An Overview of the Environmental Conditions and Radar Analysis of the 22-23 May 2008 Tornadoes in Southeast Wyoming

Horse Creek Road, WY on May 23, 2008

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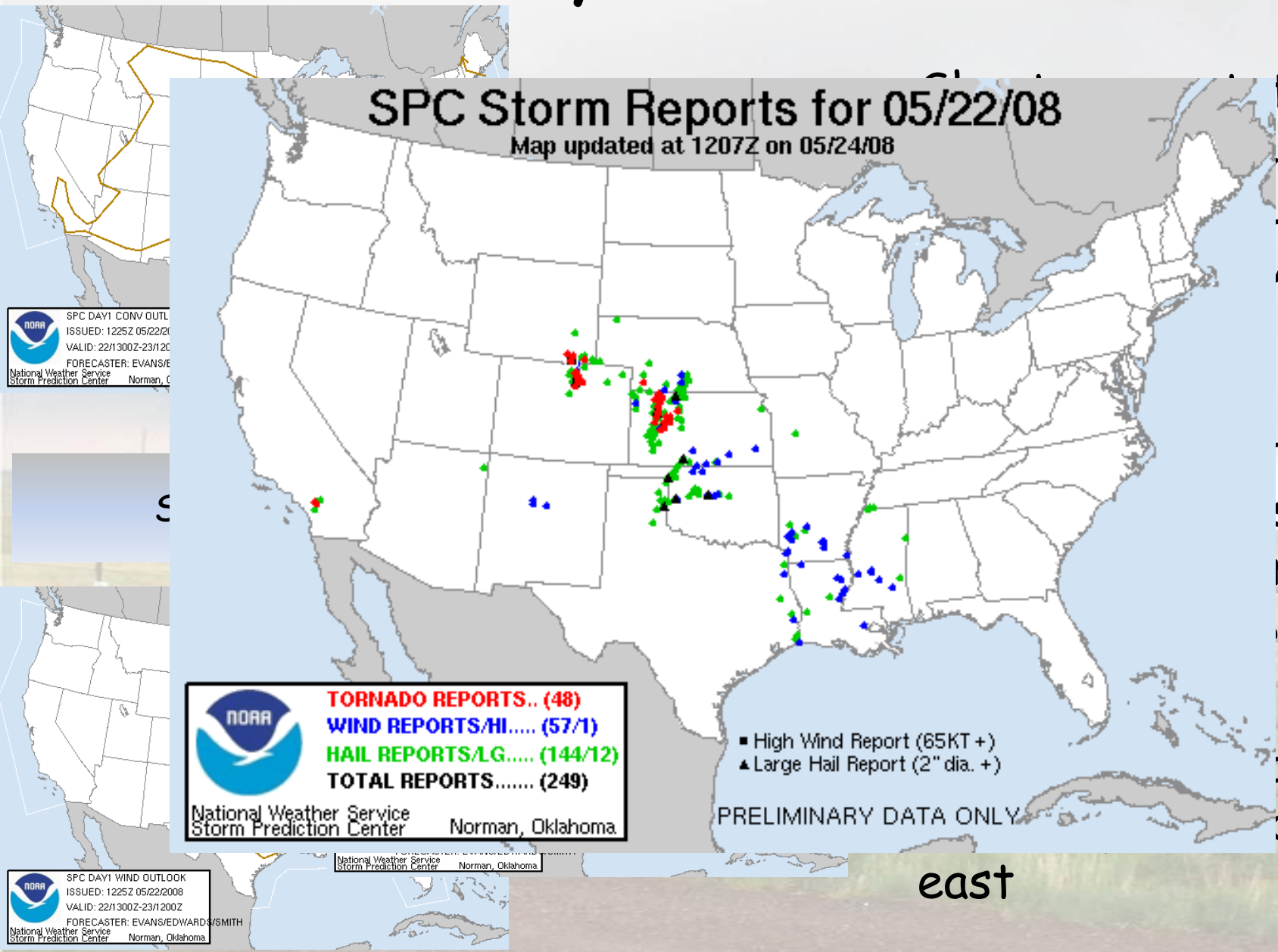
NWS Cheyenne, WY

12th Annual High Plains Conference, September 4-5, 2008

Introduction

- Tornado Events on the 22-23 May 2008
  - SREF probabilistic forecast from SPC
  - Overview of environmental conditions (SPC Mesoscale Analysis)
  - Storm tracks and damage images
- Very brief remarks on following:
  - Geographical comparison of severe weather parameters
  - Examination radar-hail technique

May 22, 2008



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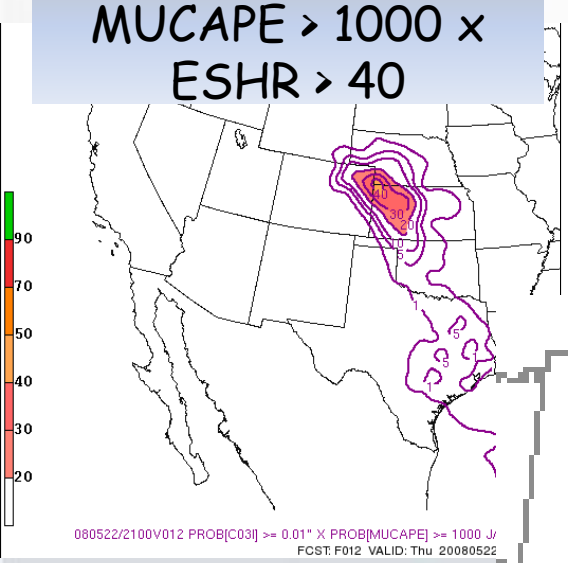
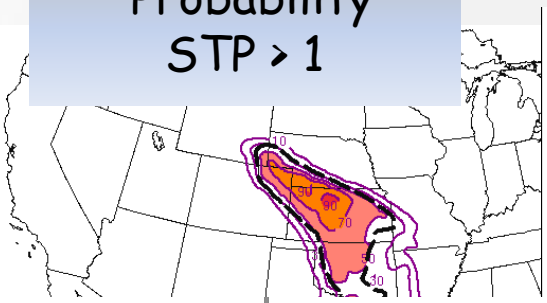
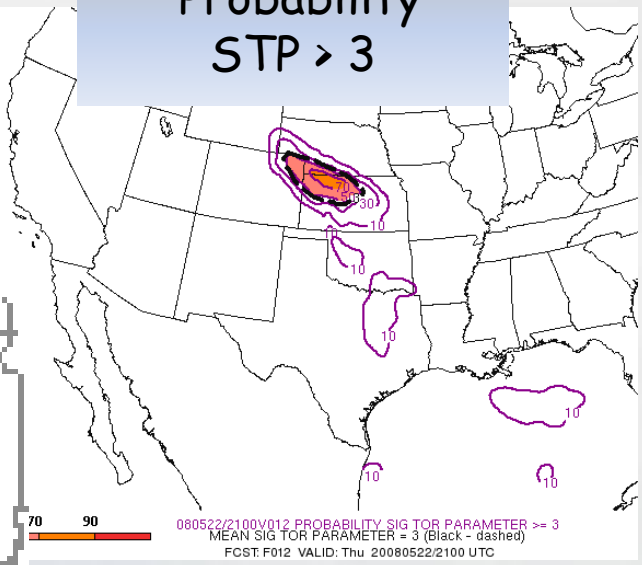
Prob CP > .01 x Prob MUCAPE > 1000 x ESHR > 40



Probability STP > 1

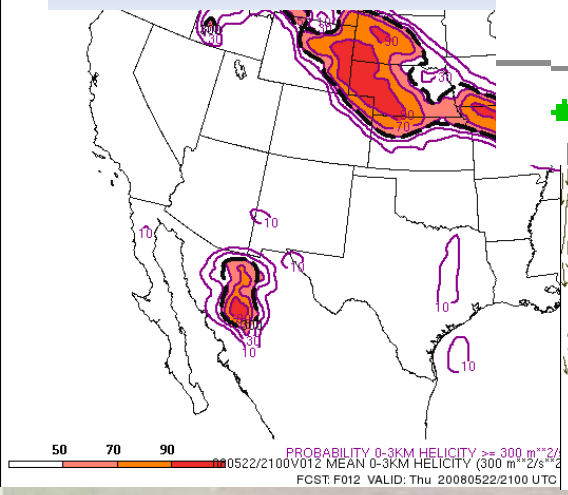


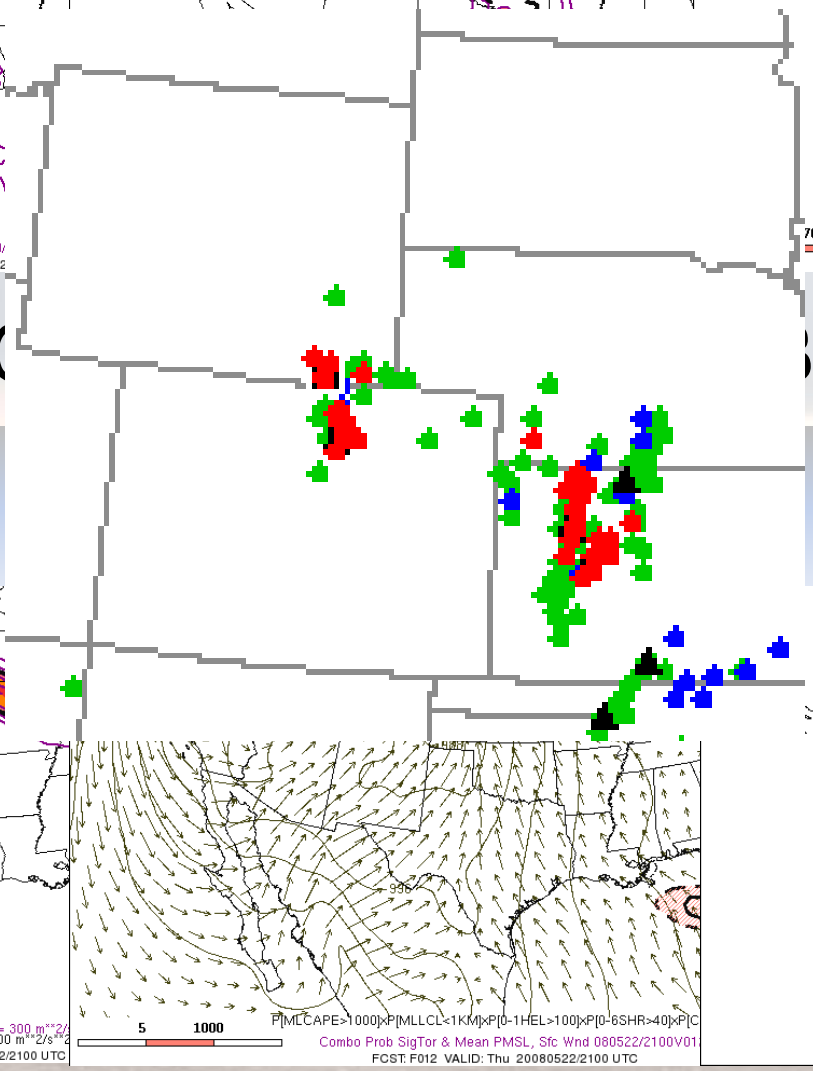
Probability STP > 3



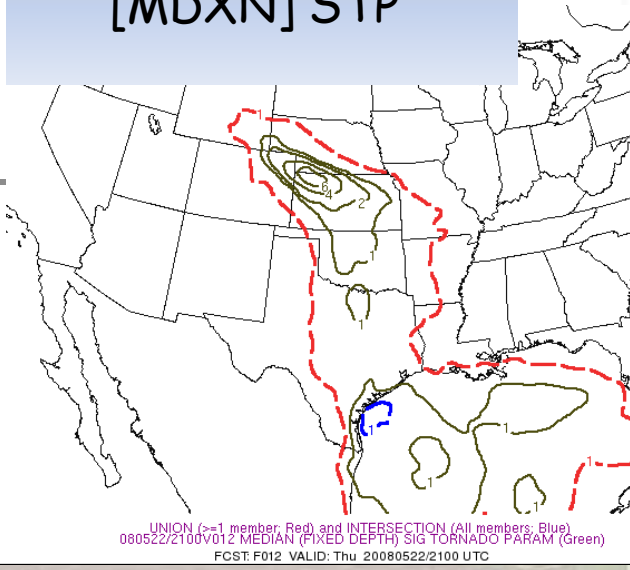
SREF 0522/0 30522/2100 UTC

Probability 0-3km SRH > 300

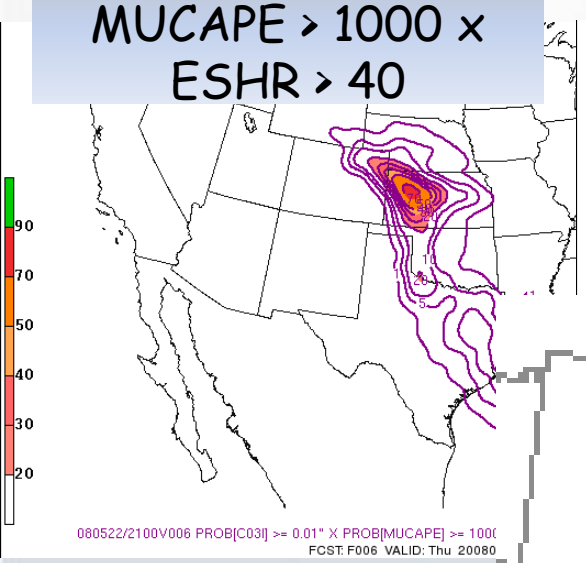




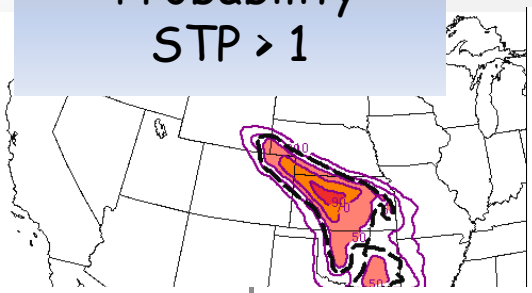
[MDXN] STP



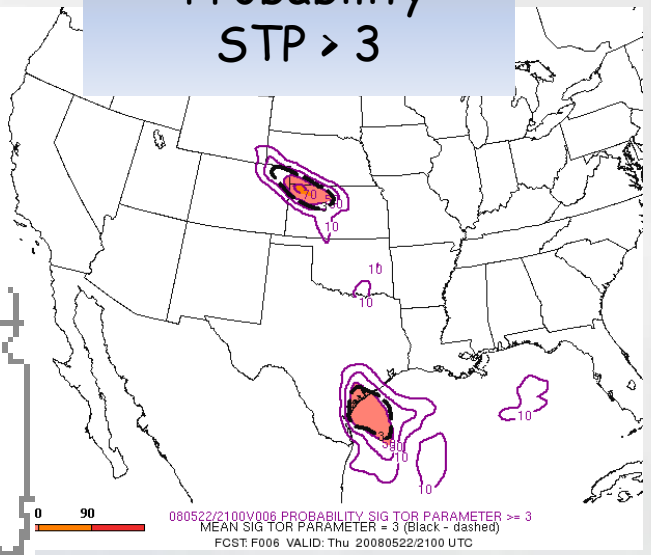
Prob CP > .01 x Prob MUCAPE > 1000 x ESHR > 40



Probability STP > 1



Probability STP > 3



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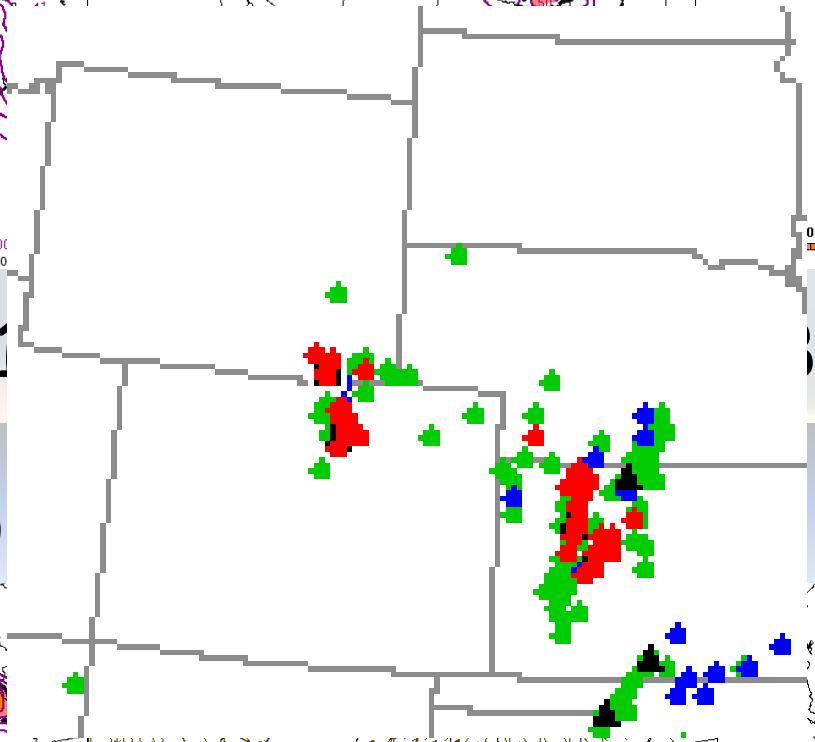
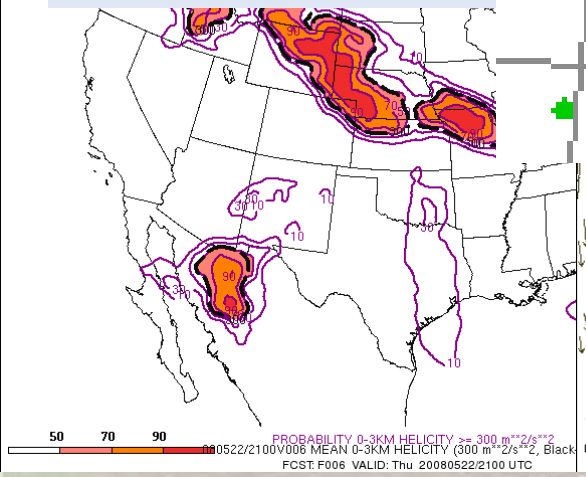
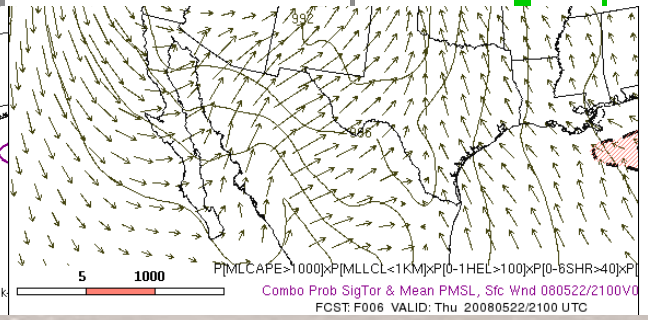


Probability 0-3km SRH > 300





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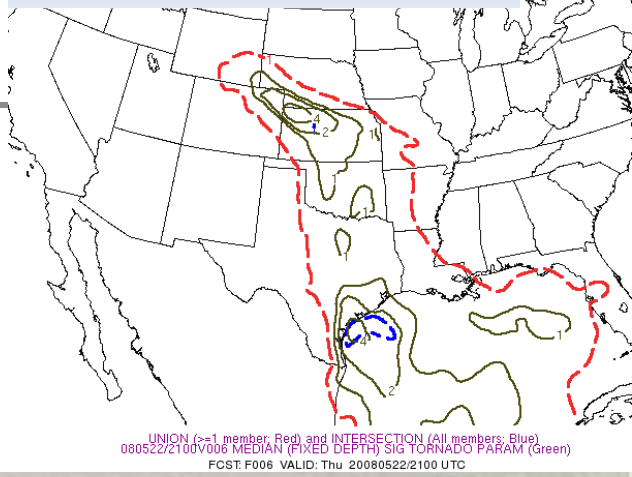
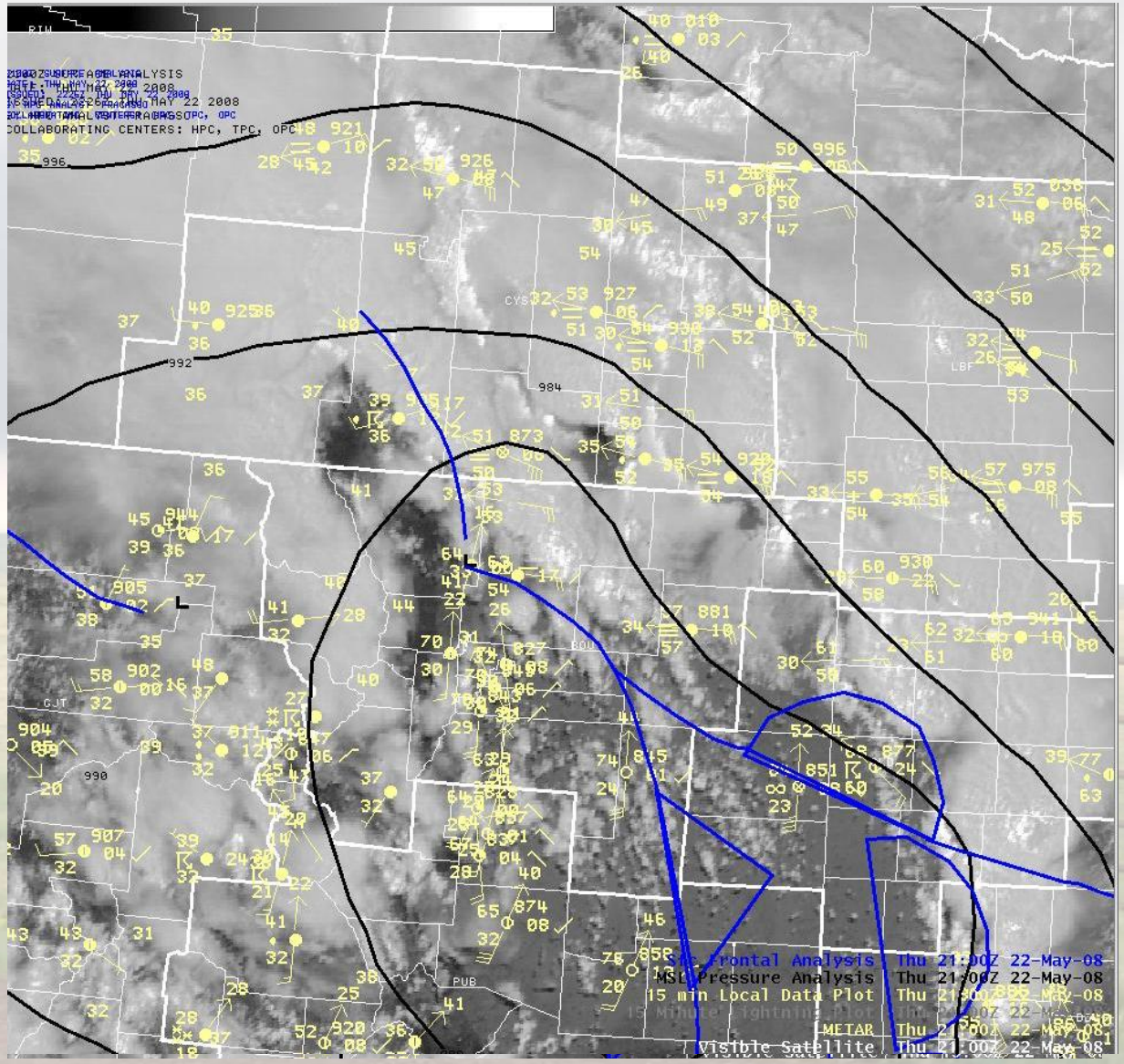
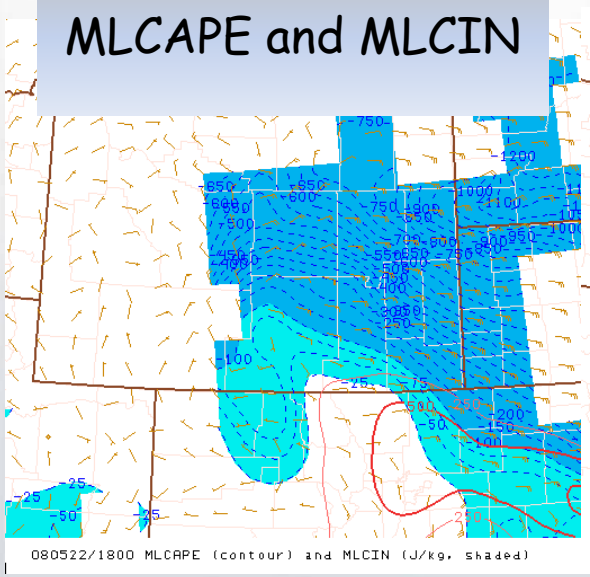


Overview Environmental Conditions

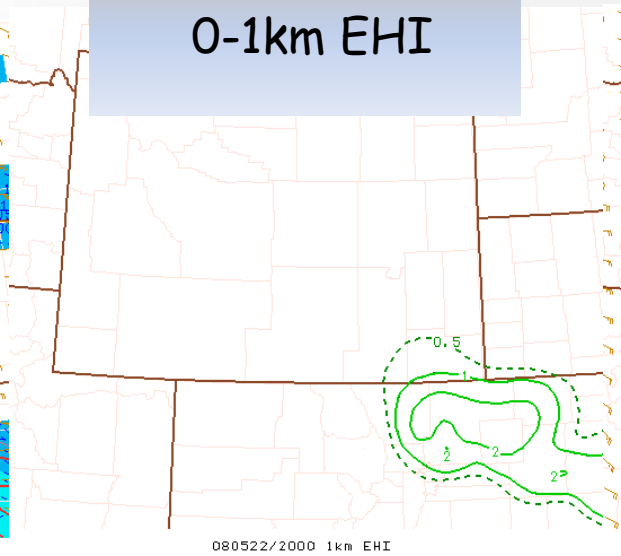
- Surface low located over northern CO
- Warm front extending east from low
  - Temperatures in the 70s in Denver
- Dense fog extending across Cheyenne through Laramie
- Easterly upslope flow
  - Dew point temperatures in the 50s



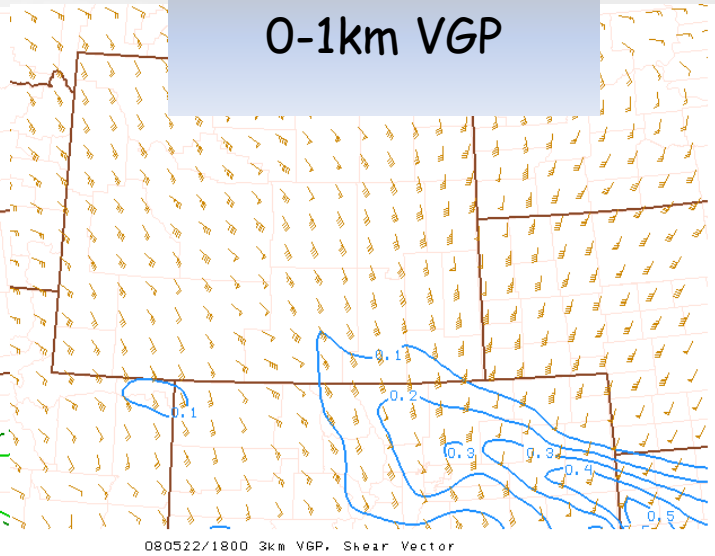
MLCAPE and MLCIN



0-1km EHI



0-1km VGP

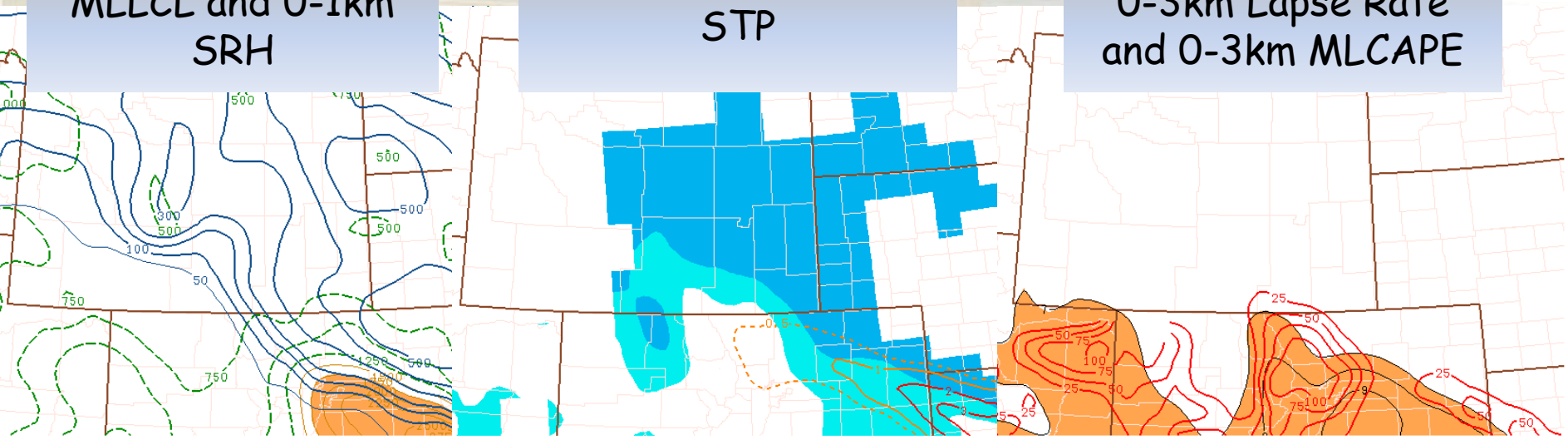


Environmental Conditions: 20080522 at 18z

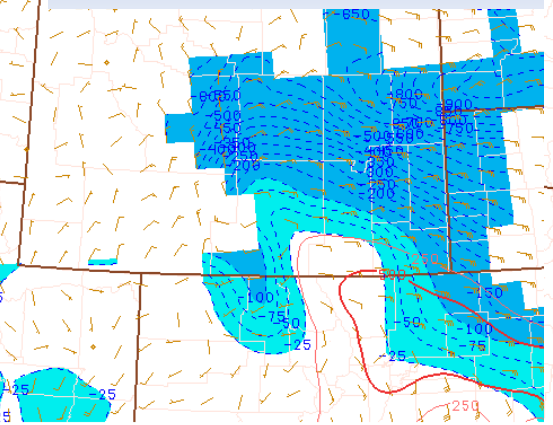
MLLCL and 0-1km SRH

STP

0-3km Lapse Rate and 0-3km MLCAPE

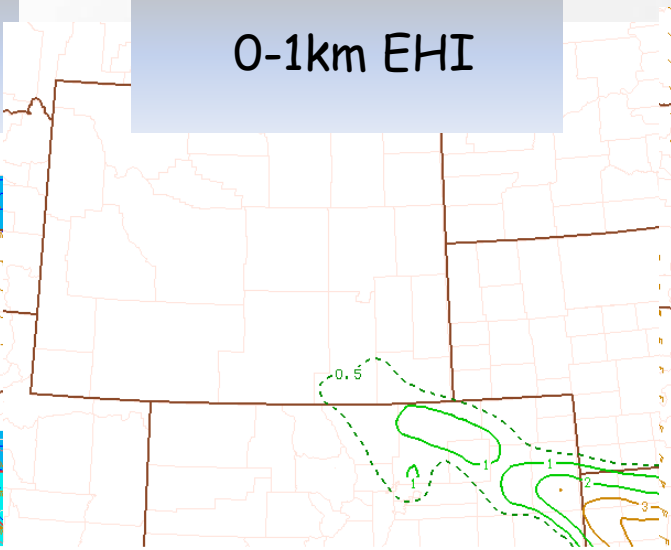


MLCAPE and MLCIN



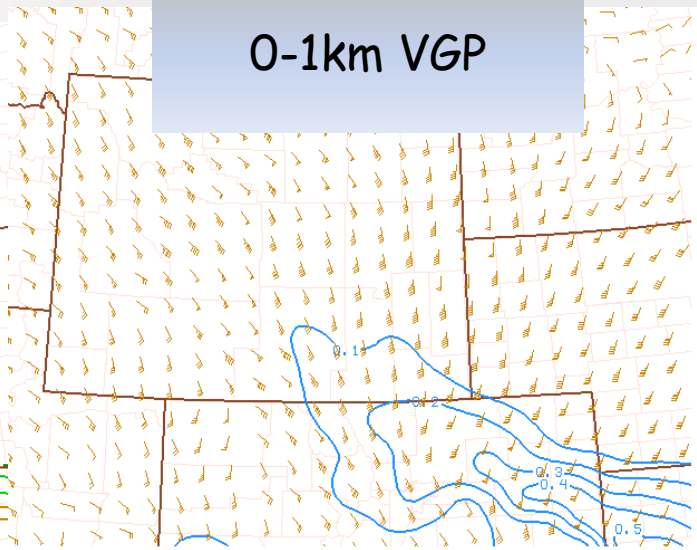
080522/1900 MLCAPE (contour) and MLCIN (J/kg, shaded)

0-1km EHI



080522/1900 1km EHI

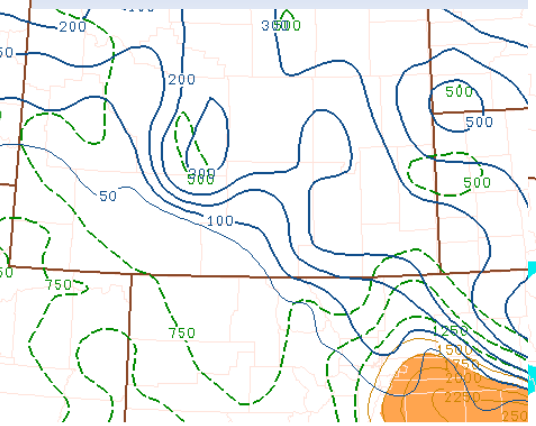
0-1km VGP



080522/1900 3km VGP, Shear Vector

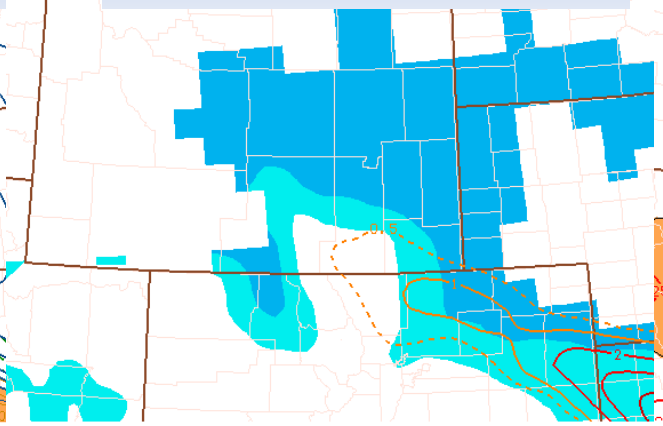
Environmental Conditions: 20080522 at 19z

MLLCL and 0-1km SRH

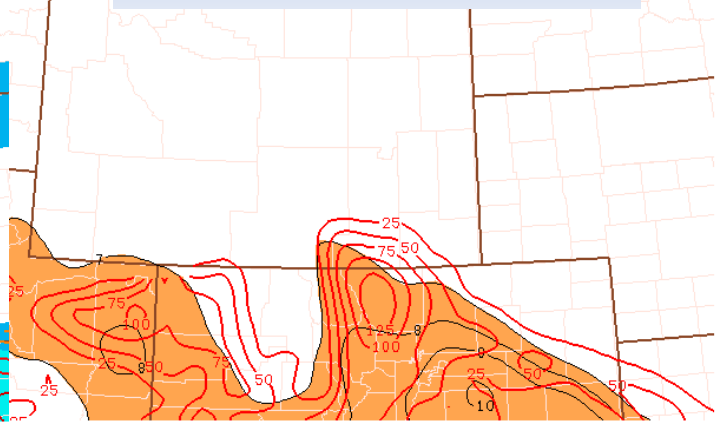


0522/1900 100 mb mean LCL (fill > 1750 m) and 0-1 km SRHcant Tornado Parameter (fixed layer) and MLCIN (J/kg, shaded at 25

STP



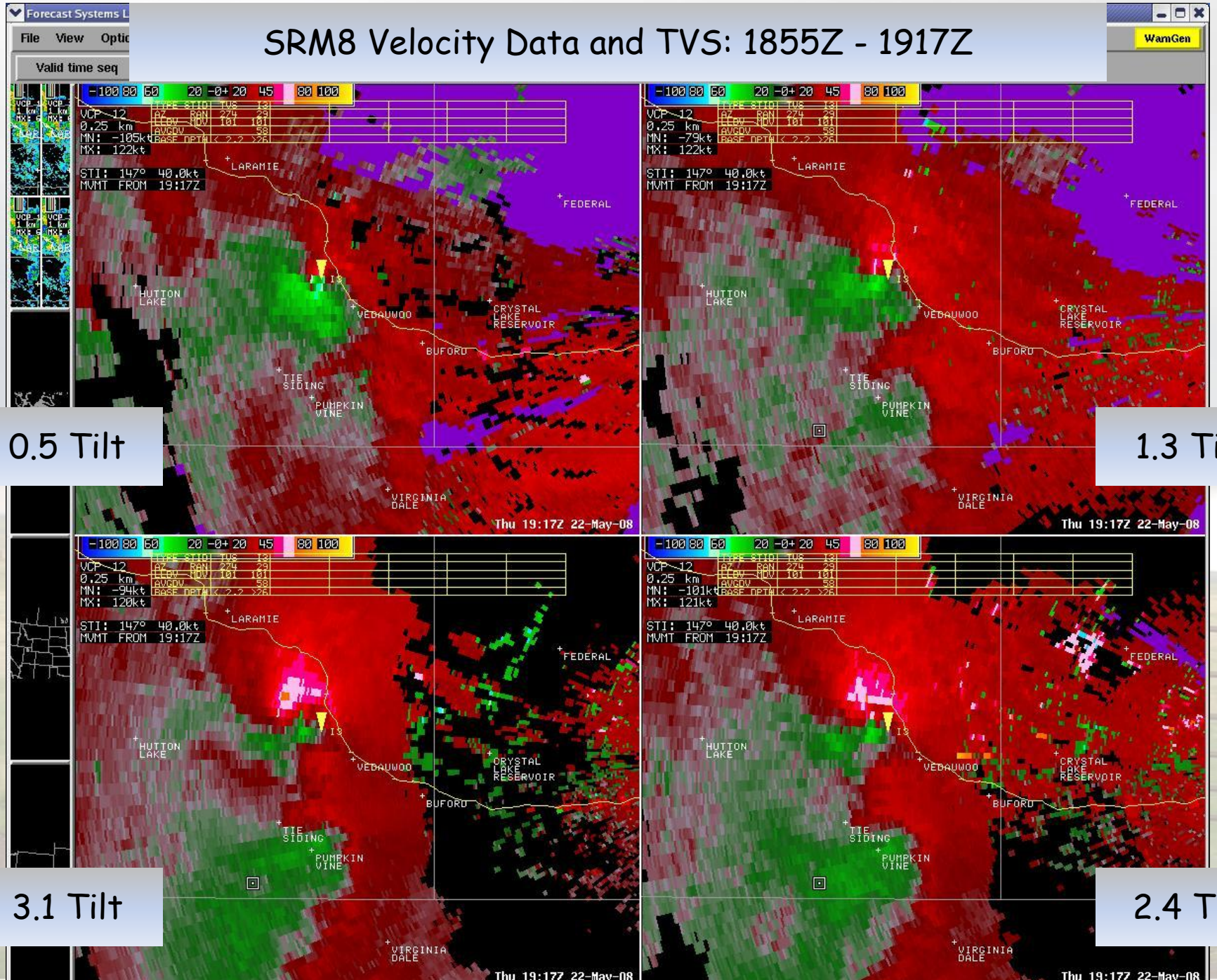
0-3km Lapse Rate and 0-3km MLCAPE



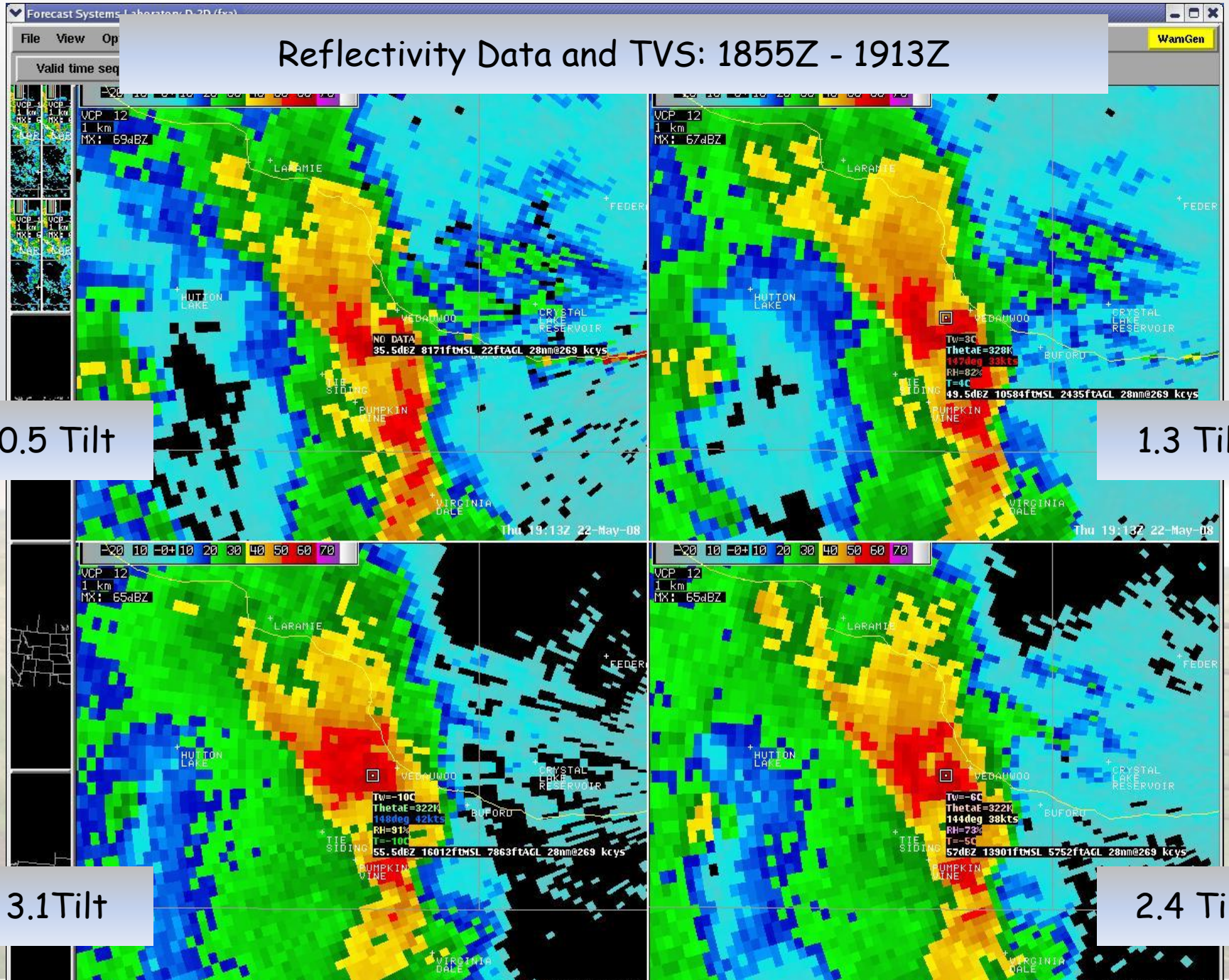
0522/1900 0-3 km lapse rate (fill) and 0-3 km MLCAPE (red)

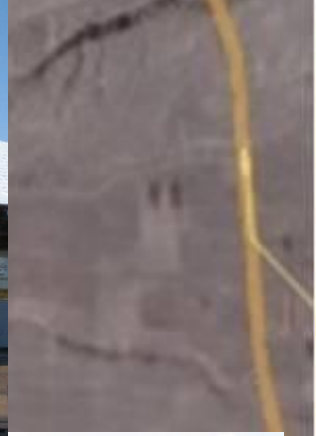
Tornado Tracks: May 22, 2008

SRM8 Velocity Data and TVS: 1855Z - 1917Z



Reflectivity Data and TVS: 1855Z - 1913Z





Courtesy of Jeff Mitros

May 23, 2008

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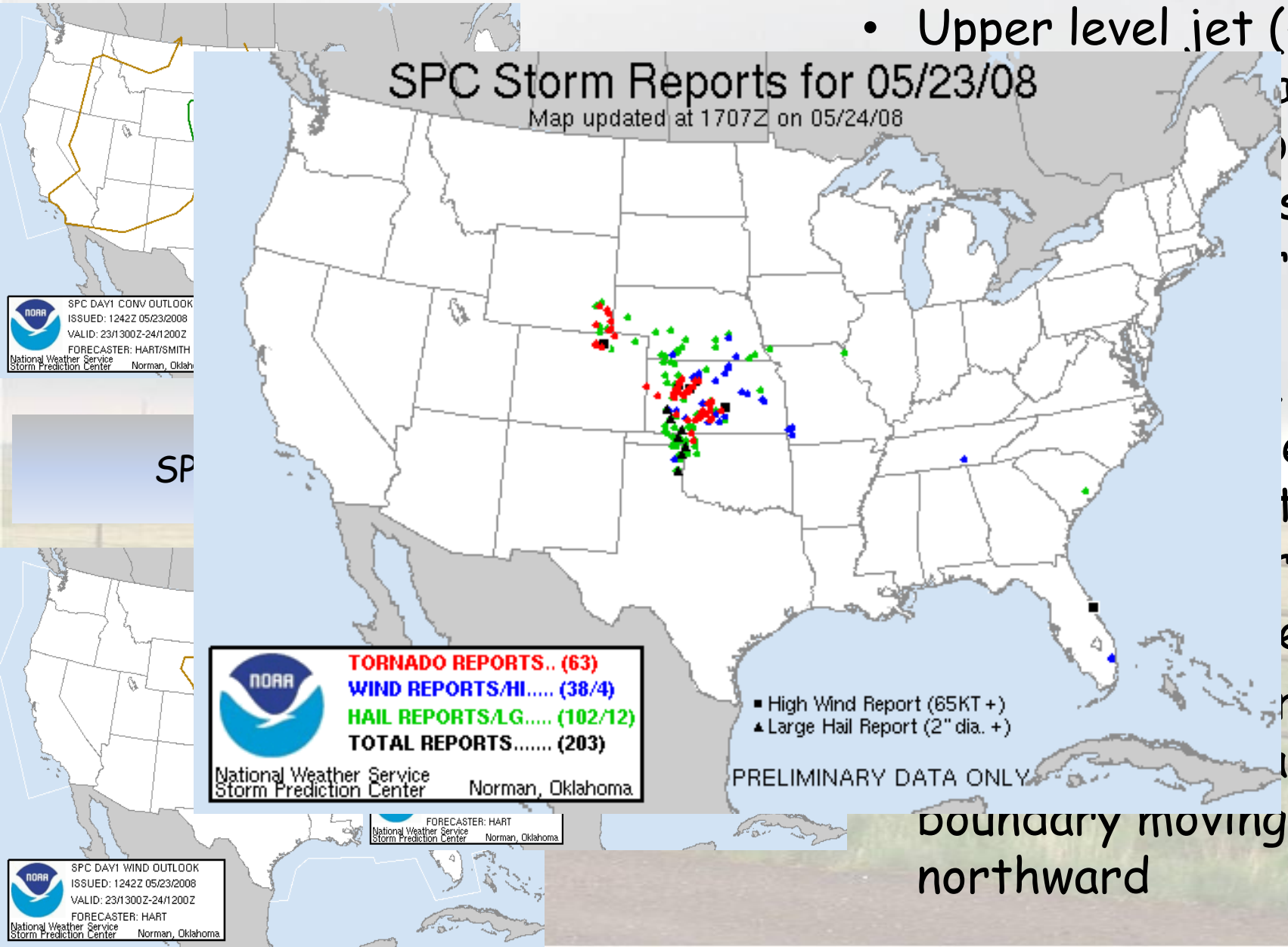
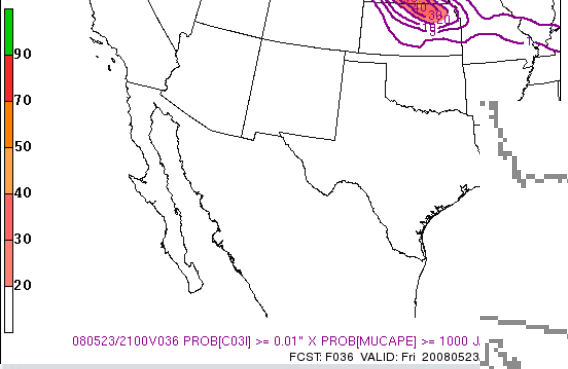
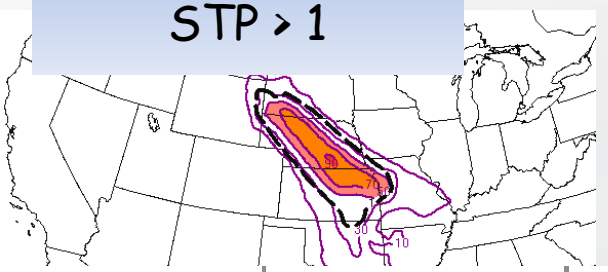
- Boundary moving northward



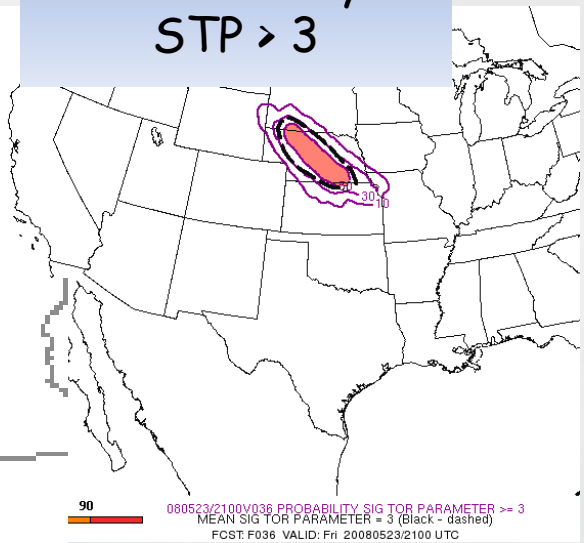
Prob CP > .01 x Prob MUCAPE > 1000 x ESHR > 40



Probability STP > 1

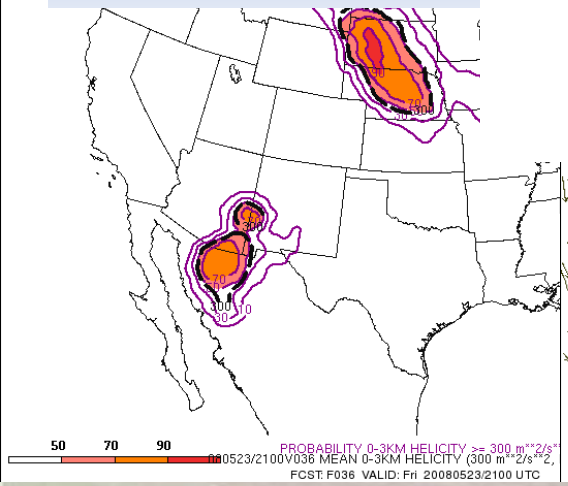


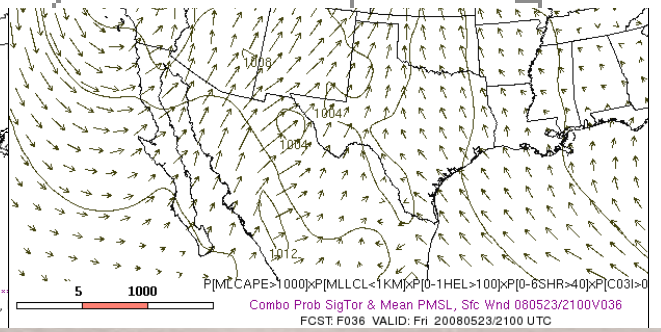
Probability STP > 3



SREF 0522/ 23/2100 UTC

Probability 0-3km SRH > 300





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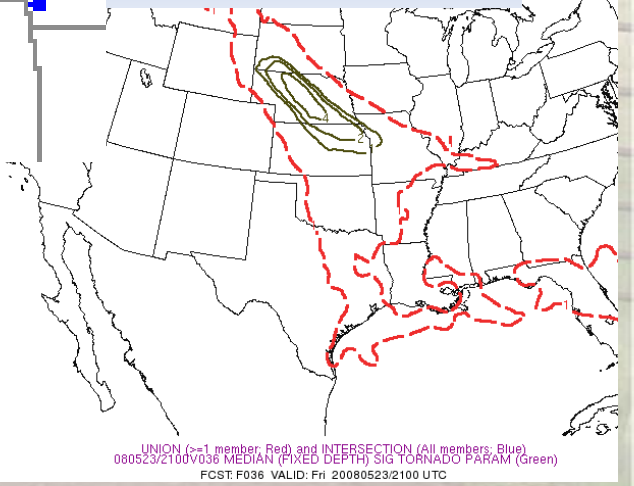

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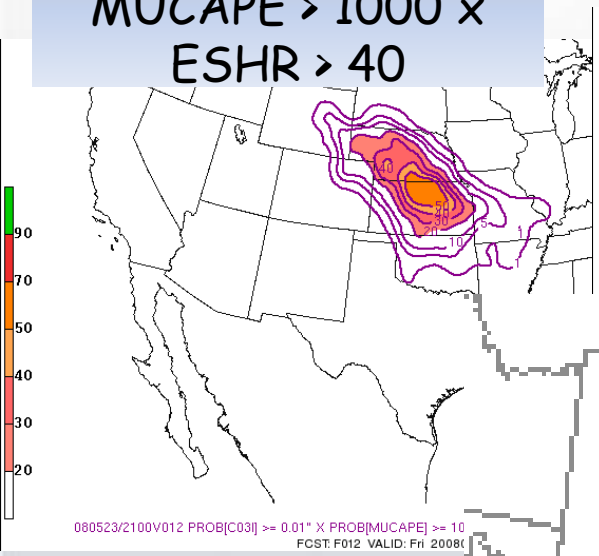
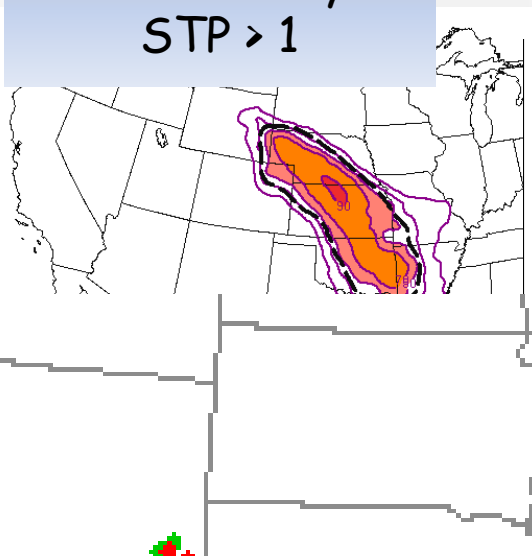
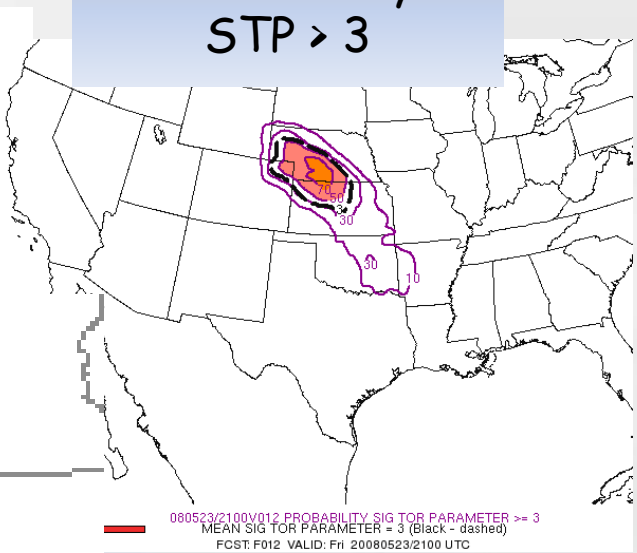


Probability STP > 1



Probability STP > 3



SREF 0523/ 523/2100 UTC

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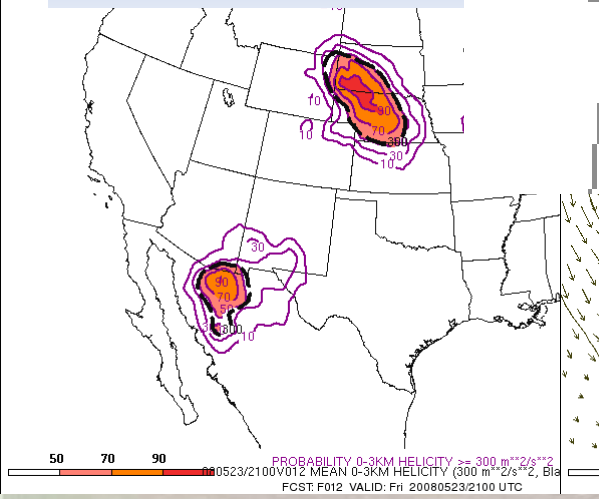

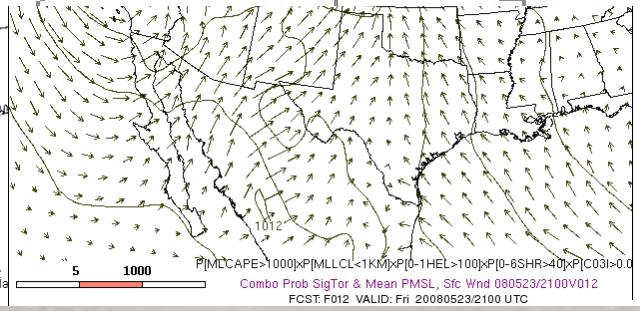

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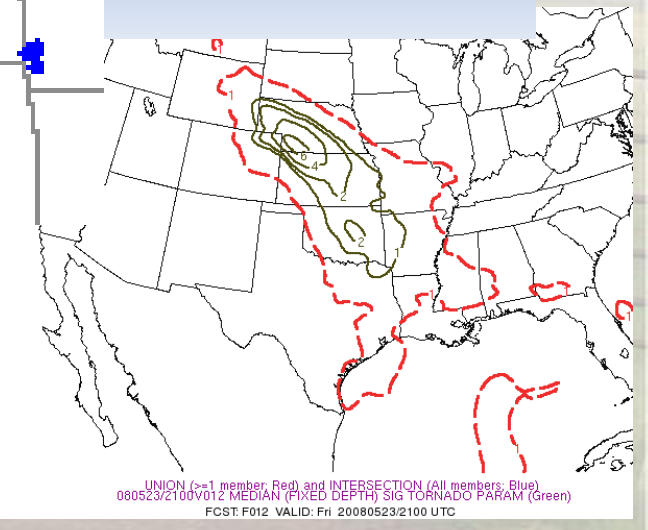
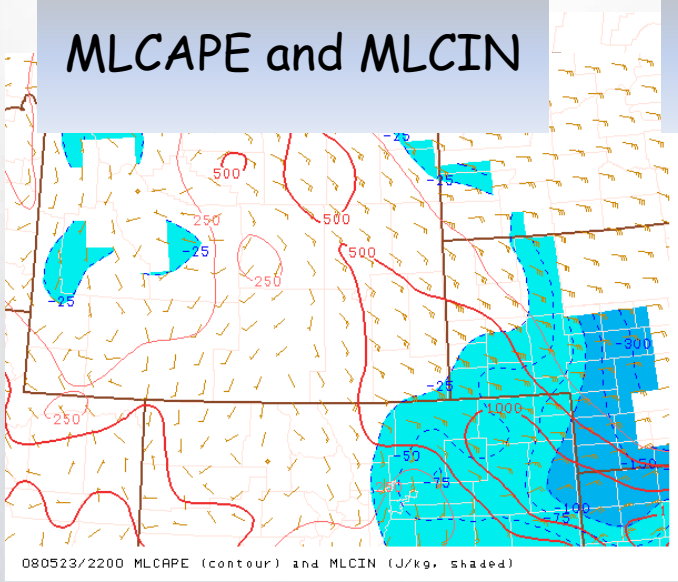
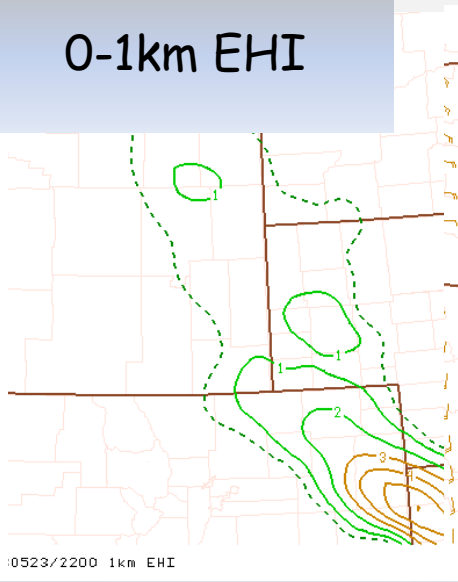


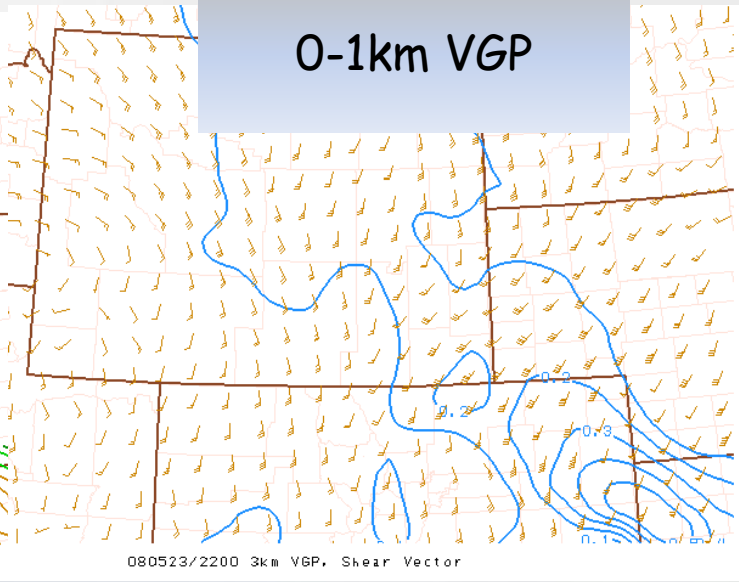
MLCAPE and MLCIN



0-1km EHI

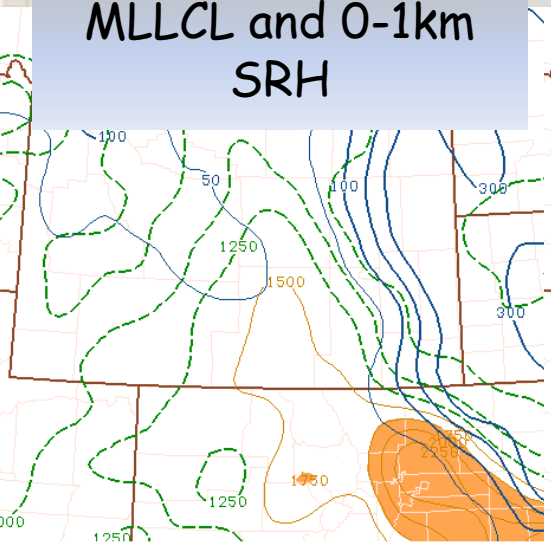


0-1km VGP

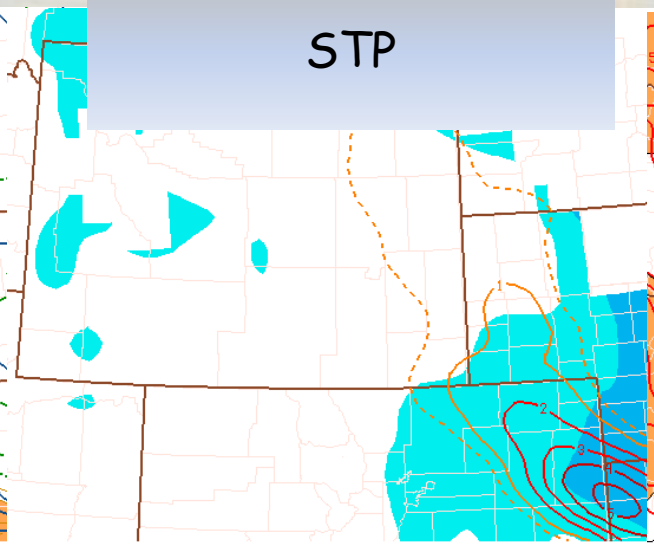


Environmental Conditions: 20080523 at 22z

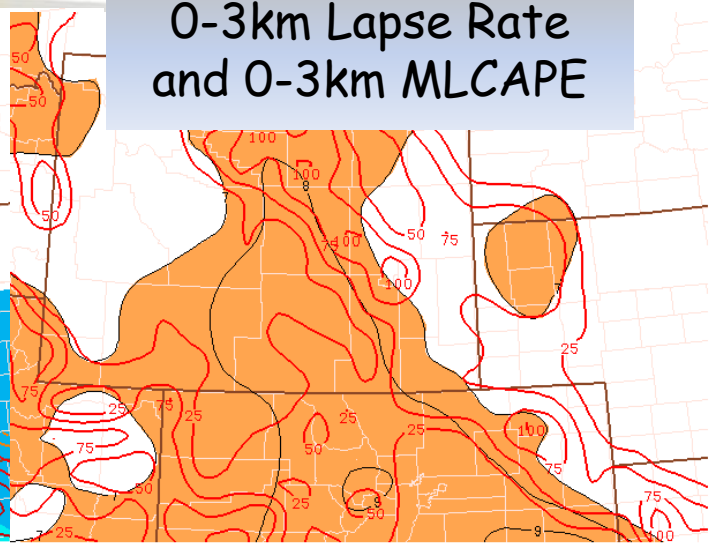
MLLCL and 0-1km SRH



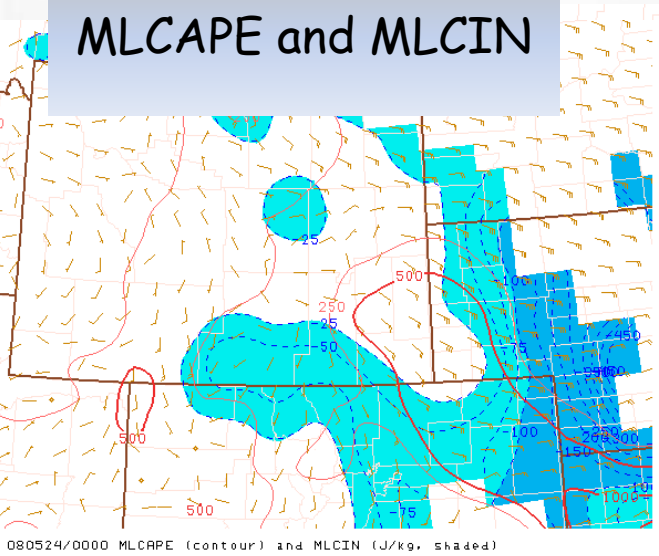
STP



0-3km Lapse Rate and 0-3km MLCAPE



MLCAPE and MLCIN



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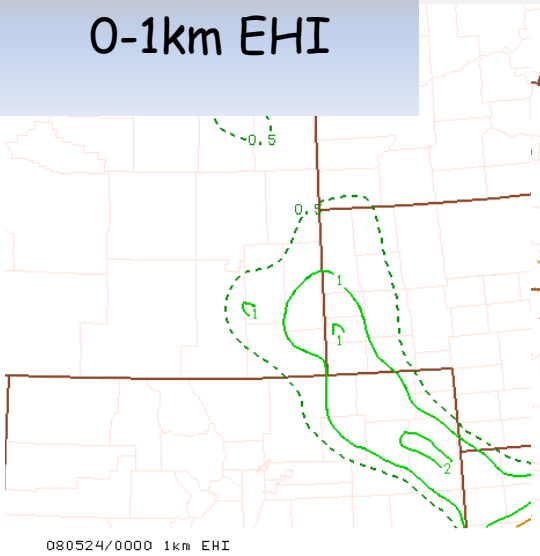
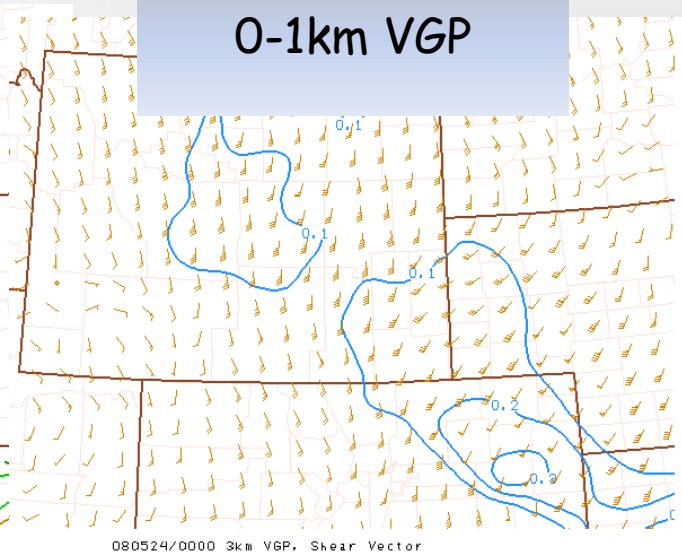
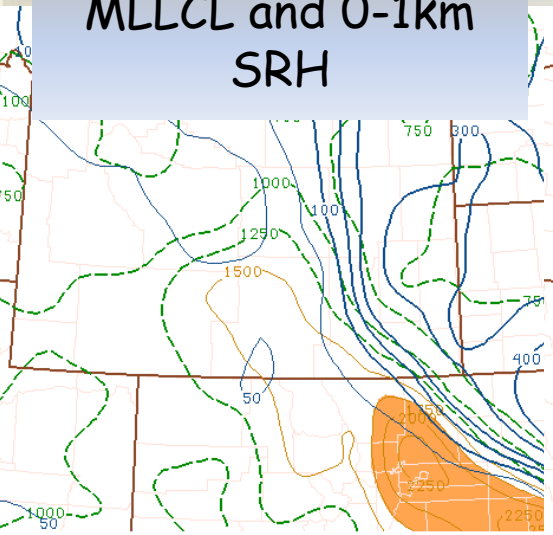


0-1km VGP



Environmental Conditions: 20080524 at 00z

MLLCL and 0-1km SRH



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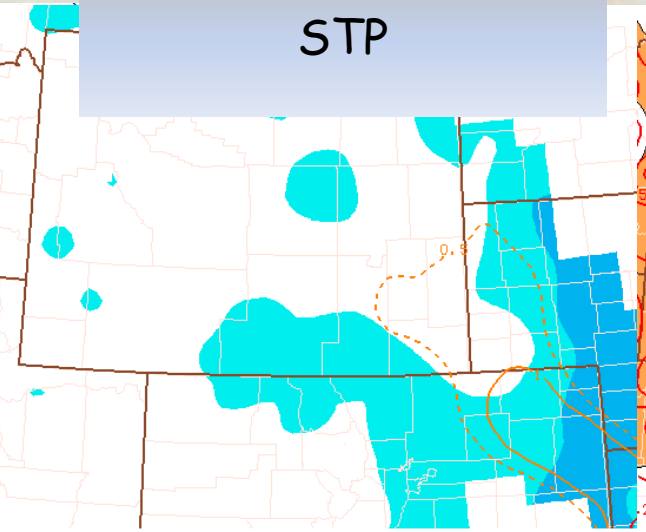

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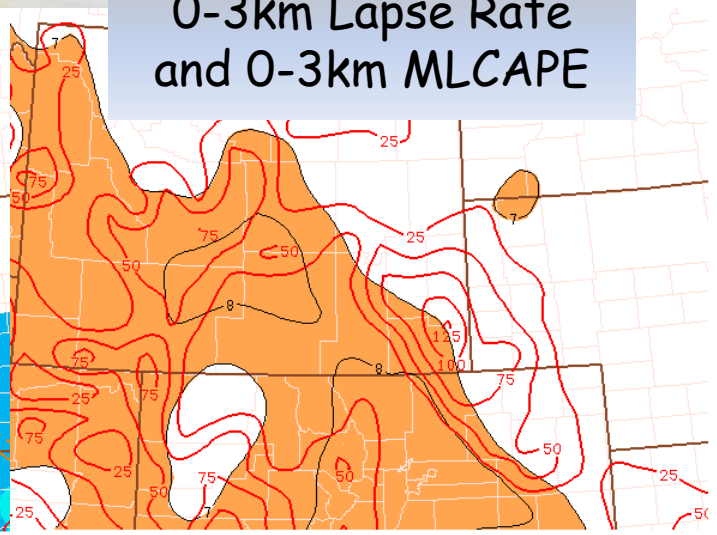
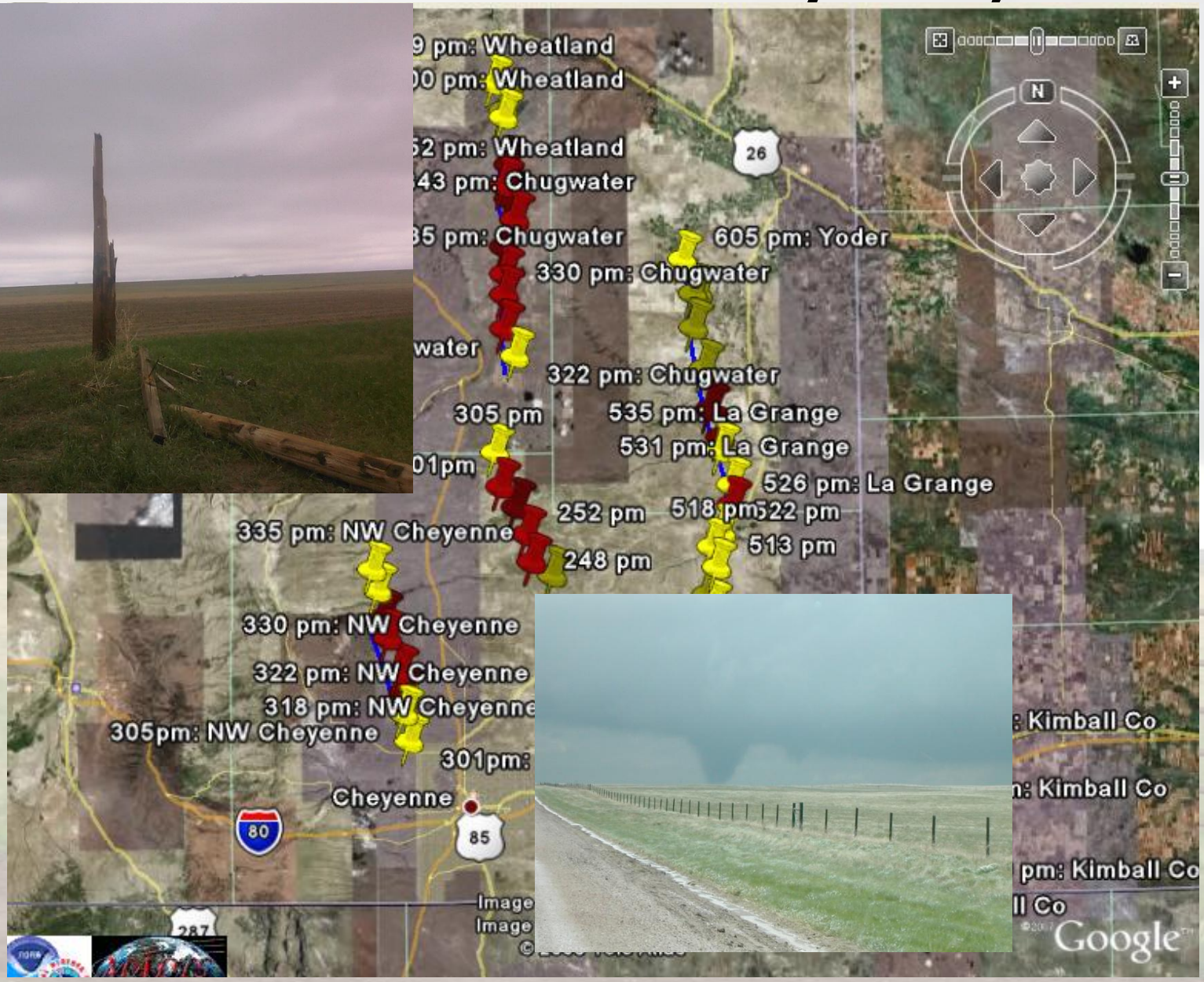
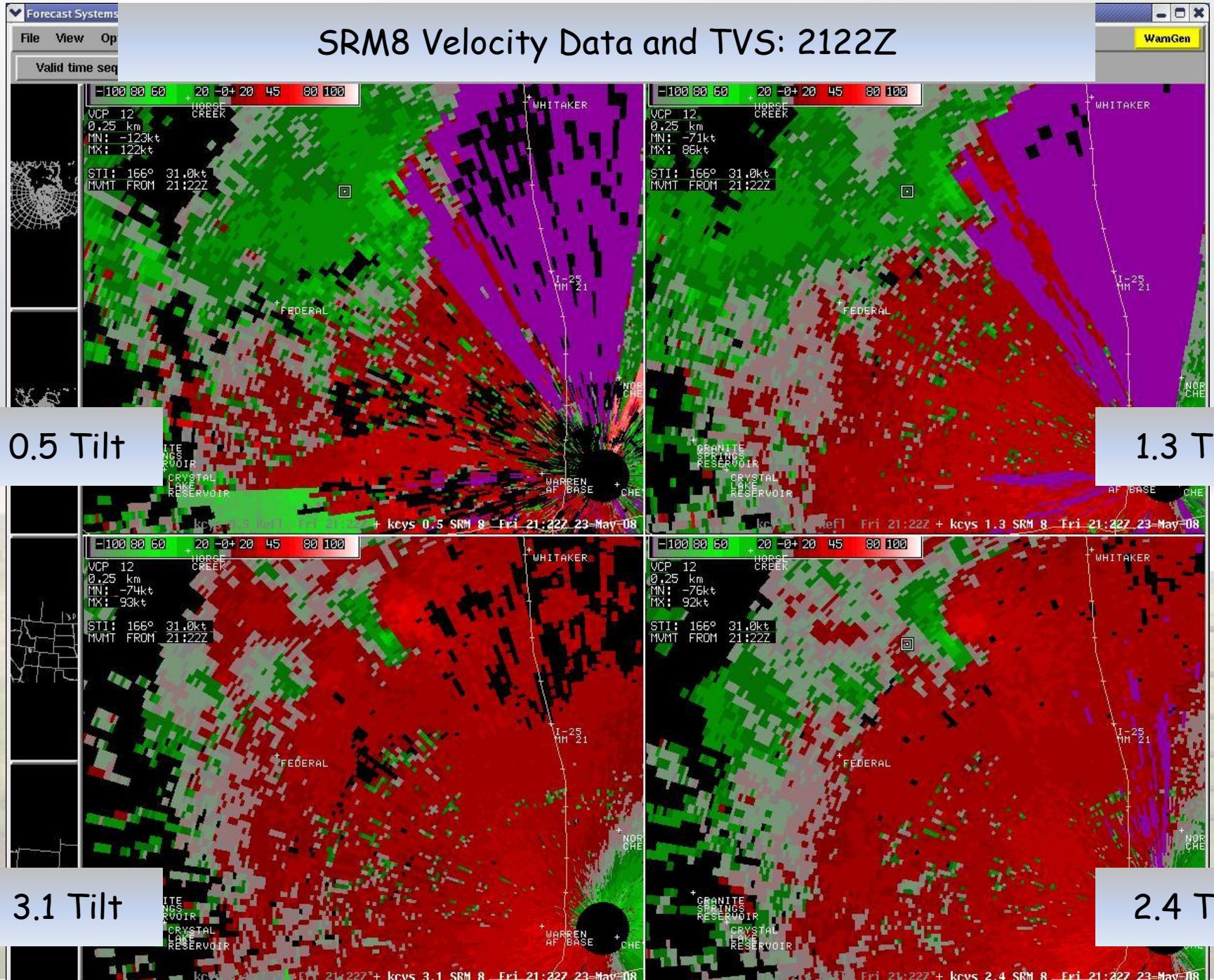


Tornado Tracks: May 23, 2008



SRM8 Velocity Data and TVS: 2122Z



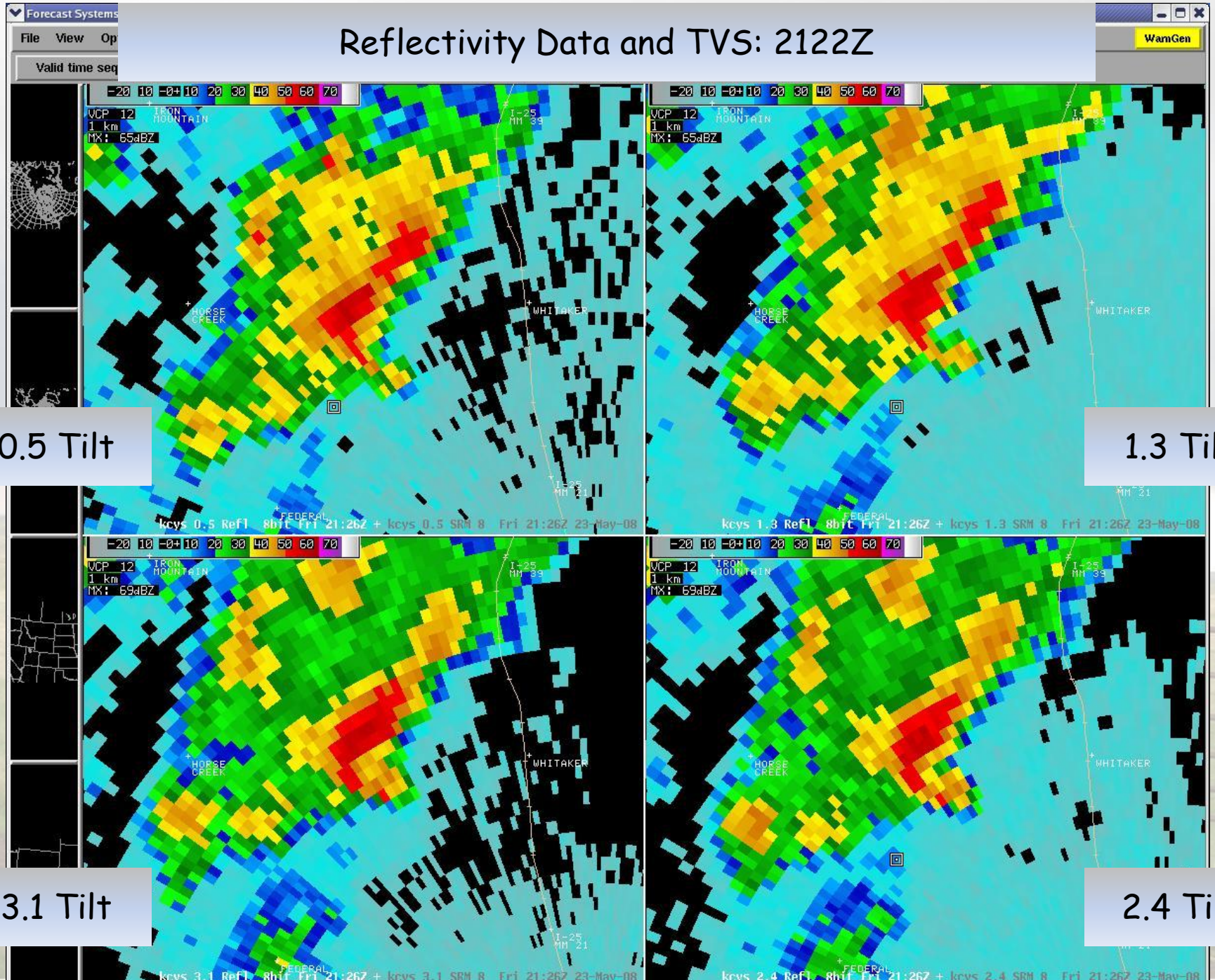
0.5 Tilt

1.3 Tilt

3.1 Tilt

2.4 Tilt

Reflectivity Data and TVS: 2122Z



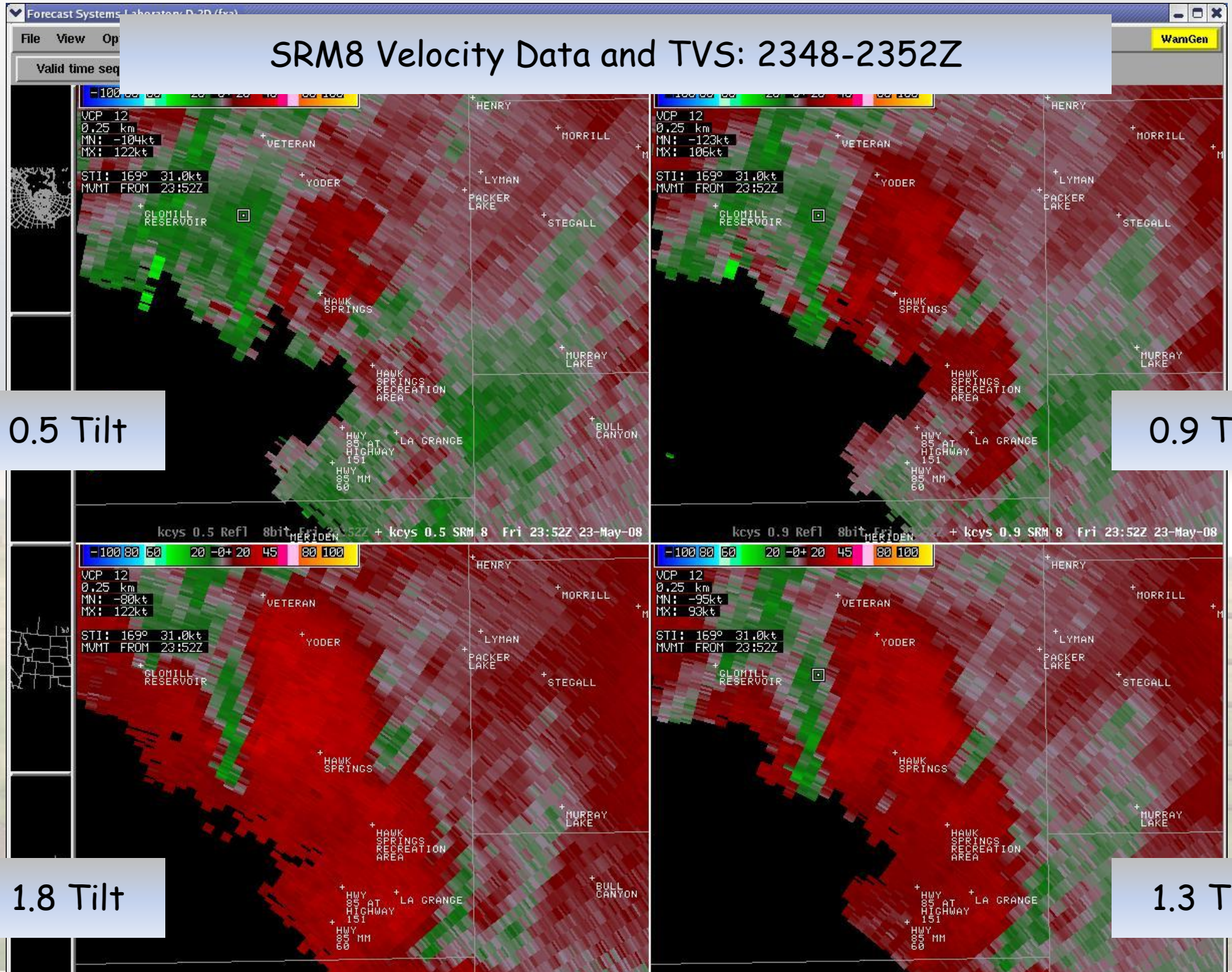
0.5 Tilt

1.3 Tilt

3.1 Tilt

2.4 Tilt

SRM8 Velocity Data and TVS: 2348-2352Z



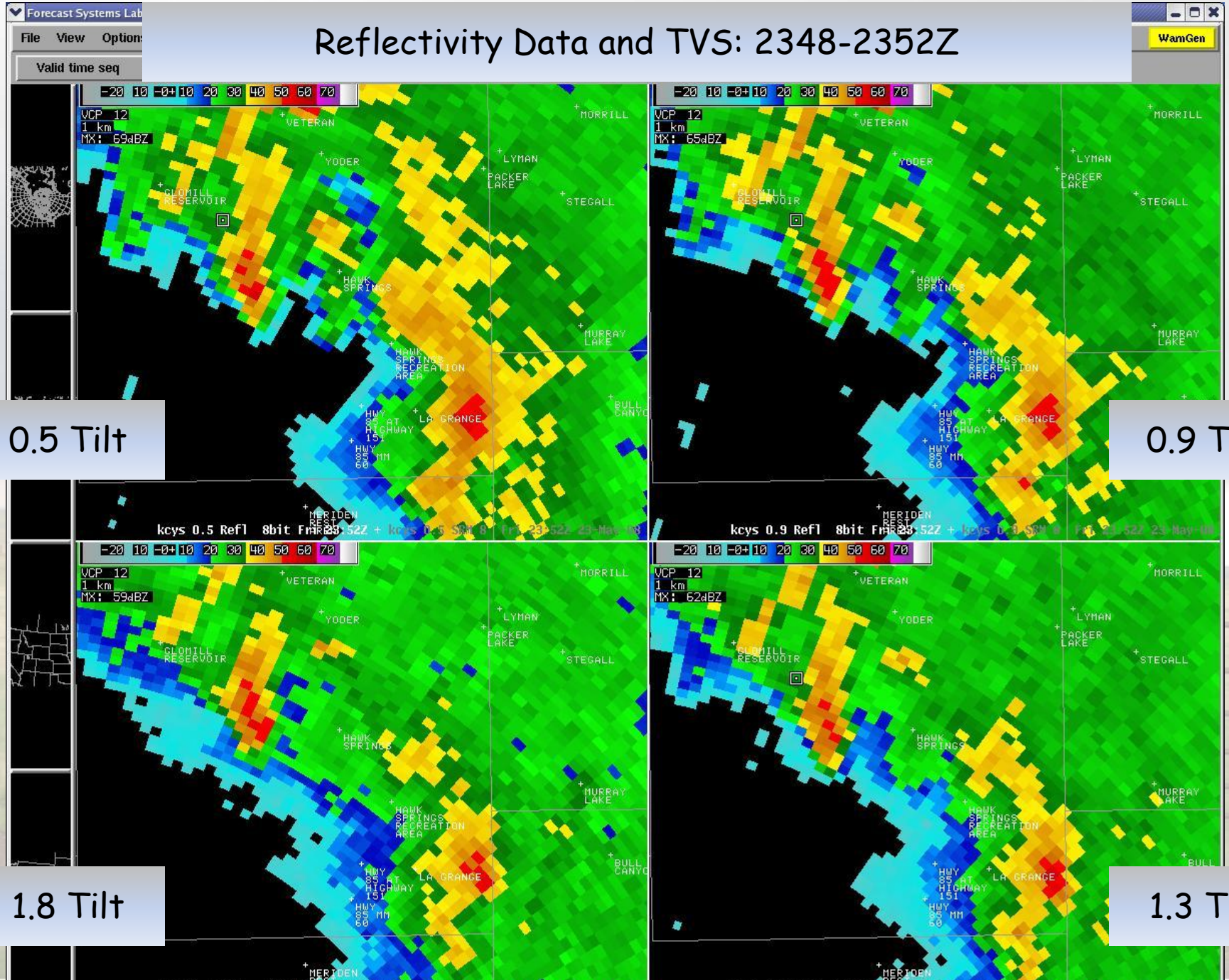
0.5 Tilt

0.9 Tilt

1.8 Tilt

1.3 Tilt

Reflectivity Data and TVS: 2348-2352Z

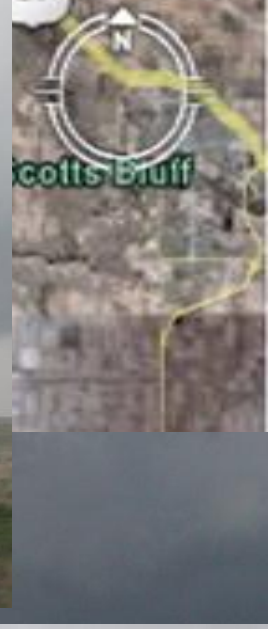


0.5 Tilt

0.9 Tilt

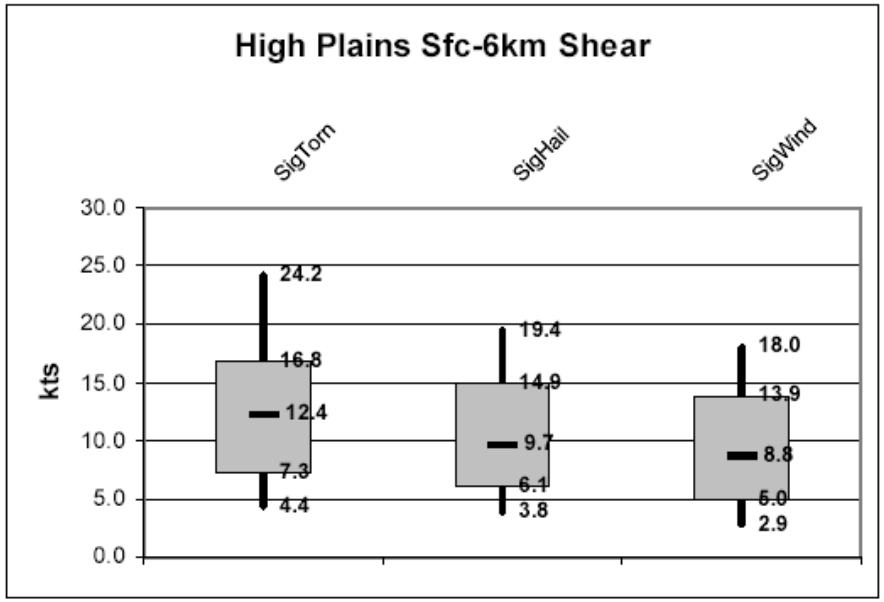
1.8 Tilt

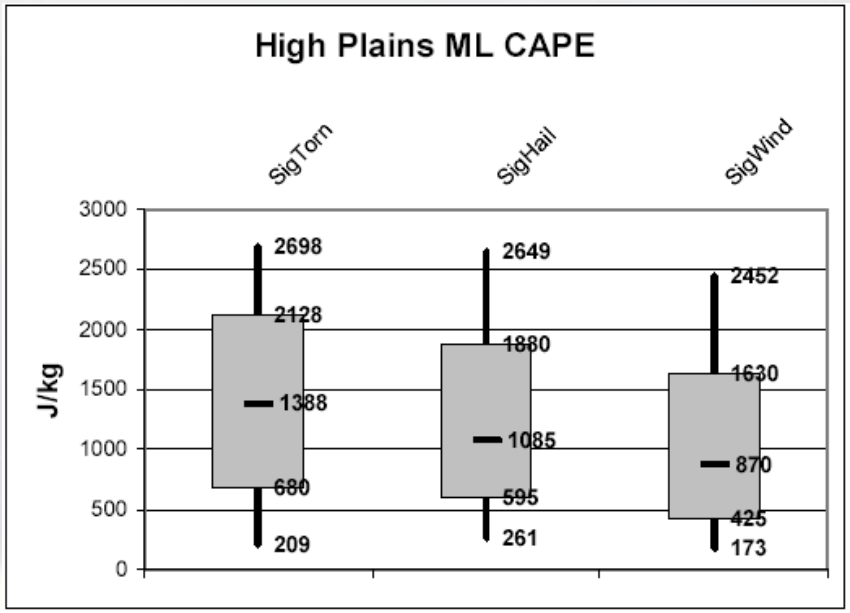
1.3 Tilt

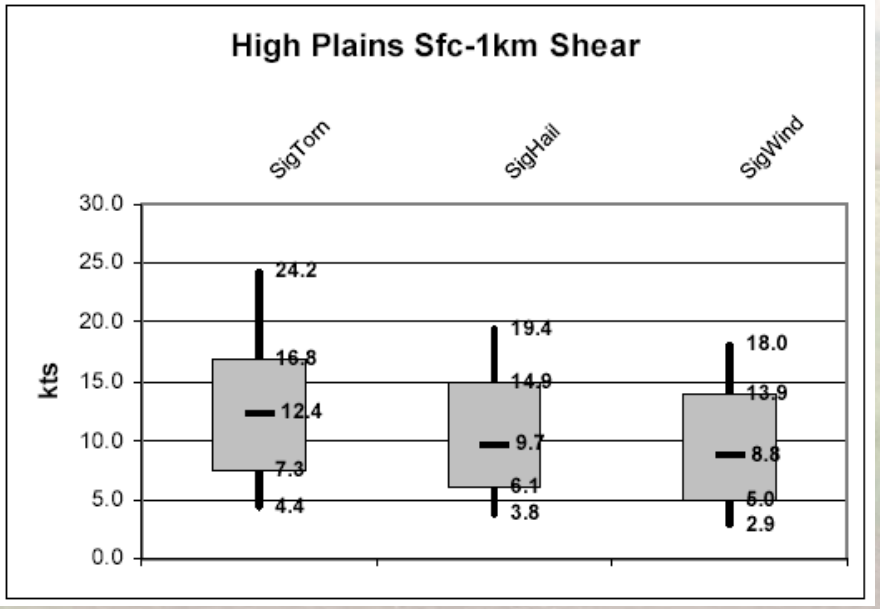


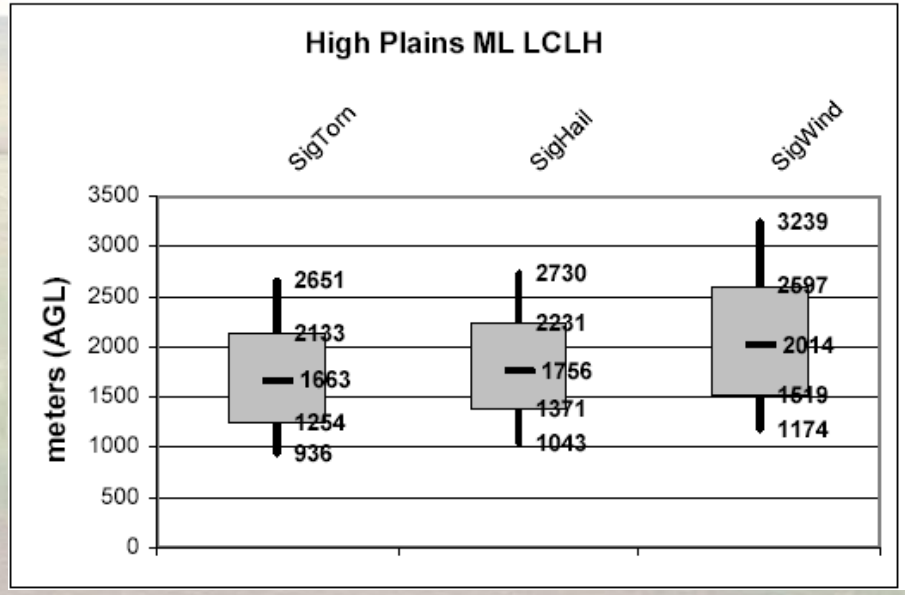
ngs (Courtesy of Matt Bunkers)

Geographical Comparisons









Radar-Hail Technique

- Hail sizes ranged from nickel to golf ball on 22-23 May
  - Picture of hail damage indicates potential for baseball
- Strongly sheared environments does not necessarily favor the Donovan 1" hail technique
  - WER, meso

Hail Damage on May 22, 2008
(Courtesy of Jeff Mitros)

Summary

- SREF Probabilistic forecast provided guidance to forecasters for a potential severe weather outbreak
  - Main focus was slightly east of CWA
- SPC Mesoscale Analysis graphs showed hourly severe weather potential with such parameters a STP, VGP, etc
- Although low 0-1km shear/high ML LCLH environments typical for High Plains, it has been shown that significant outbreaks occur high 0-1km shear/low ML LCLH environments
  - Most forecasters were surprised about the strong tornadic supercells given the cool environment
- Futures projects
  - Examine the hail events across CYS CWA from 2007-2008 environments for close inspections of Donovan 1" hail technique