02/11/2006 03:03:30 UTC
Prod: 02/11/2006 03:02:43 UTC
VCP: 31
Tilt: 0.398°

Select Product:

<input checked="" type="radio"/> BR	<input type="radio"/> VIL
<input type="radio"/> BV	<input type="radio"/> VILD
<input type="radio"/> SRV	<input type="radio"/> POSH
<input type="radio"/> SW	<input type="radio"/> MEHS
<input type="radio"/> ET	

Select Tilt:

<input type="text" value="0.4°"/>	<input type="text" value="1.4°"/>	<input type="text" value="2.4°"/>	<input type="text" value="3.4°"/>
<input type="text" value="4.4°"/>			

Warnings:

<input checked="" type="checkbox"/>	Flash Flood - 0
<input checked="" type="checkbox"/>	Thunderstorm - 0
<input checked="" type="checkbox"/>	Tornado - 0

<input type="checkbox"/>	Smoothing
<input type="checkbox"/>	Dealias

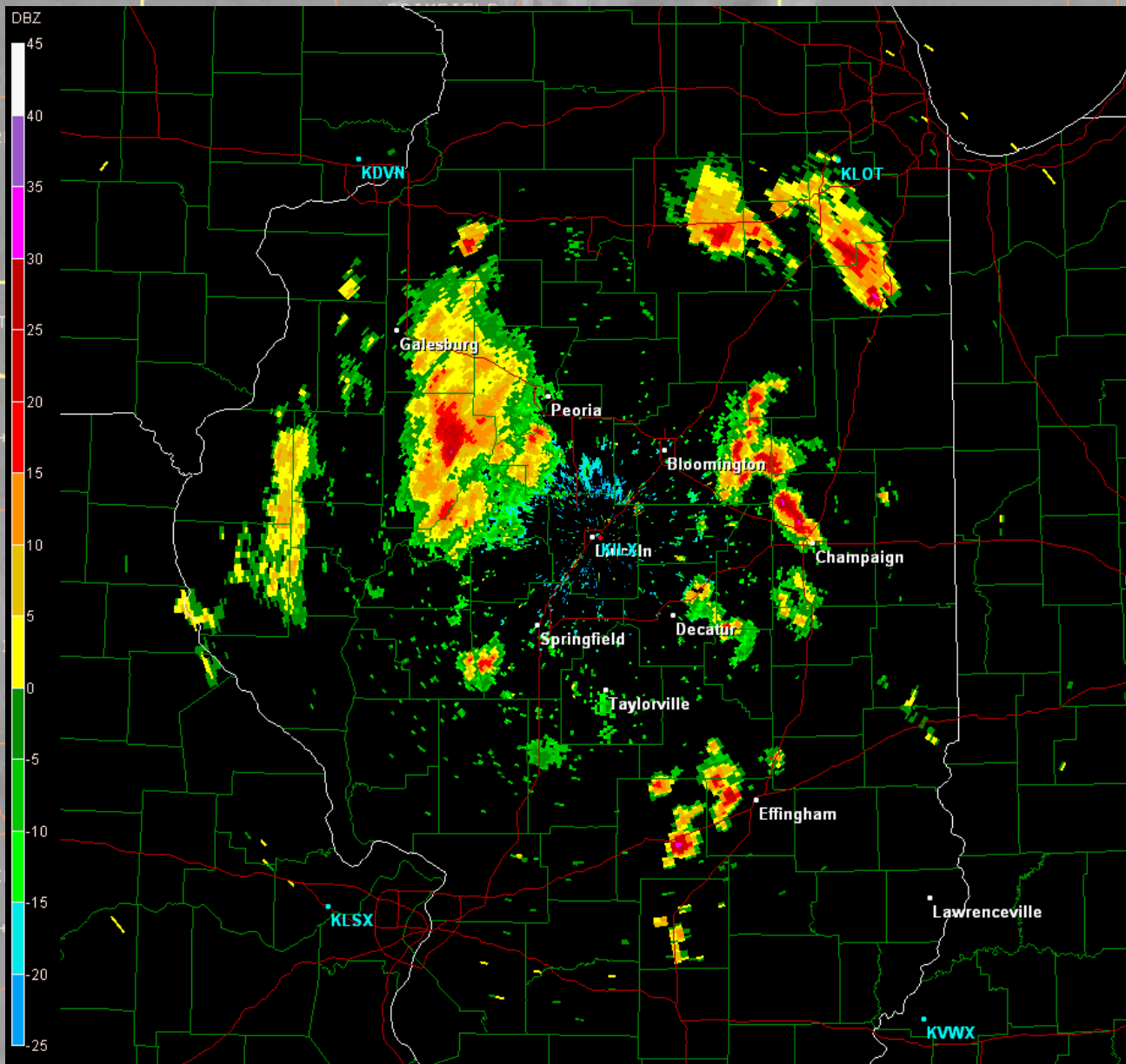
4 am Forecast – Feb 11, 2006

- .Today...Cloudy. Flurries this morning... then scattered snow showers this afternoon. Highs in the mid 30s. North winds 10 to 15 mph. Chance of snow 40 percent.



Let's see how that is going...

Feb 11 - 06z to 12z



Site: KILX
VST: 02/11/2006 06:00:27 UTC
Prod: 02/11/2006 05:59:38 UTC
VCP: 31
Tilt: 0.397°

- Select Product:
- BR
 - BV
 - SRV
 - SW
 - ET
 - VIL
 - VJLD
 - POSH
 - MEHS

- Select Tilt:
- -
 -
 -
 -

- Warnings:
- Flash Flood - 0
 - Thunderstorm - 0
 - Tornado - 0

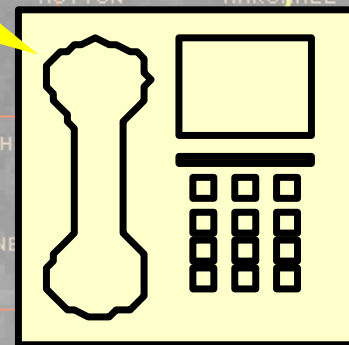
- Smoothing
- Dealias

606 am Update – Feb 11, 2006

- .Rest of Today...Occasional snow this morning...then scattered snow showers this afternoon. Snow accumulation of 1 to 2 inches. Highs in the mid 30s. North winds 10 to 15 mph. Chance of snow 80 percent.

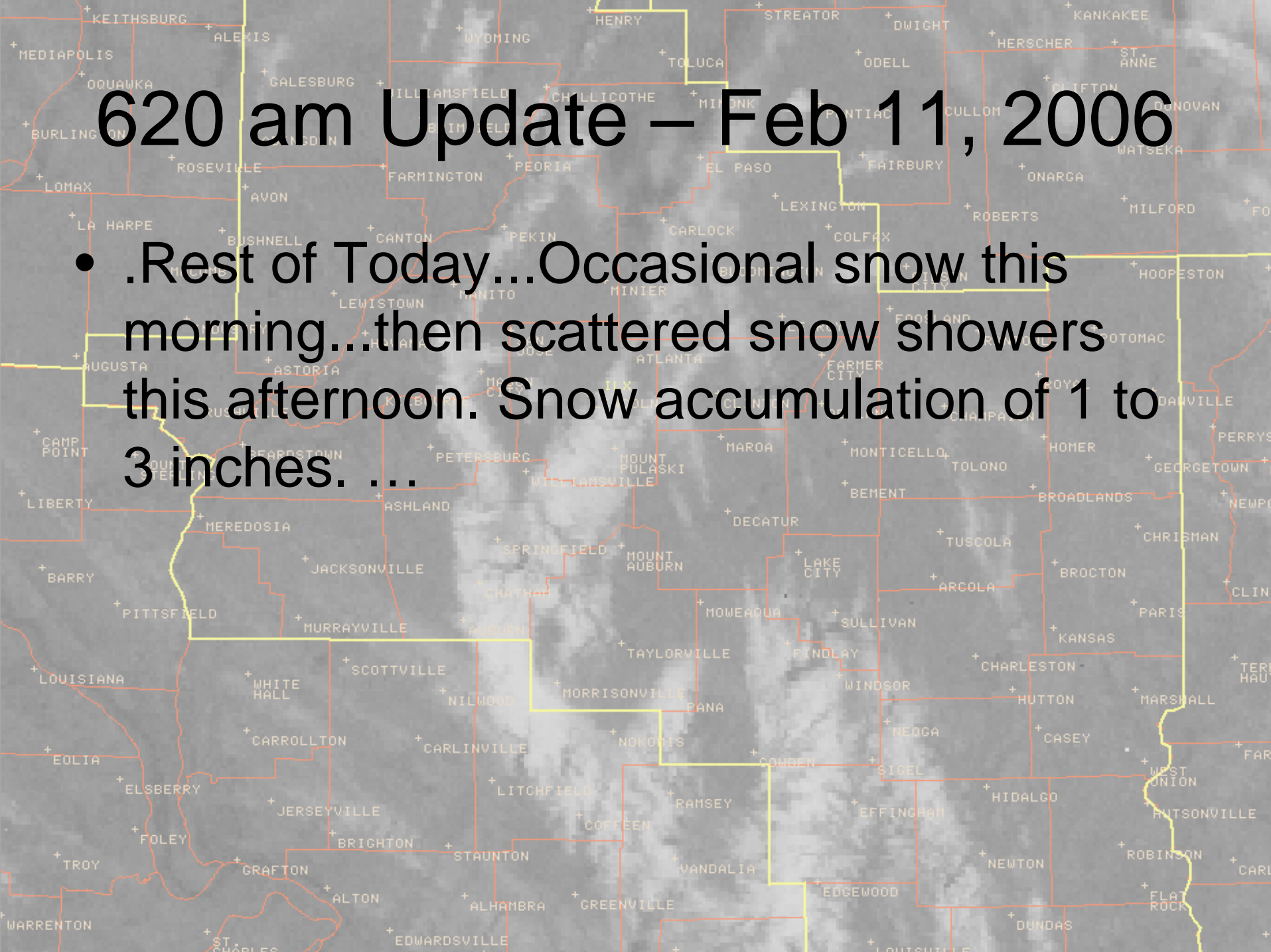
615 am phone calls

- Sheriff Depts –
 - Dusting
 - It's Snowing??
- COOP reported 2 inches already in Springfield area.

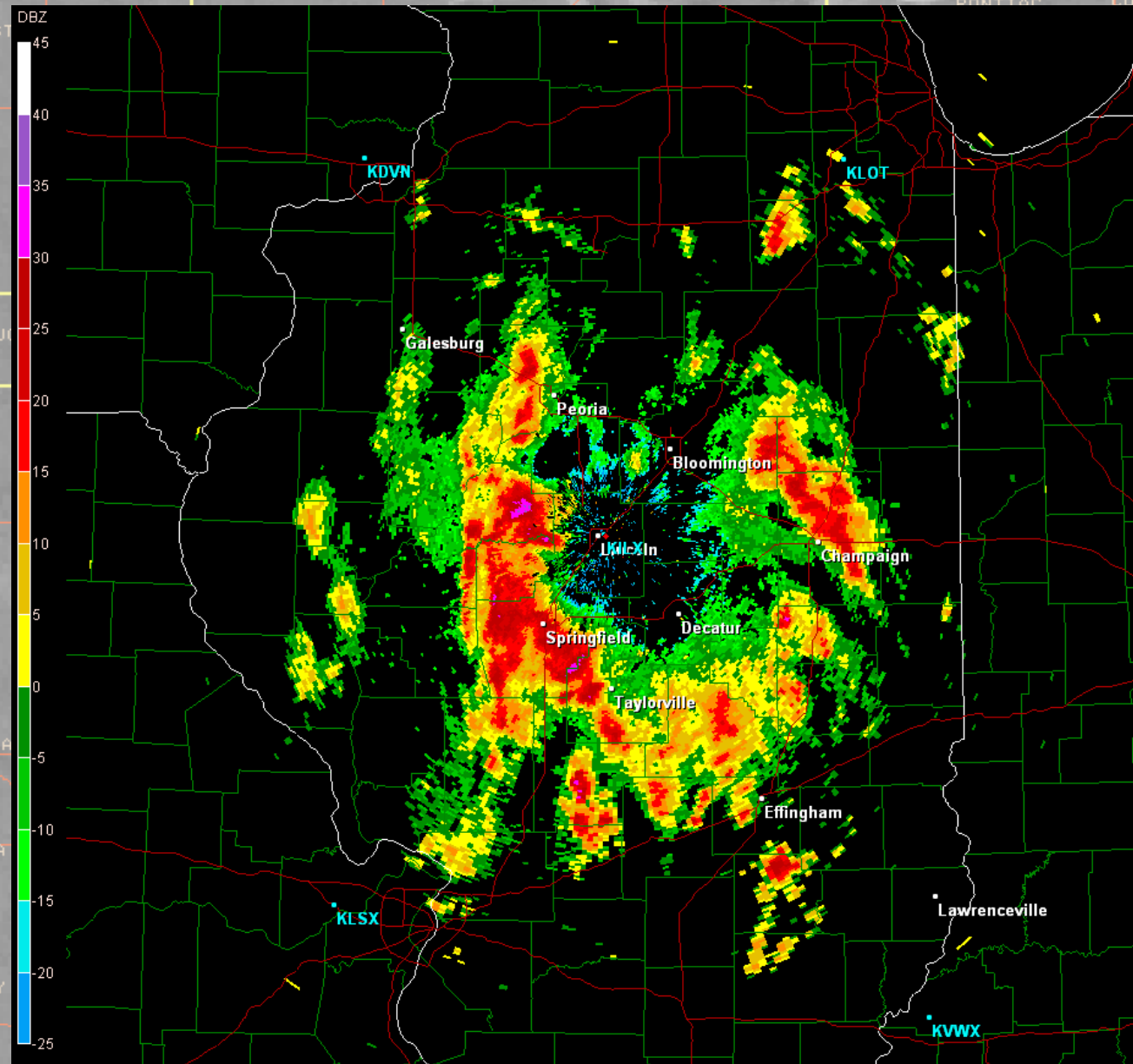


620 am Update – Feb 11, 2006

- .Rest of Today...Occasional snow this morning...then scattered snow showers this afternoon. Snow accumulation of 1 to 3 inches. ...



Feb 11 - 09 to 1315z



Site: KILX
VST: 02/11/2006 08:58:18 UTC
Prod: 02/11/2006 08:58:29 UTC
VCP: 31
Tilt: 0.399°

Select Product:

- BR
- BV
- SRV
- SW
- ET
- VIL
- VJLD
- POSH
- MEHS

Select Tilt:

- 0.4°
- 1.4°
- 2.4°
- 3.4°
- 4.4°

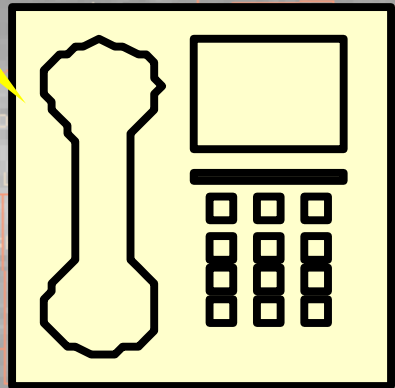
Warnings:

- Flash Flood - 0
- Thunderstorm - 0
- Tornado - 0

- Smoothing
- Dealias

715 am - Phone call from MIC - Lives directly in the snow band ☹️

- How's it going?
- 4 inches here already. 😊





720 am Update – Feb 11, 2006

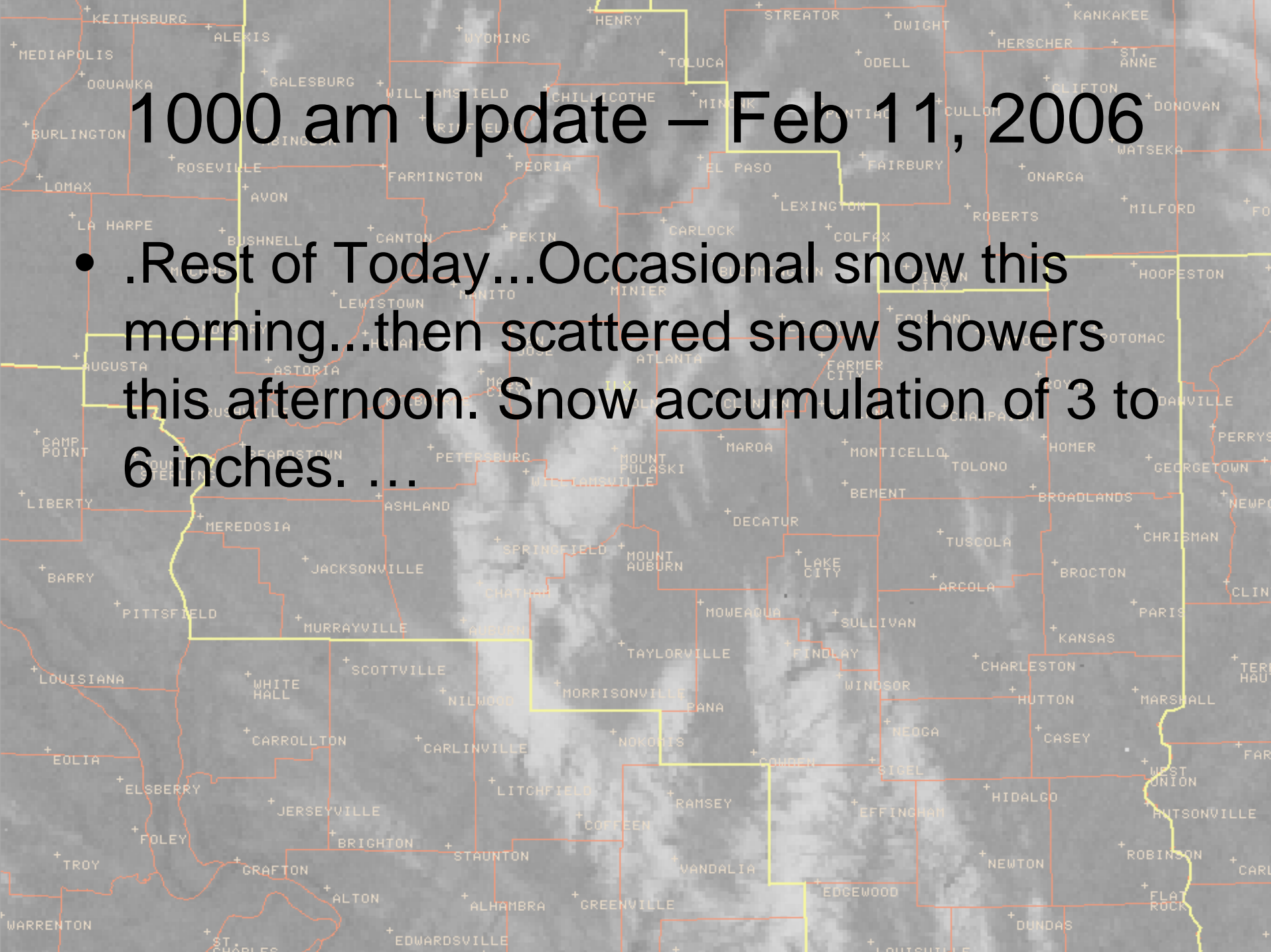
- .Rest of Today...Occasional snow this morning...then scattered snow showers this afternoon. Snow accumulation of 2 to 4 inches...

Shift briefing ☹️

- Humble pie.
 - Dreaded accumulating flurries.
- Not sure what's causing it. Shouldn't get too much more. 😊
- Bye!
- Made mistake of not issuing some sort of headline before I left.

1000 am Update – Feb 11, 2006

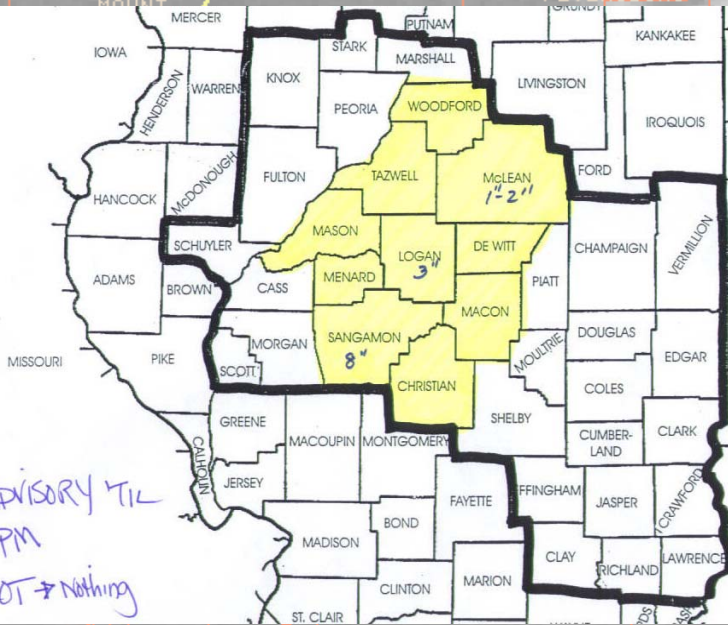
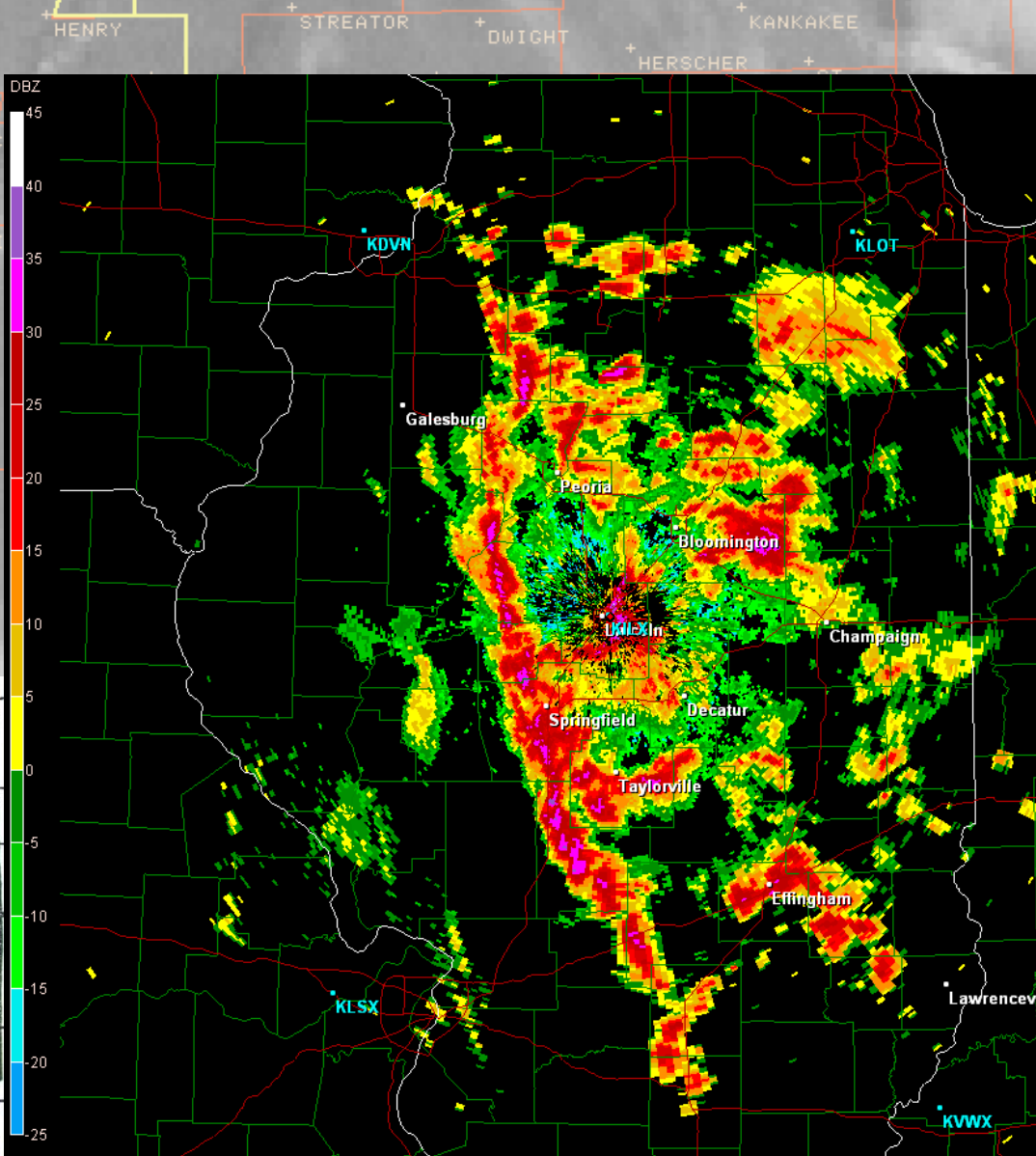
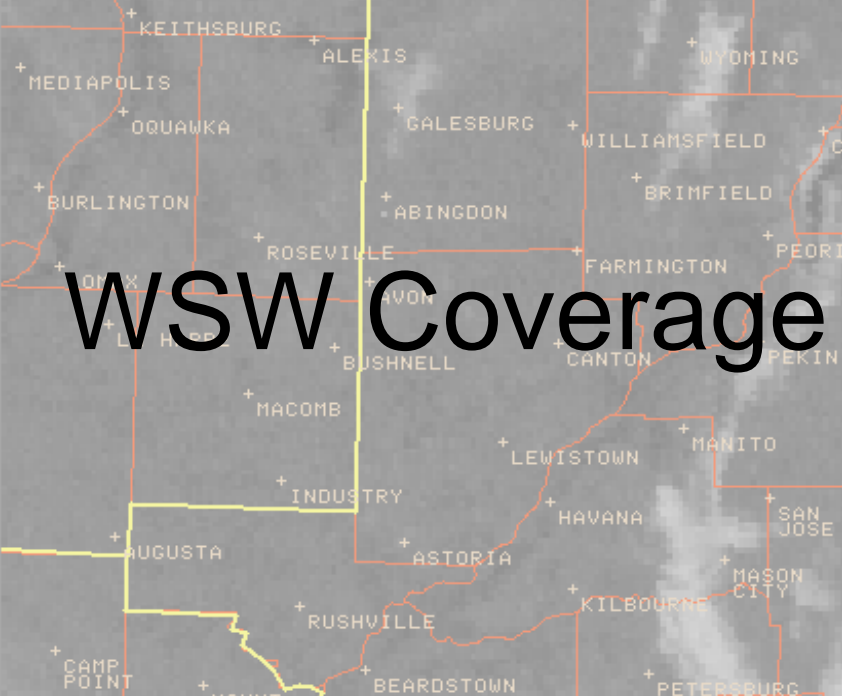
- .Rest of Today...Occasional snow this morning...then scattered snow showers this afternoon. Snow accumulation of 3 to 6 inches. ...



Snow Advisory (thanks to day shift)

- What counties to include?
 - Sporadic coverage
- Wording to use?
 - Wide variability of snowfall
- Issued WSW until 6 pm for 3 to 6 inches.

WSW Coverage

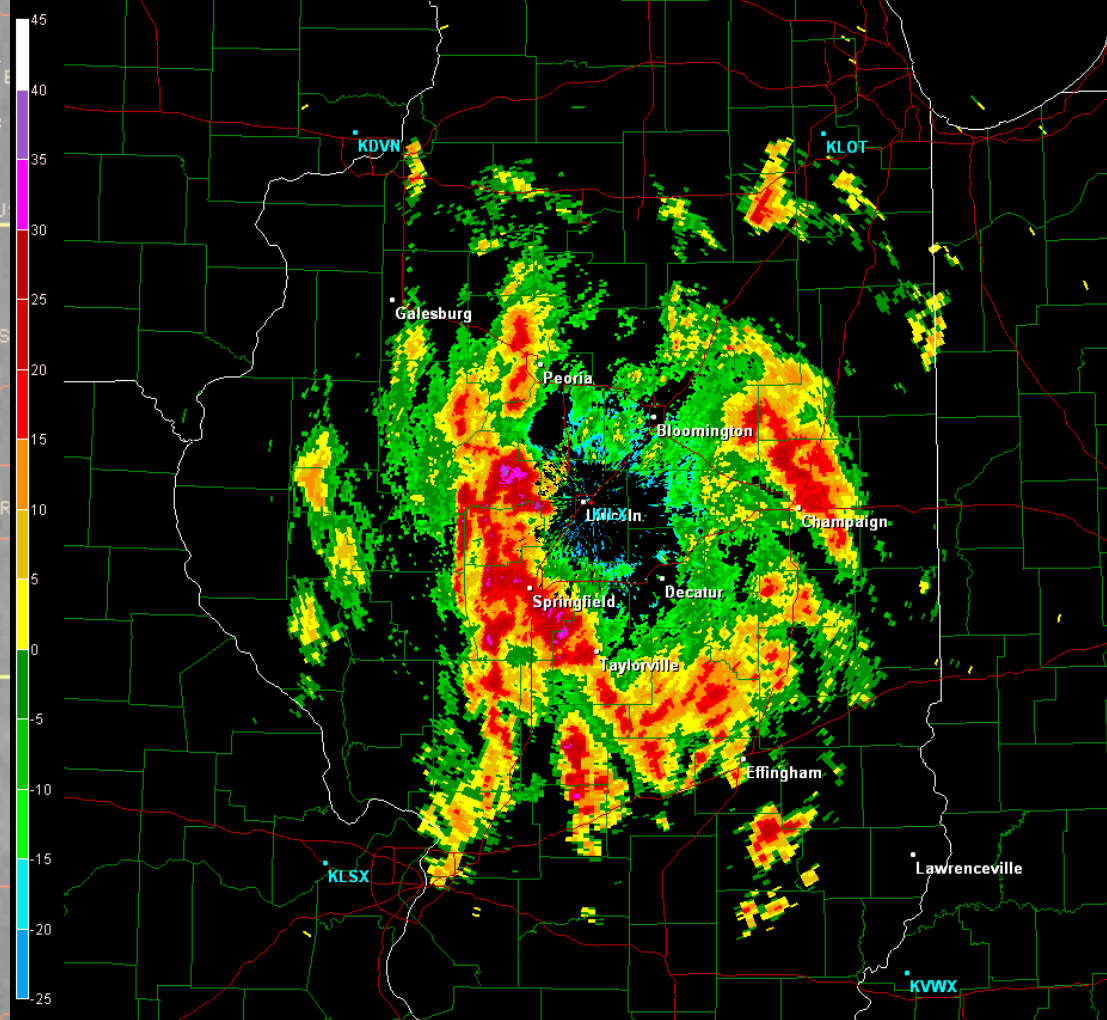


SNOW ADVISORY TIL
6PM
LSX & LOT → Nothing



Radar Feb 11 09z-20z

AdGr - UNREGISTERED



Site: KILX
VST: 02/11/2006 09:18:58 UTC
Prod: 02/11/2006 09:18:08 UTC
VCP: 31
Tilt: 0.399°

Select Product:

- BR
- VIL
- BV
- VLD
- SRV
- POSH
- SW
- MEHS
- ET

Select Tilt:

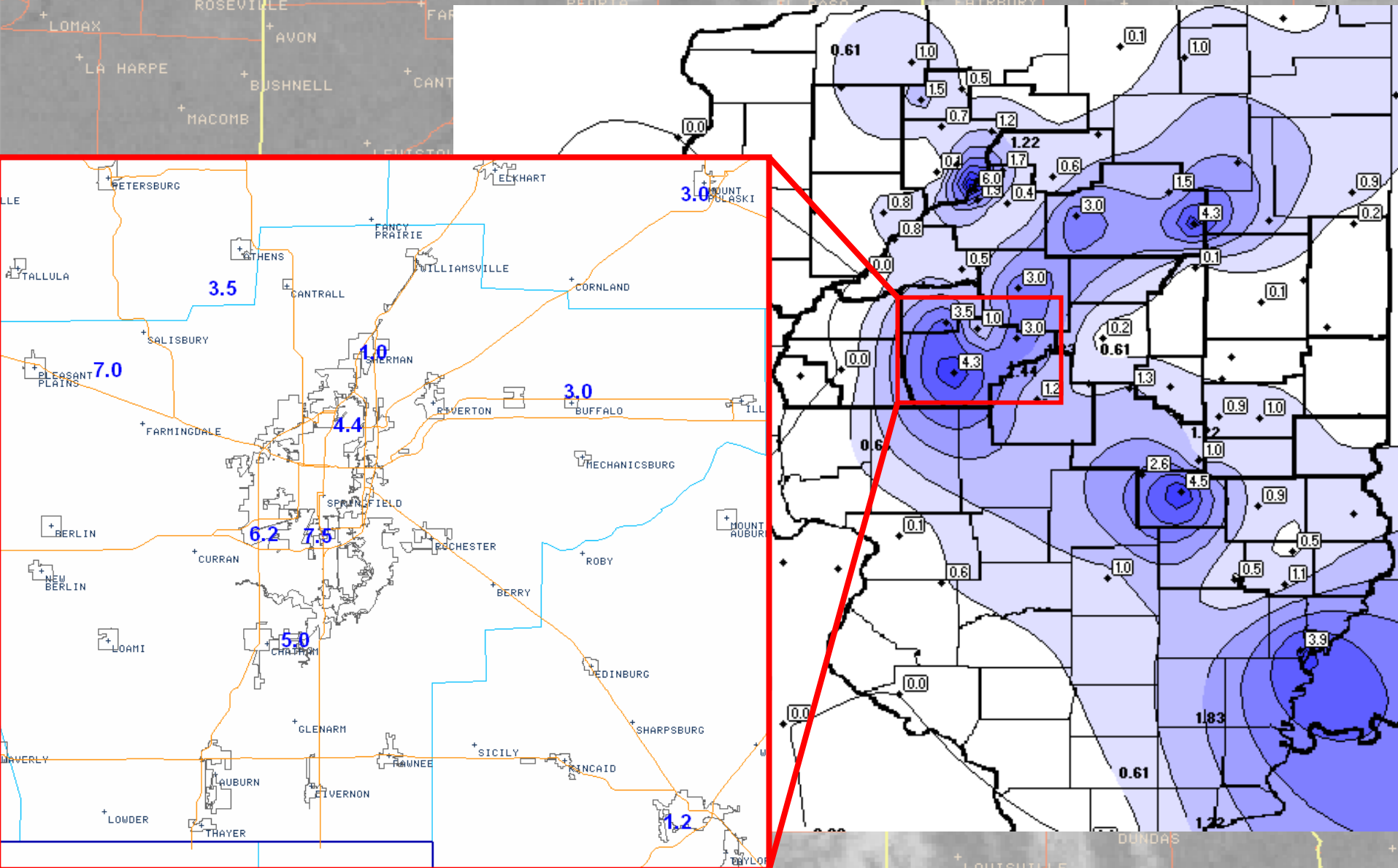
0.4° 1.4° 2.4° 3.4°
4.4°

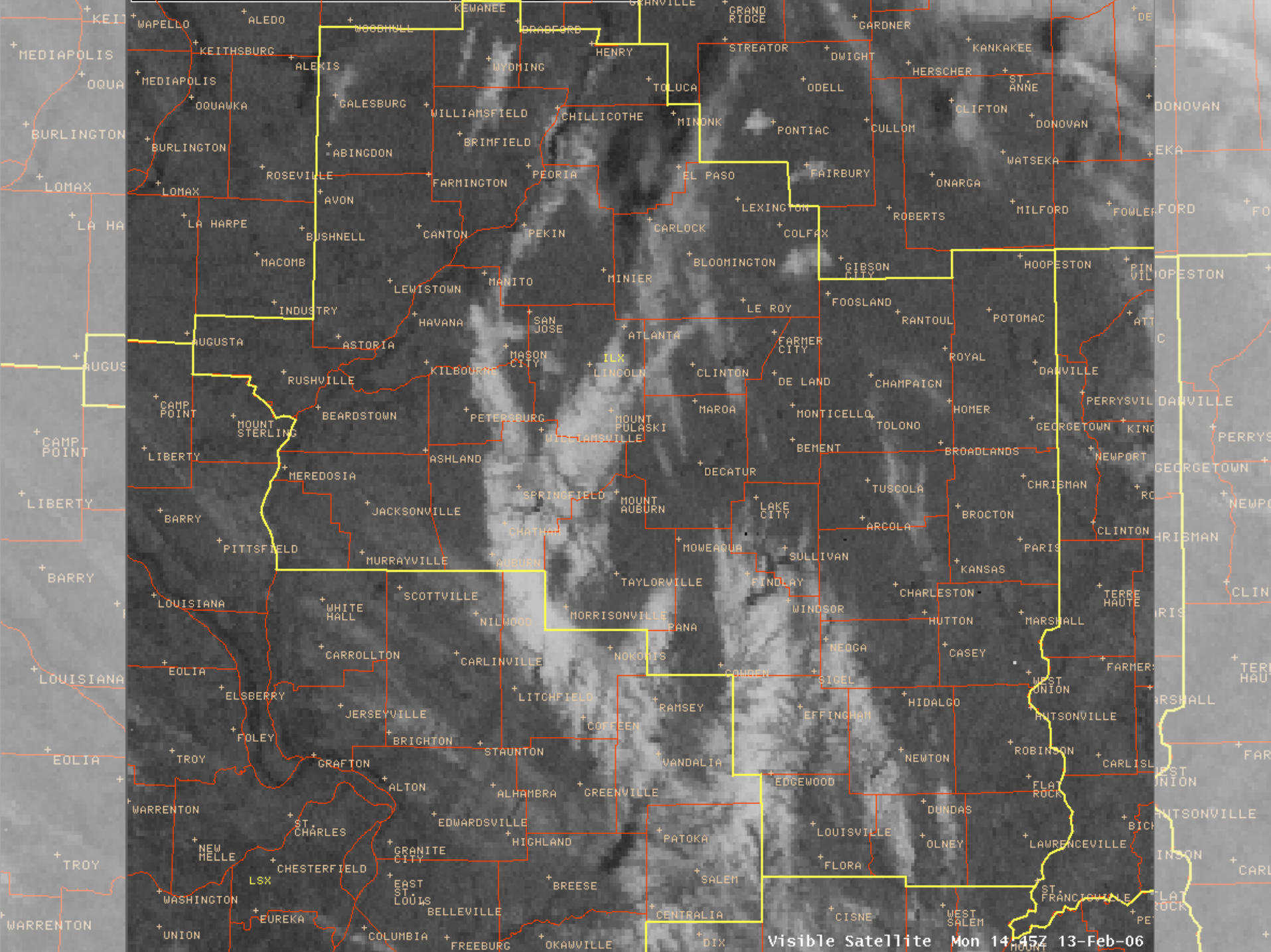
Warnings:

- Flash Flood - 0
- Thunderstorm - 0
- Tornado - 0

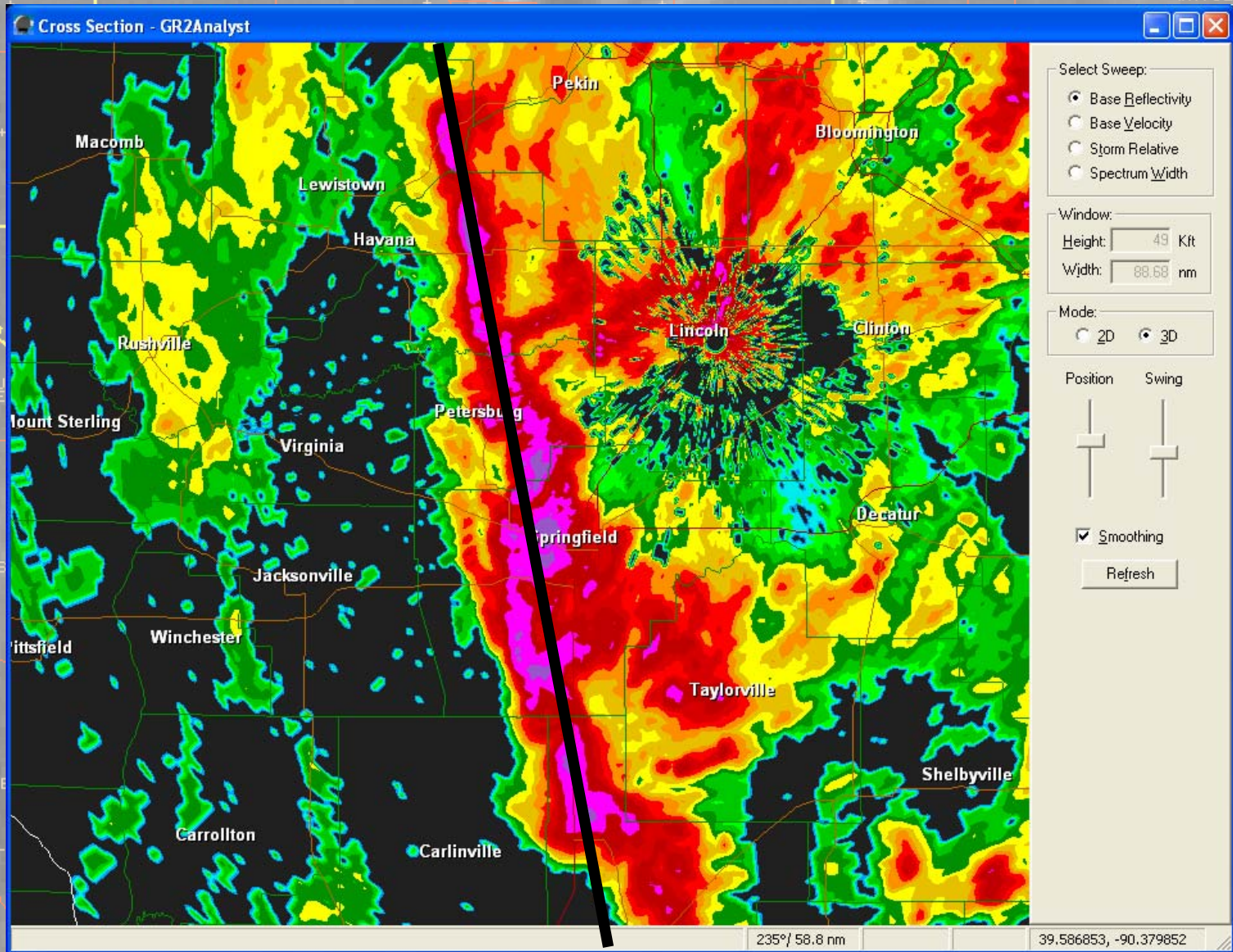
Smoothing
 Details

Snowfall totals





Cross Section



Cross Section - GR2Analyst

- Select Sweep:
- Base Reflectivity
 - Base Velocity
 - Storm Relative
 - Spectrum Width

Window:

Height: 49 Kft

Width: 88.68 nm

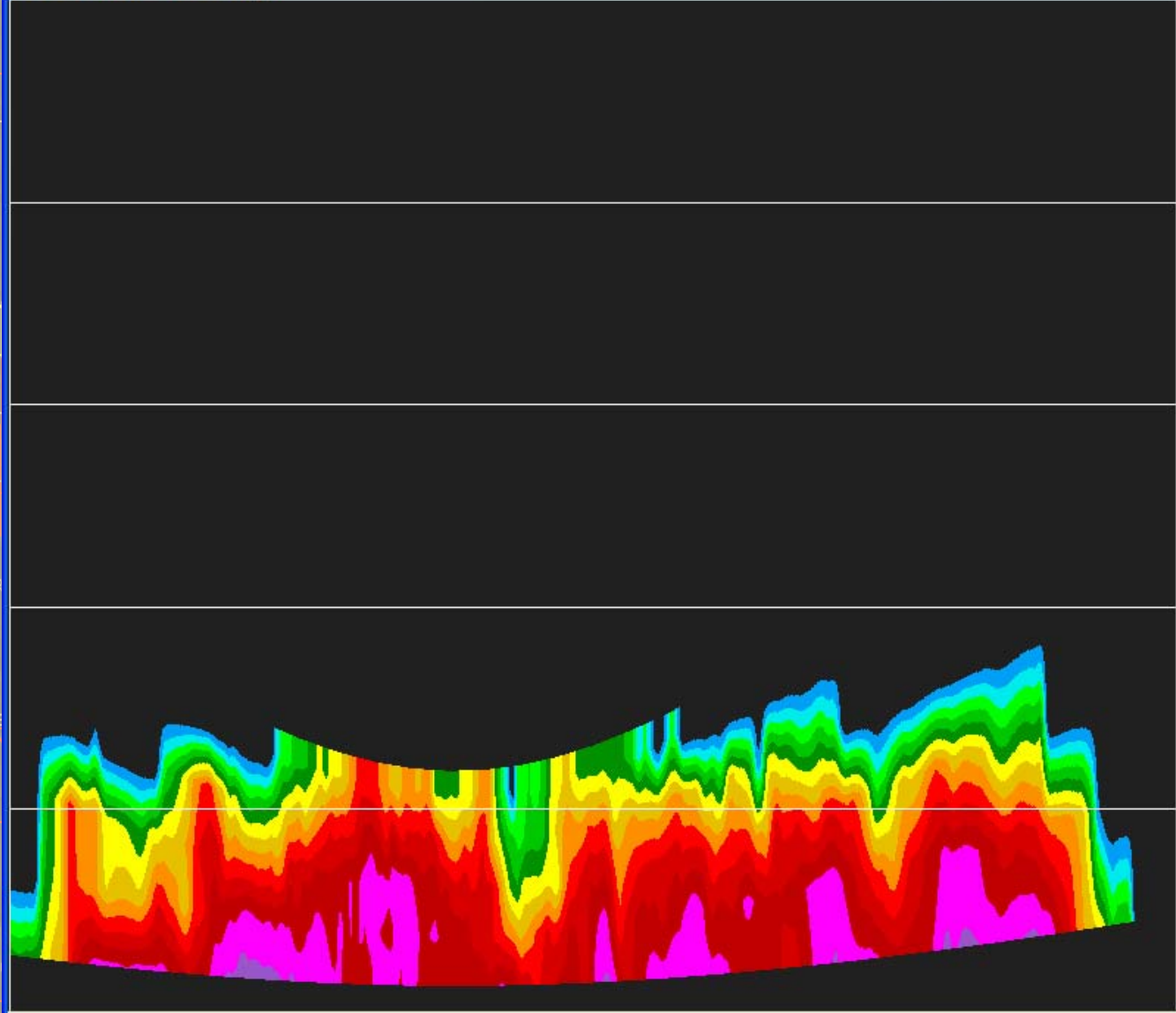
- Mode:
- 2D
 - 3D

Position

Swing

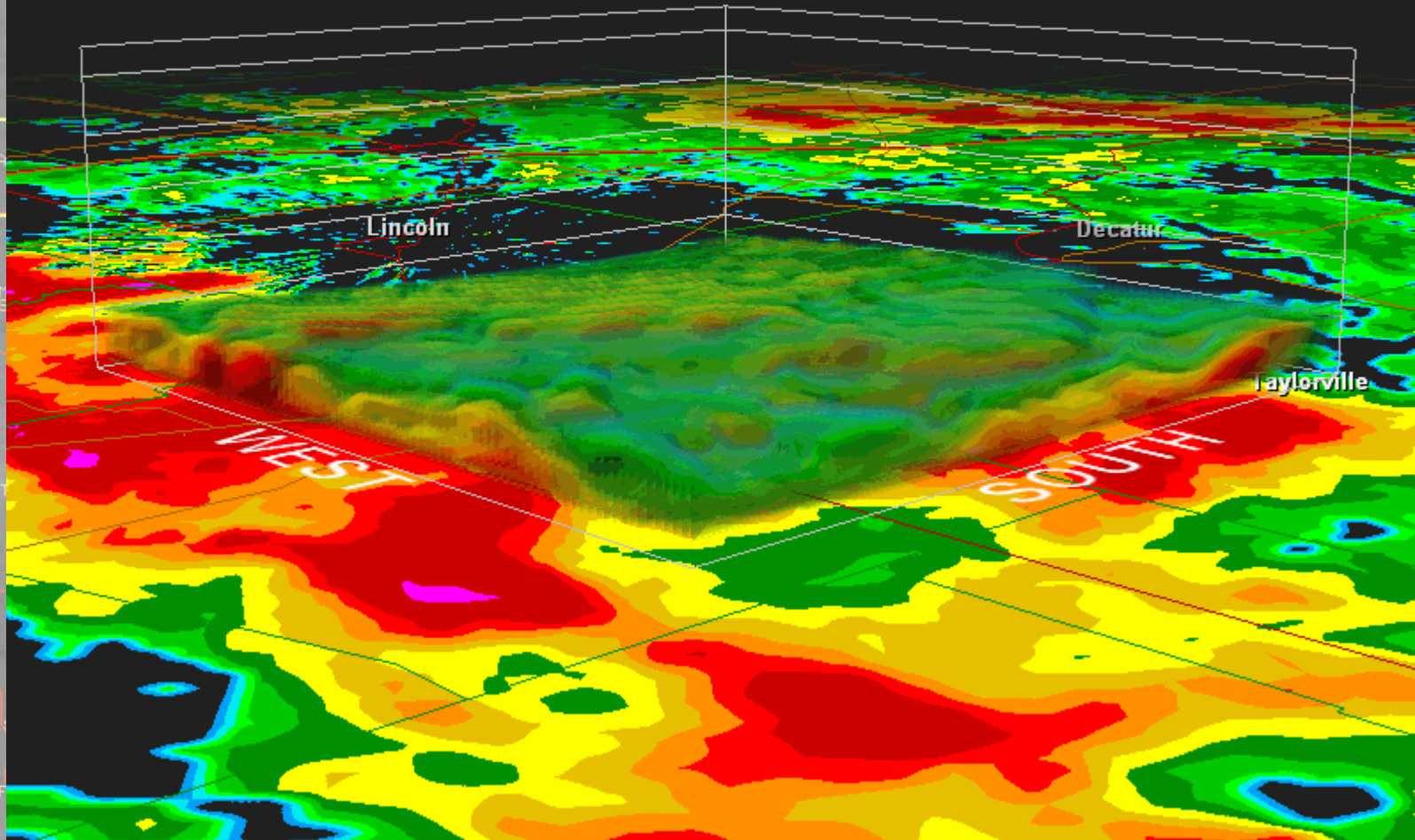
Smoothing

Refresh



227° / 26.2 nmi 29651 ft 39.856140, -89.757881

10+ dBZ isosurface Facing Northeast



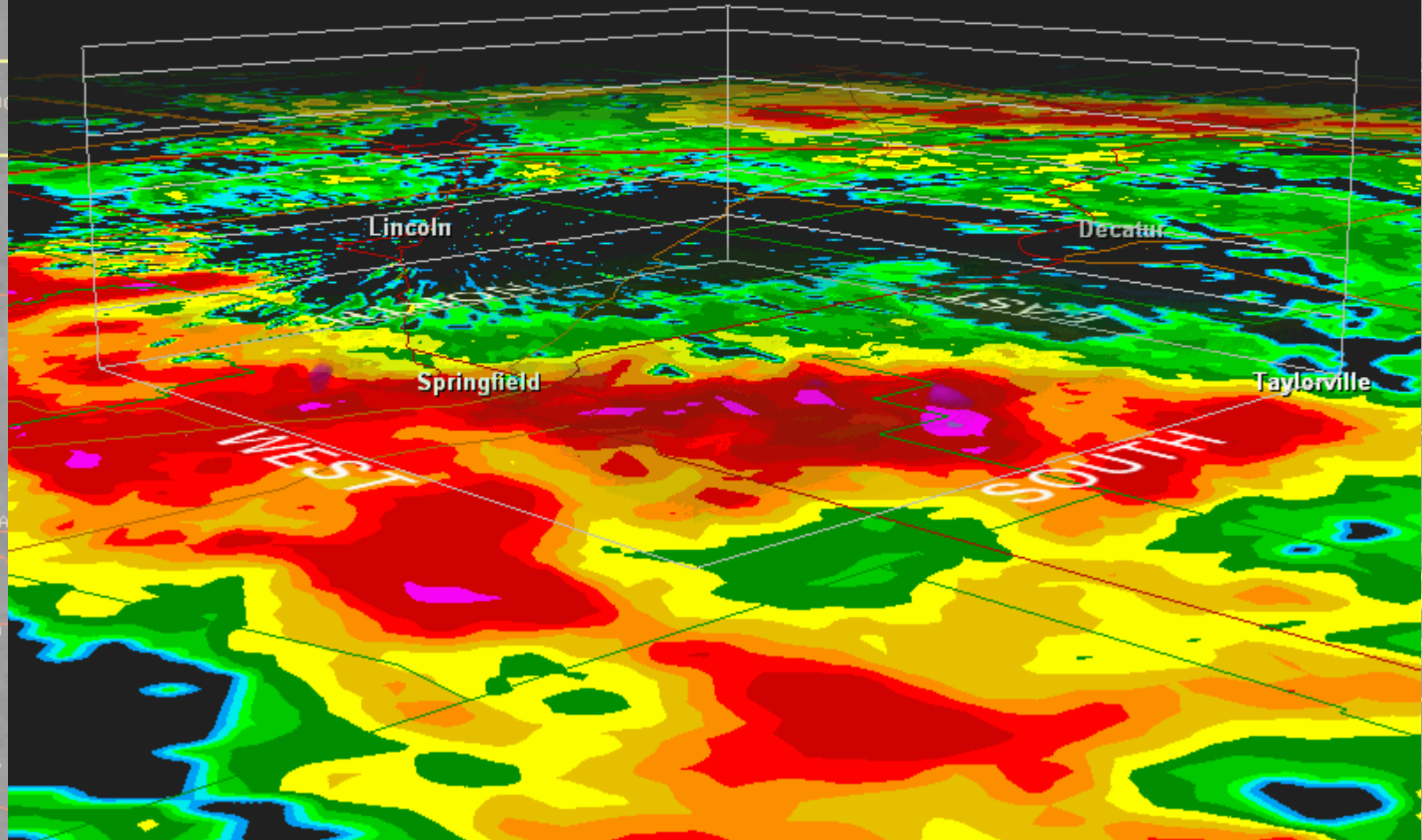
+ KEITHS
+ MEDIAPOLIS
+ OQUAWKI
+ BURLINGTON
+ LOMAX
+ LA HARPE
+ AUGUSTA
+ CAMP POINT
+ LIBERTY
+ BARRY
+ PITTSBURGH
+ LOUISIANA
+ EOLIA
+ ELIZABETH
+ TROY

AN
+ FO
ON
+ LLE
+ PERRYS
+ TOWN
+ NEWPO
AN
+ CLIN
+ TER
+ HAU
L
+ FAR
VILLE
+ CAR

+ WARRENTON
+ ALTON
+ ALHAMBRA
+ GREENVILLE
+ EDWARDSVILLE
+ EDGEMOND
+ LOUISVILLE
+ DUNDAS
+ FLAT ROCK

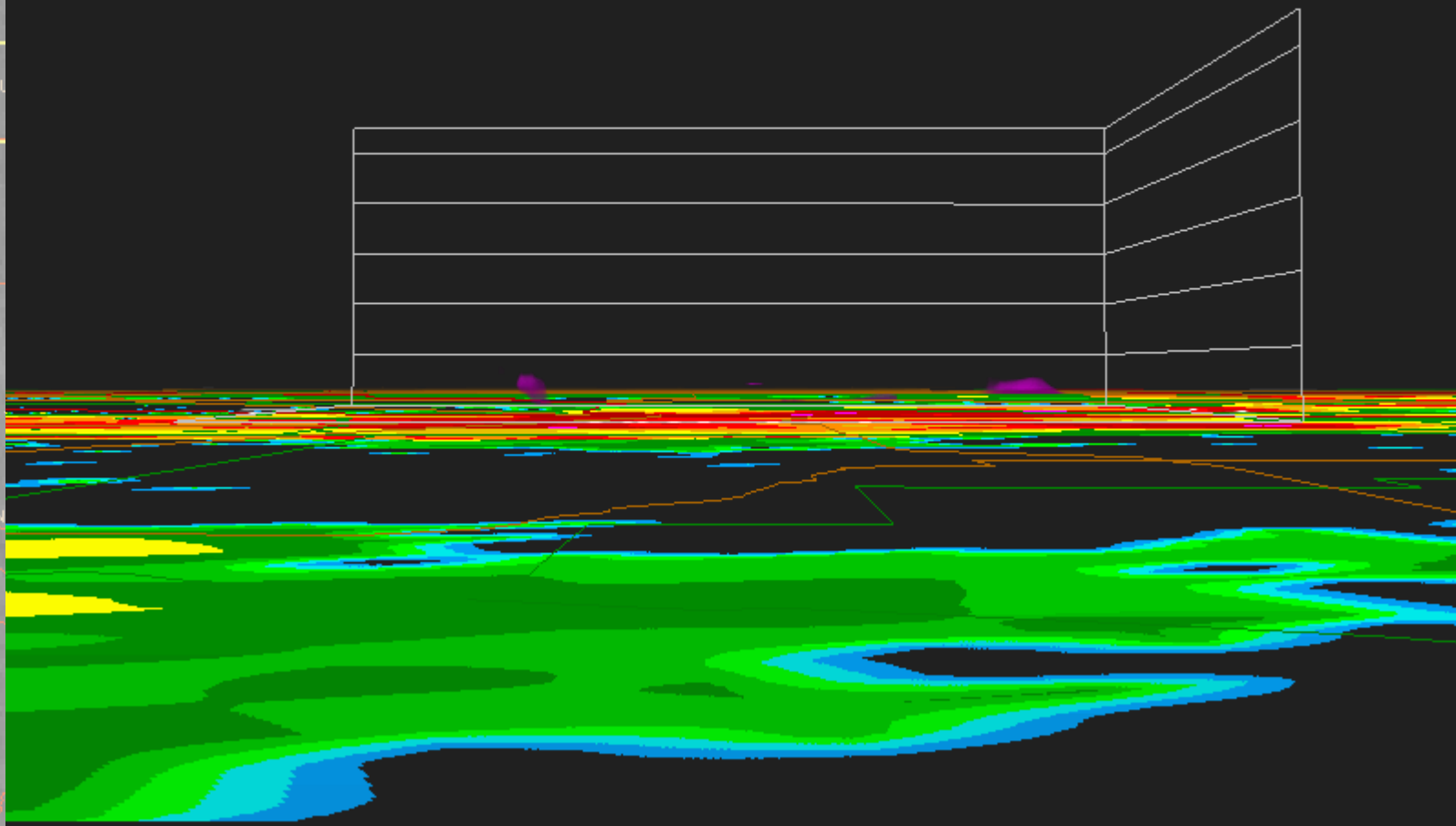
AdGif - UNREGISTERED

35+ dBZ isosurface Facing Northeast



AdGif - UNREGISTERED

35+ dBZ isosurface Facing East



MSLP 00z - 21z

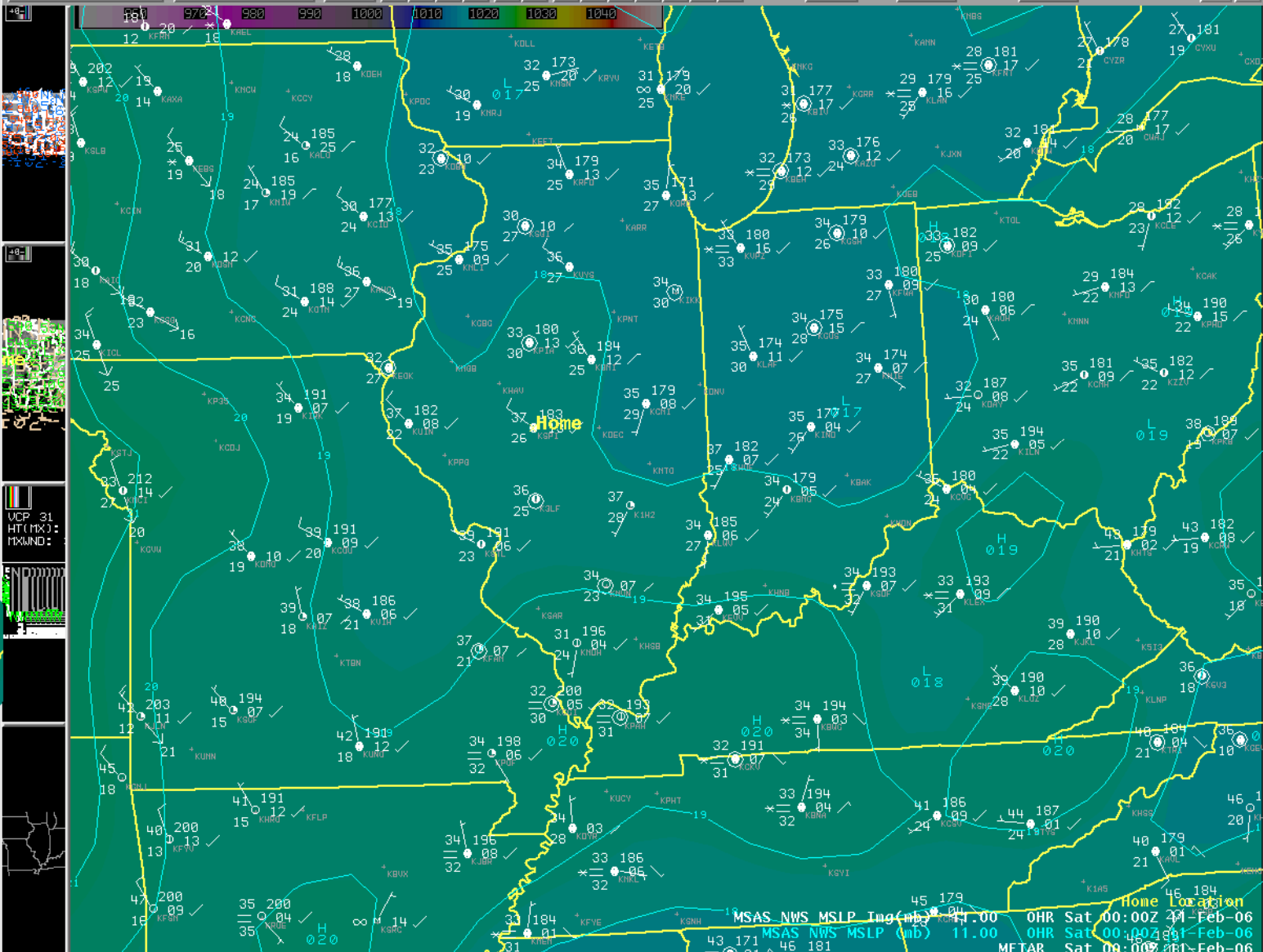
AdGif - UNREGISTERED

Forecast Systems Laboratory D-2D (eshimon)

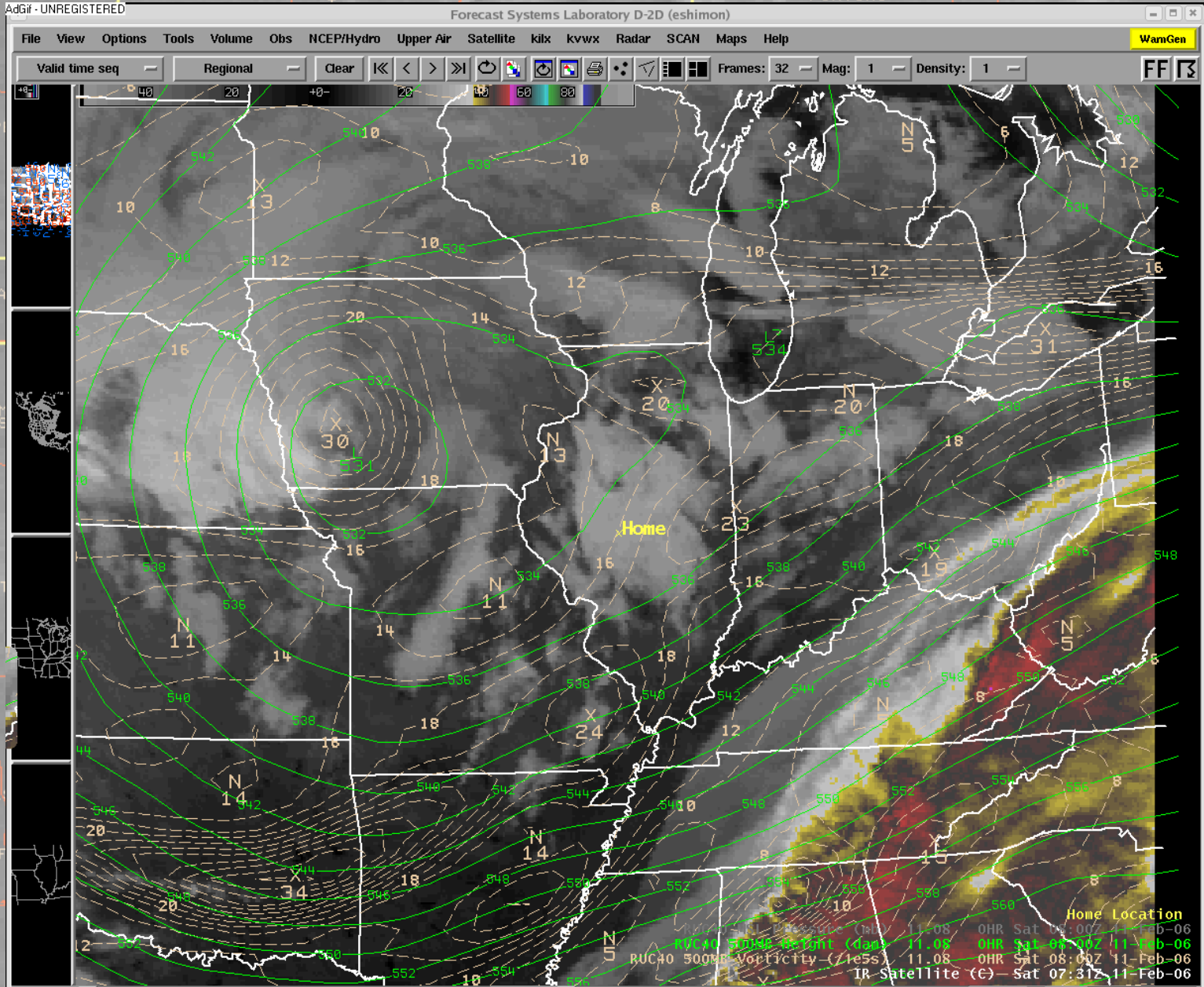
WamGen

File View Options Tools Volume Obs NCEP/Hydro Upper Air Satellite Kilx kvwx Radar SCAN Maps Help

Valid time seq Regional Clear Frames: 32 Mag: 1 Density: 1



IR Sat – 500 Ht/Vort 07z-18z



Snow Band Checklist

Presence of (1"/hr):

- limited dry air advection in near surface.***
- near saturated low-mid level RH present (1000-500mb >85%)***
- Favorable thermodynamic profile for snow (i.e. cloud top temp <-9C, no melting layers)***
- Sloped region of mid-level 2-D frontogenesis / Deformation axis in 800-600mb range (Banacos 2003; Schumacher 2003)***
- Relative minimum in wind speed (<20kt) within 850-700mb region (col point aloft) and/or uniform deep-layer shear profile, absence of substantial hodograph curvature (Banacos 2003)***

Snow Band Checklist (cont.)

Enhancement of (1-3"/hr, 5"/hr in extreme cases):

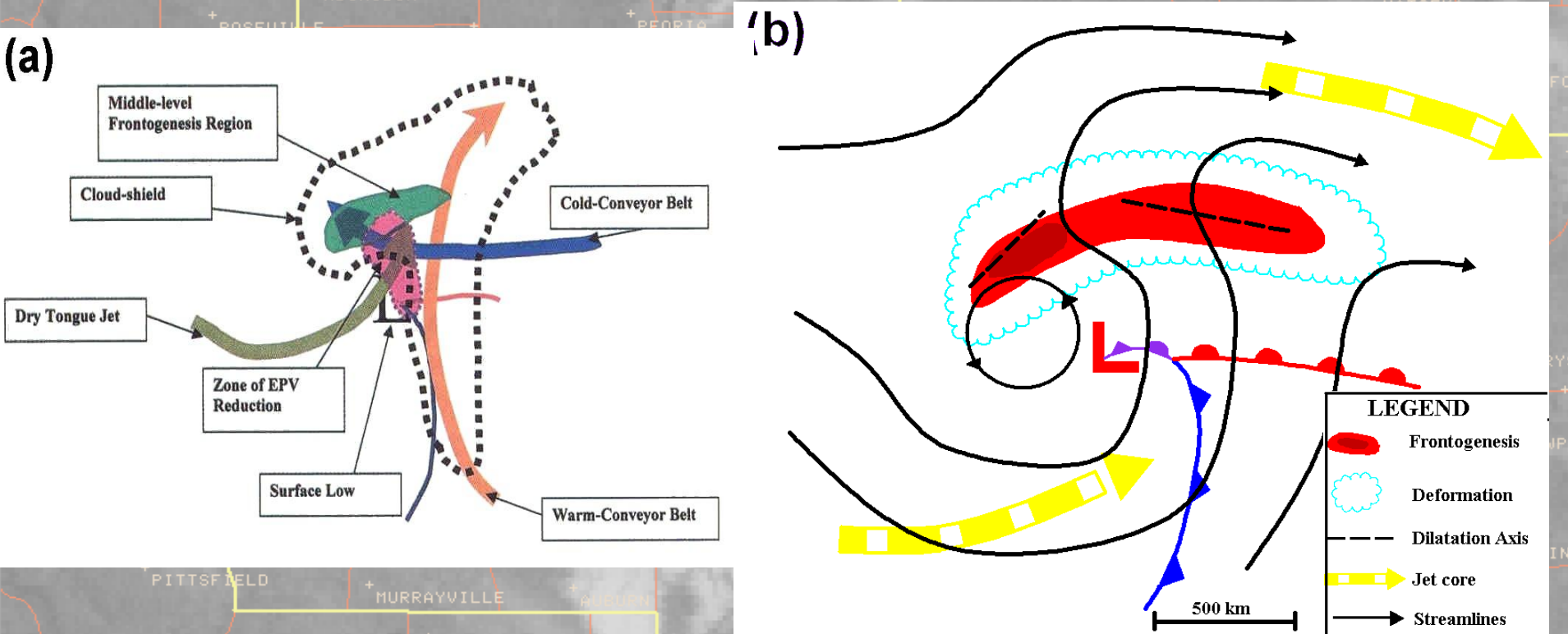
Saturation through dendrite growth layer (-12 to -16C) coincident with strong UVV (high precipitation efficiency)

Presence of negative EPV in a saturated area above a maximum of frontogenesis -- elevated potential or slantwise instability (convective snow potential, band multiplicity)

Typically associated with major, deepening cyclones

(Shumacher and Schultz, 1999; Novak et al. 2002; Trapp et al. 2000)

Banded Snow Conceptual Models



- *Conceptual models of synoptic and mesoscale environments of banded cyclones from (a) Nicosia and Grumm (1999) and (b) Novak et al. (2003).*

Common Synoptic Patterns

Forecast premise for mesoscale banding:

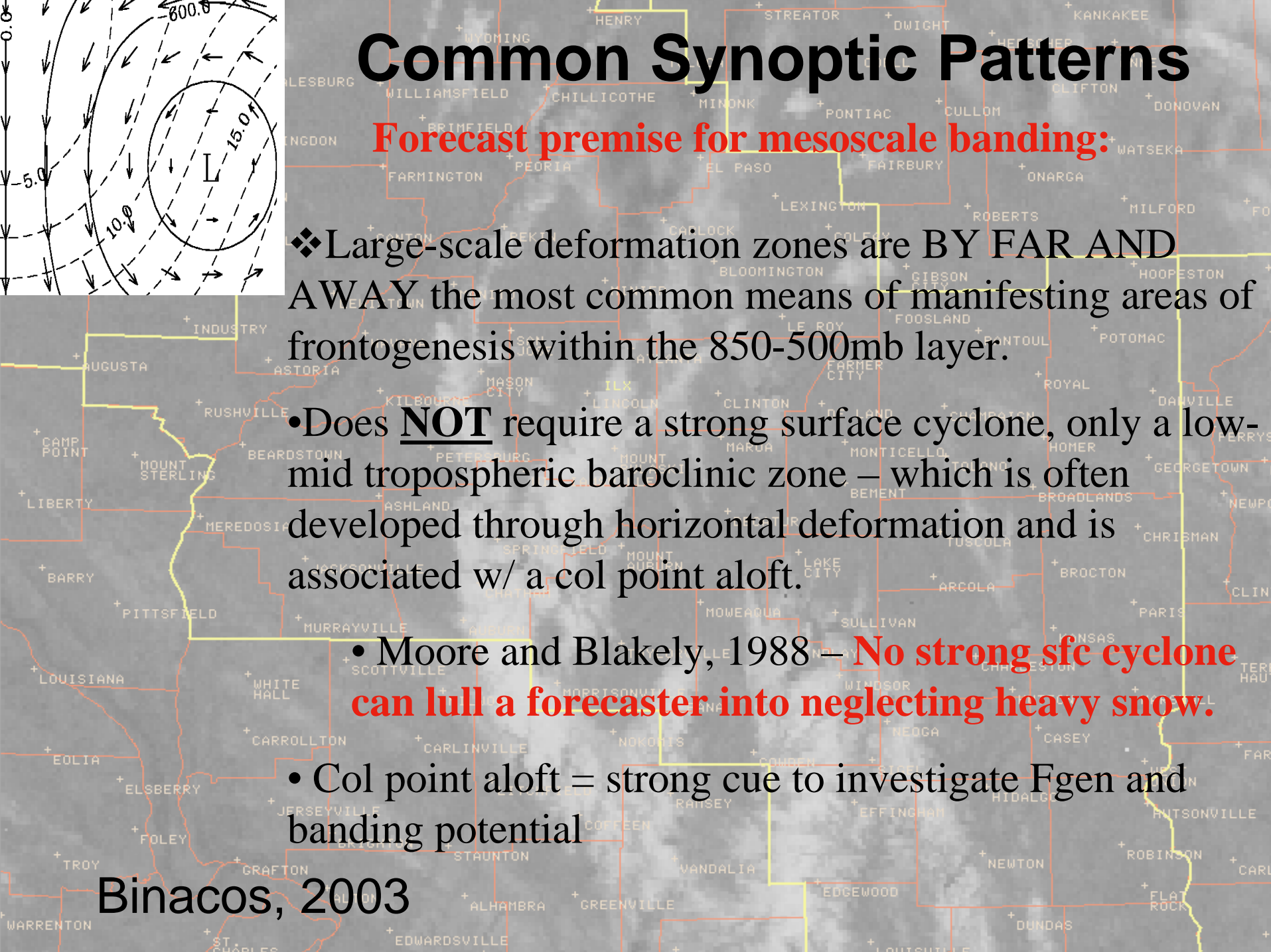
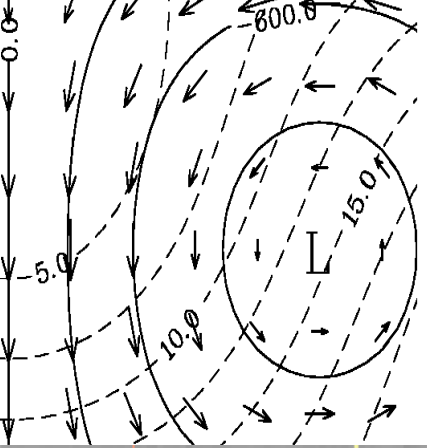
❖ Large-scale deformation zones are BY FAR AND AWAY the most common means of manifesting areas of frontogenesis within the 850-500mb layer.

• Does **NOT** require a strong surface cyclone, only a low-mid tropospheric baroclinic zone – which is often developed through horizontal deformation and is associated w/ a col point aloft.

• Moore and Blakely, 1988 – **No strong sfc cyclone can lull a forecaster into neglecting heavy snow.**

• Col point aloft = strong cue to investigate Fgen and banding potential

Binacos, 2003



Col Point example

Boston, MA Surface Observations

BOS 13 UTC 1 1/2 SM -SN

BOS 14 UTC 1/2 SM SN

BOS 15 UTC 1/2 SM SN SNINCR 1/2

BOS 16 UTC 1/2 SM SN SNINCR 1/3

BOS 17 UTC 1/2 SM SN SNINCR 2/4

BOS 18 UTC 1/4 SM +SN SNINCR 2/6

BOS 19 UTC 1/4 SM +SN SNINCR 2/8

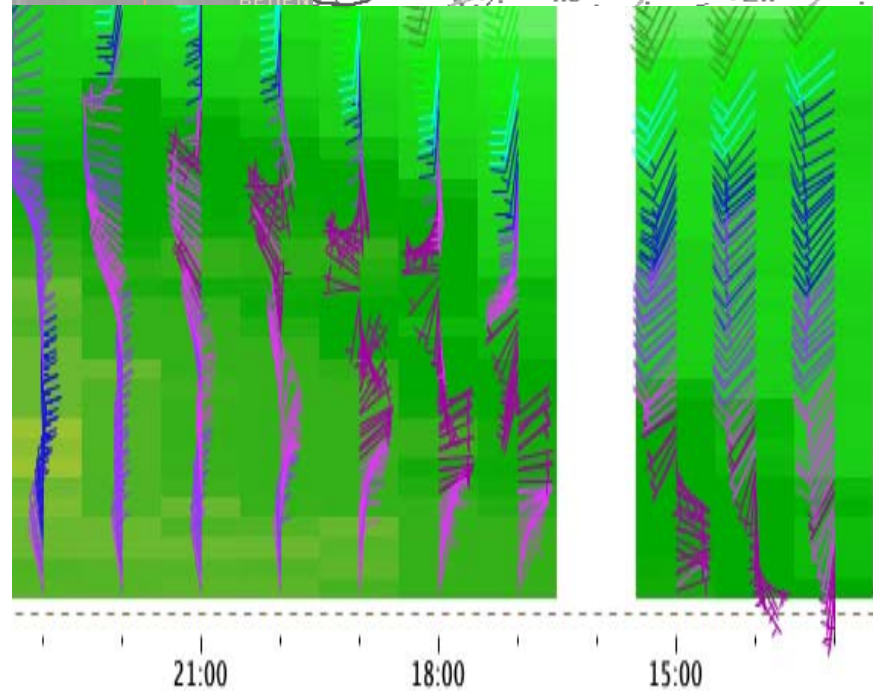
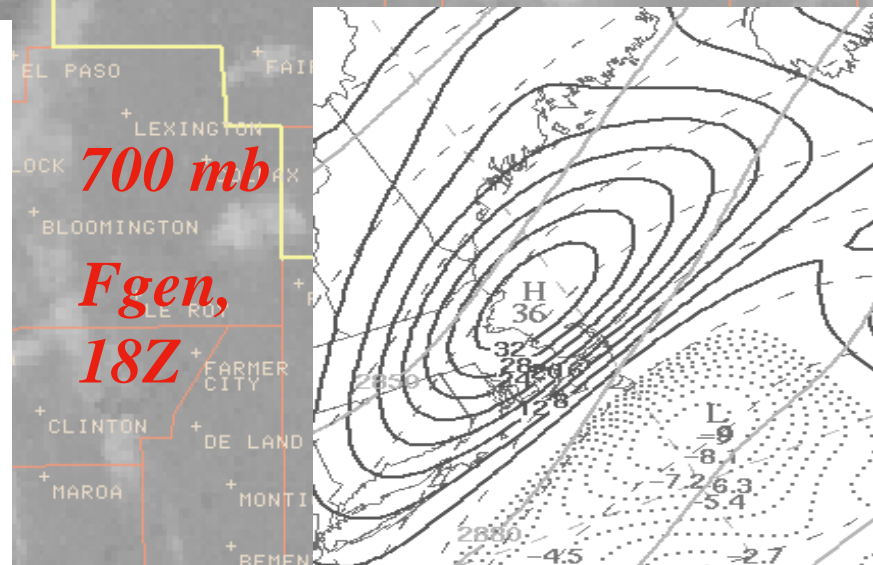
BOS 20 UTC 1/4 SM +SN SNINCR 2/10

BOS 21 UTC 1/4 SM SN SNINCR 1/10

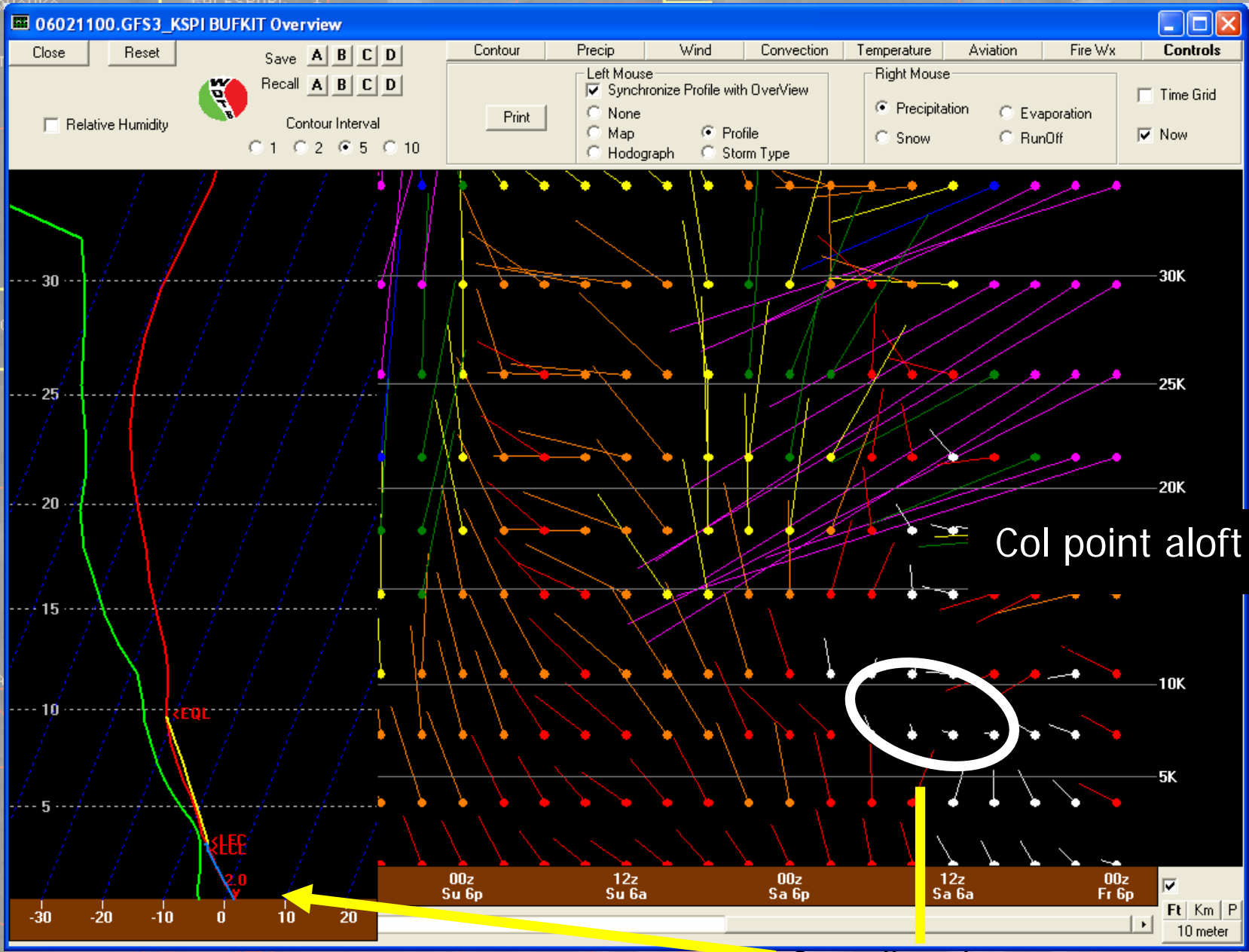
BOS 22 UTC 1/4 SM -SN

BOS 23 UTC 2 SM -SN

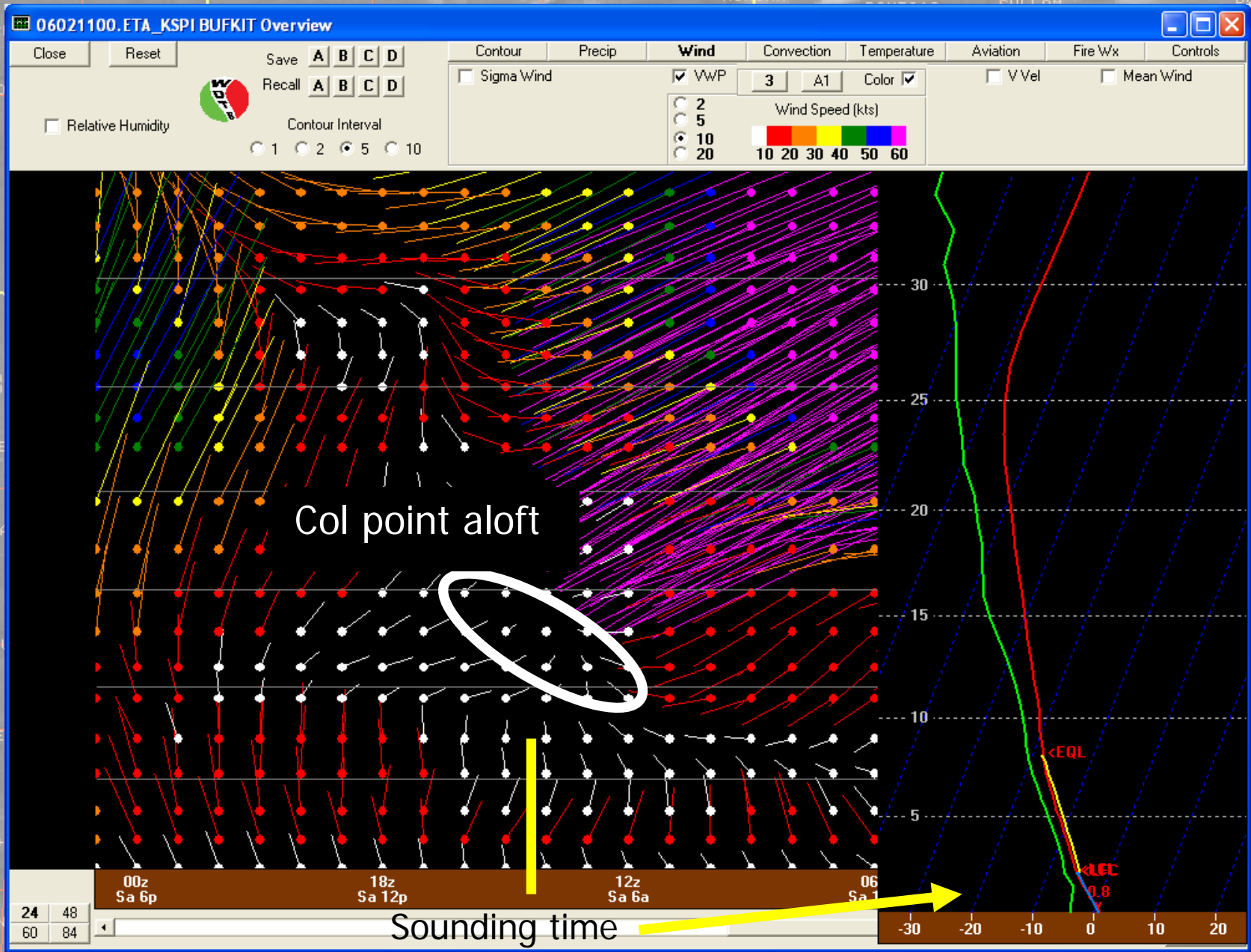
BOS 00 UTC 10 SM



GFS 00z Feb 11 – Wind Profile

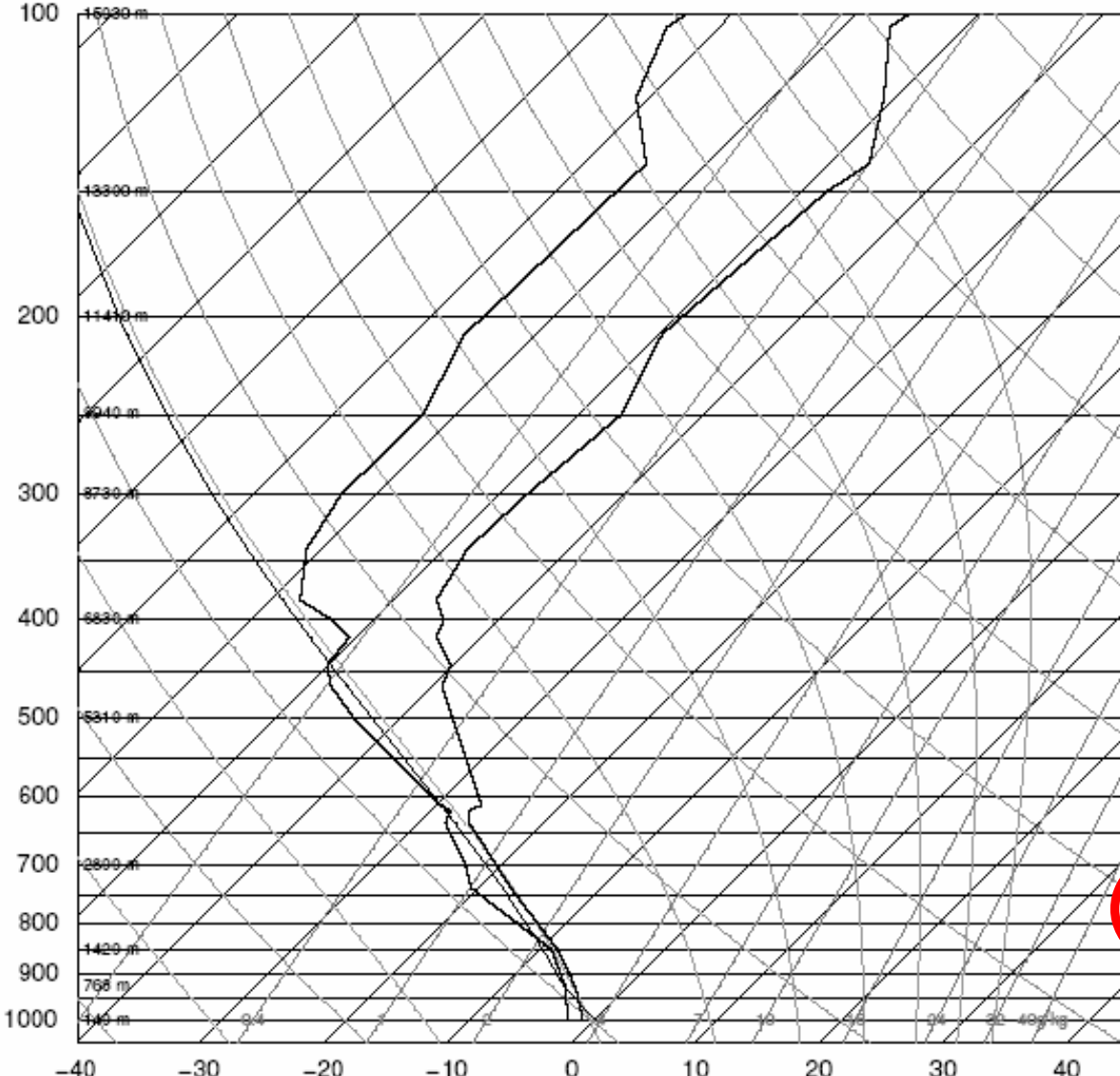


NAM 00z Feb 11 - Wind Profile



Sounding – ILX 12z Feb 11

74560 ILX Lincoln



SLAT	40.16
SLON	-89.3
SELV	178.0
SHOW	5.27
LFT	6.46
LFTV	6.46
SWET	115.9
KIX	15.50
CTOT	26.70
VTOT	27.20
TOTL	53.90
CAPE	0.00
CAPV	0.00
CINS	0.00
CINV	0.00
EQLV	-9999
EQTV	-9999
LFCT	-9999
LFCV	-9999
BRCH	0.00
BRCV	0.00
LCLT	269.4
LCLP	950.2
MLTH	273.4
MLMR	3.08
THCK	5161.
PWAT	7.57

Col Point Aloft



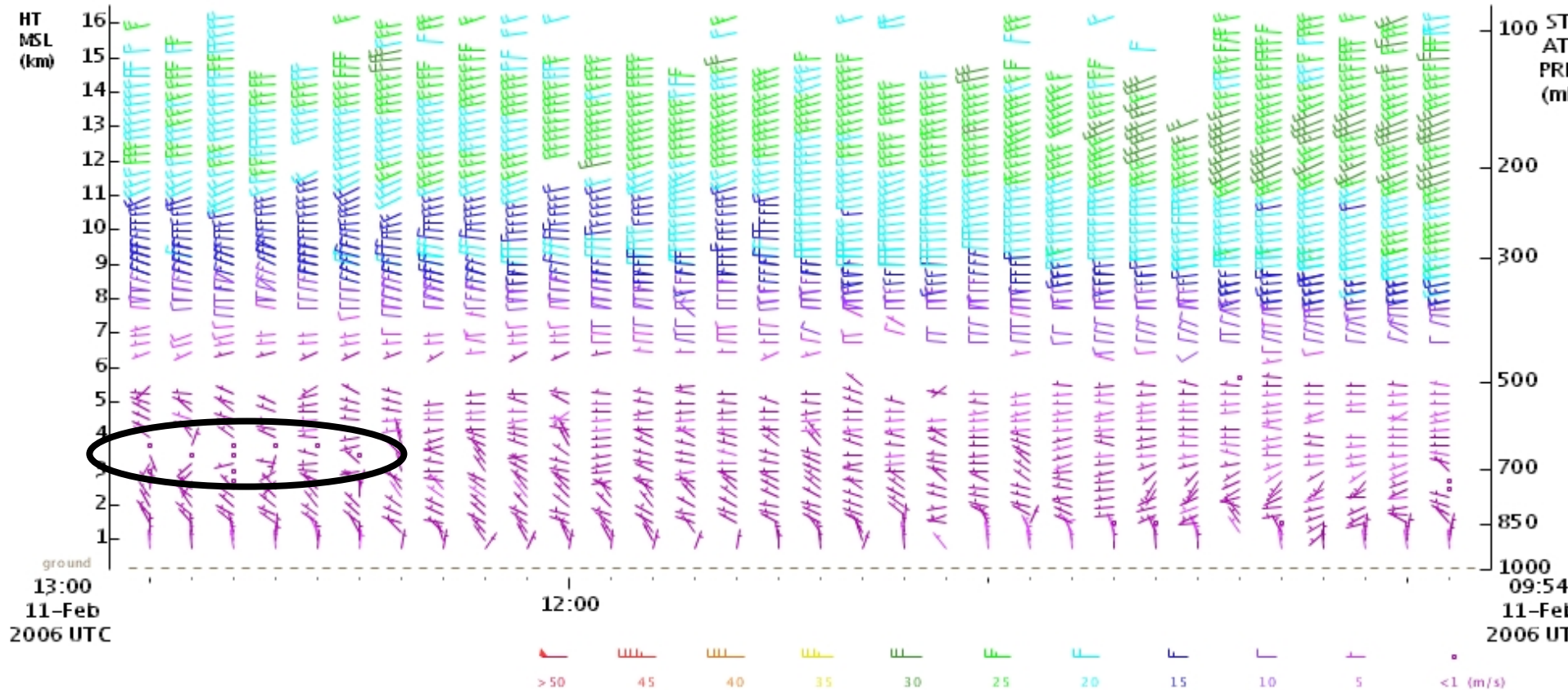
12Z 11 Feb 2006

University of Wyoming

30 miles southwest of SPI

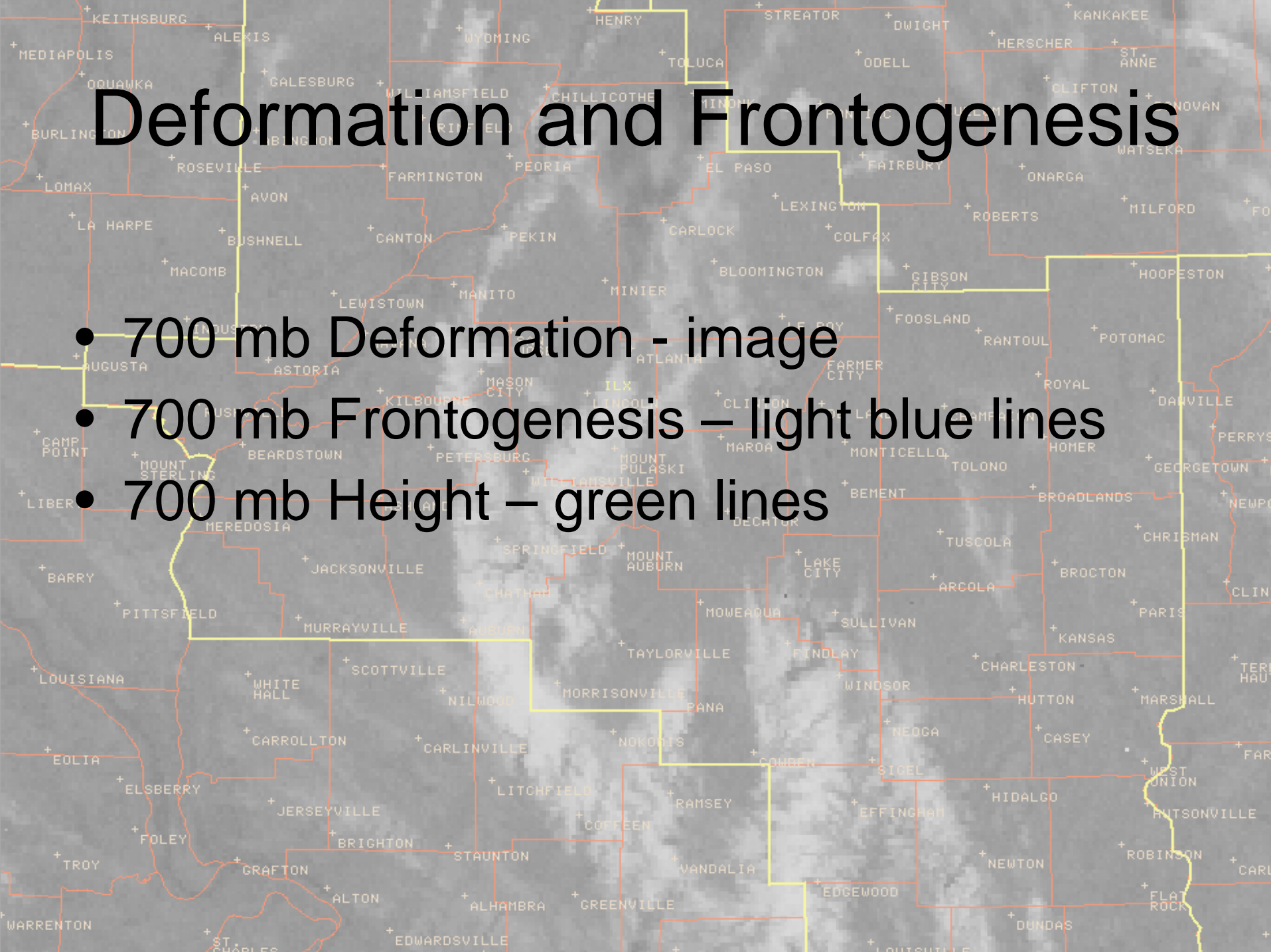


WINCHESTER, IL US Lat:39.65 Lon:-90.48 Elev:170m
WindSpeedDirection| Mode:900m,310m | Res:6min | QC:good only
NOAA PROFILER NETWORK



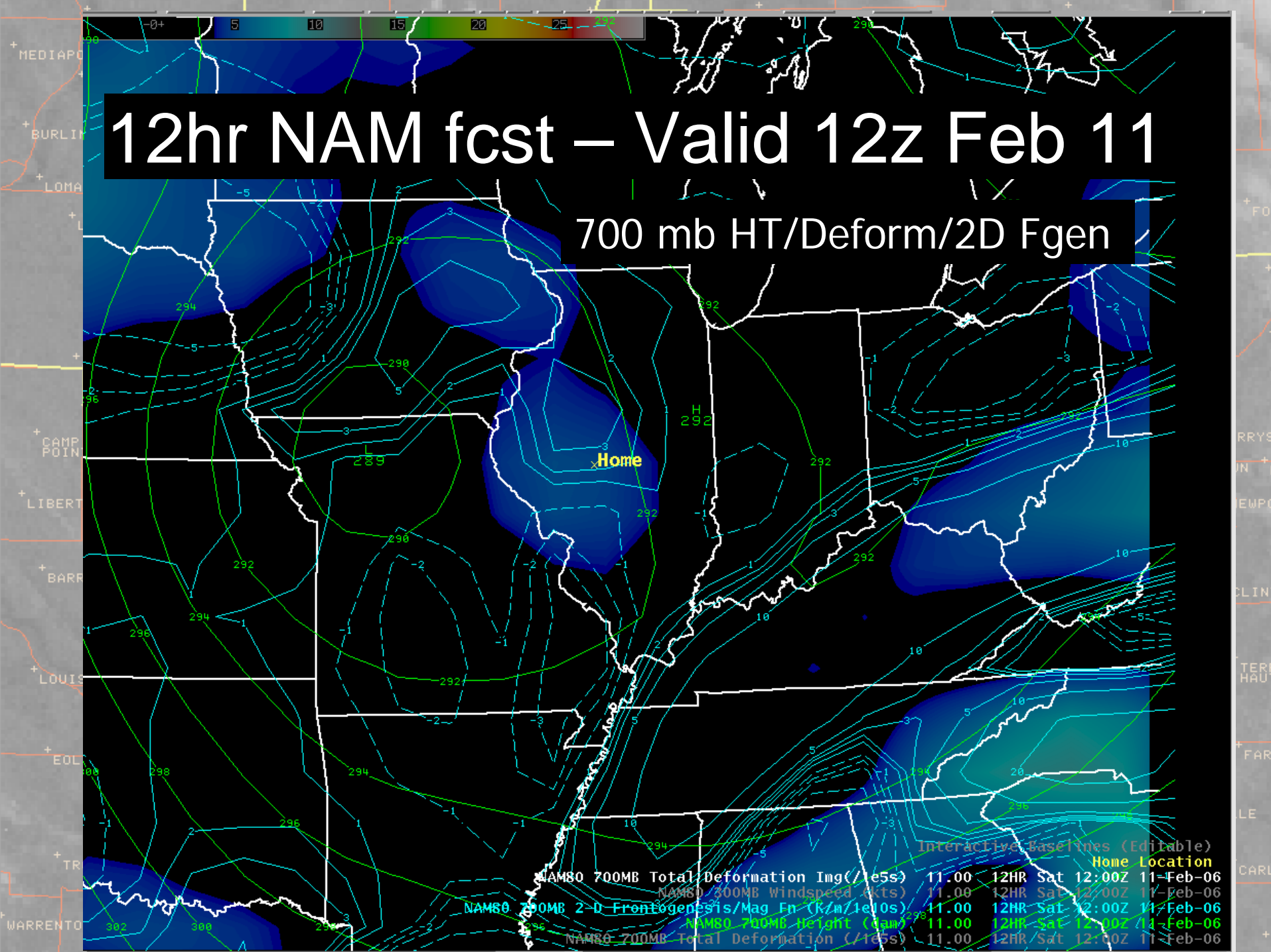
Deformation and Frontogenesis

- 700 mb Deformation - image
- 700 mb Frontogenesis – light blue lines
- 700 mb Height – green lines



12hr NAM fcst – Valid 12z Feb 11

700 mb HT/Deform/2D Fgen

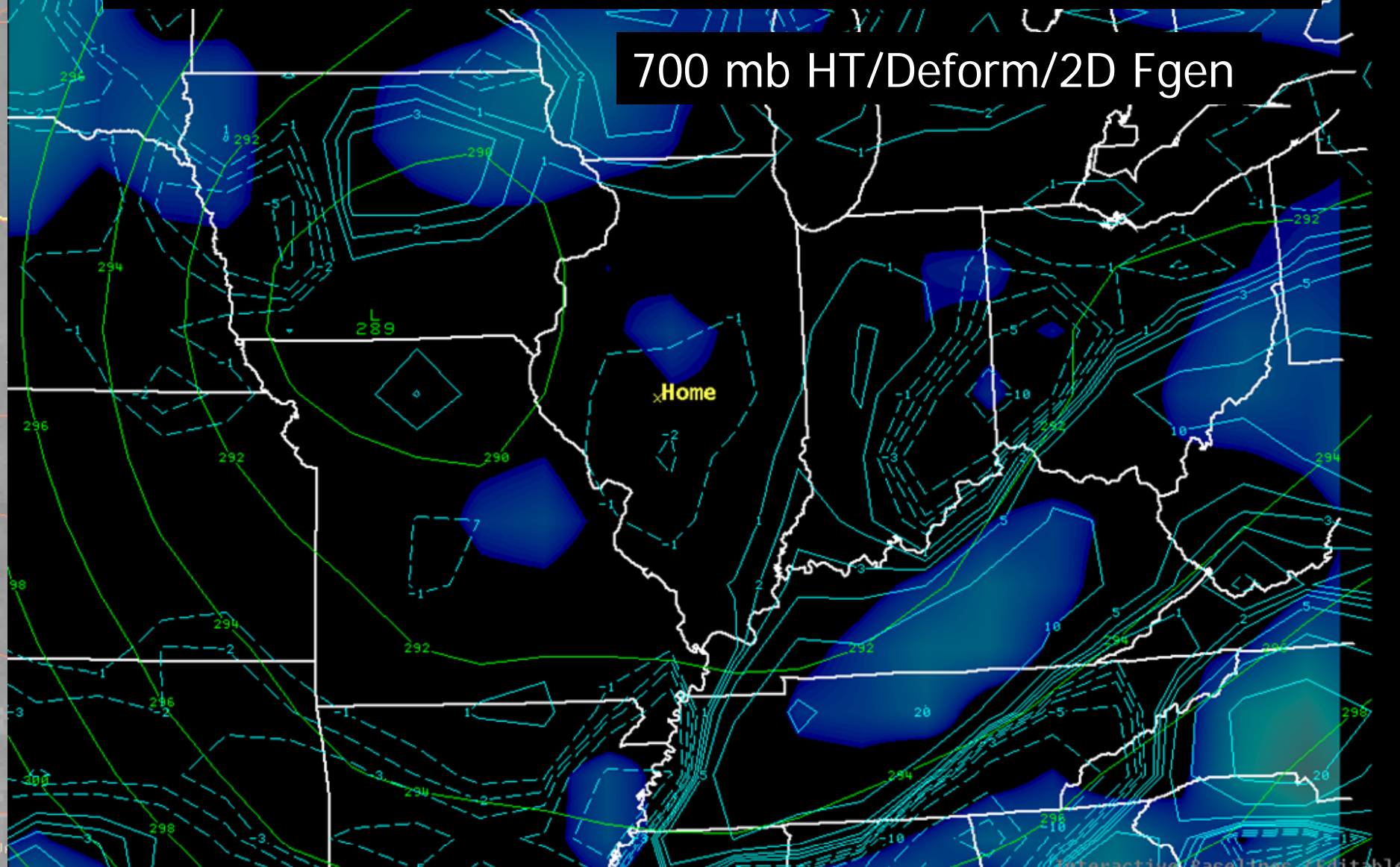


Interactive Baselines (Editable)

	Home Location
NAMS0 700MB Total Deformation Img (/e5s)	11.00 12HR Sat 12:00Z 11-Feb-06
NAMS0 700MB Windspeed (kts)	11.00 12HR Sat 12:00Z 11-Feb-06
NAMS0 700MB 2-D Frontogenesis/Mag Fn (K/m/1e10s)	11.00 12HR Sat 12:00Z 11-Feb-06
NAMS0 700MB Height (dam)	11.00 12HR Sat 12:00Z 11-Feb-06
NAMS0 700MB Total Deformation (/e5s)	11.00 12HR Sat 12:00Z 11-Feb-06

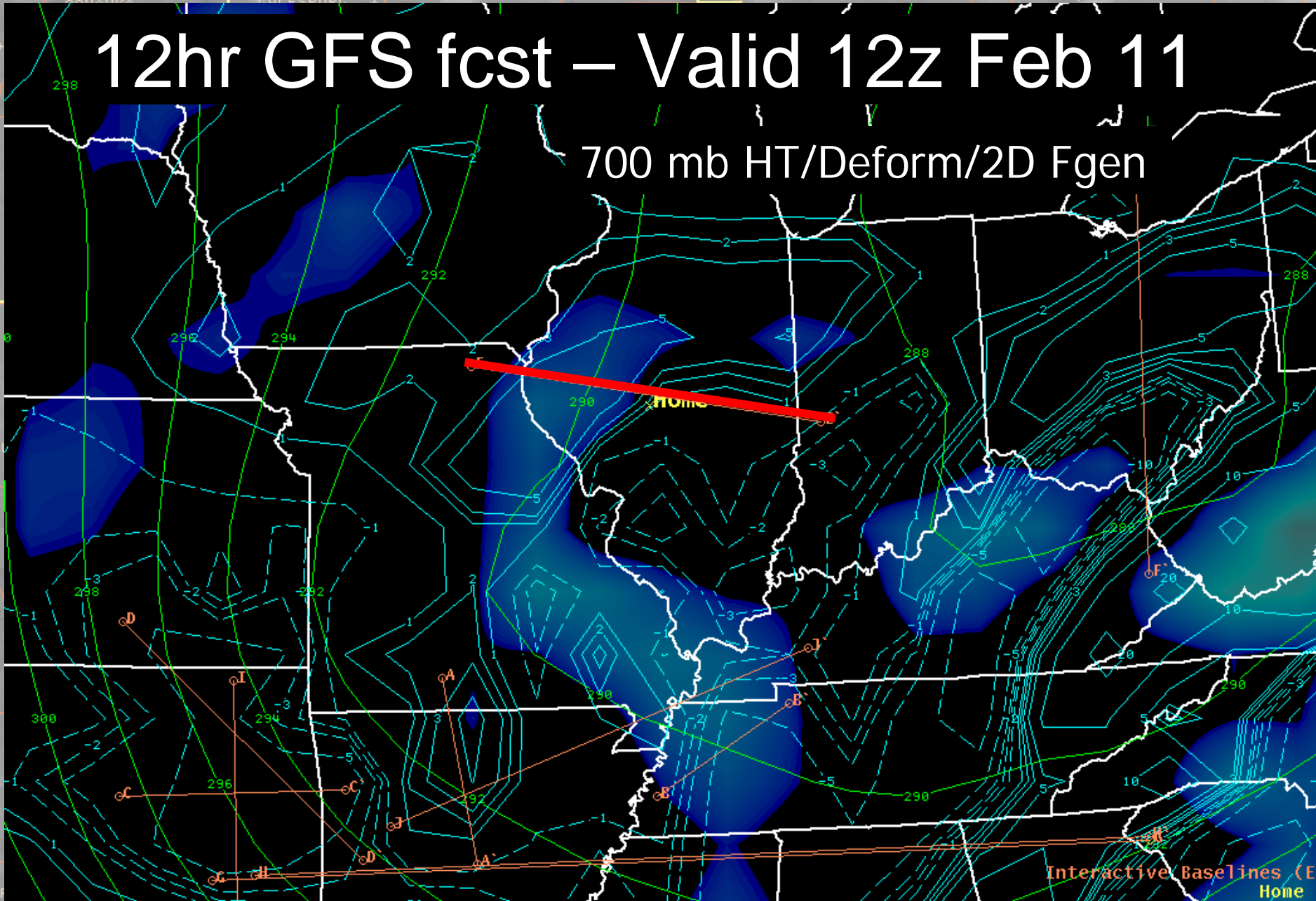
3hr RUC fcst – Valid 12z Feb 11

700 mb HT/Deform/2D Fgen



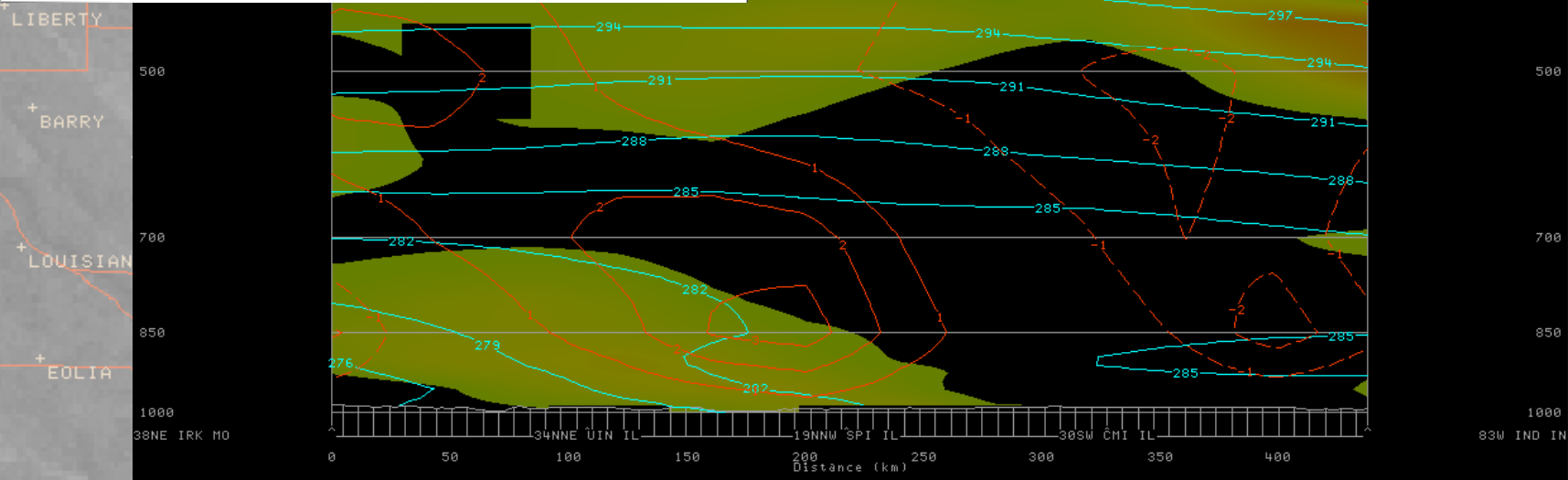
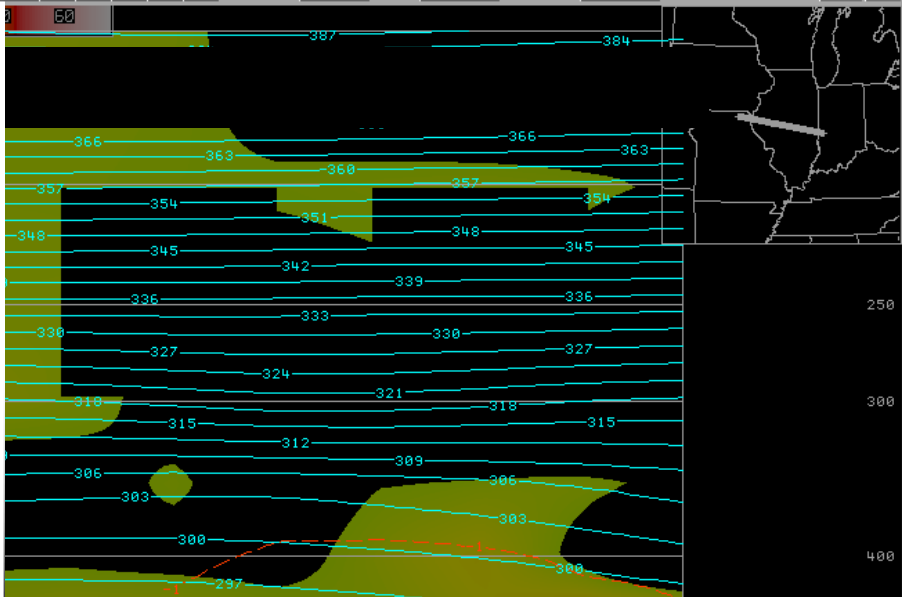
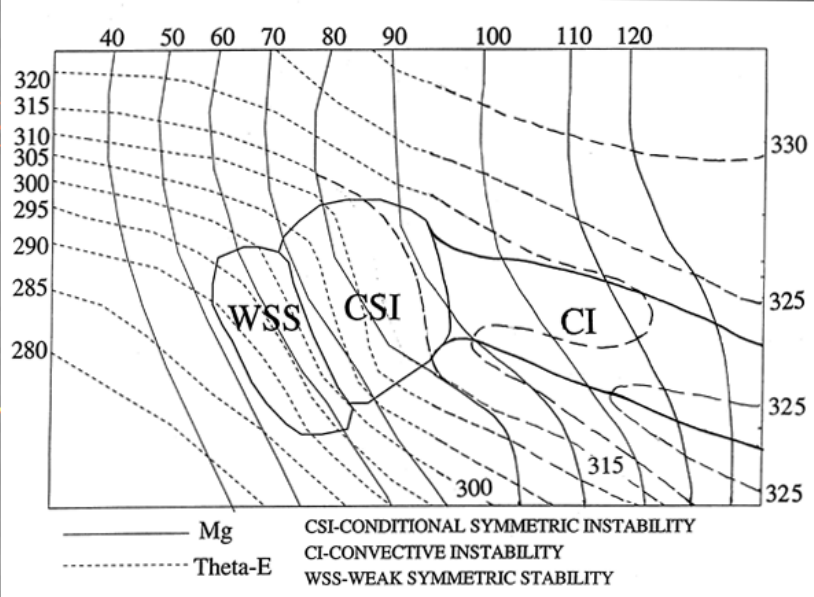
12hr GFS fcst – Valid 12z Feb 11

700 mb HT/Deform/2D Fgen

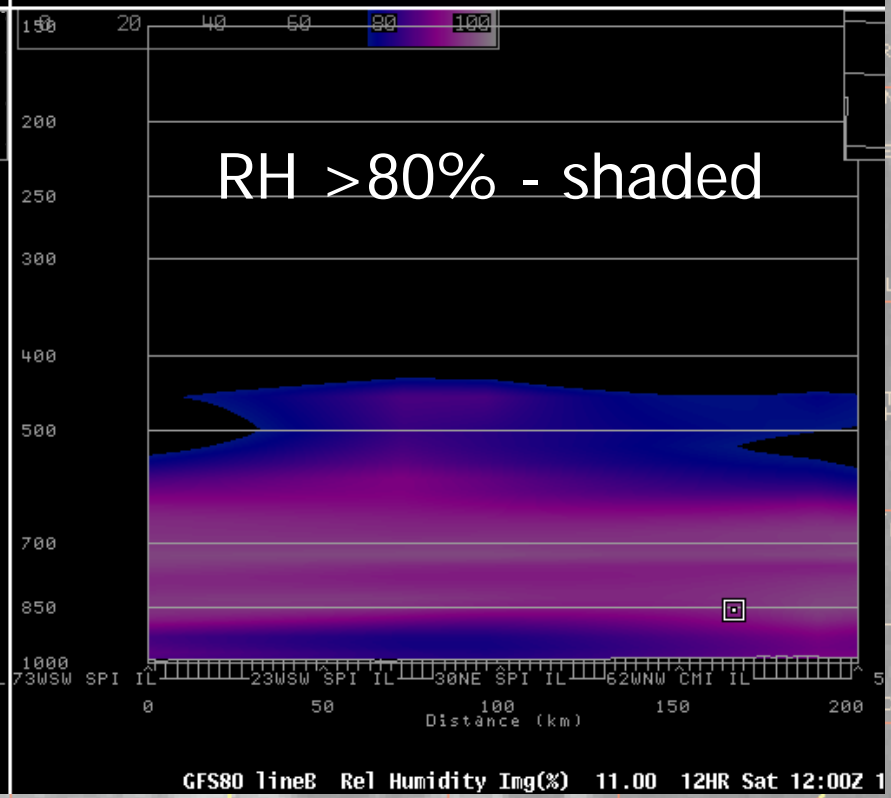
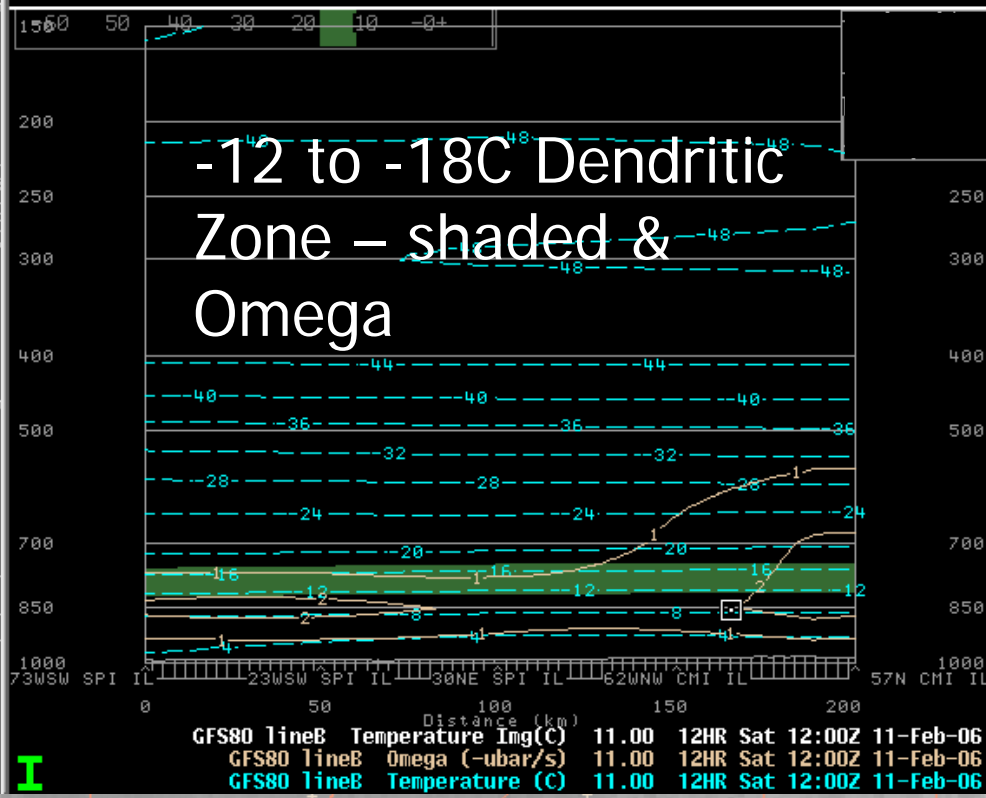
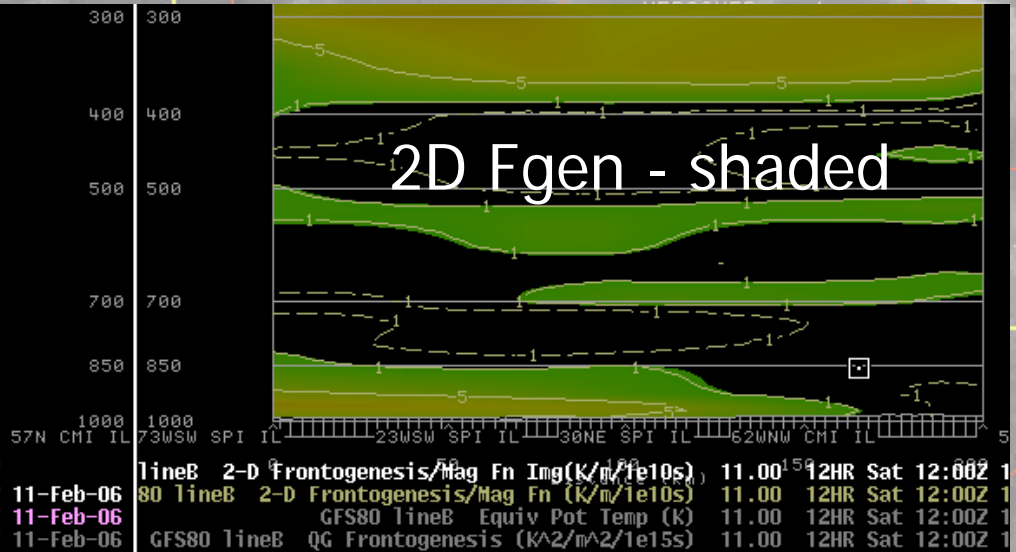
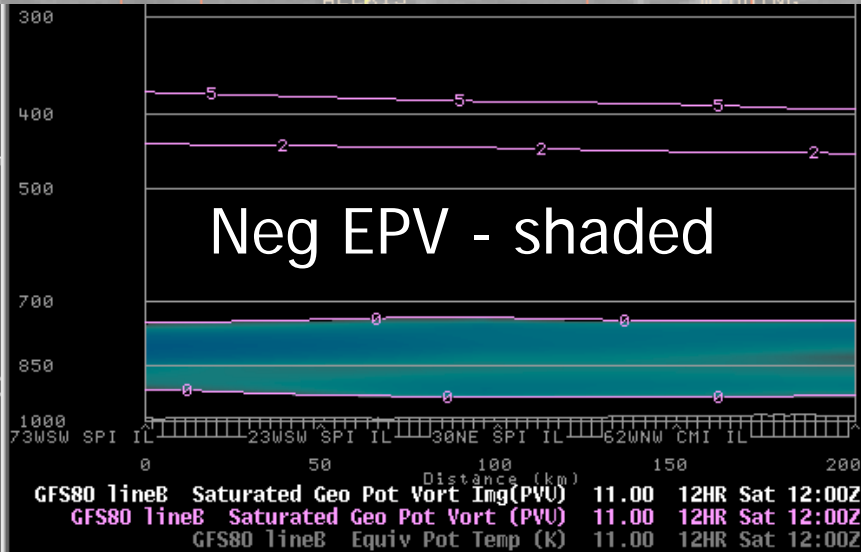


Interactive Baselines (E Home)

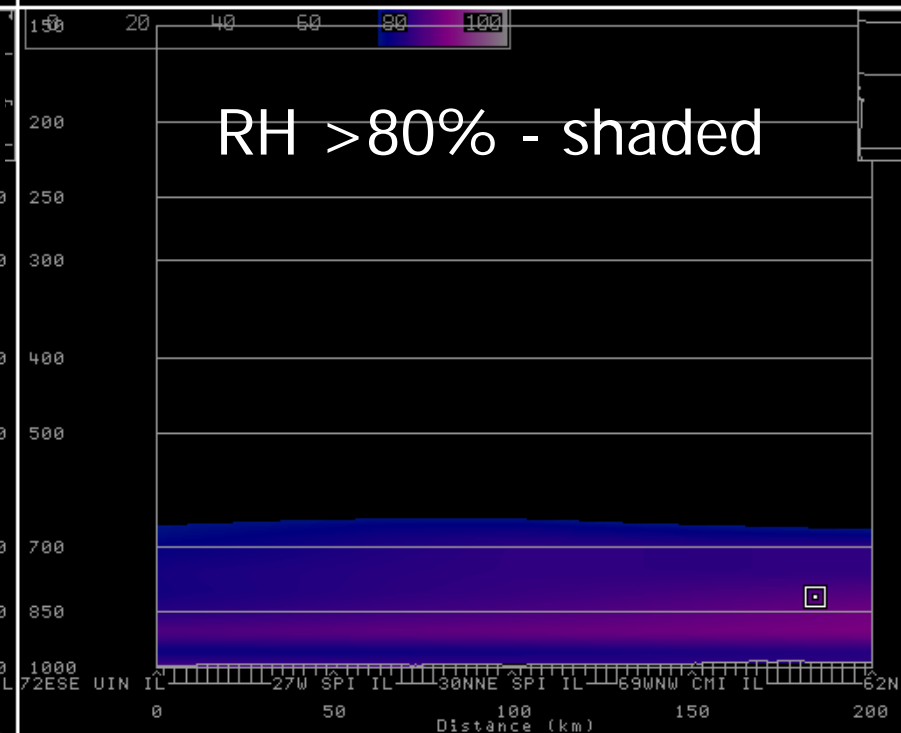
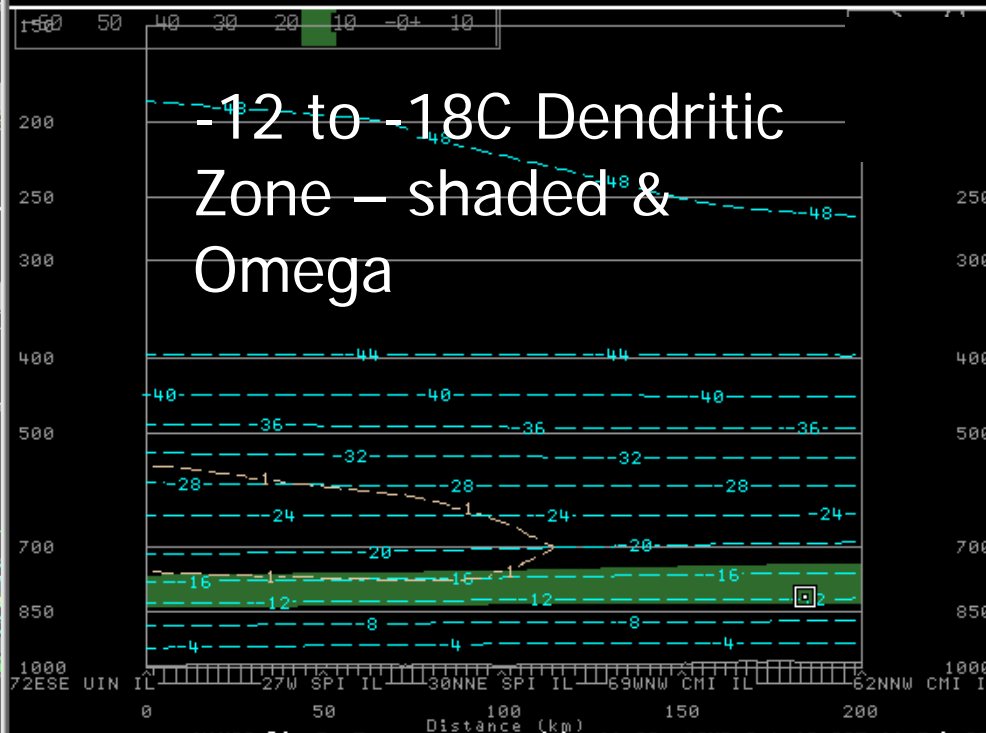
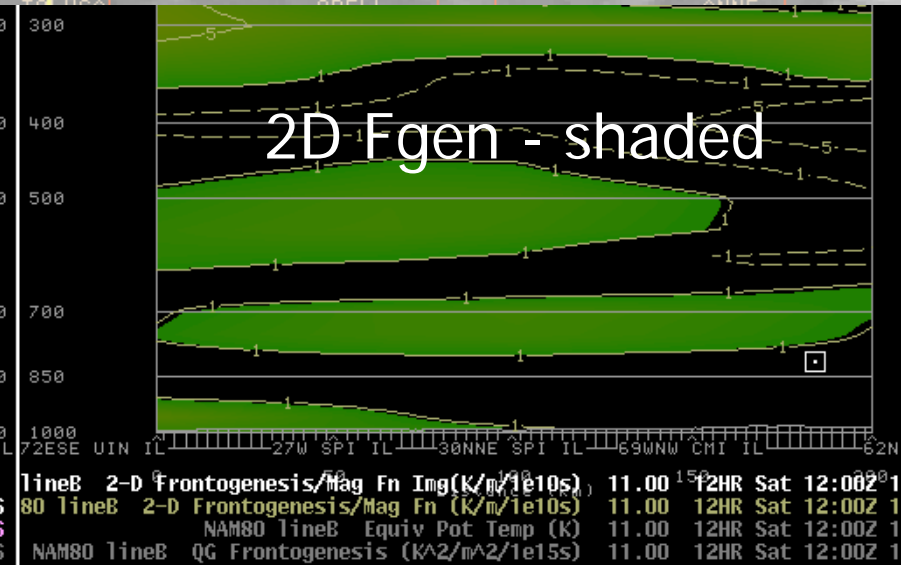
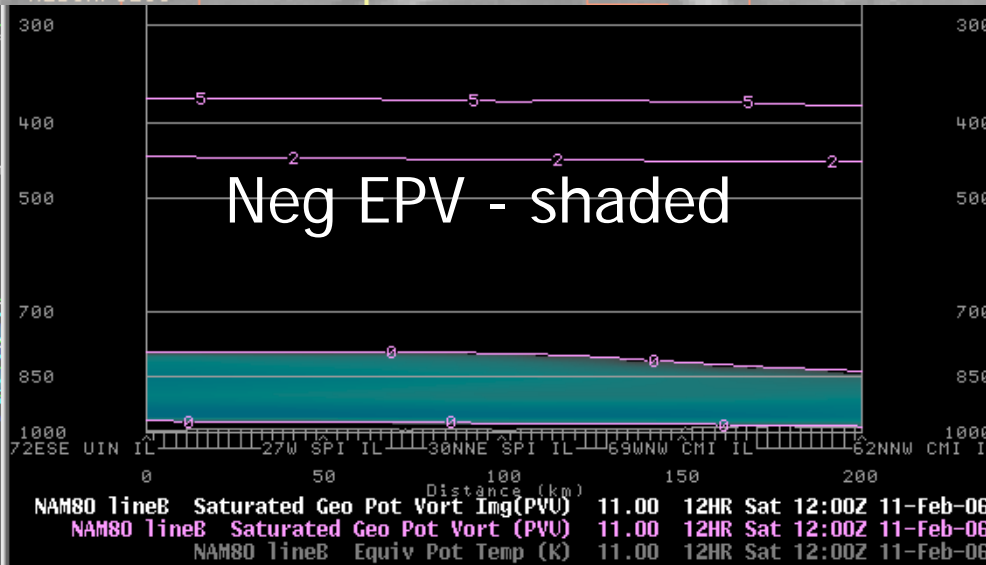
2hr RUC - 12z Feb 11

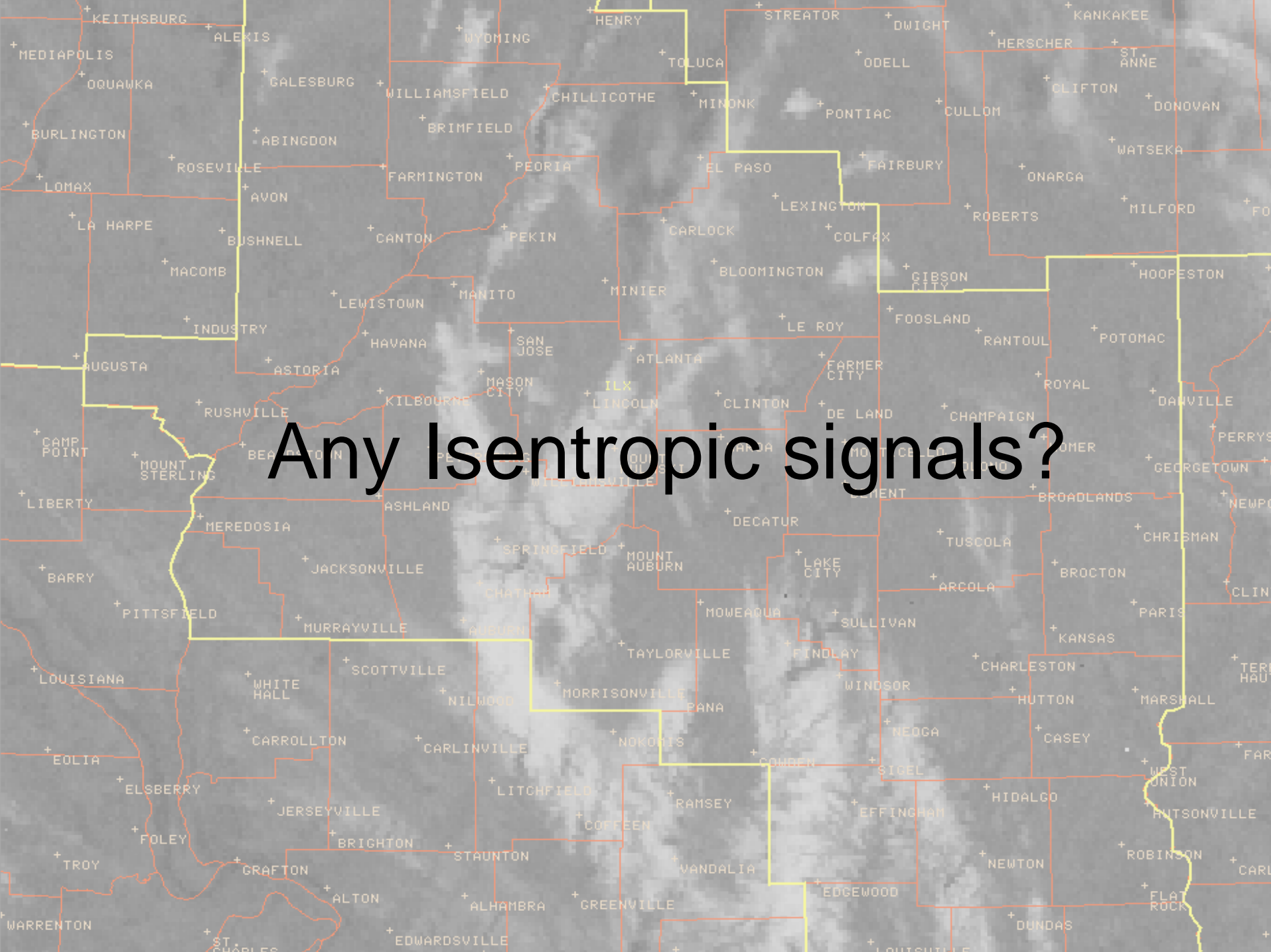


RUC40 lineE Omega (-ubar/s)	11.10	2HR Sat 12:00Z 11-Feb-06
RUC40 lineE 2-D Frontogenesis/Mag Fn $\text{Im}g(\text{K}/\text{m}/1\text{e}10\text{s})$	11.10	2HR Sat 12:00Z 11-Feb-06
RUC40 lineE 2-D Frontogenesis/Mag Fn ($\text{K}/\text{m}/1\text{e}10\text{s}$)	11.10	2HR Sat 12:00Z 11-Feb-06
RUC40 lineE Saturated Equiv Pot Temp (K)	11.10	2HR Sat 12:00Z 11-Feb-06



12hr NAM fcst - valid 12z Feb 11

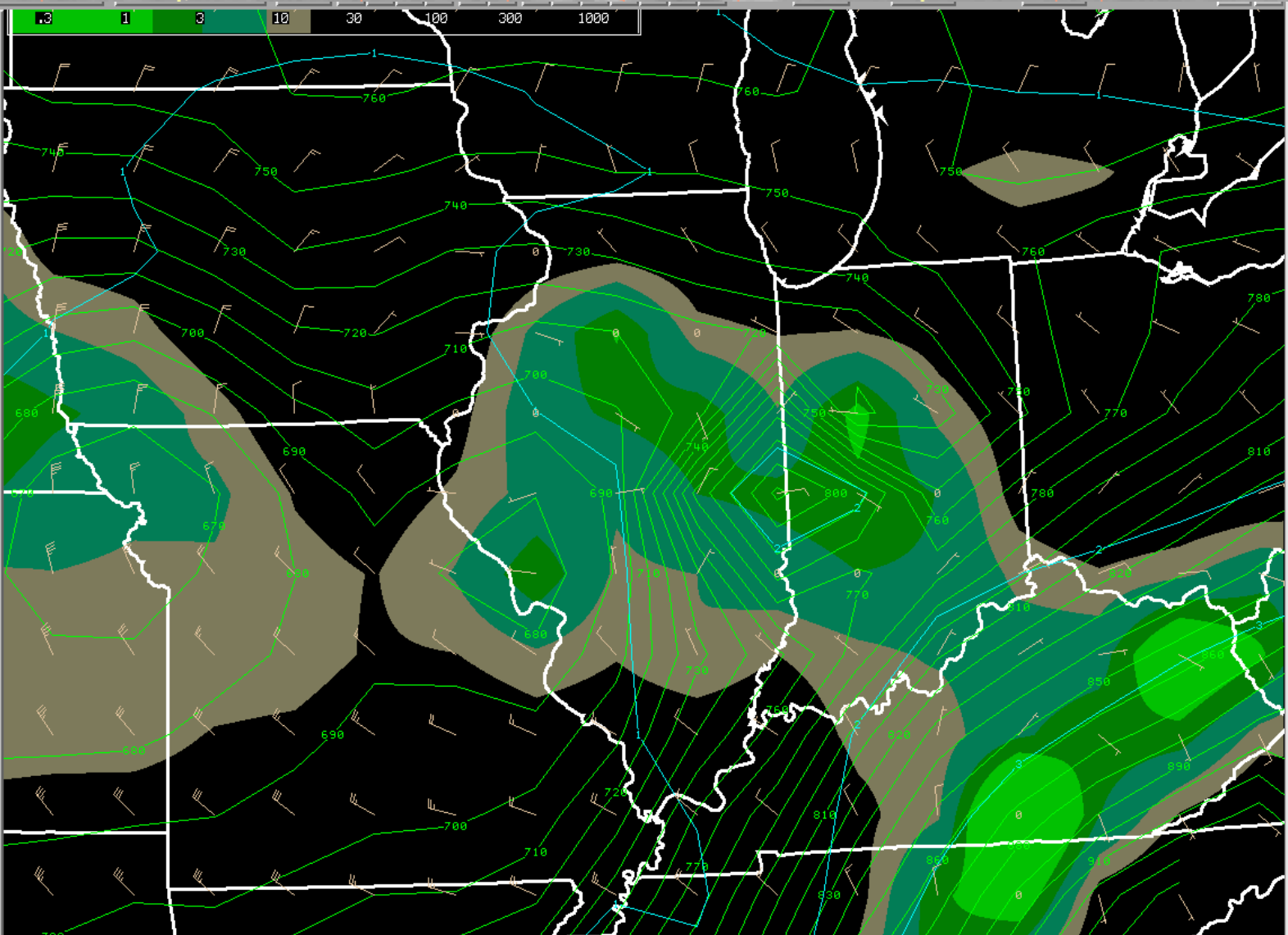




Any Isentropic signals?

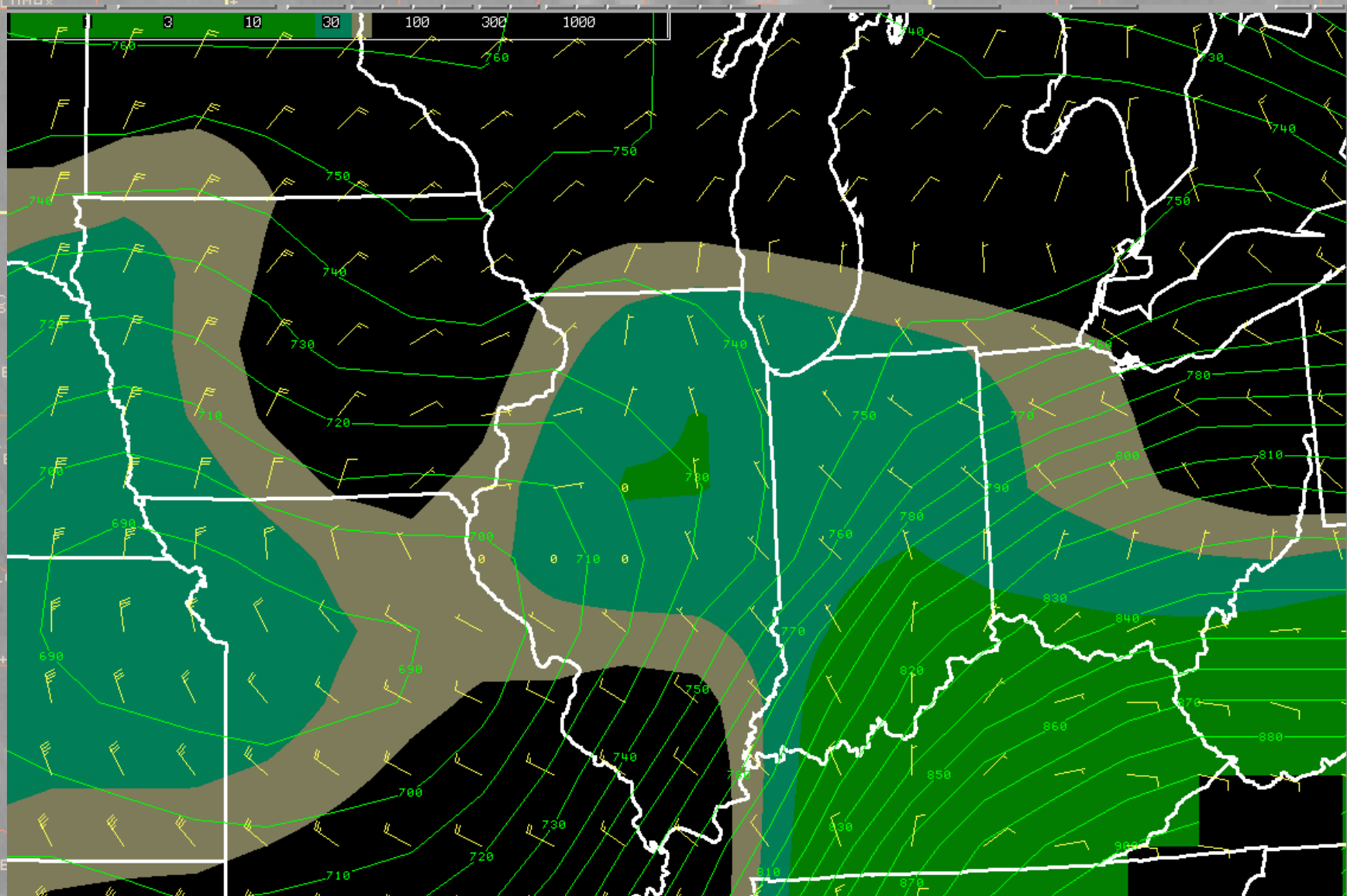
12hr GFS – valid 12z Feb 11

280K Ison – Cond Pres Deficit shaded <40 mb, Pressure (green), Specific Humidity (blue), Wind (tan)



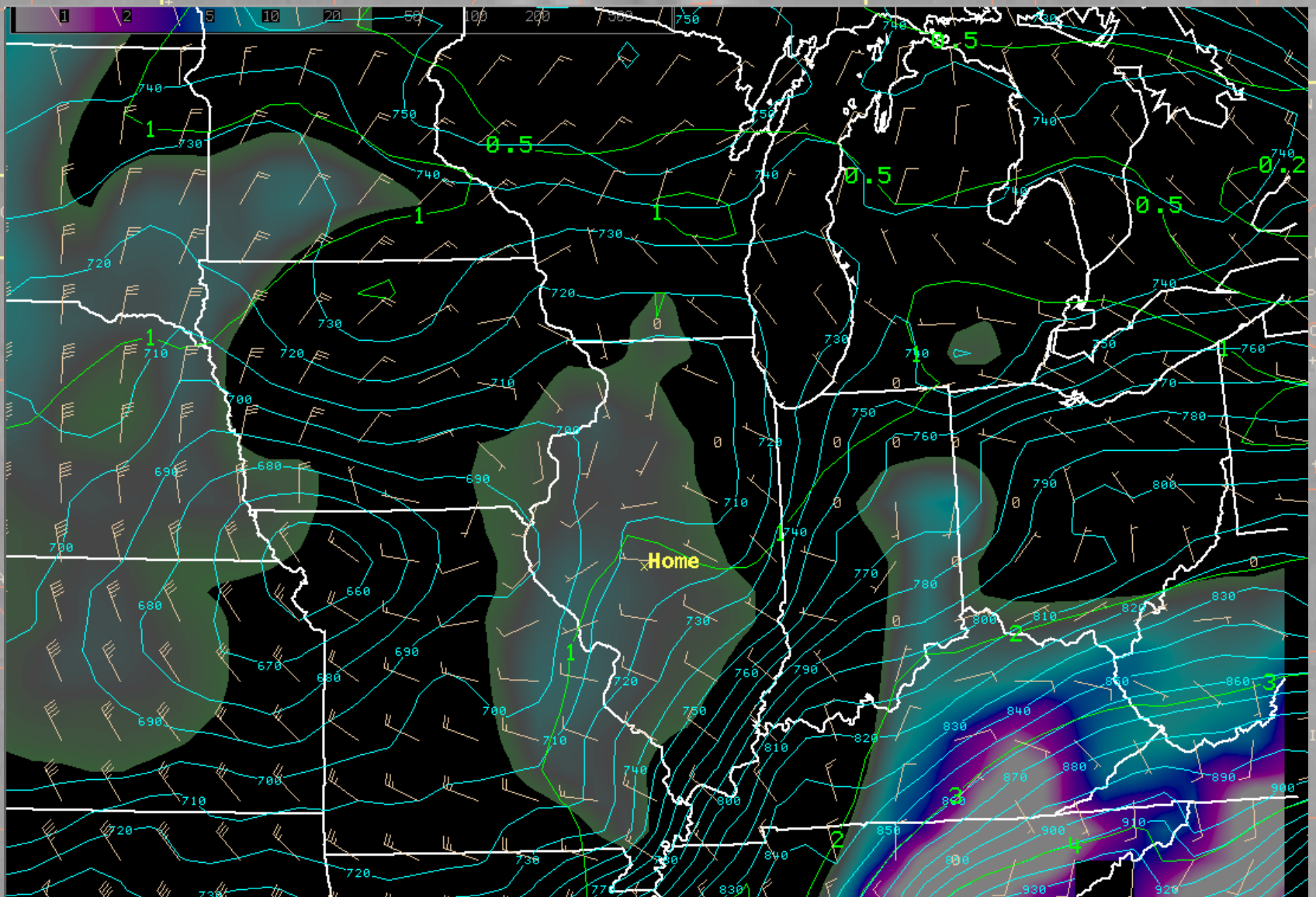
12hr NAM – valid 12z Feb 11

280K Isen – Cond Pres Deficit shaded <40 mb, Pressure (green), Specific Humidity (blue), Wind (tan)



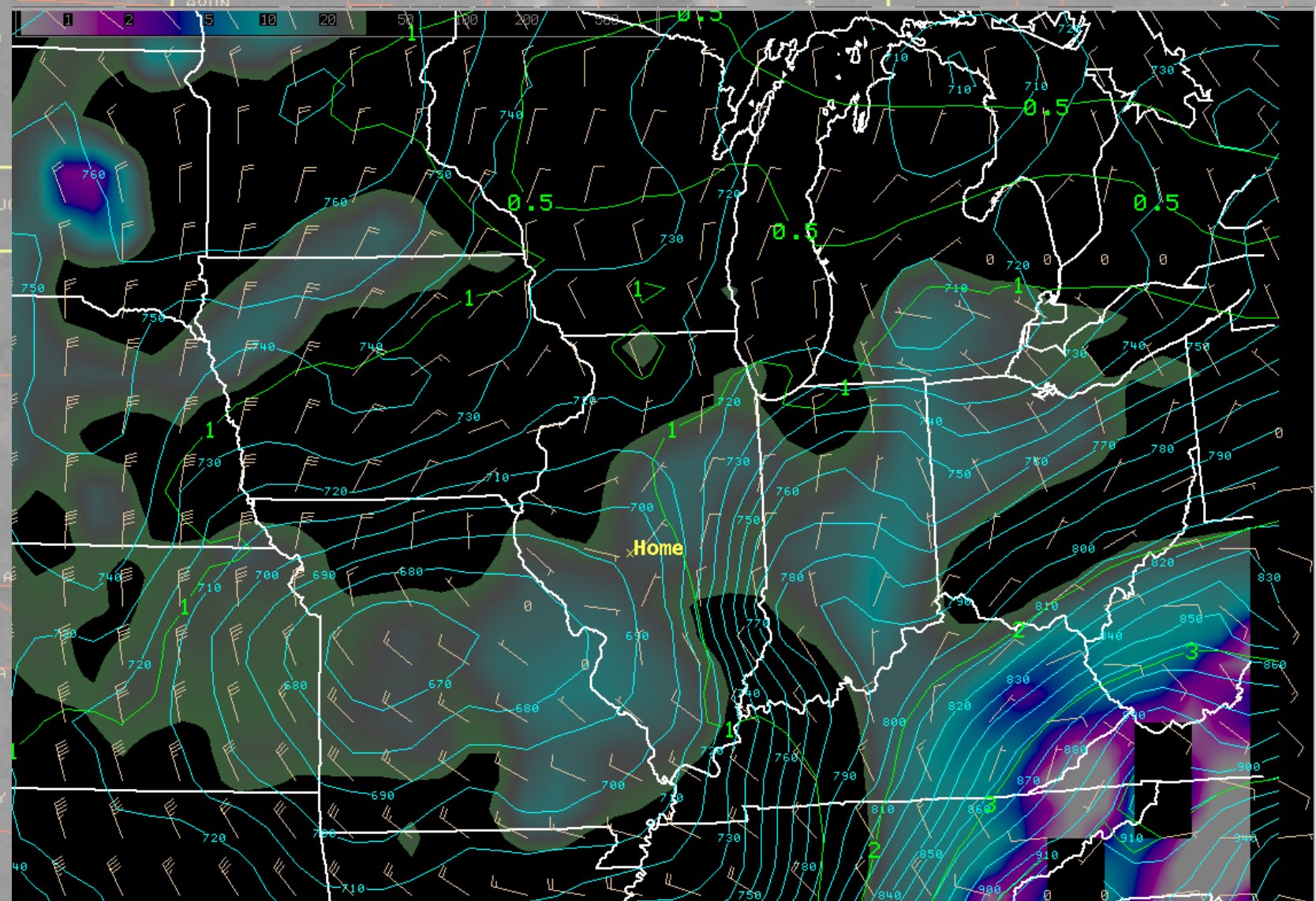
2hr RUC – valid 12z Feb 11

280K Isen – Cond Pres Deficit shaded <40 mb, Pressure (blue), Specific Humidity (green), Wind (tan)



0hr RUC – valid 16z Feb 11

280K Isen – Cond Pres Deficit shaded <40 mb, Pressure (blue), Specific Humidity (green), Wind (tan)



Summary & Conclusions

- No strong signals in the synoptic pattern for much more than scattered snow showers.
- Specific humidity on Isentropic level 280K only 1 g/kg. All QPF fields were minimal. (5-6 mm snow).
- Be careful of complacency in the absence of a strong surface low. Low to mid level baroclinic zone will suffice.
- Main banded snow params – **Col point aloft**, Fgen directly below EPV, EPV 950 – 850 mb, 700 mb deformation.
- Post analysis indicates conflicting banded snow indicators, even from 00hr model output. GFS had the best signal at T-12hrs.
 - Enough to sway forecast toward these snow amounts?
- Be vigilant to jump on the bands once they develop and add 3 to 5 cm/hr (1-2"/hr) snow rates to the forecast for the next several hours.

Storm takes 2 casualties

'Odd' snowstorm hits parts of Central Illinois



Ted Schurter/The State Journal-Register

John Sharp of Rochester unloads goose decoys from his vehicle after a multiple-vehicle accident Saturday on Interstate 55 between Clear Lake and Sangamon avenues. Sharp said he was northbound when cars started piling up in front of him. After he came to a stop, he said he was hit three or four times. Police say 18 vehicles were involved in the pile-up.

Parts of city see 7 inches of snow

By AMANDA REAVY

flurries instead strengthened overnight as it hov-

Sgt. Jack Campbell with the Sangamon County



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Wiesmueller, J.L., and S.M. Zubrick, 1998: Evaluation and application of conditional symmetric instability, equivalent potential vorticity, and frontogenetical forcing in an operational forecasting environment. *Wea. Forecasting*, **13**, 84-101.

A map of Illinois with county boundaries and names. A yellow outline highlights a specific region in the central part of the state, including counties like Peoria, Tazewell, and Woodford. The text "Thank You" is overlaid in the center of the map.

Thank You

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