By: Ken Cook – SOO ICT

METEOROLOGICAL FACTORS CRITICAL TO THE 8 FEBRUARY 2011 HEAVY SNOW ACROSS CENTRAL KANSAS

Why This Presentation

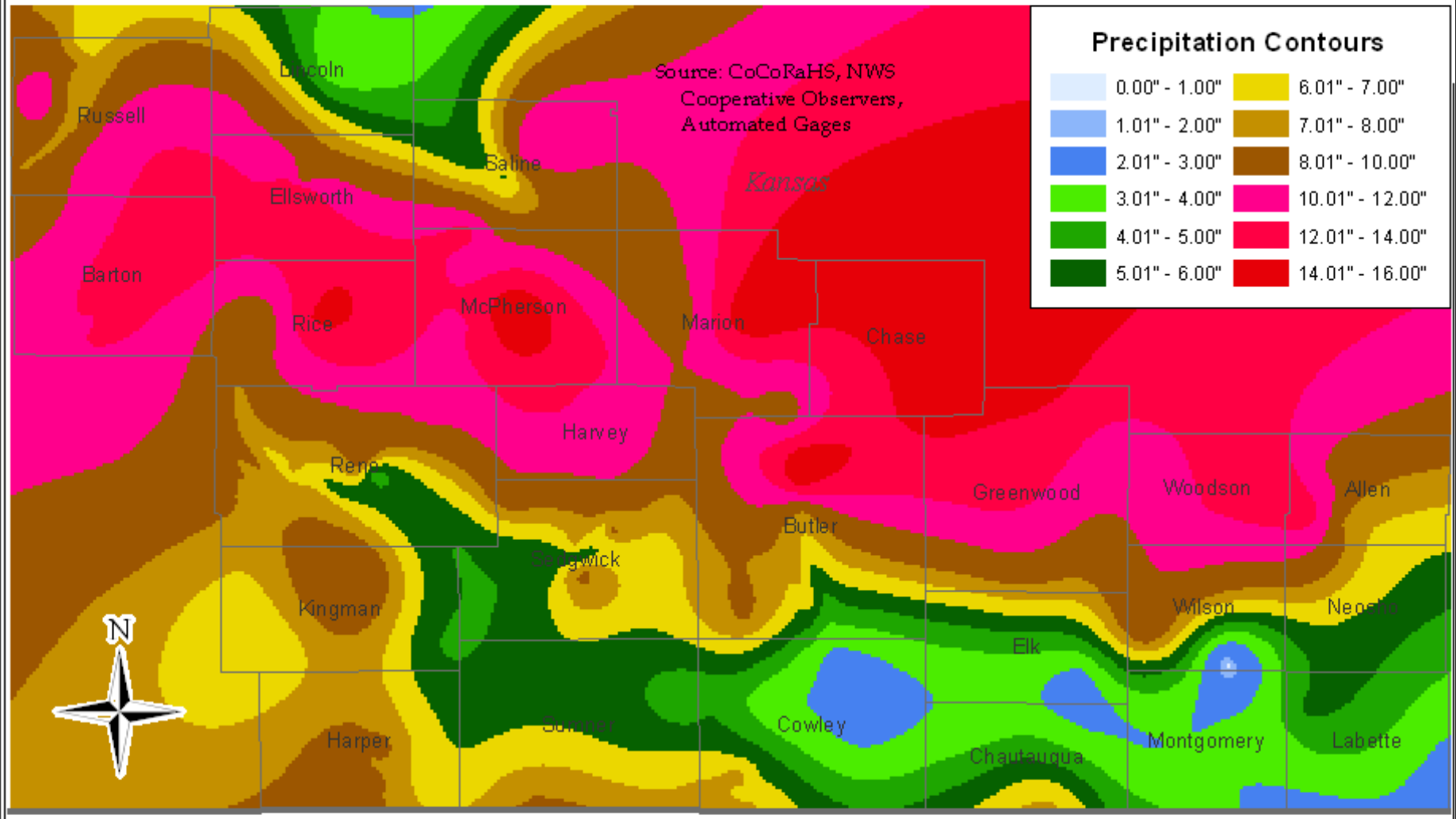
- Event: Significant snow accumulations along the central portion of Kansas.

- Forecast: Did not recognize the amount of snow possible; main ingredients did not adequately indicate threat.

Why This Presentation

- Theory: The depth of the Dendritic Growth Zone (the residence time of hydrometeors in this zone) significantly modulates the SLR upward, resulting in much higher snow amounts unless there is strong shear within or below the DGZ which can act to fracture crystals and reduce SLR.

Preliminary Snowfall Amounts as of 7am February 9th, 2011



Created by the National Weather Service Forecast Office Wichita, Kansas

This map is an interpolation of actual reported values and should be considered an estimation only. These preliminary data may contain errors.

The Forecast Process

- Ingredients for Heavy Snow:
  - Coupled forcing/PV phase locking
  - TROWAL
  - Frontogenesis (Fn)
  - Instability
  - Snow Growth
  - Residence Time of Precipitation

The Forecast Process

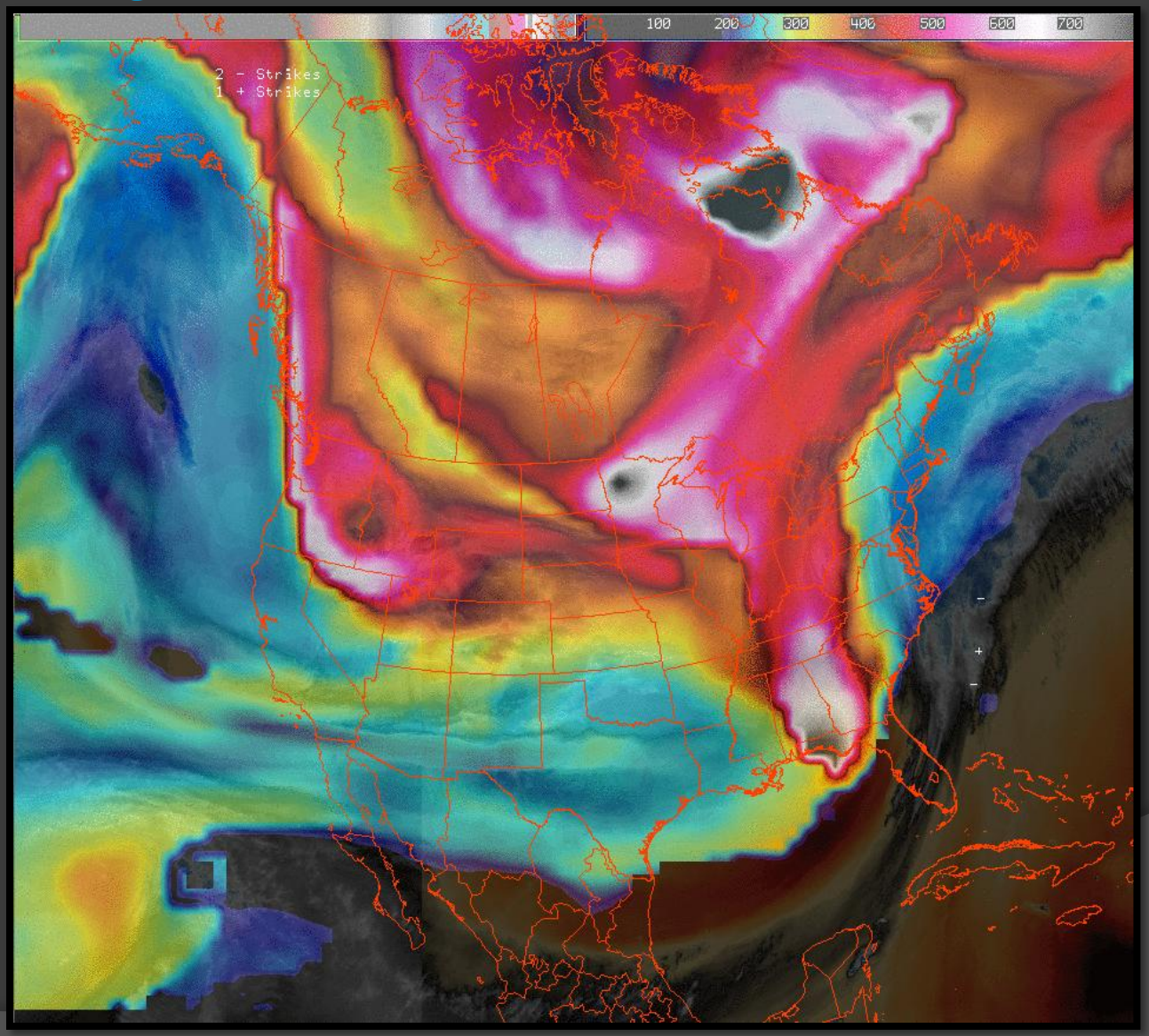
Significant Winter Storm Ingredients

Date: _____ Cycle: _____

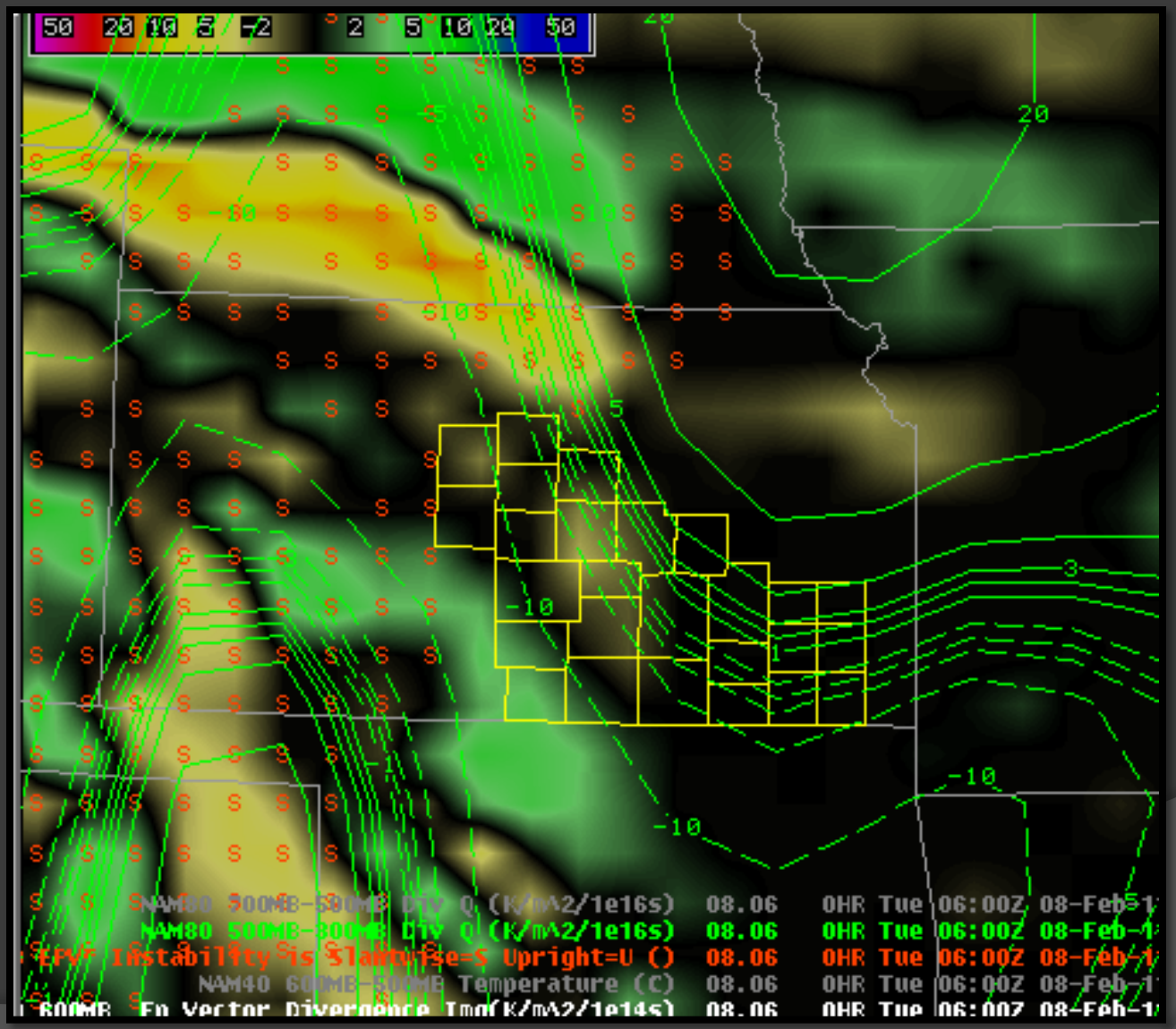
Potential Vorticity	Treble Clef, Deep Anomaly, WV Darkening		No Treble Clef, Weak Anomaly, Little/No Darkening	
Coupled Forcing	Strong	Moderate	Weak	None
TROWAL	Yes		No	
Frontogenesis	Strong	Moderate	Weak	None
Instability	Strong	Moderate	Weak	None
Snow Growth	Very Favorable	Somewhat	Slightly	None
Residence Time of Pcpn	Long (> 8)	Moderate (4-8)	Short (< 4)	

Notes: _____

Overview



Overview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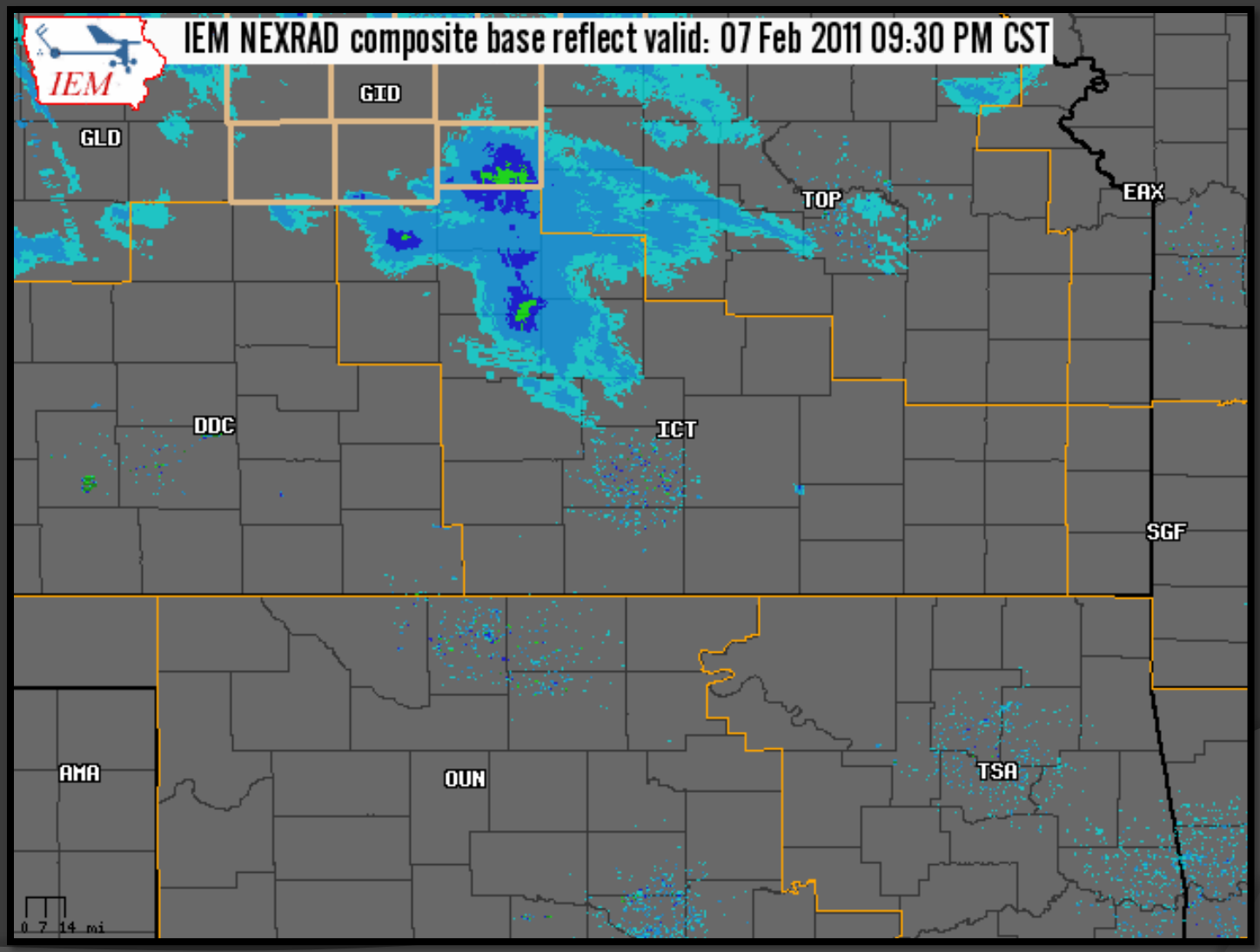
NAM80 500MB-500MB DIV Q (K/m^2/1e16s) 08.06 OHR Tue 06:00Z 08-Feb-1
NAM80 500MB-300MB DIV Q (K/m^2/1e16s) 08.06 OHR Tue 06:00Z 08-Feb-1
EPV: Instability is Slantwise=S Upright=U () 08.06 OHR Tue 06:00Z 08-Feb-1
NAM40 600MB-500MB Temperature (C) 08.06 OHR Tue 06:00Z 08-Feb-1
600MB Eq Vector Divergence Tmp(K/m^2/1e14s) 08.06 OHR Tue 06:00Z 08-Feb-1

Overview


IEM NEXRAD composite base reflect valid: 07 Feb 2011 09:30 PM CST
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The Forecast Process

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Notes: _____

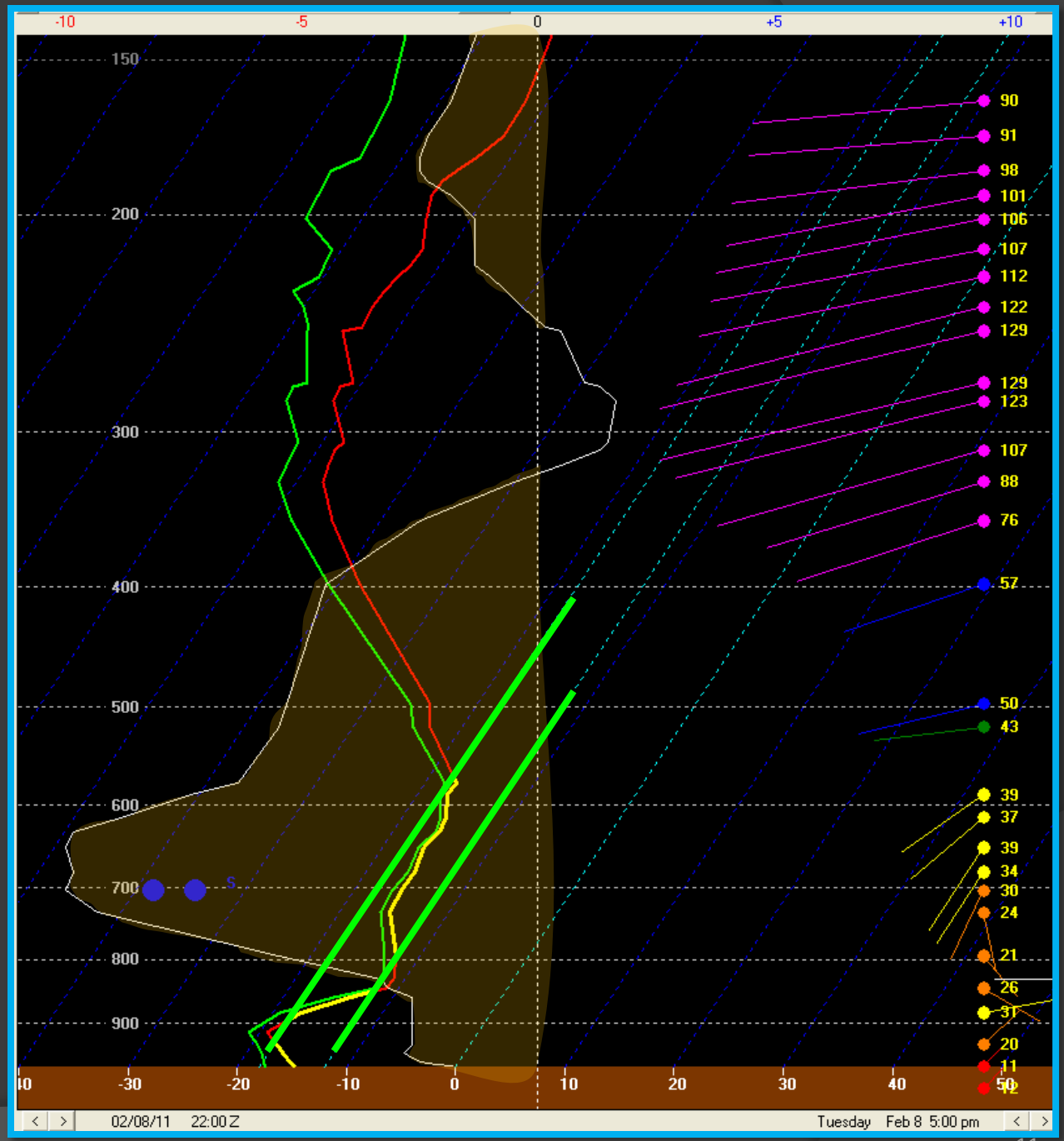
Sounding

Hillsboro, KS

Dendritic Growth Zone

Omega

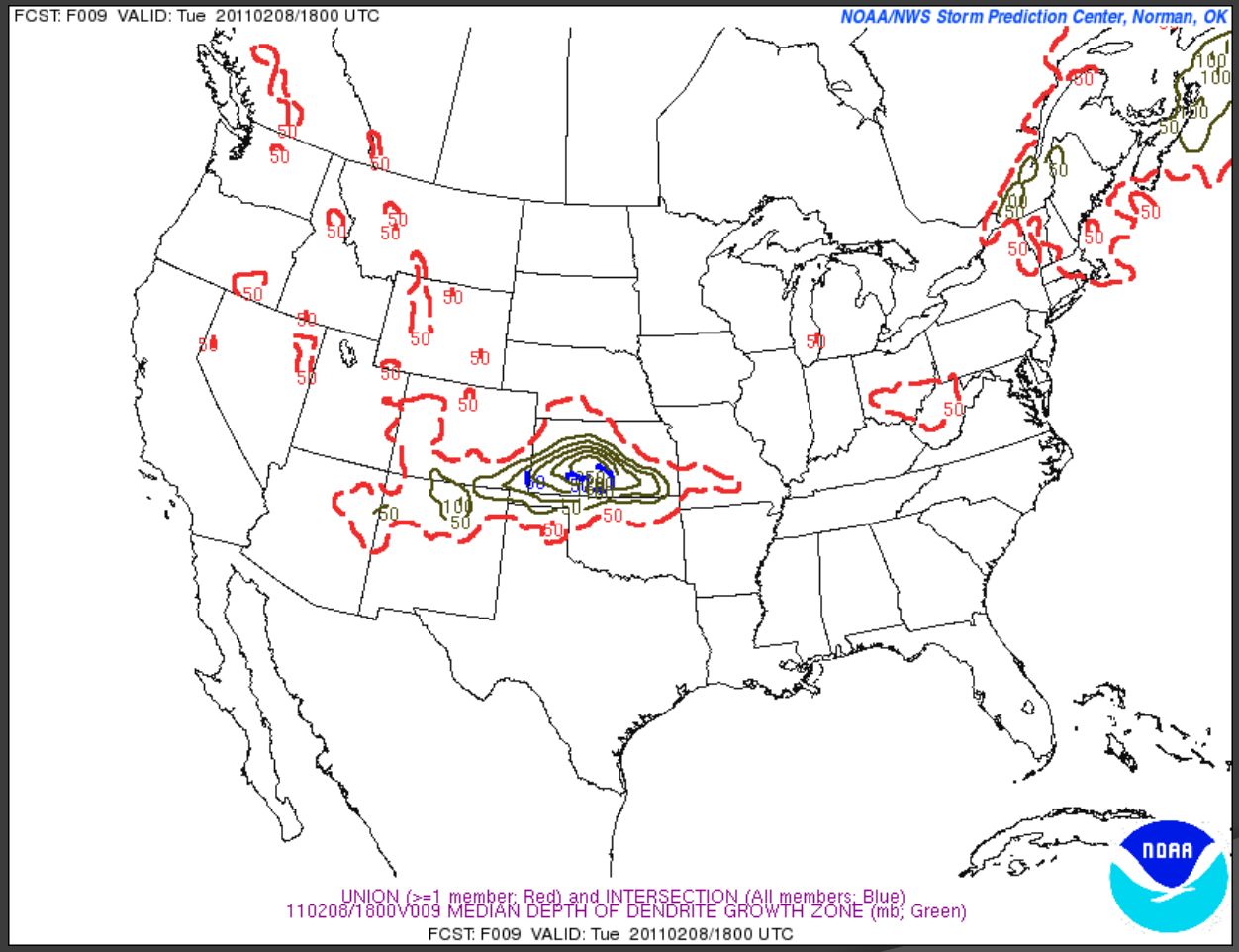
Over 400 mb Deep!!!



Utility of SPC SREF

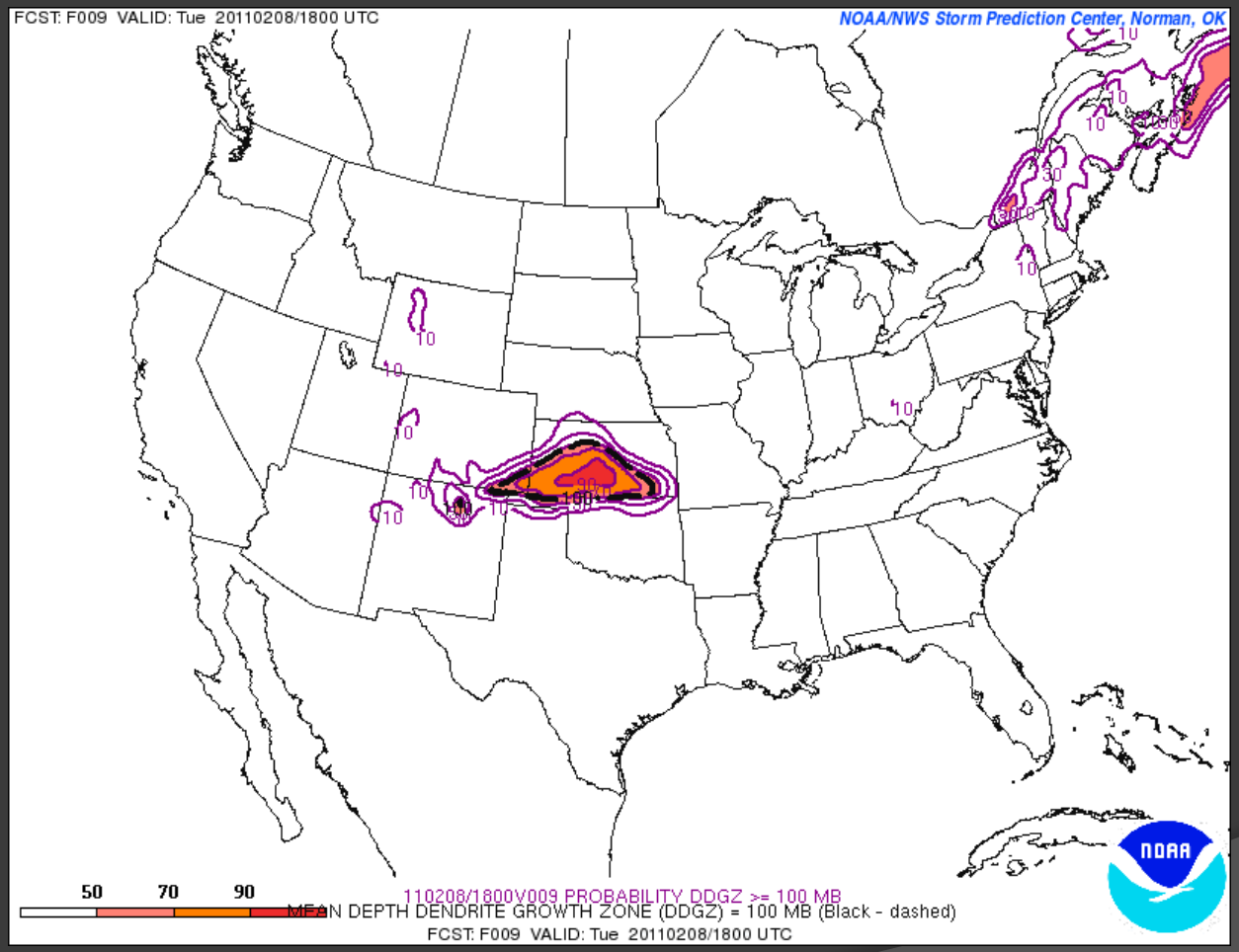
- Identifies threat areas
- Not just for convective weather (anymore)
- Will look at current day and previous day forecasts

SREF 08 February 2011



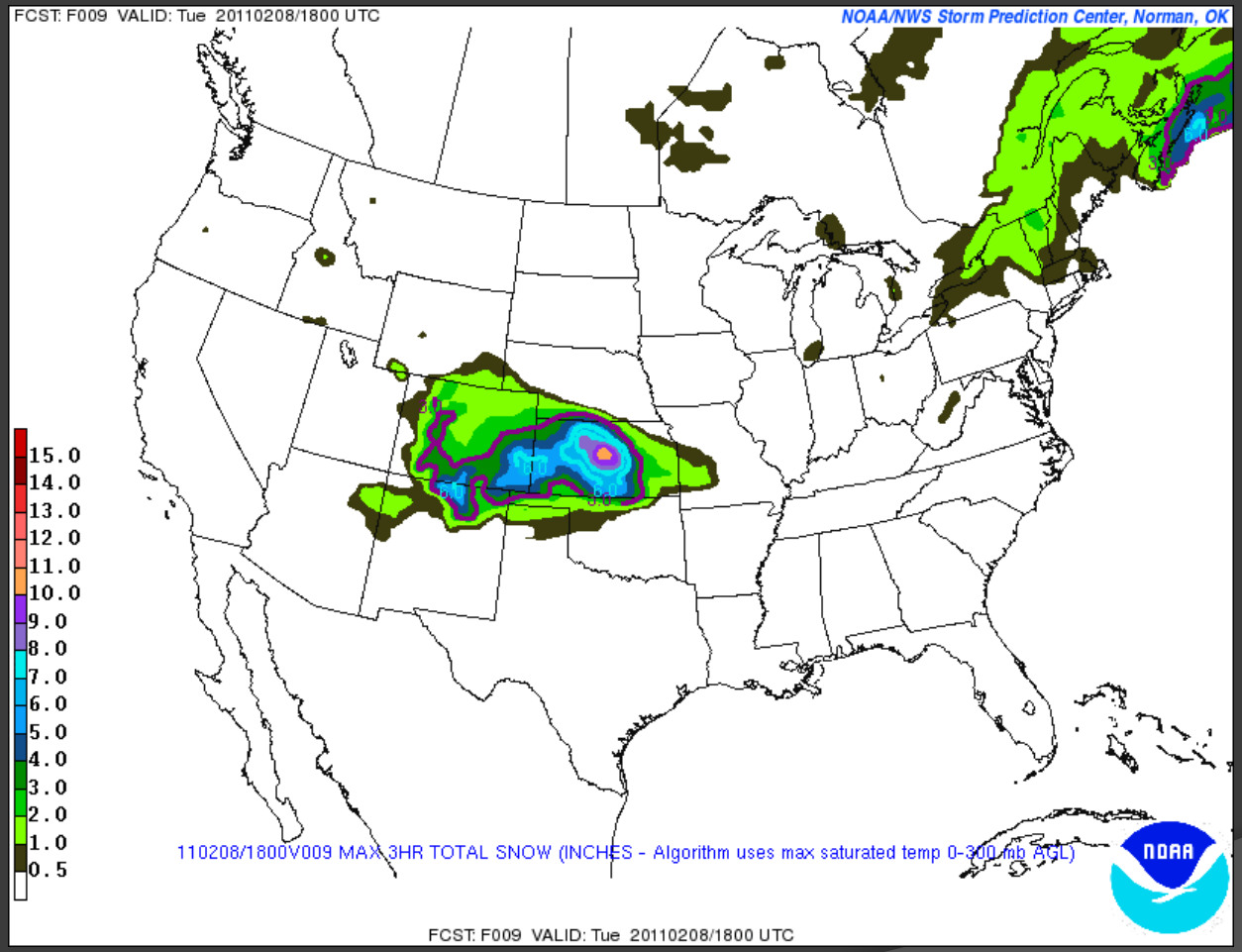
Median Depth of Dendritic Growth Zone

SREF 08 February 2011



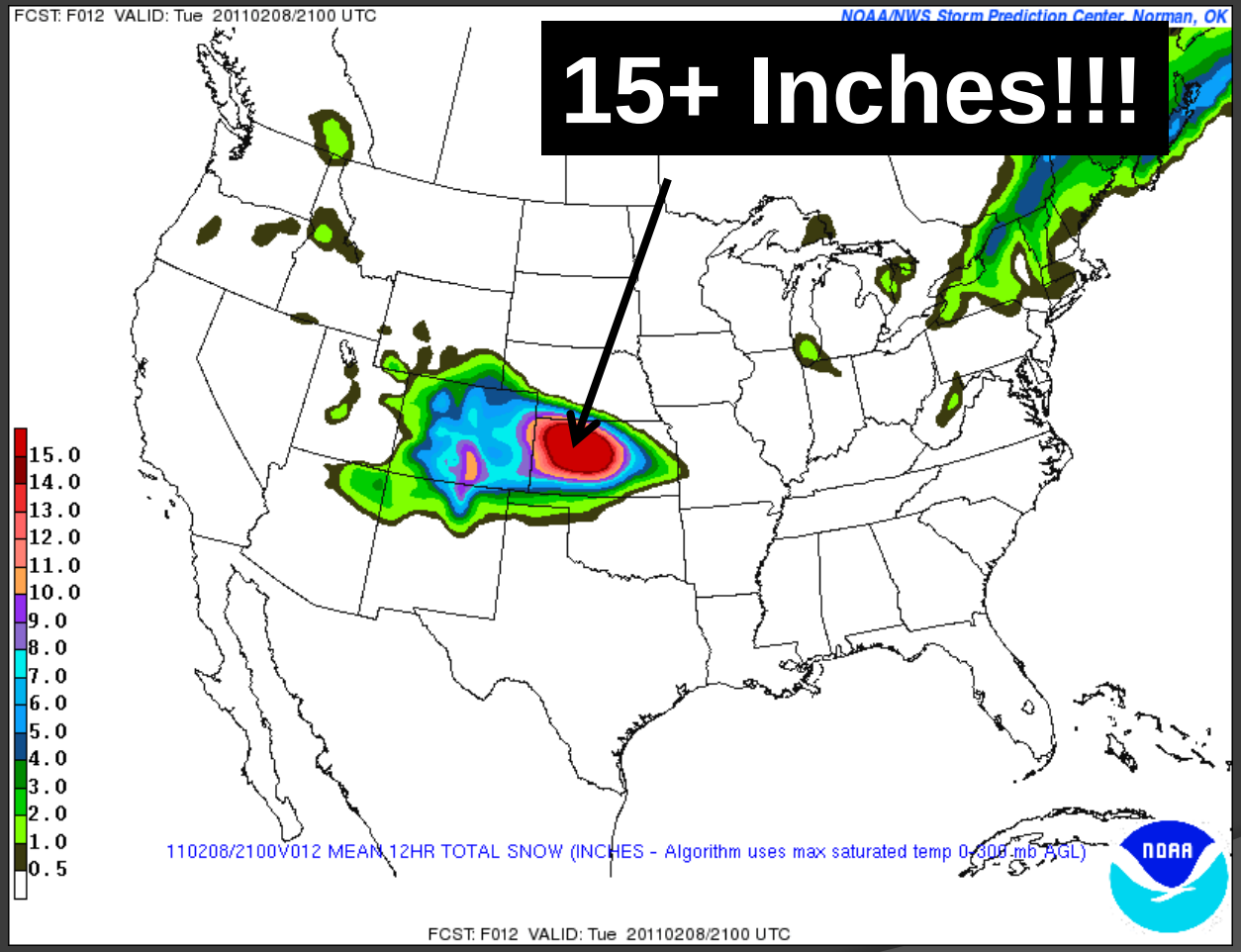
Probability of Dendritic Growth Zone > = 100 mb

SREF 08 February 2011



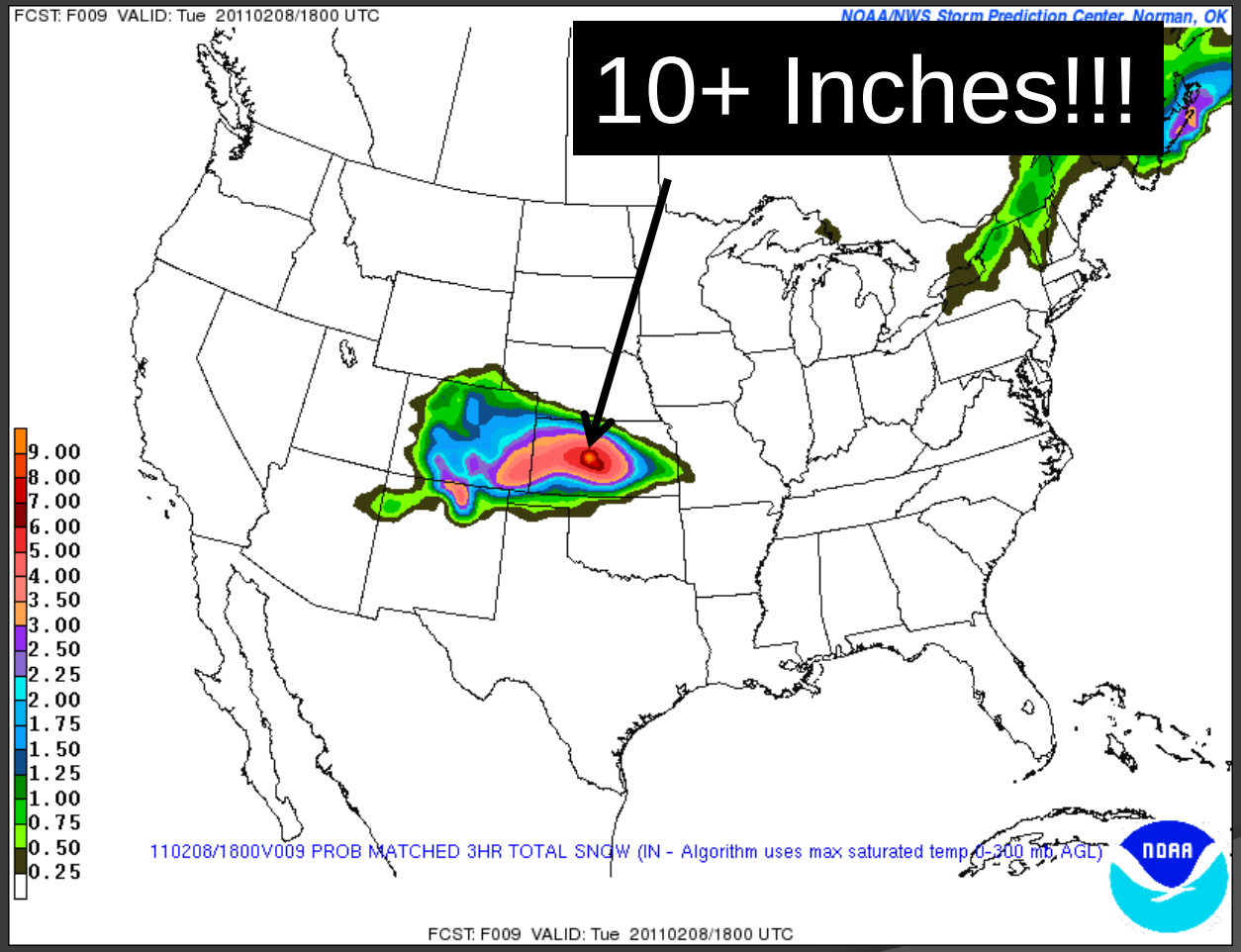
Max 3 hour Total Snow

SREF 08 February 2011



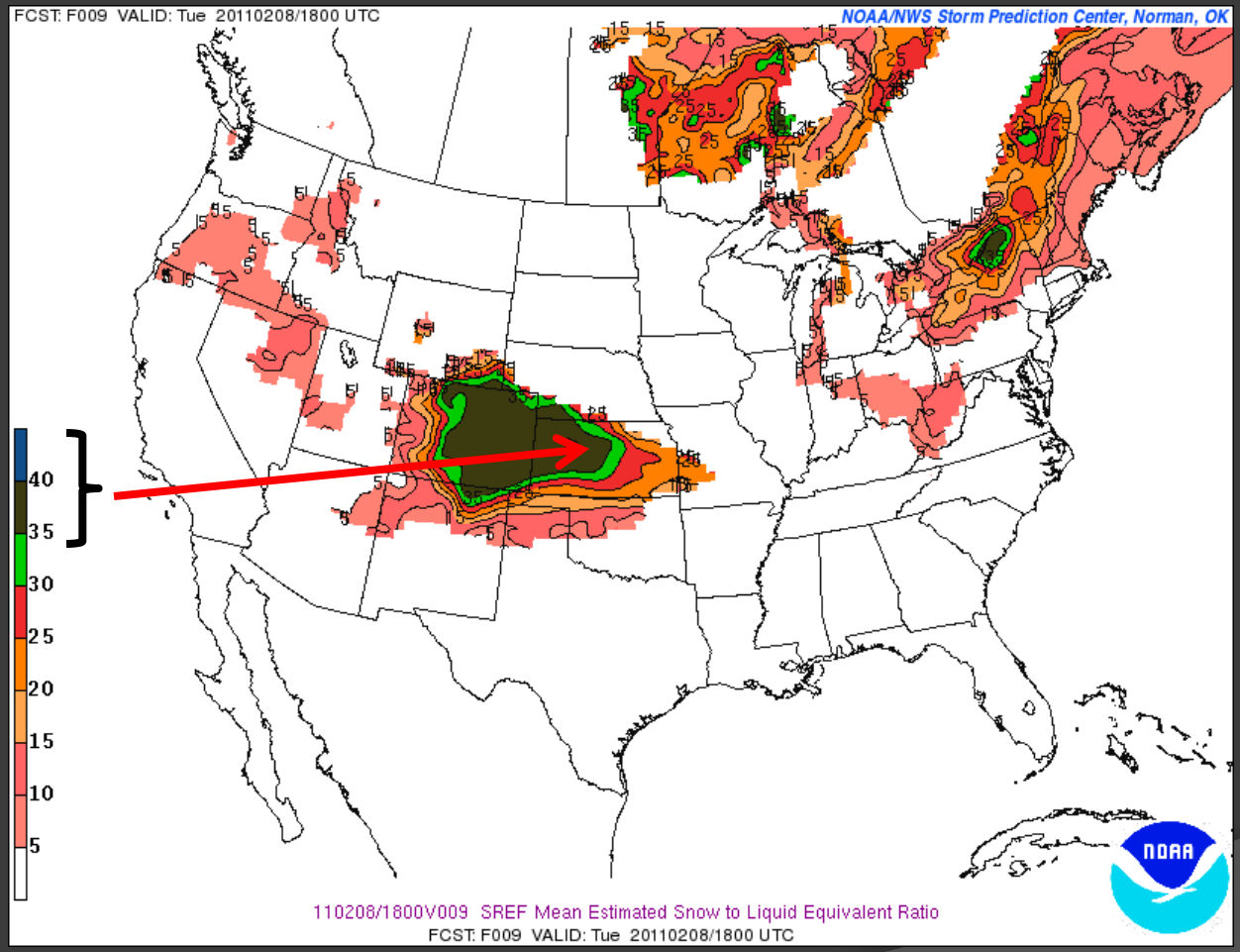
Mean 12 hr Total Snowfall

SREF 08 February 2011



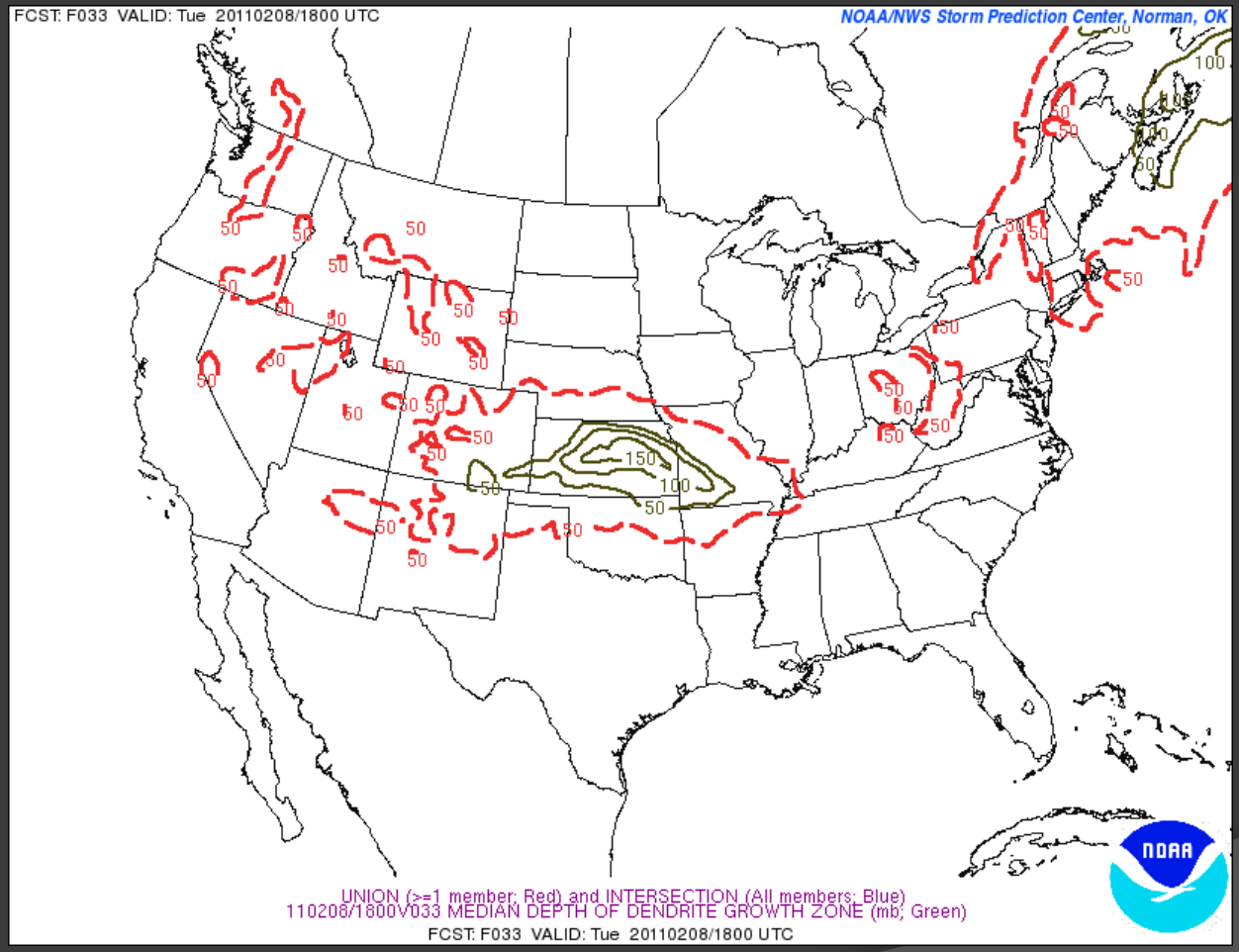
Probability Matched 3 hr Total Snow

SREF 08 February 2011



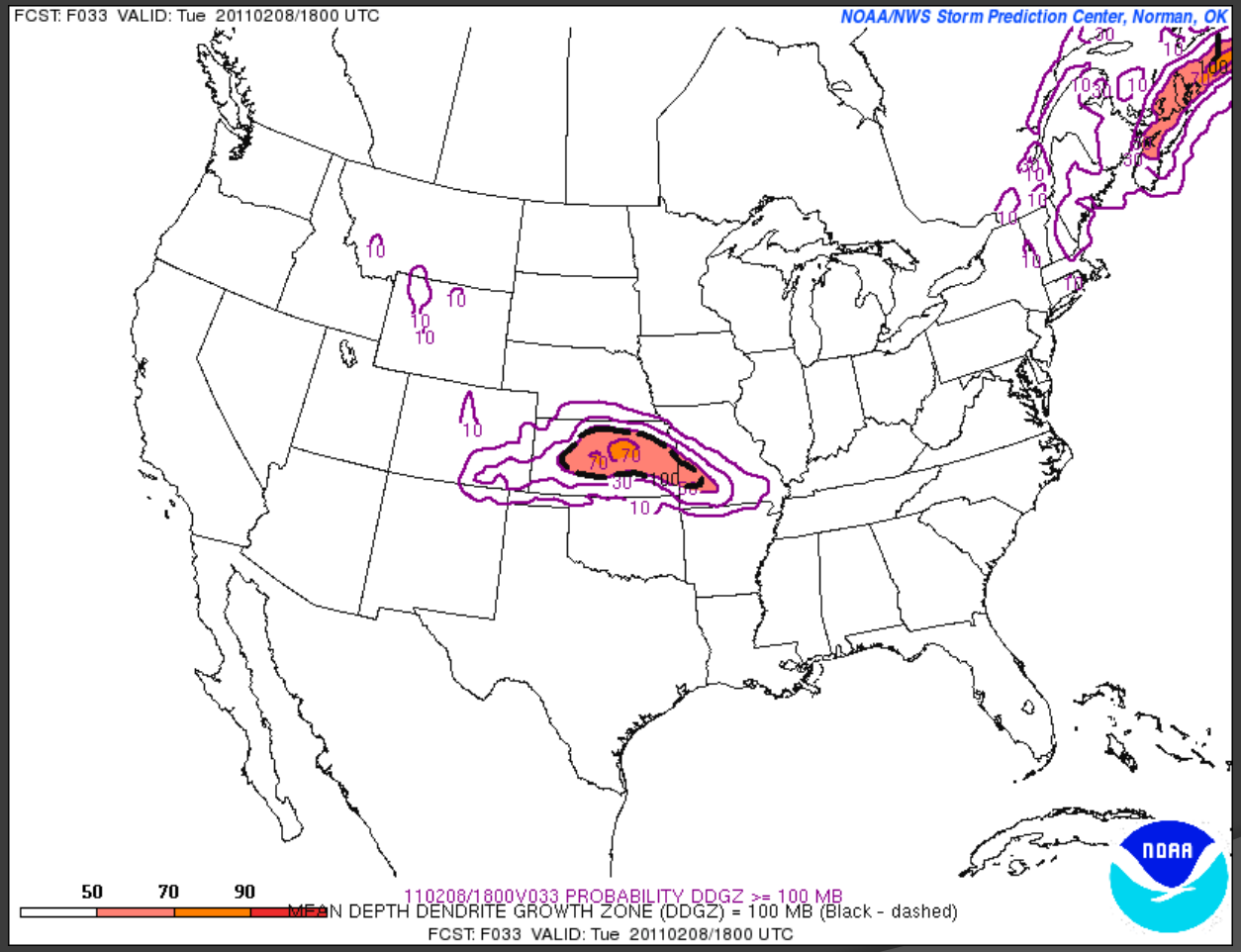
Mean SLR

SREF 07 February 2011



Median Depth of Dendritic Growth Zone

SREF 07 February 2011



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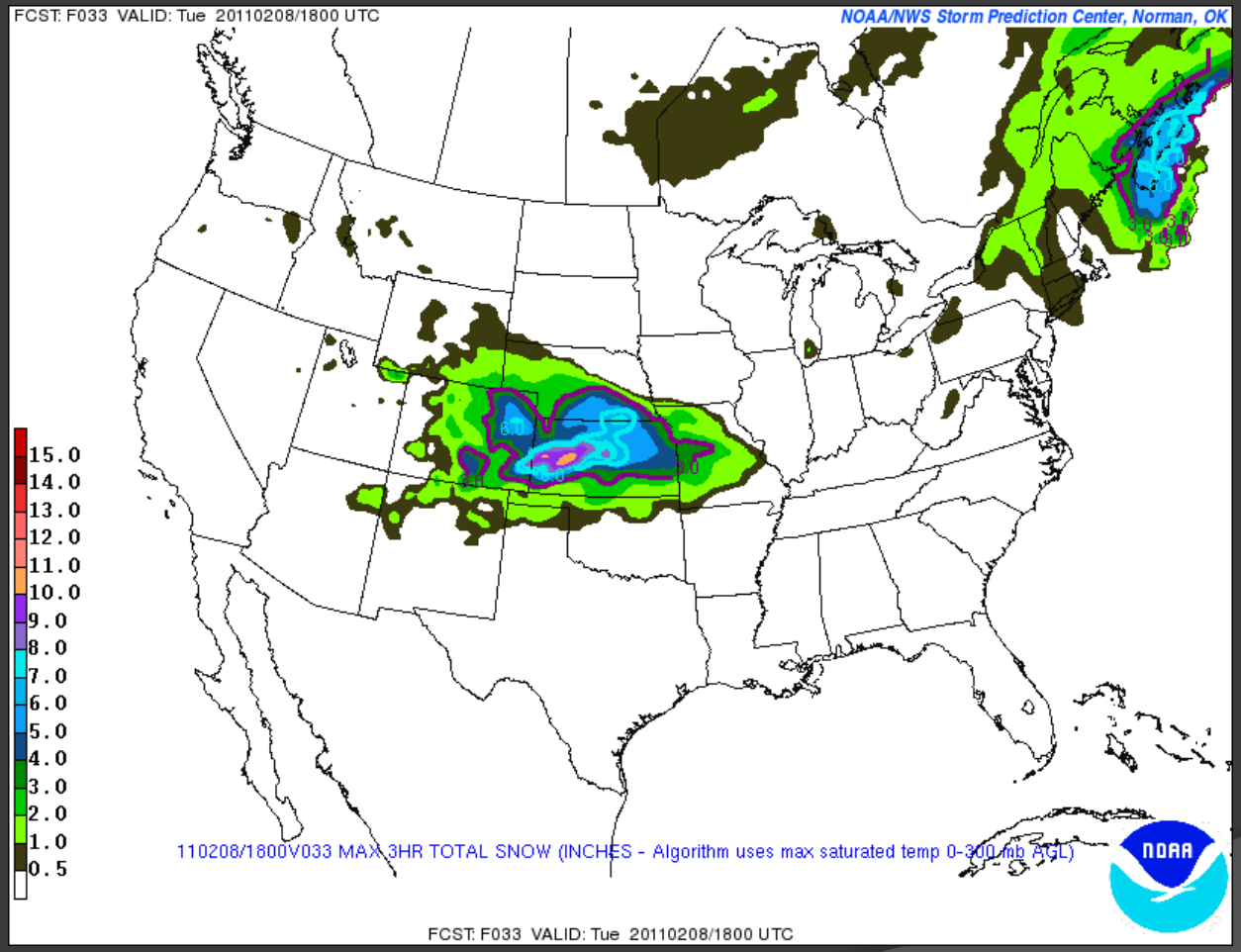

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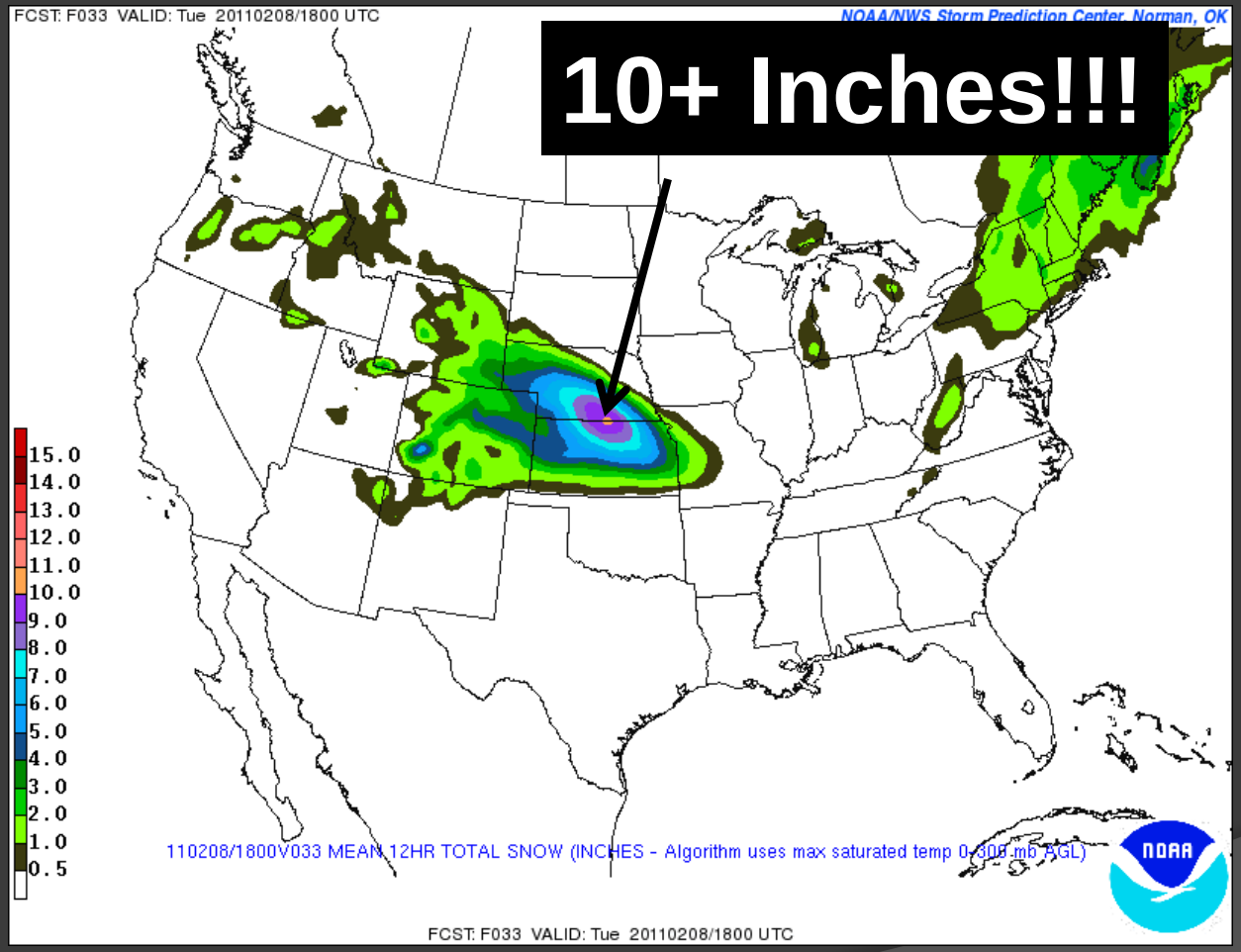

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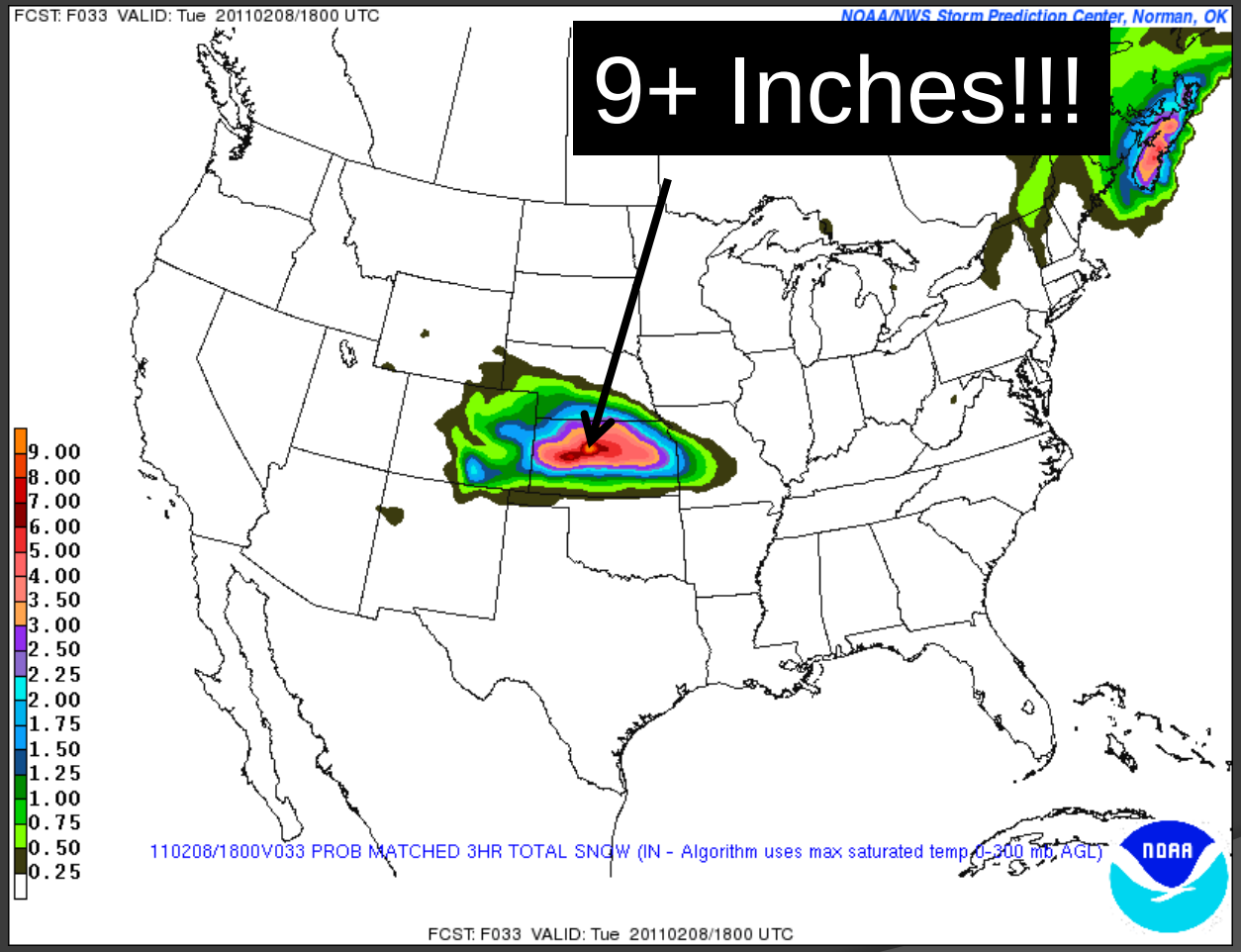

Probability Matched 3 hr Total Snow

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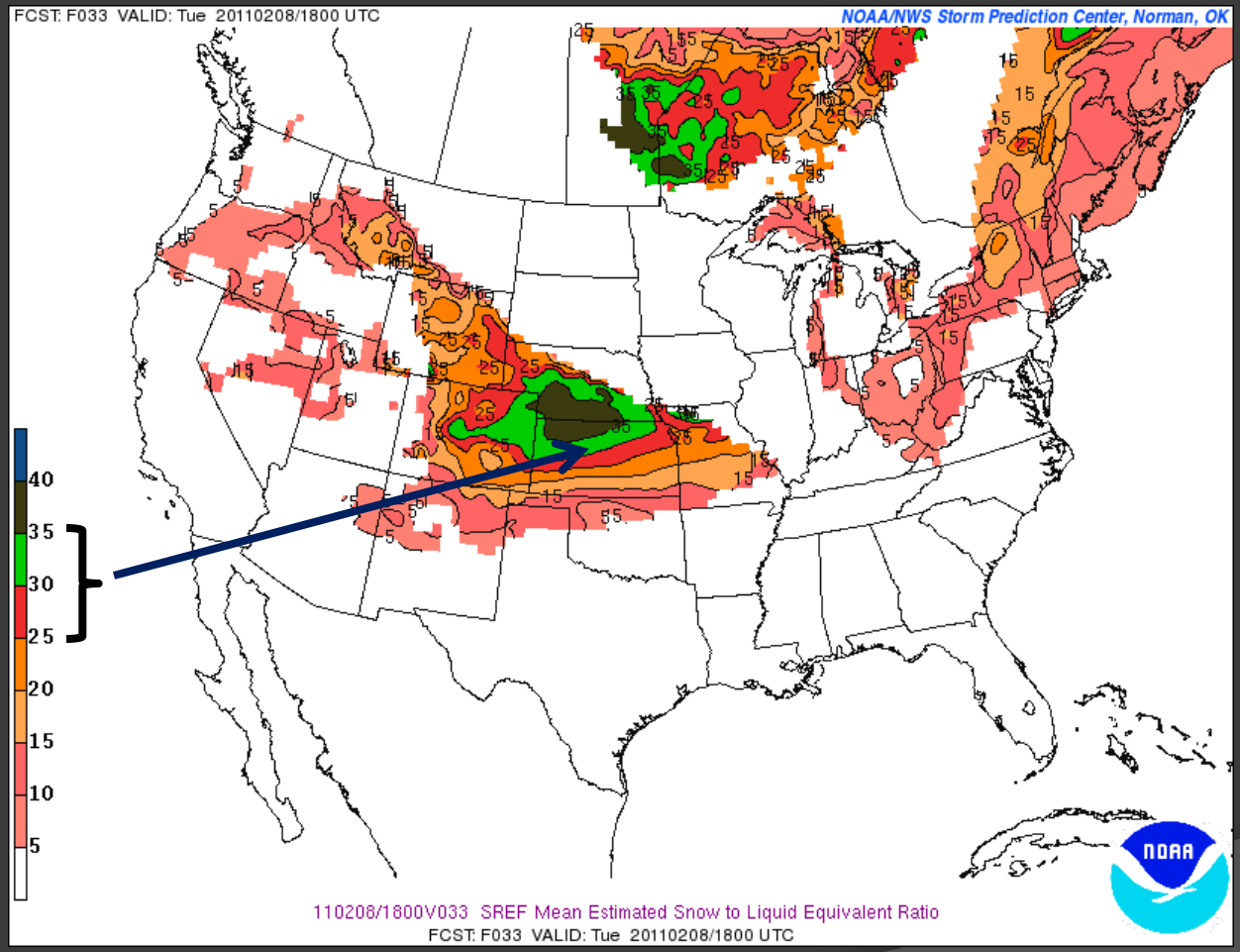

Mean SLR

Conclusions

- Theory: The depth of the Dendritic Growth Zone (the residence time of hydrometeors in this zone) significantly modulates the SLR upward, resulting in much higher snow amounts unless there is strong shear within or below the DGZ which can act to fracture crystals and reduce SLR.
  - This may be the main factor for this case, need more cases for statistical significance.
- "Three Steps To Recovery"
  - Step 1: Know HOW you need to assess
    - What scale are your uncertainties at?
  - Step 2: Assess winter ingredients
  - Step 3: Assess SPC Composites