Overview of Analyses and Findings from the Rural Monitoring Network during TexAQS II

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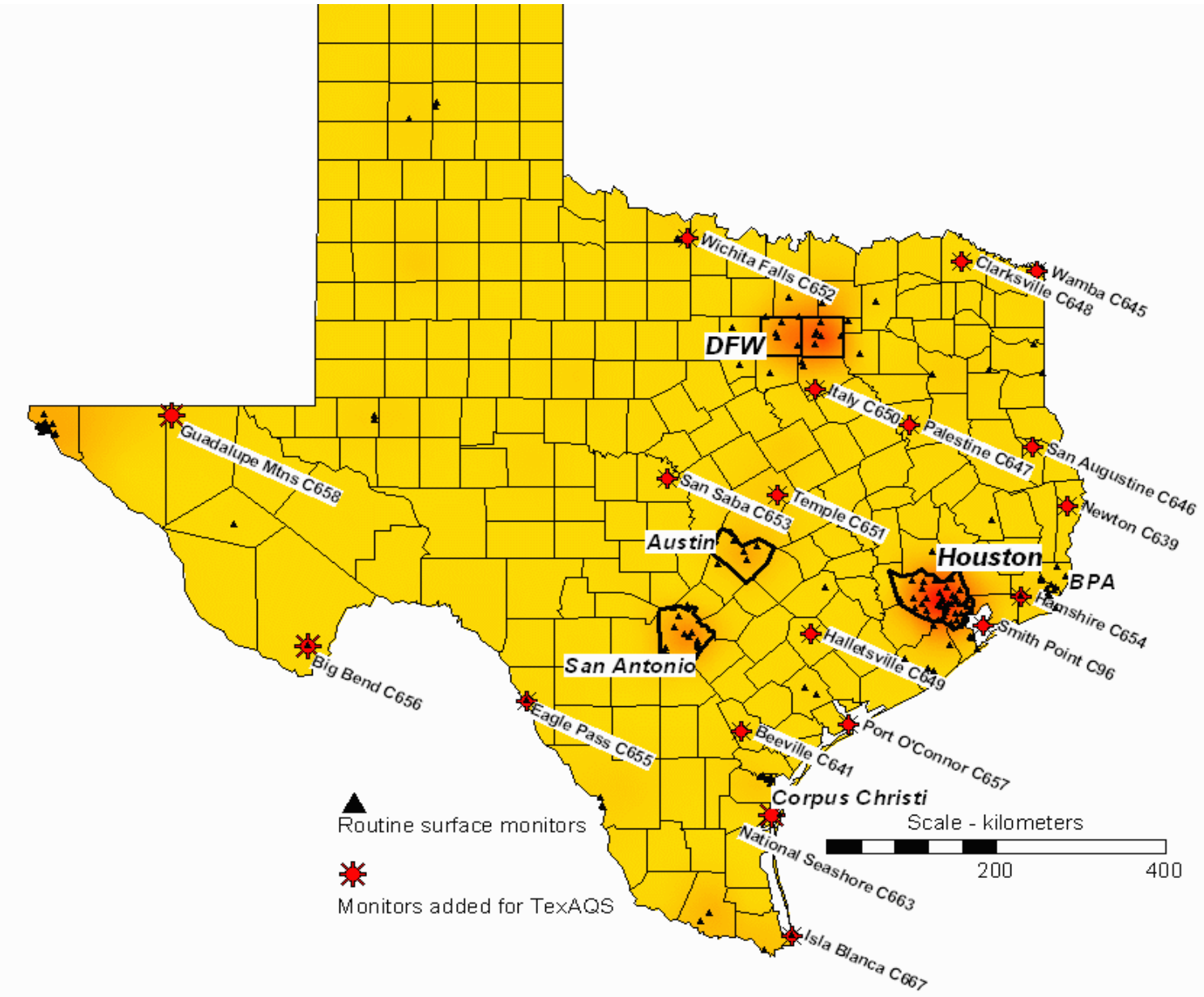
University of Texas at Austin

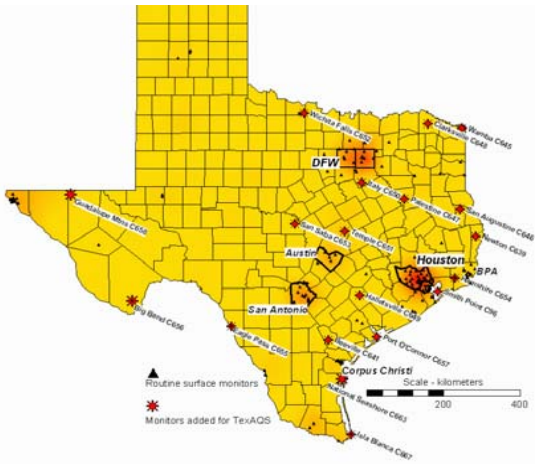
TexAQS II Rural Surface Sites

Summer 2005



Data collected at sites

CAMS	Site Description	Surface Measurements	Latitude	Longitude	Project
638	Smith Point Hawkins Camp C96/C638	O3, met	29.546	-94.787	NTRD
639	Newton NTRD C639	O3, met	30.885	-93.742	NTRD
645	Wamba NTRD C645	O3, met	33.500	-94.120	NTRD
646	San Augustine Airport NTRD C646	O3, neph, met, 2.5 filter	31.539	-94.170	NTRD
648	Clarksville NTRD C648	O3, neph, met, 2.5 filter	33.620	-95.060	NTRD
641	Beeville Airport C641	O3, met	28.360	-97.790	TEXAQS II
649	Halletsville C649	O3, met	29.447	-96.933	TEXAQS II
650	Italy High School C650	O3, met	32.178	-96.878	TEXAQS II
651	Temple C651	O3, met	30.998	-97.339	TEXAQS II
652	Wichita Falls TEXAQSII C652	neph, met, 2.5 filter	33.870	-98.460	TEXAQS II
653	Millpond Park San Saba C653	neph, met, 2.5 filter	31.187	-98.712	TEXAQS II
654	Hamshire C64/C654	O3, neph, NOx, 2.5 teom, met	29.864	-94.318	TEXAQS II
655	Eagle Pass C319/C655	neph, 2.5 teom, met	28.702	-100.451	TEXAQS II
647	Palestine C647	O3, met	31.779	-95.706	TEXAQS II
657	Port O Connor C657	O3, 2.5 teom, met	28.434	-96.455	TEXAQS II
667	Isla Blanca C667/C323	O3, neph, met	26.073	-97.167	TEXAQS II
Site ID	**Site Description**	**Upper Air Measurements**	**Latitude**	**Longitude**	**Project**
SNRTX	Sonora NOAA	wind, RASS	30.260	-100.570	TEXAQS II
NBFTX	New Braunfels TCEQ	wind, RASS	29.700	-98.120	TEXAQS II
BVLTX	Beeville NOAA	wind, RASS	28.370	-97.790	TEXAQS II
BRZ19	Brazos A19 TCEQ	wind, RASS	28.200	-95.600	TEXAQS II
HVETX	Huntsville NOAA	wind, RASS	30.720	-95.640	TEXAQS II
MDYTX	Moody NOAA	wind, RASS	31.340	-97.370	TEXAQS II
LVWTX	Longview NOAA	wind, RASS	32.380	-94.710	TEXAQS II



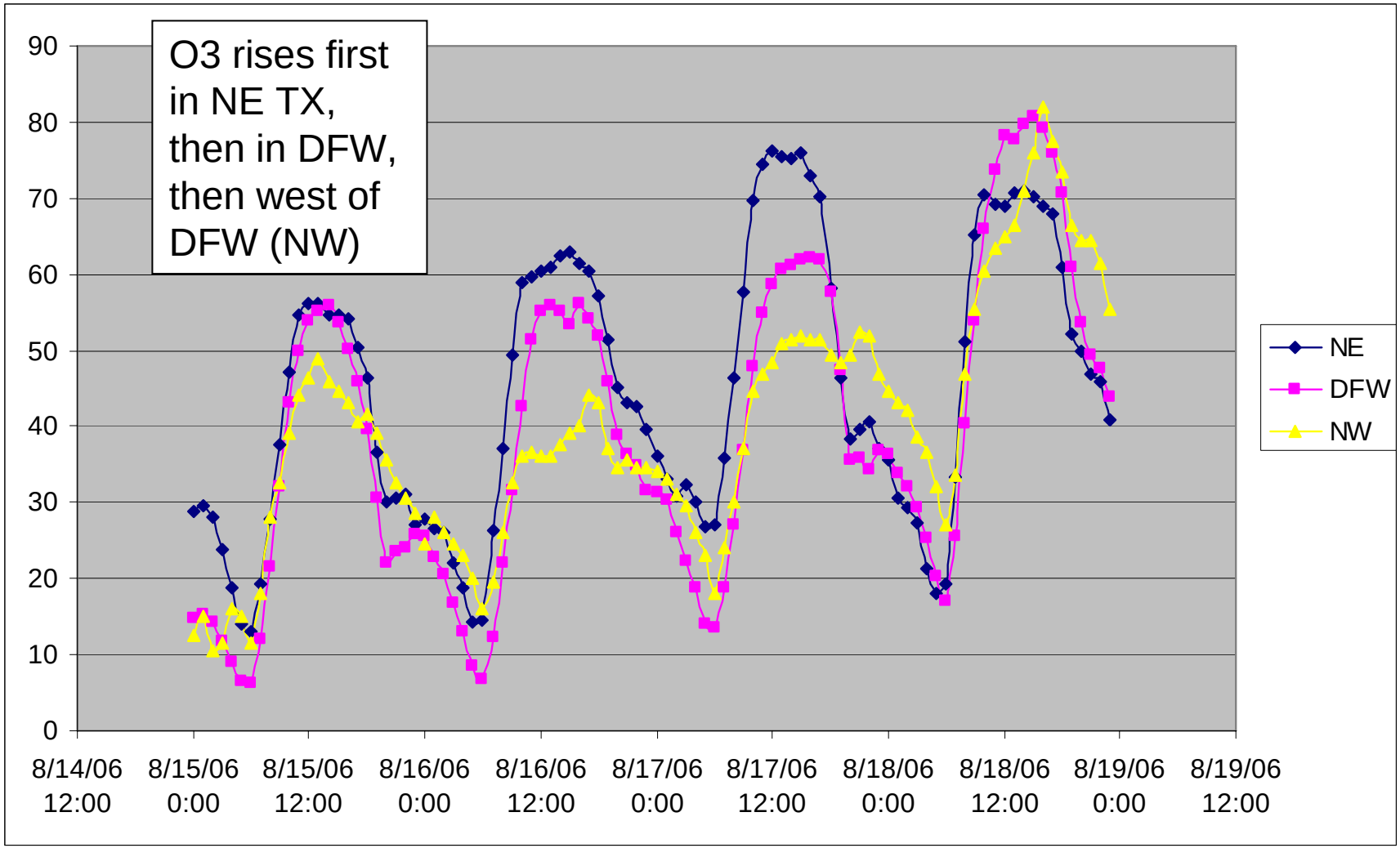
Preliminary analysis of data from rural sites

- Spatial distributions of rural ozone concentrations
- Analysis of diurnal patterns in ozone data
- Use of rural network to characterize regional transport of ozone

Ozone Isopleths – August 2006

- Episode with potential transport cases: August 15-26, 2006
- Surface monitor data and back trajectories show evidence of transport into Texas and intercity transport within the state

Regional O_3 builds during episode



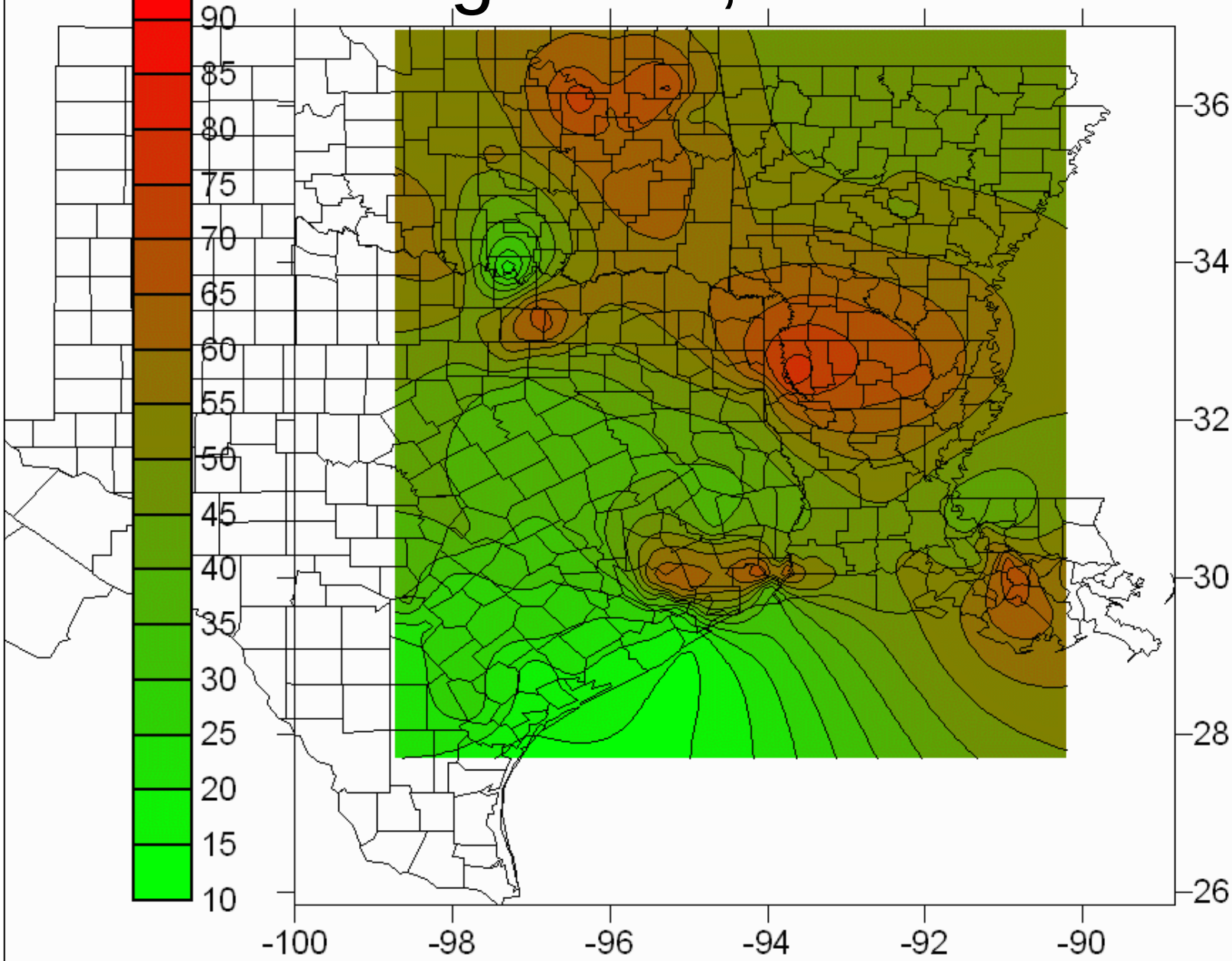
O_3 Isopleths

- Daily 8-hour maxima at O_3 monitors in East Texas, Oklahoma, Louisiana, & Arkansas
- Texas data from TCEQ internal Web-site, regulatory & non-regulatory data
- Other states' data from EPA AQS
- Simple point Kriging interpolation for contours
- No assumptions for anisotropy (implicit directionality)
- All available point data used
- 72-hr Hysplit[1] back-trajectories:
  - Start time: 18Z
  - Elevation: 300 m
  - From 6 points over East Texas
  - 1-hr time steps displayed

1. Draxler, R.R. and Rolph, G.D., 2003. HYSPLIT (HYbrid Single-Particle Lagrangian Integrated Trajectory) Model access via NOAA ARL READY Website (http://www.arl.noaa.gov/ready/hysplit4.html). NOAA Air Resources Laboratory, Silver Spring, MD.

Rolph, G.D., 2003. Real-time Environmental Applications and Display sYstem (READY) Website (http://www.arl.noaa.gov/ready/hysplit4.html). NOAA Air Resources Laboratory, Silver Spring, MD.

August 15, 2006



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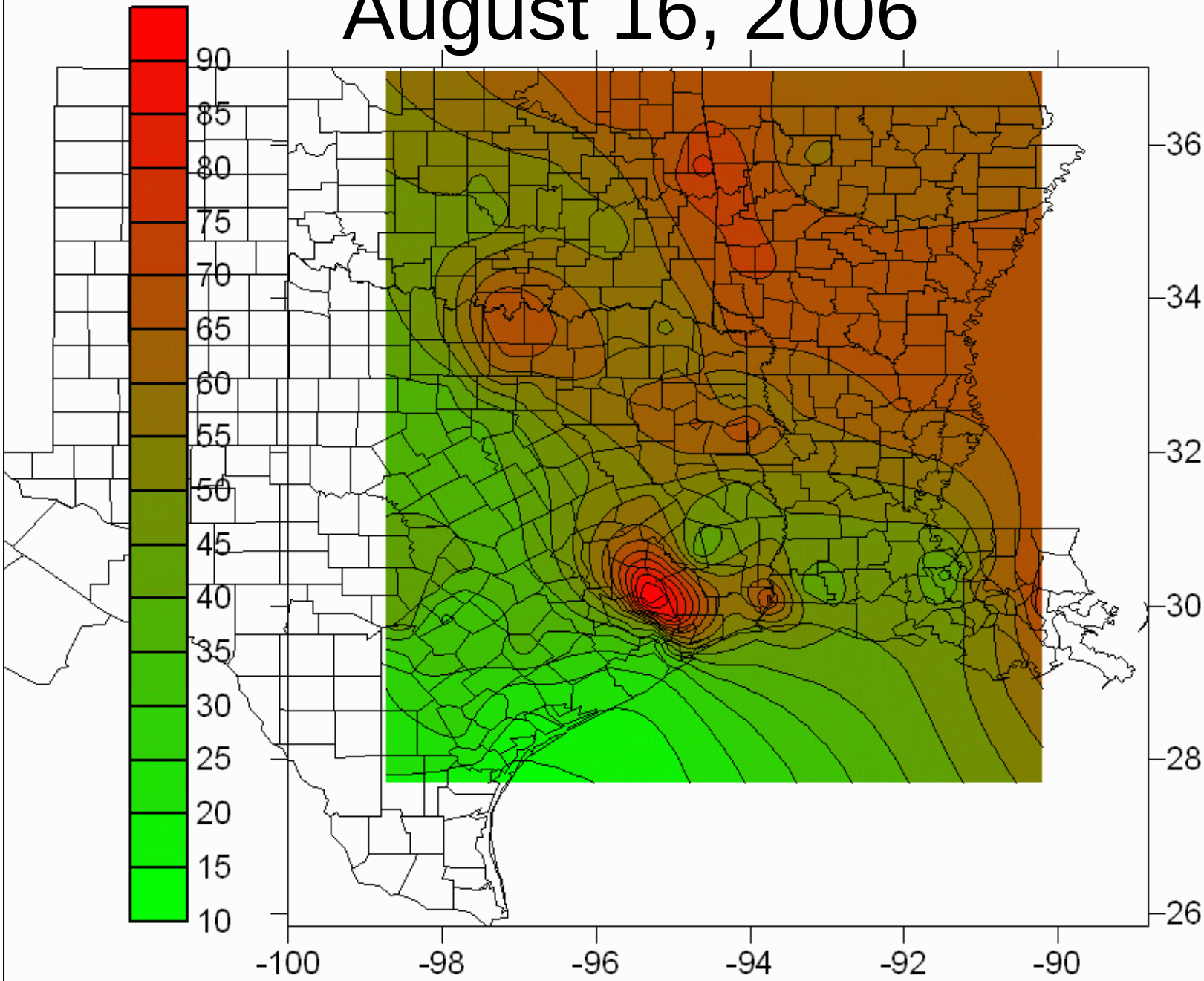

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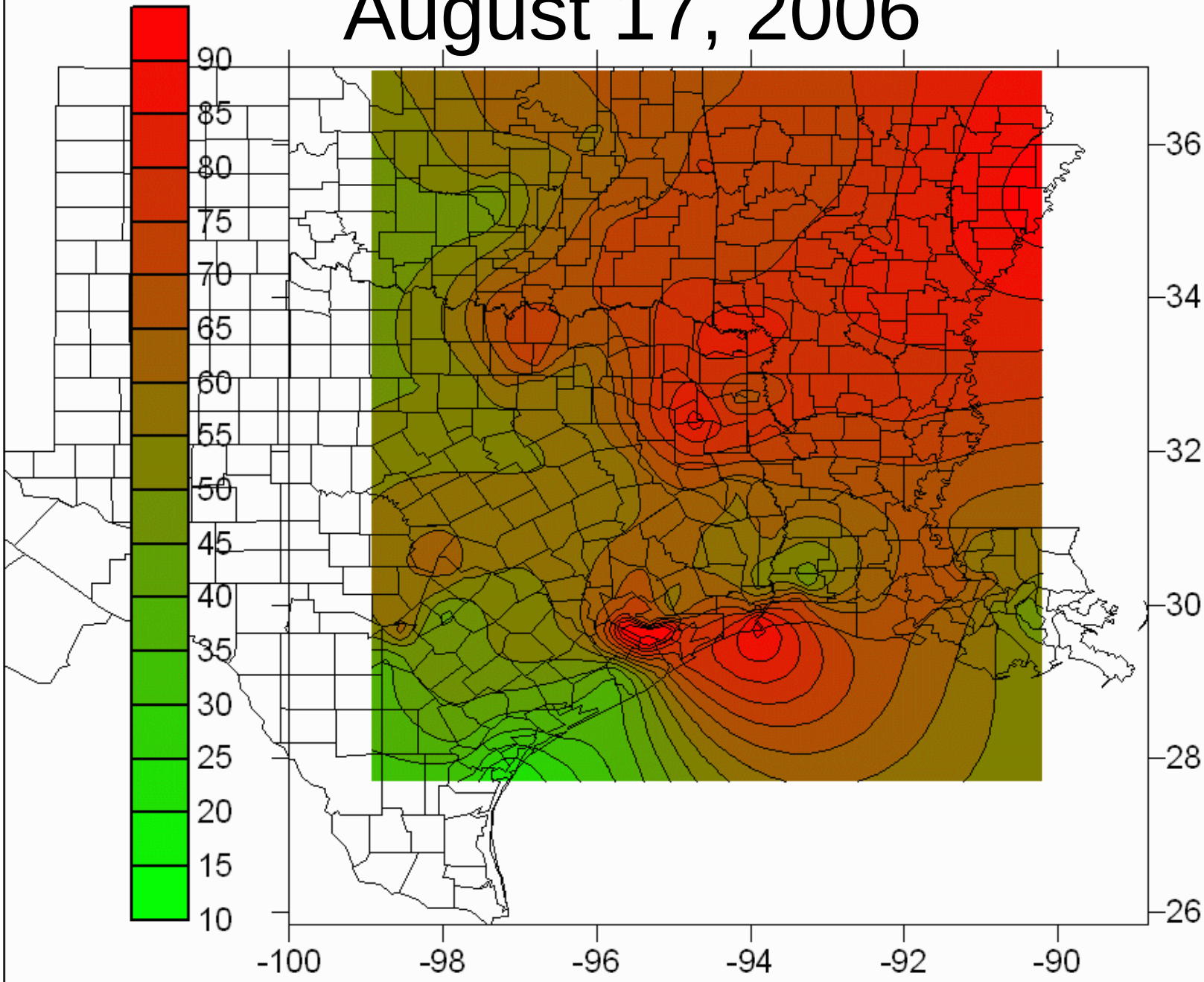

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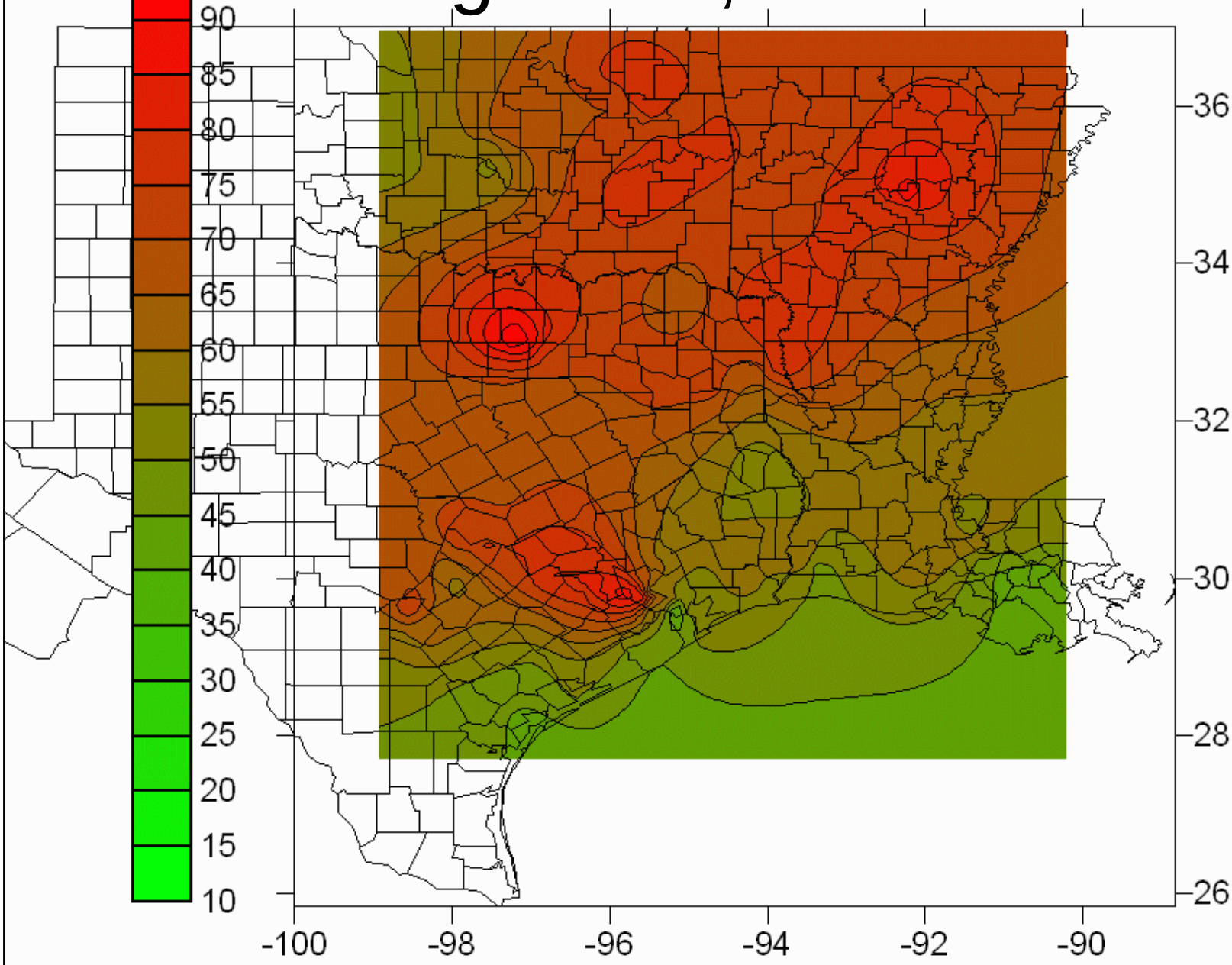

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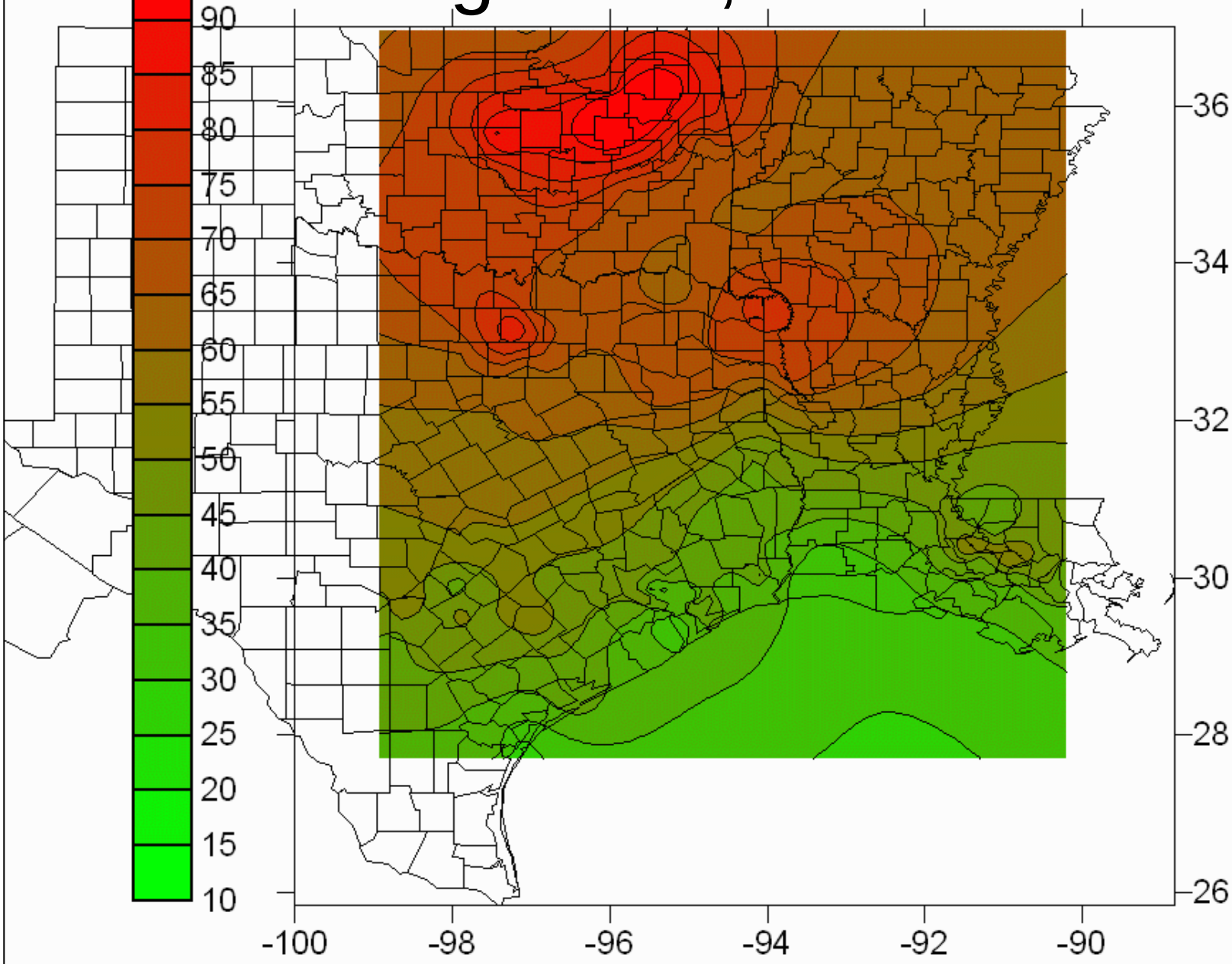

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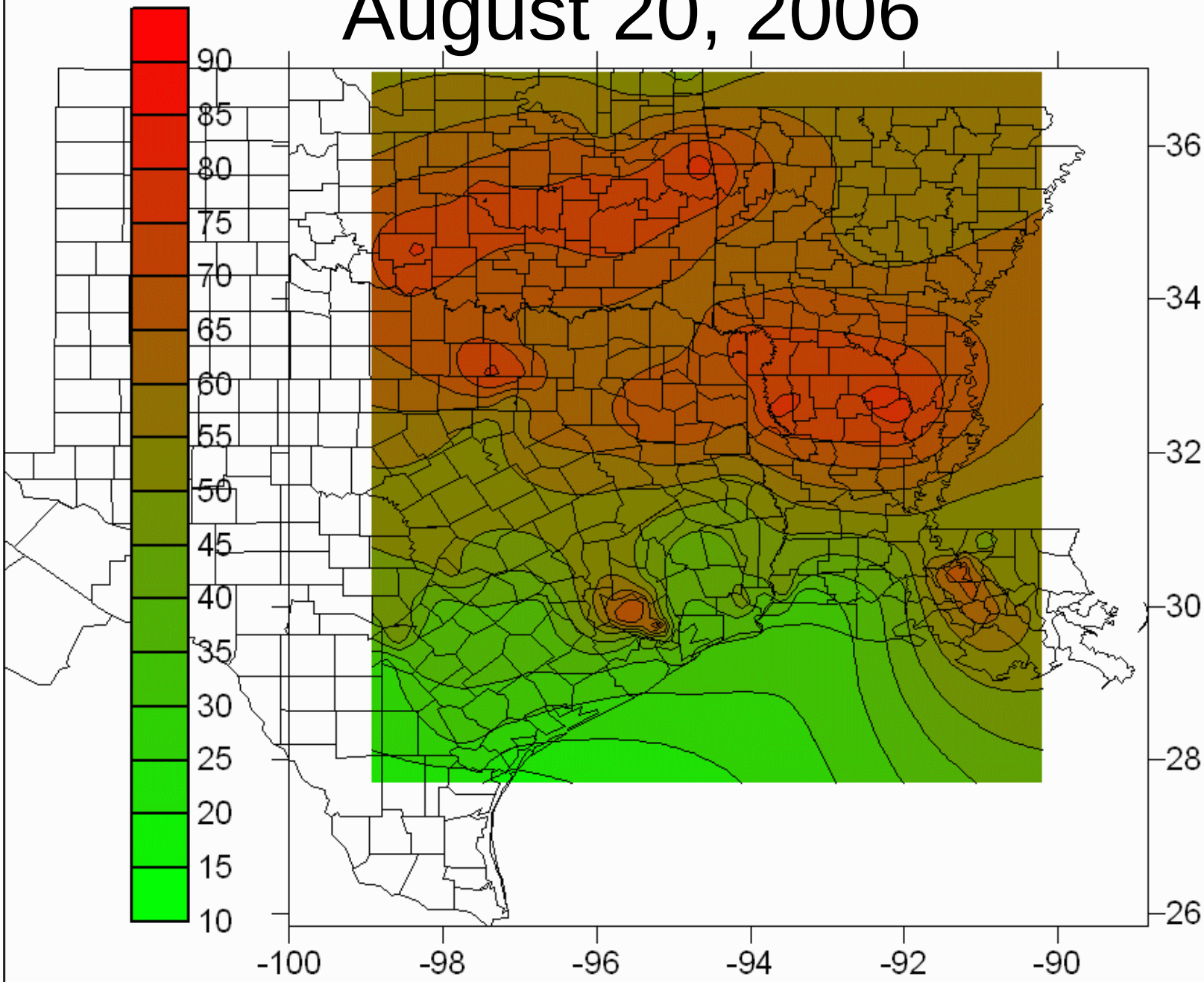

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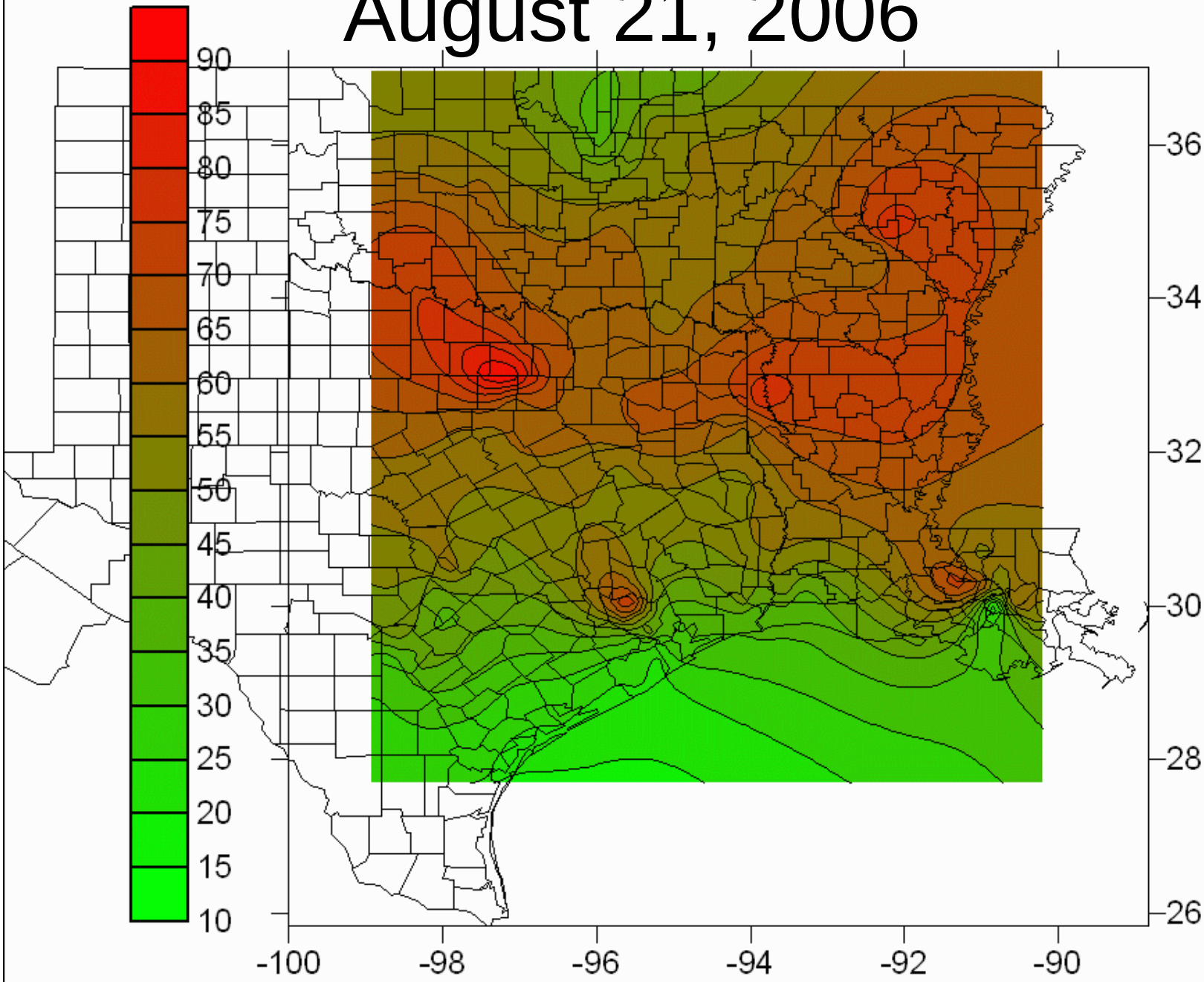

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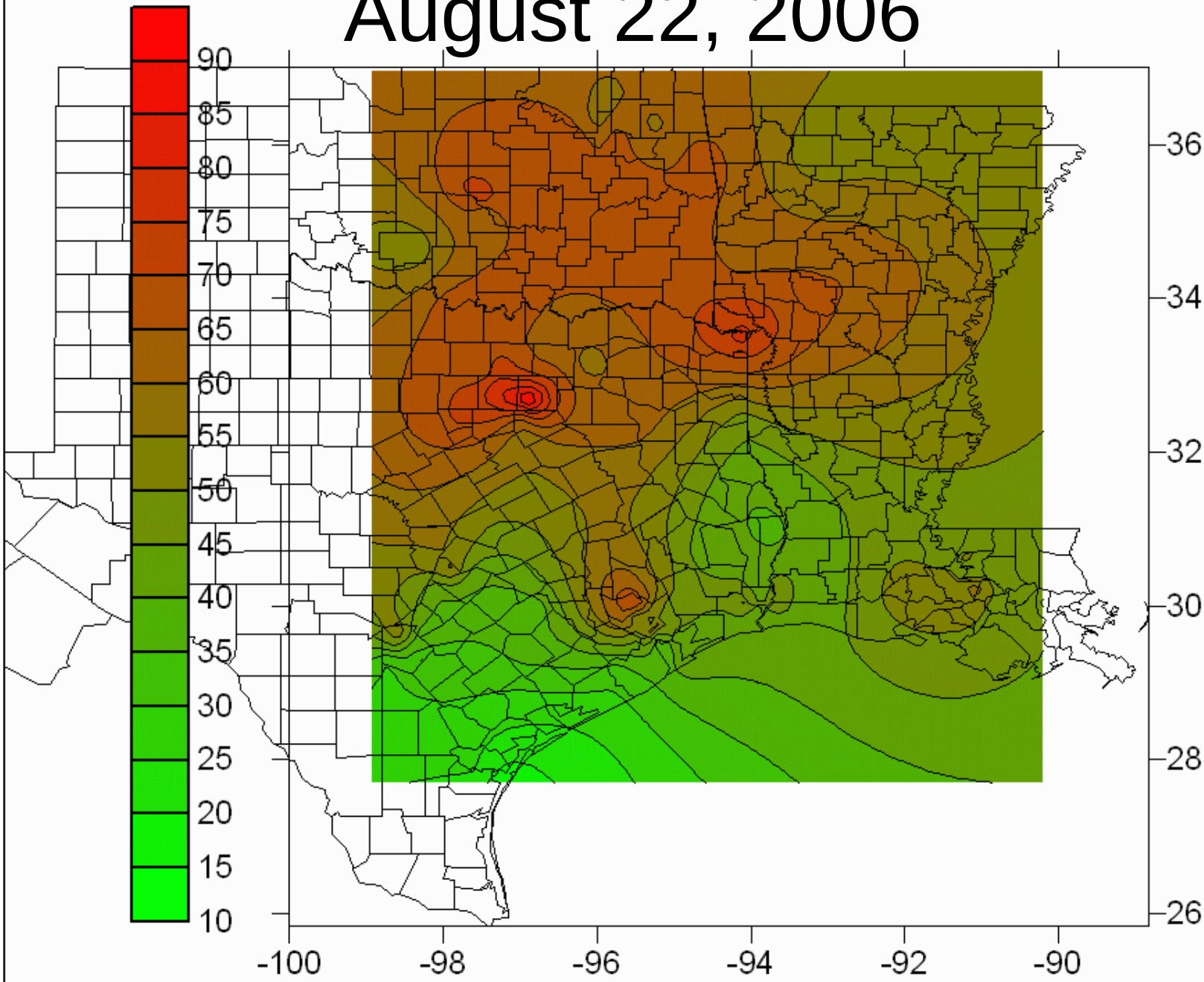

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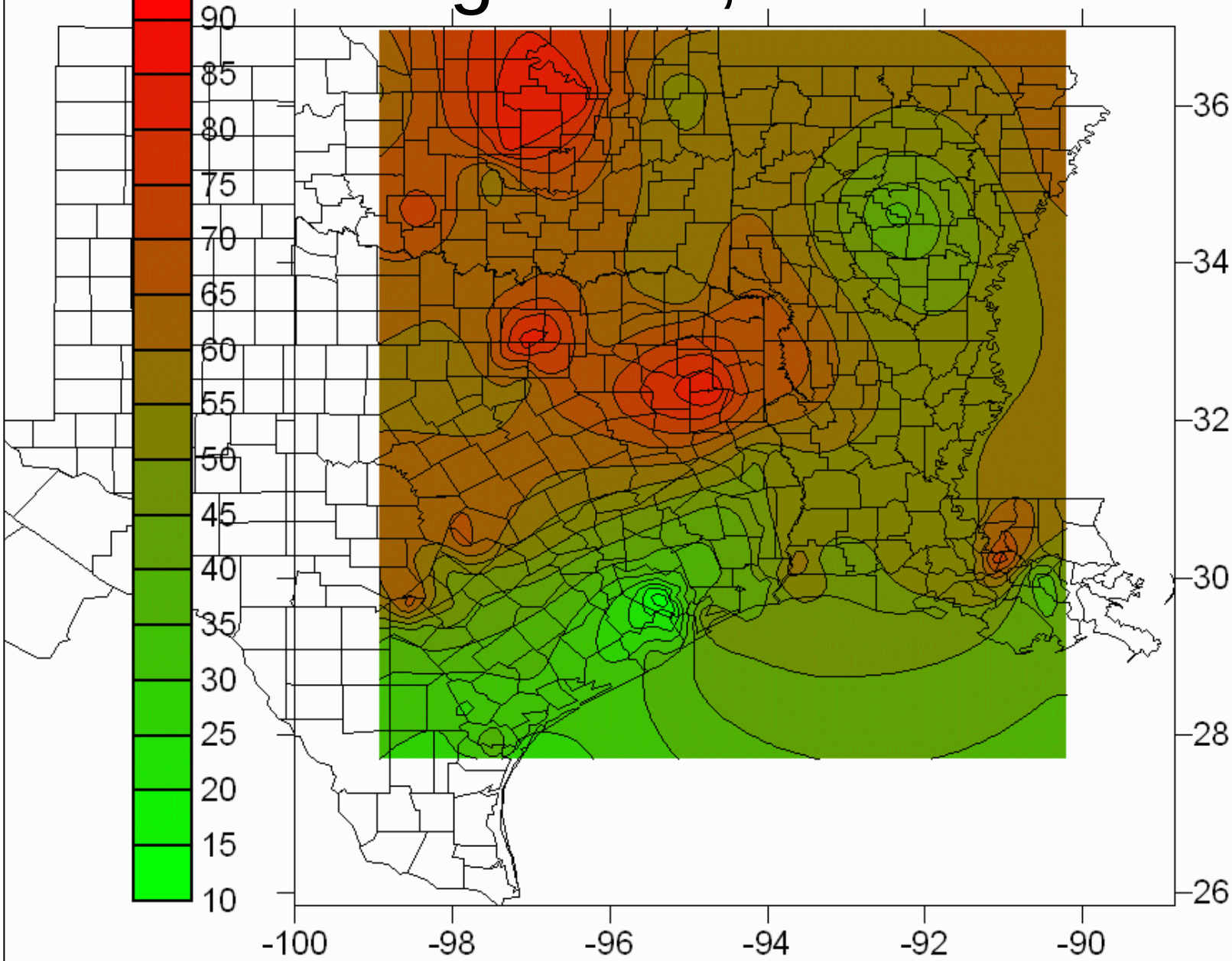

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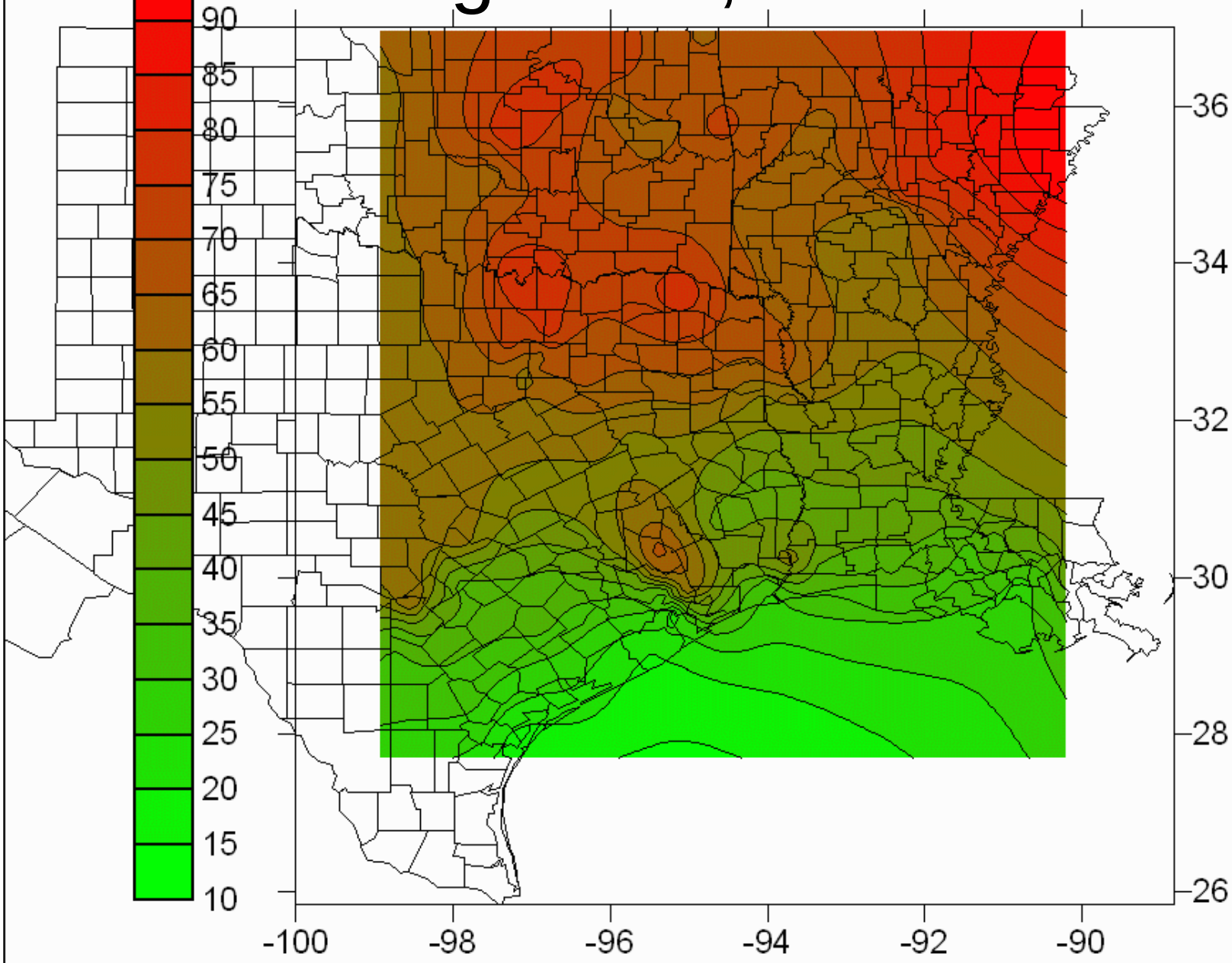

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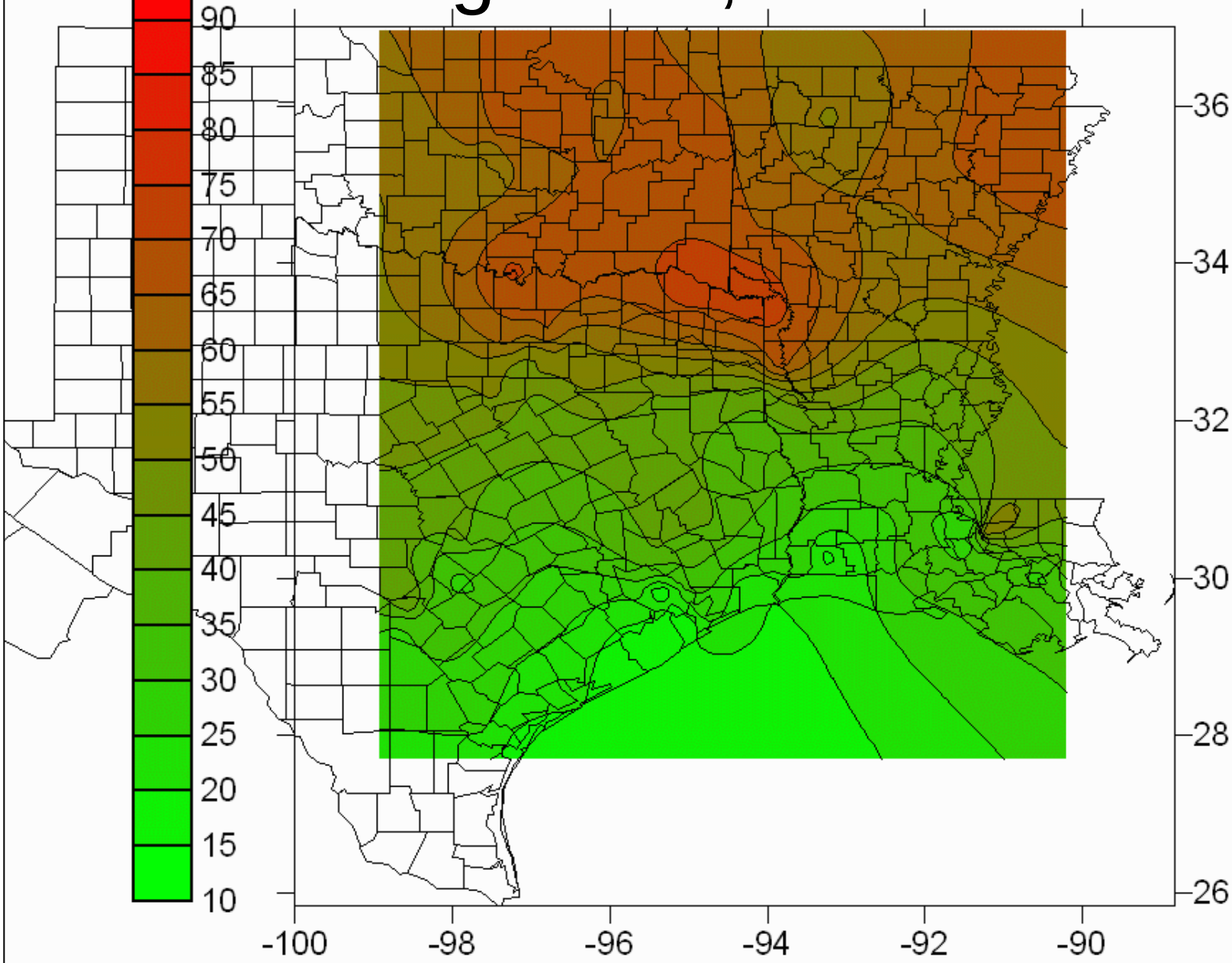

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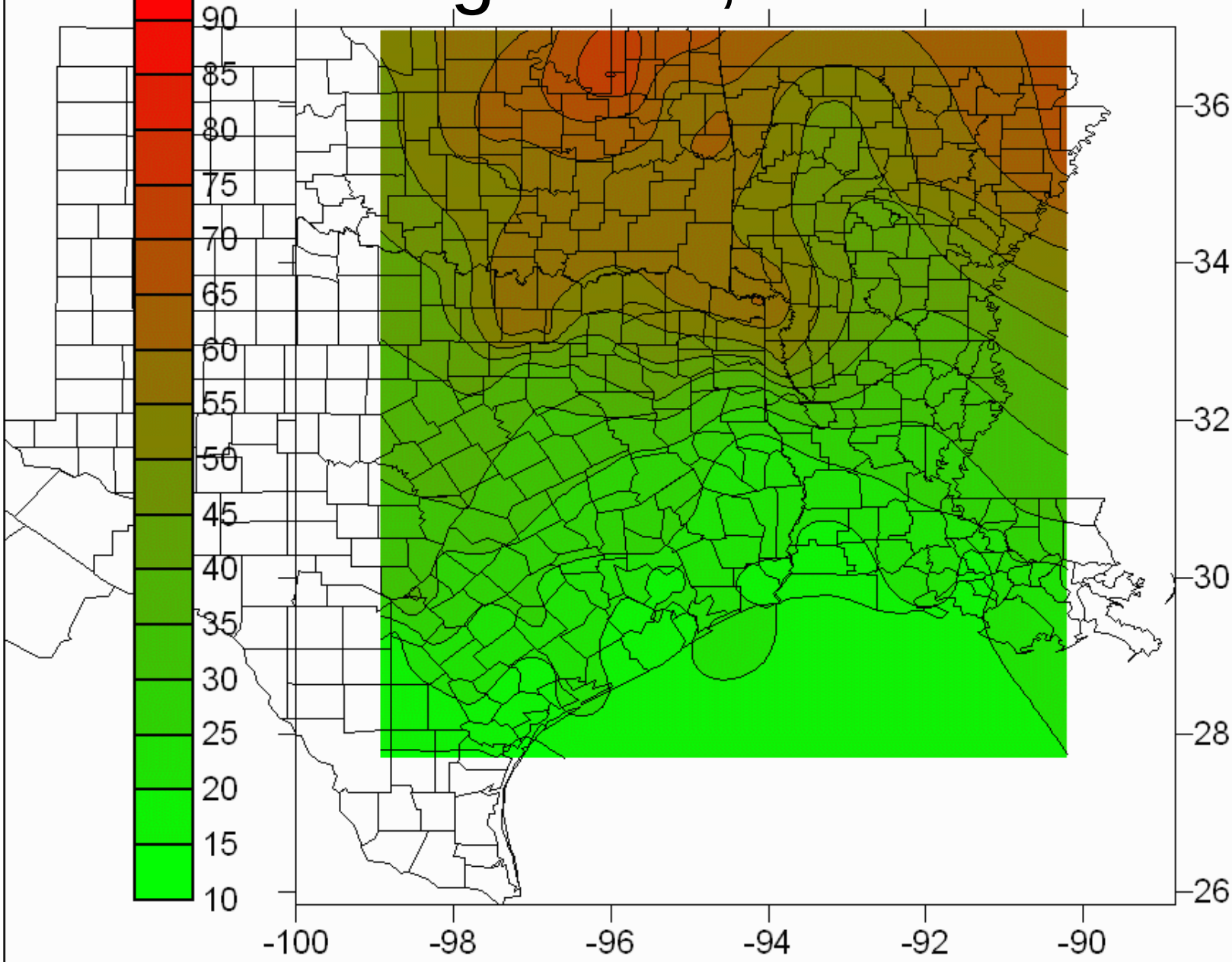

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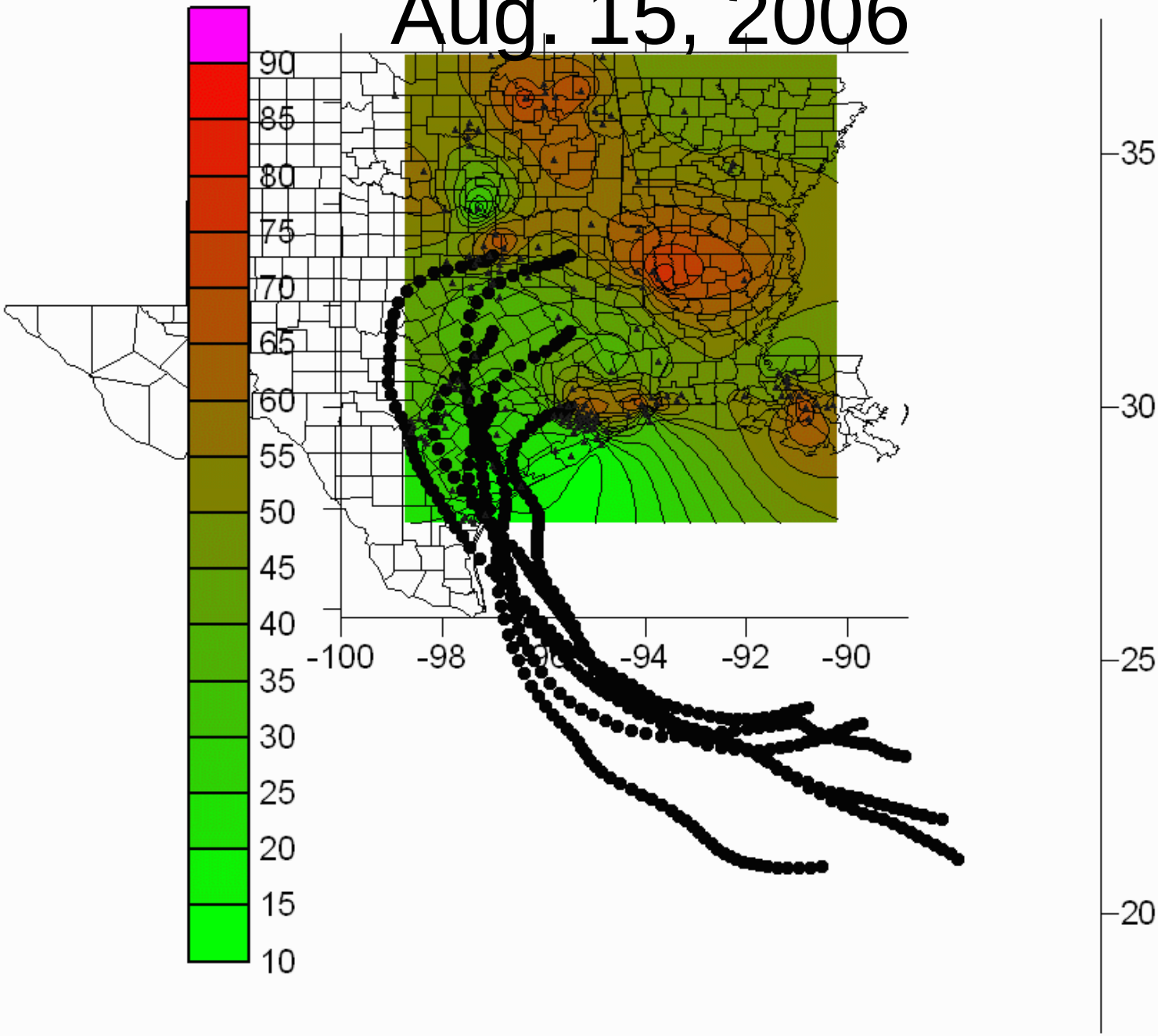
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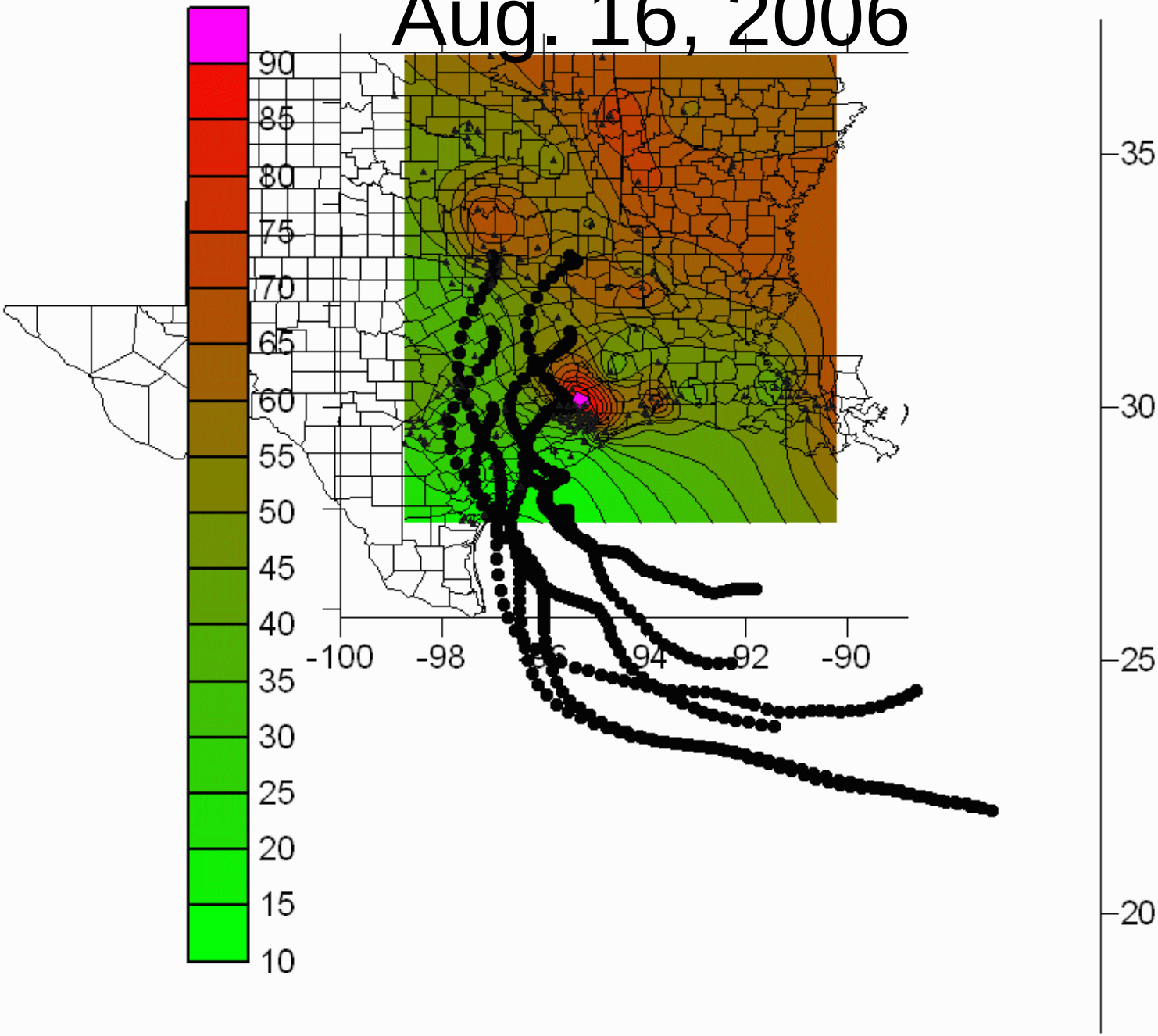
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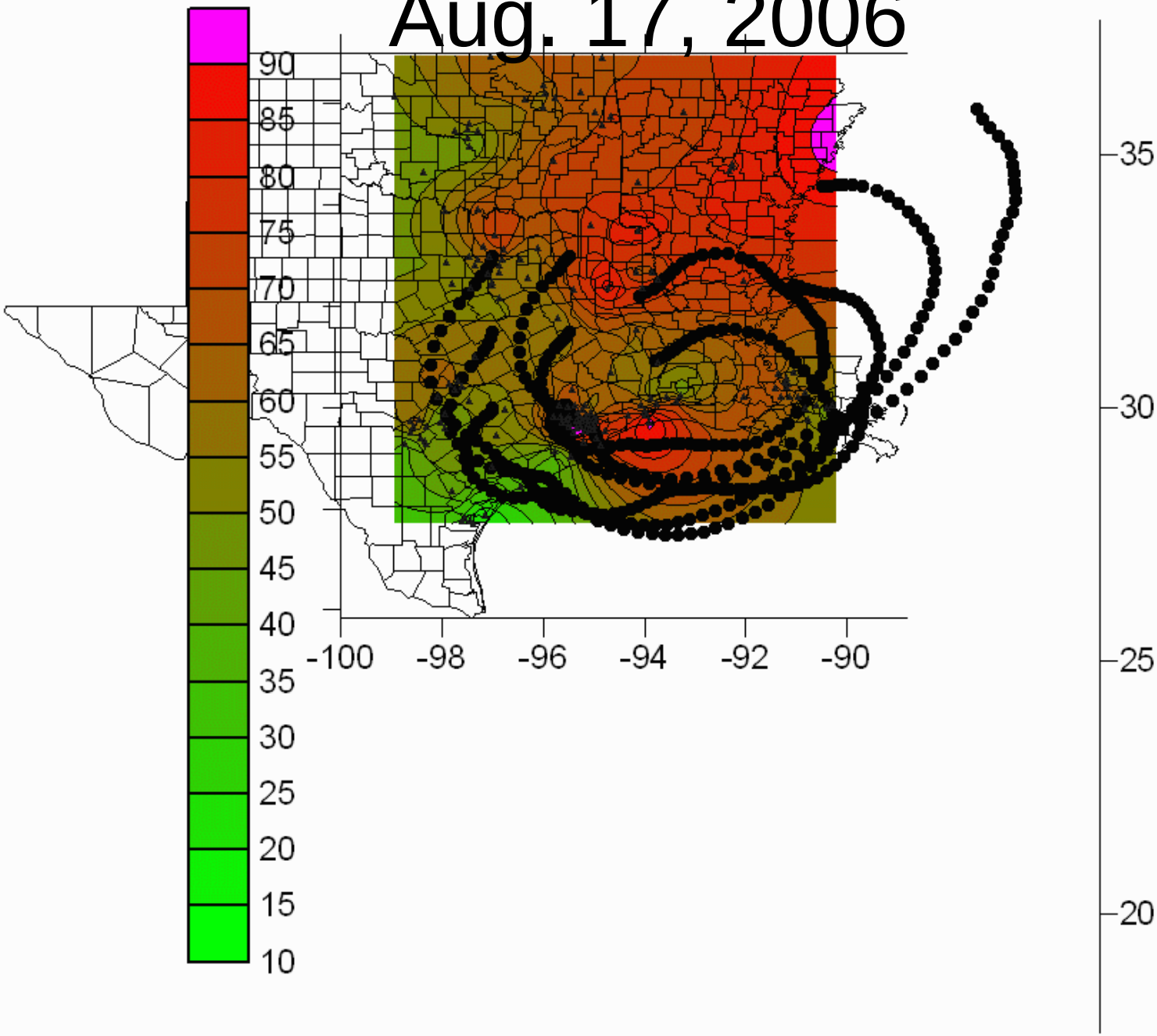
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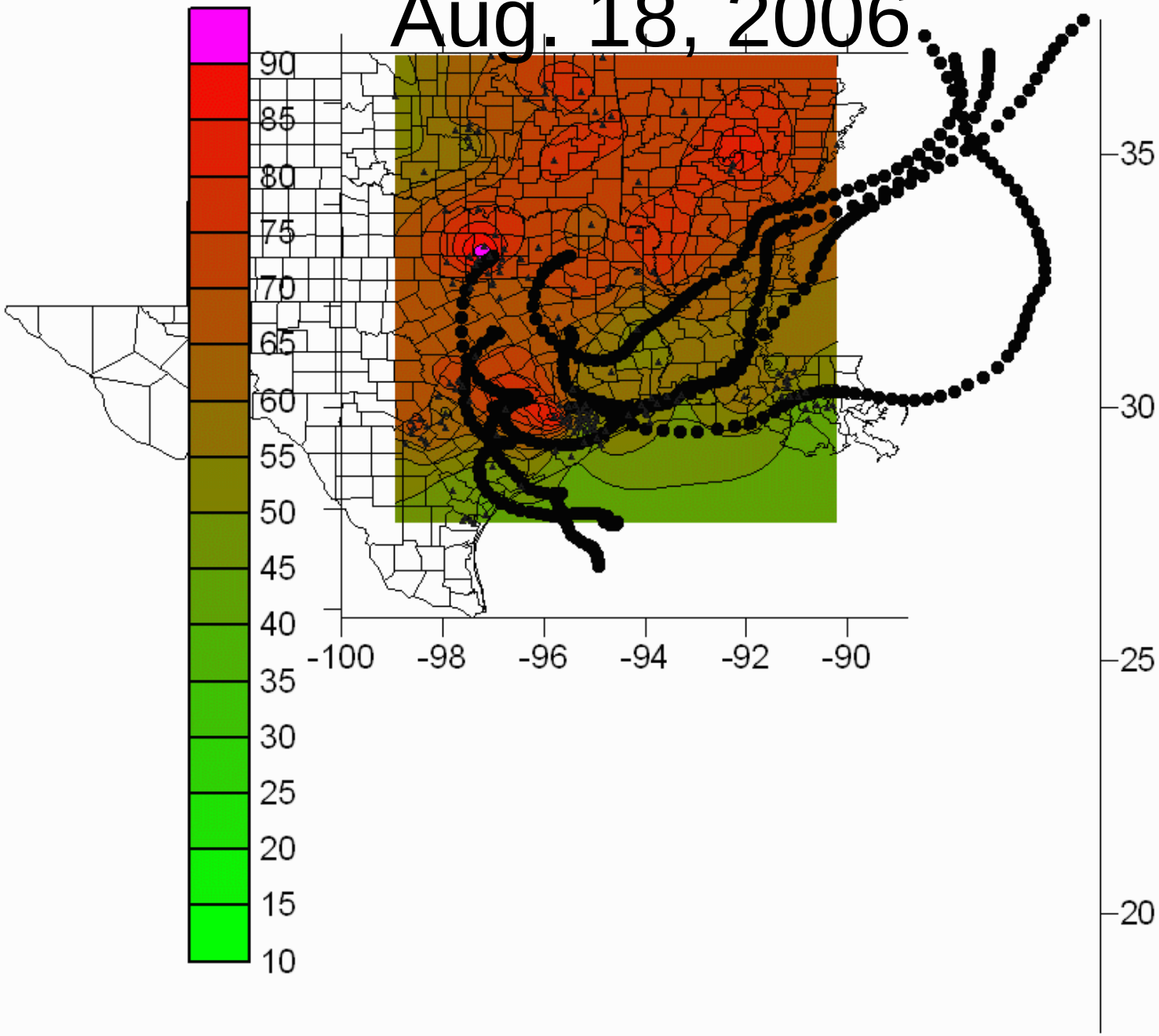
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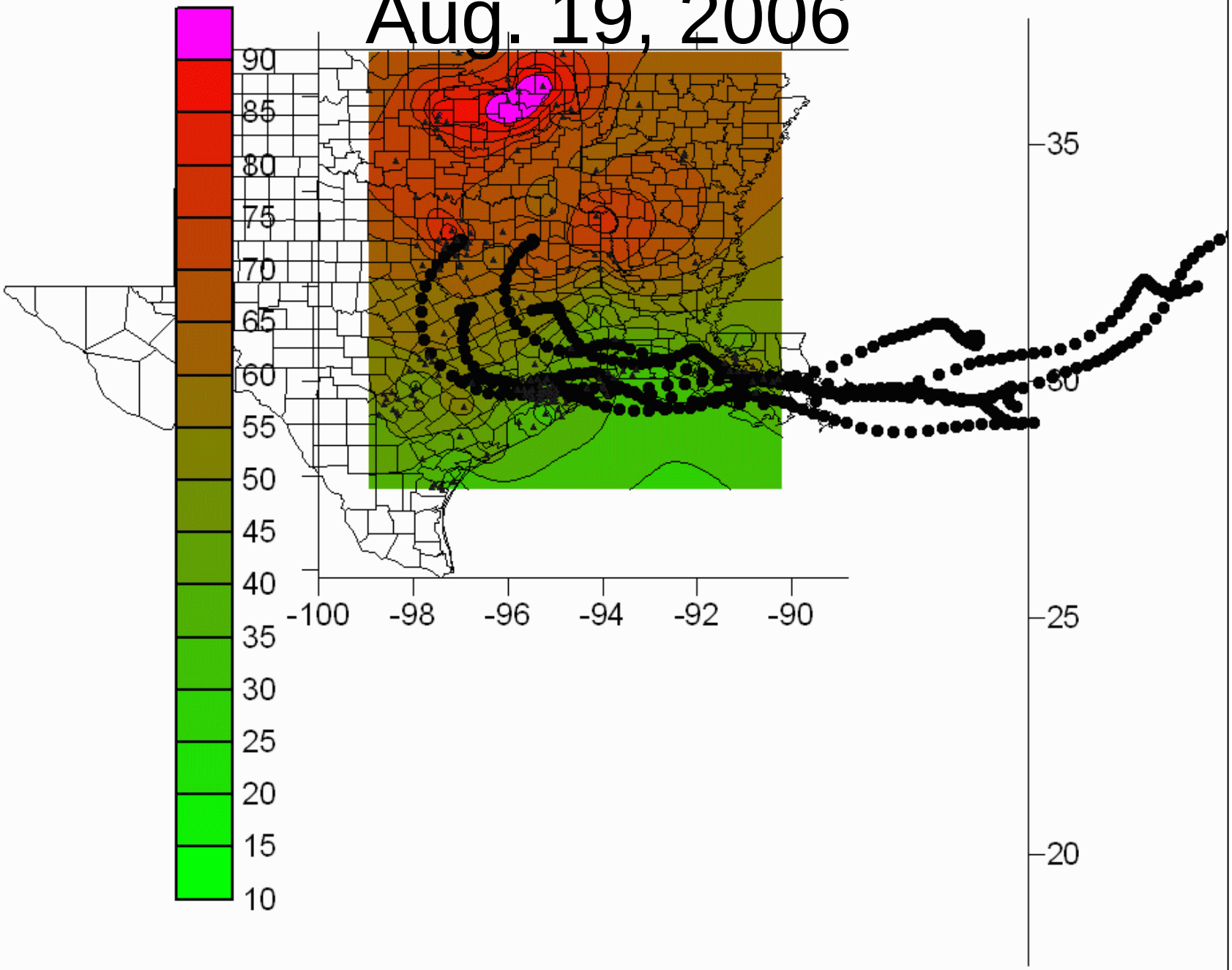
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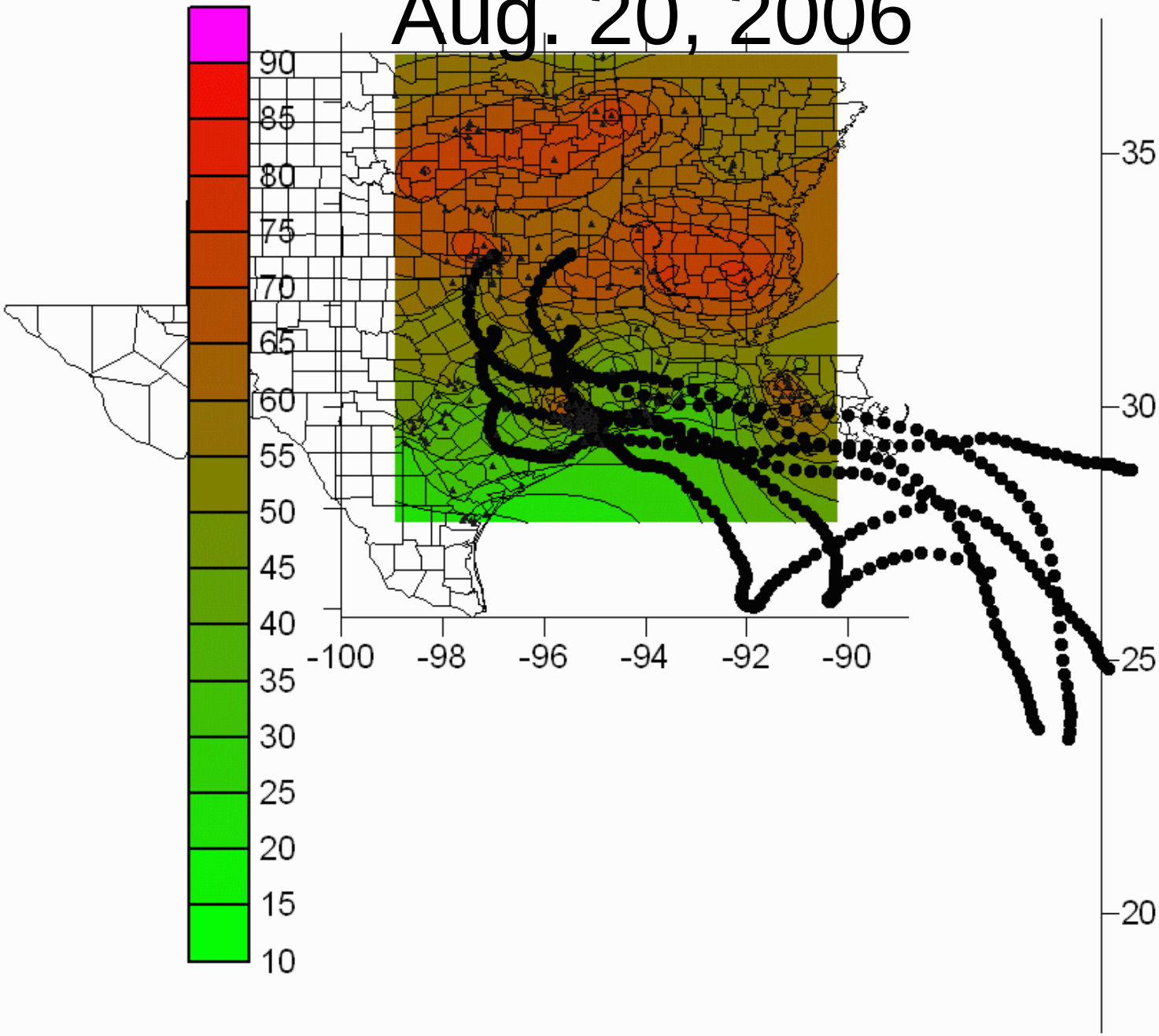
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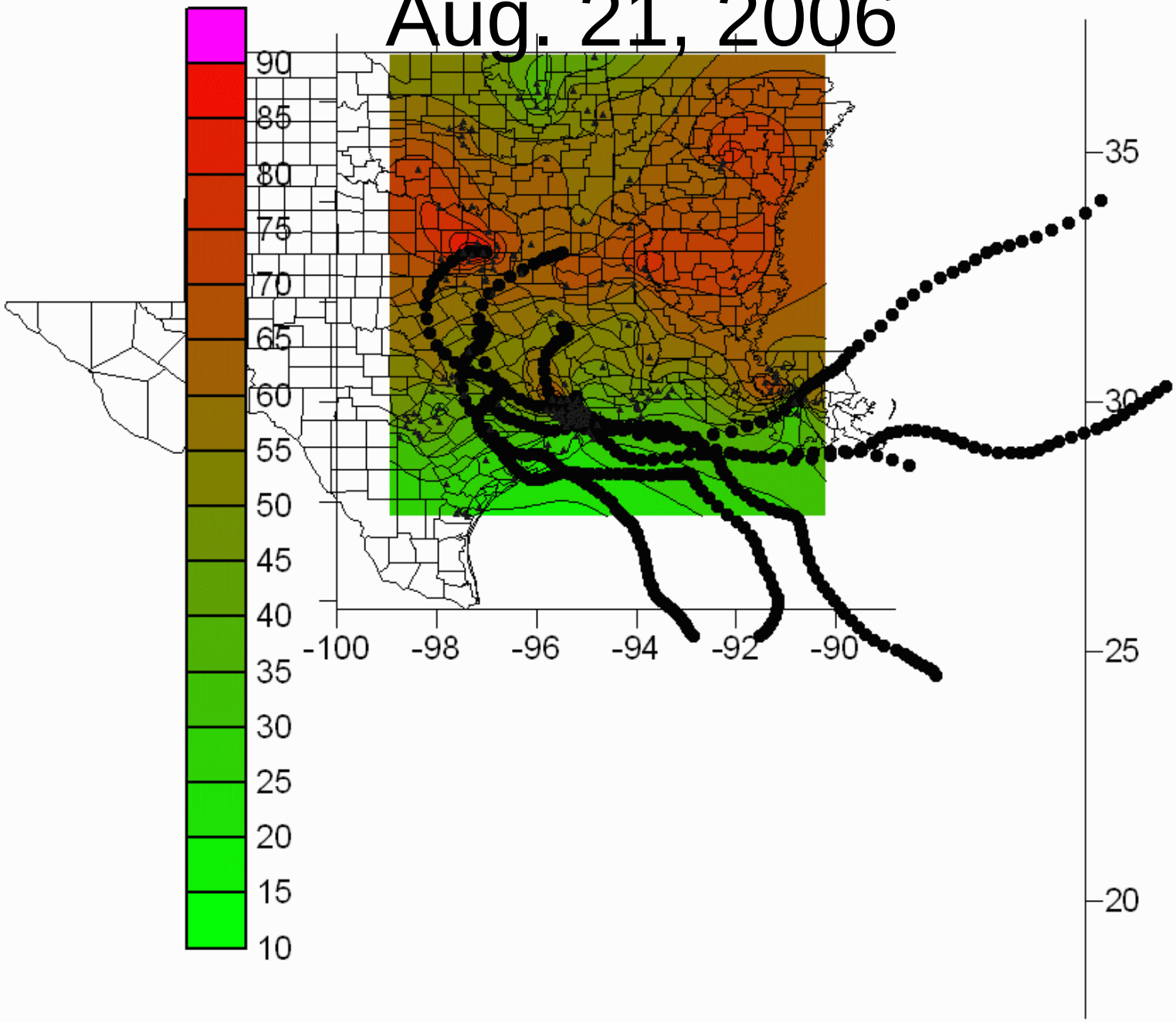
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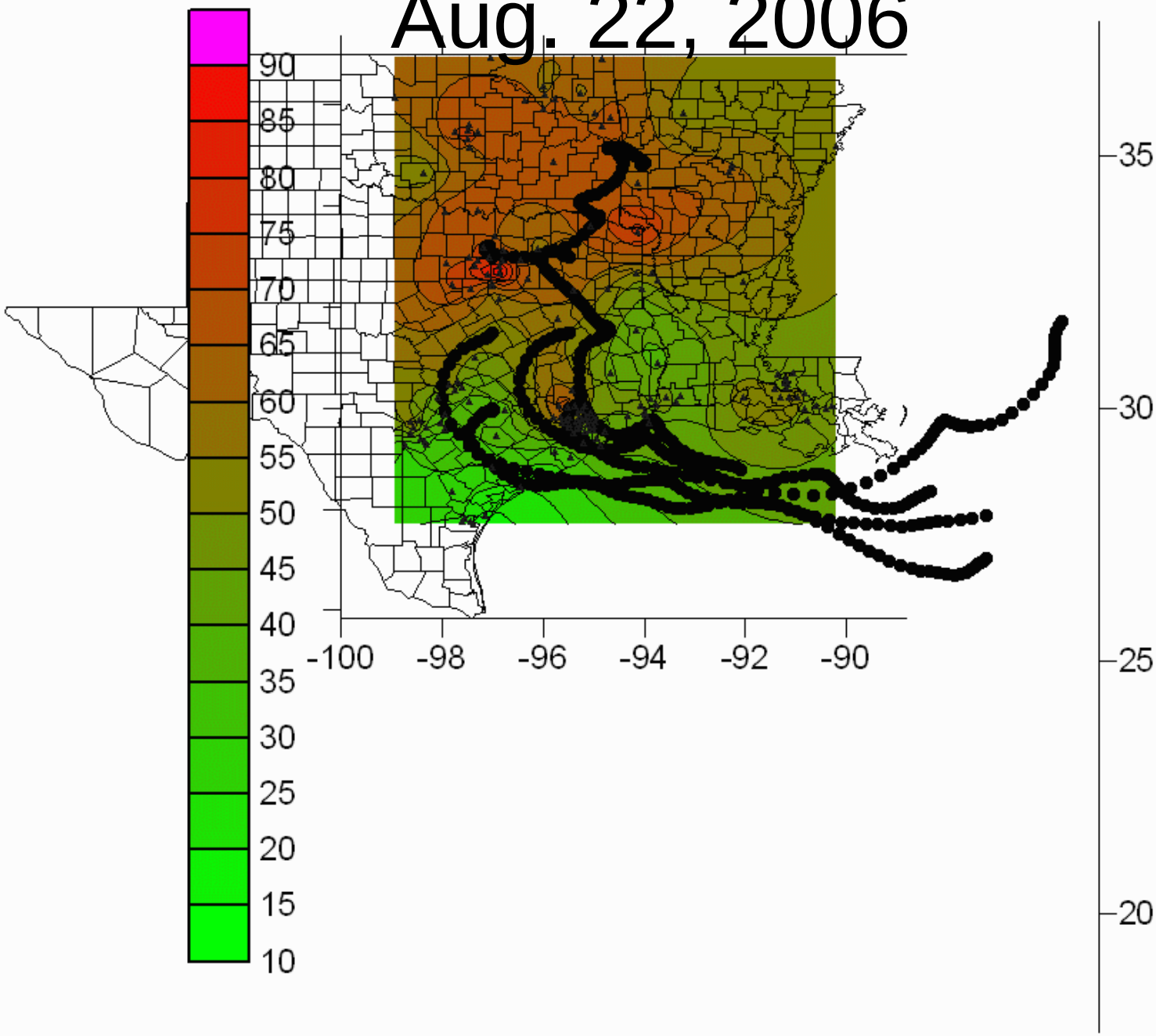
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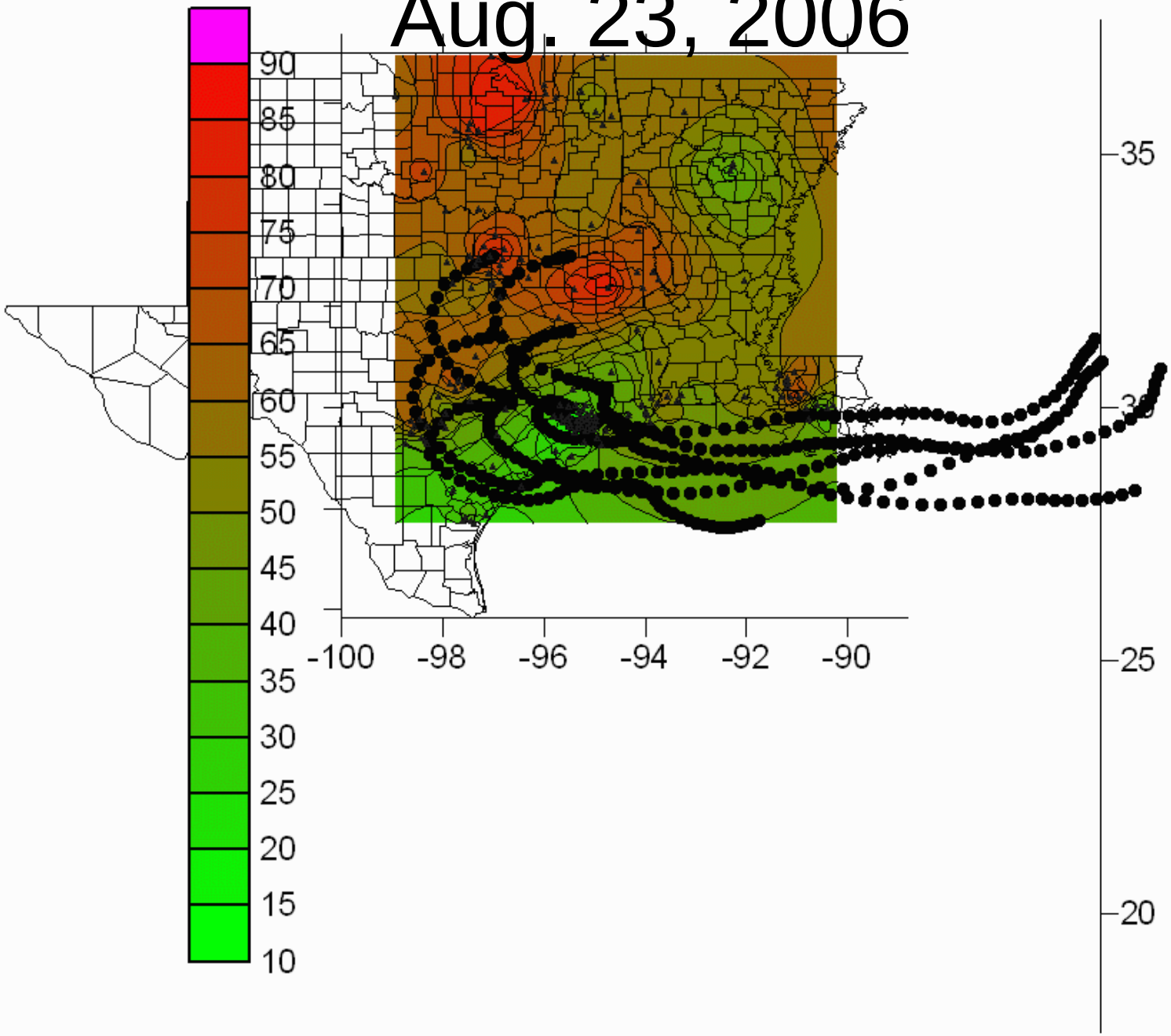
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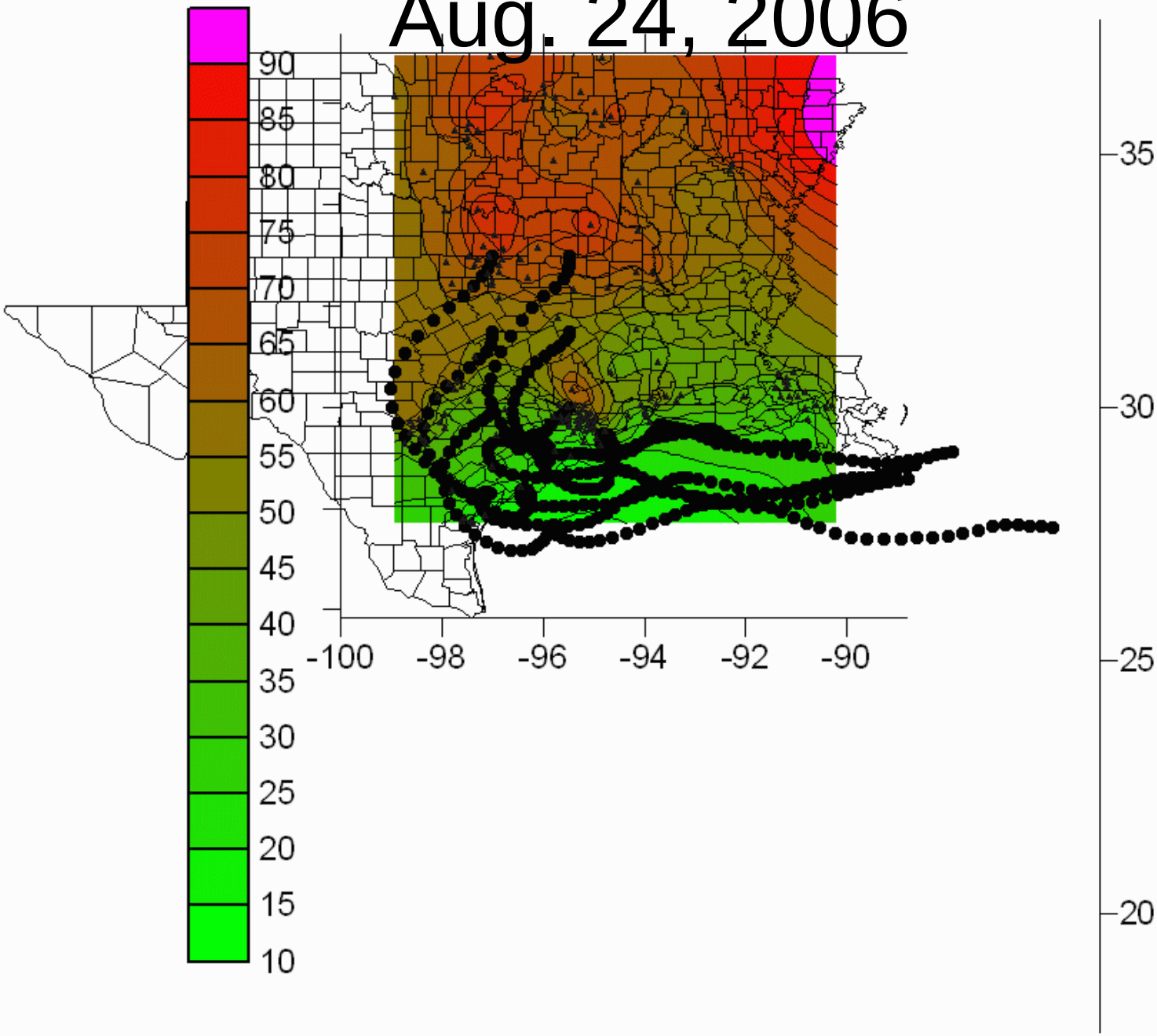
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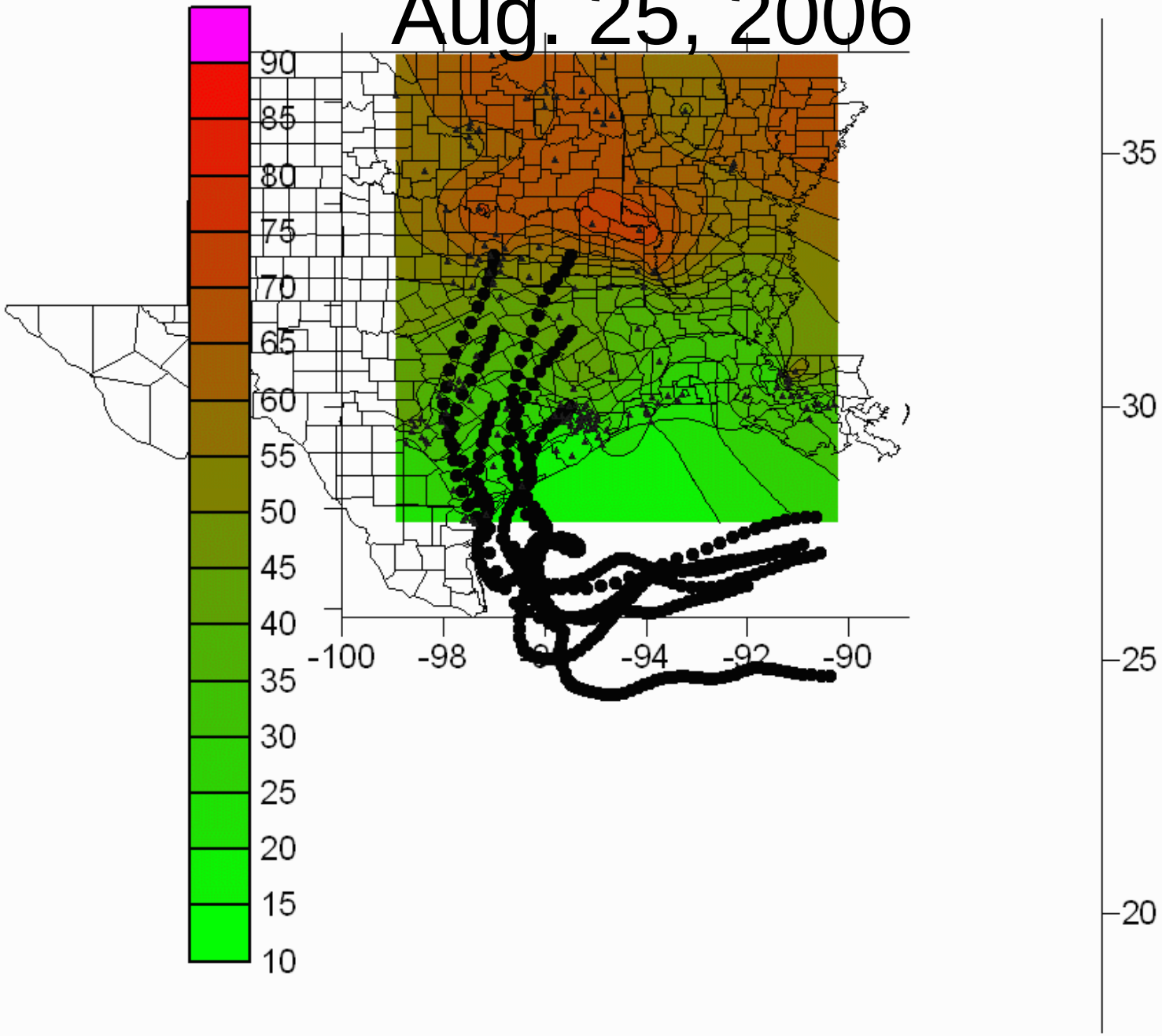
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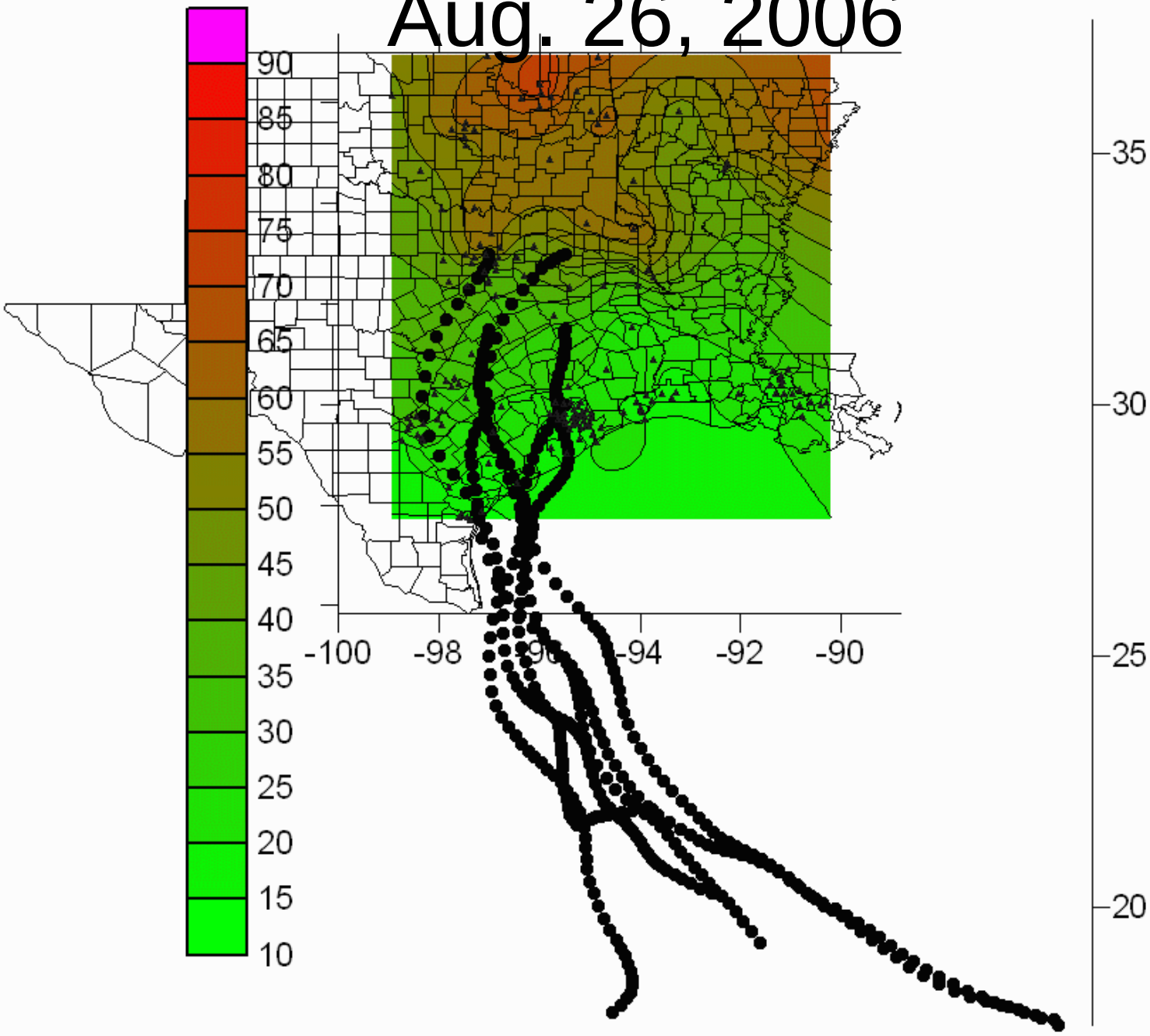
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Preliminary analyses

- Several days have back trajectories characteristic of cluster analysis results
- Evidence of transport into Texas from northeast U.S. and intercity transport
- Rural monitors provide significant benefit in reducing uncertainty in contouring

Preliminary analysis of data from rural sites

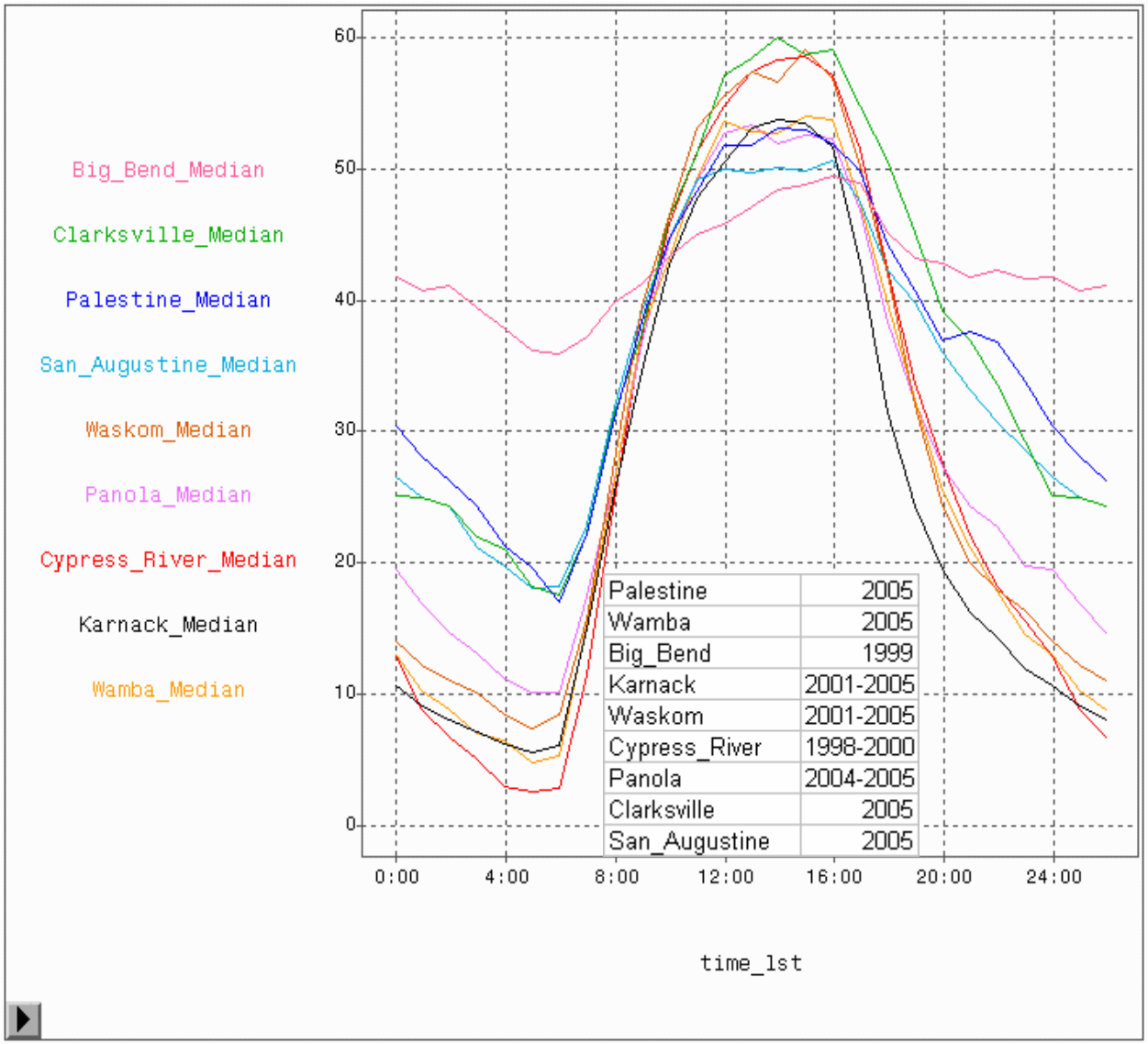
- Spatial distributions of rural ozone concentrations
- <u>Analysis of diurnal patterns in ozone data</u>
- Use of rural network to characterize regional transport of ozone

Spatial distributions of low night-time ozone concentrations

- Consistent observation emerging from rural monitoring network:

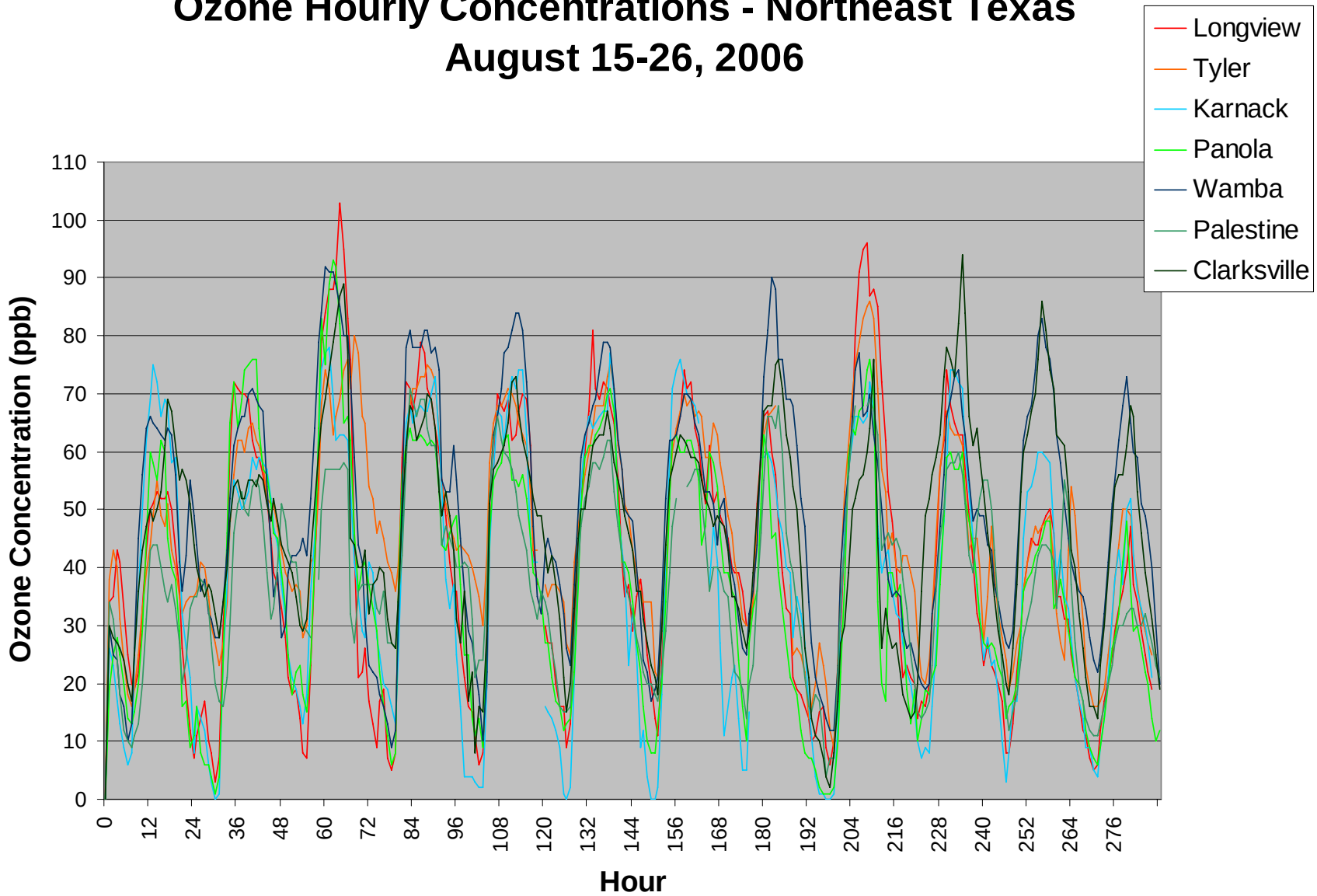
  Some (but not all) rural sites consistently exhibit very low night-time ozone concentrations

Ozone Concentration Diurnal Patterns for Rural Northeast Texas Sites and Big Bend



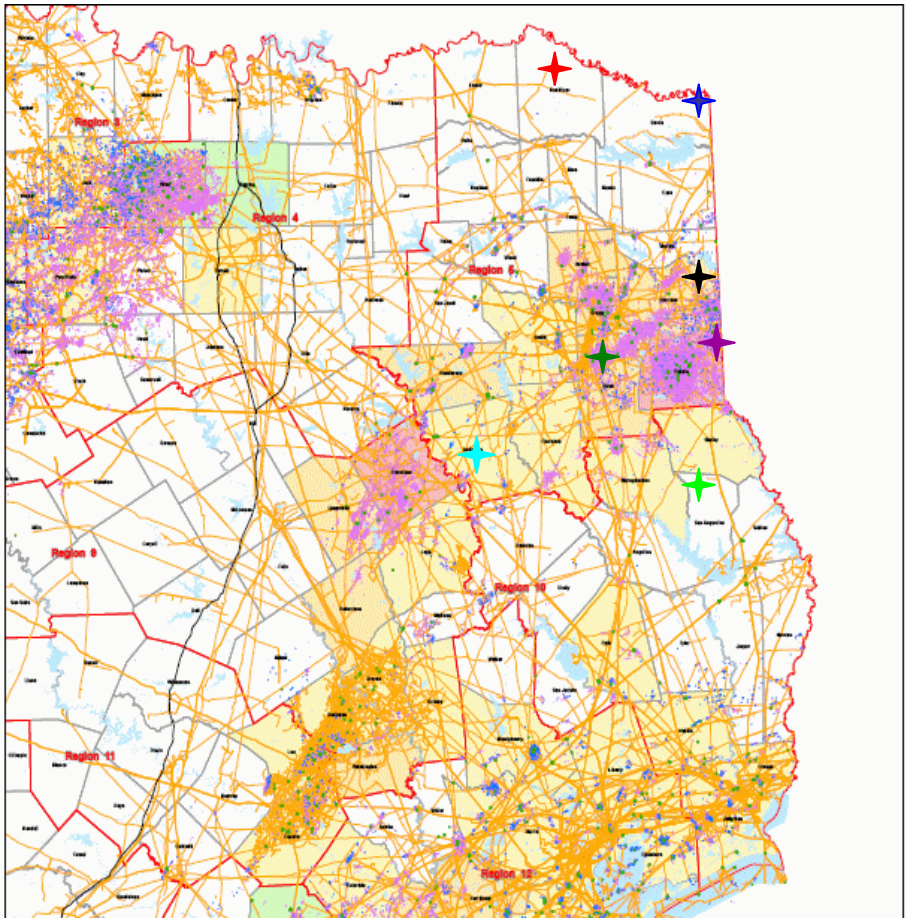
- Averaged over recent summers shown in figure
- Low nighttime ozone values with a minimum around 5 am are suspicious – too low to reflect true rural patterns
- Big Bend site represents a prototypical rural site with higher nighttime ozone values due to less NOx titration

Ozone Hourly Concentrations - Northeast Texas
August 15-26, 2006



•Low night-time ozone values are still observed at rural Eastern TX sites for 2006 high ozone days

Distribution of natural gas wells



- Hypothesis: NOx emissions from oil and gas production (pumps, compressors, steam generation for steam flooding, etc.) responsible for rural night-time ozone titration

•Wamba

•Clarksville

•San Augustine

•Palestine

•Karnack

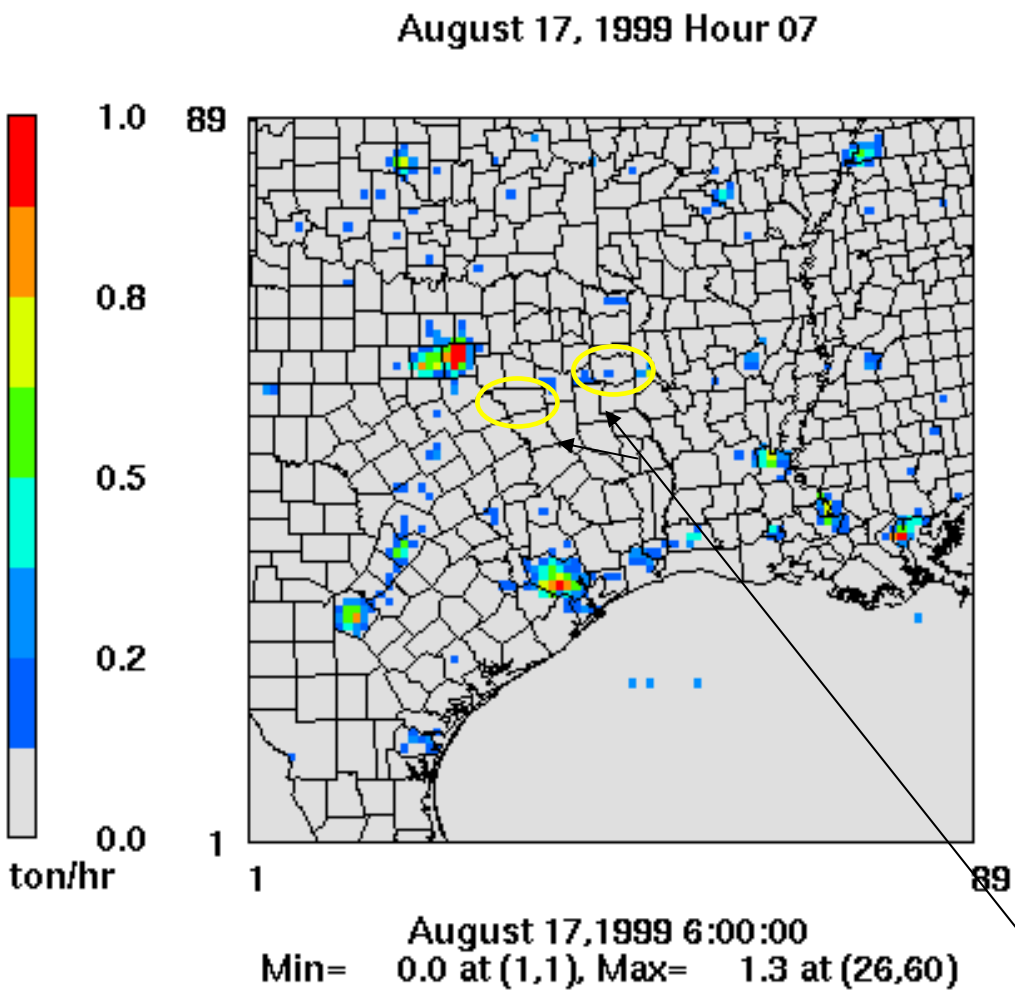
•Longview

•Panola

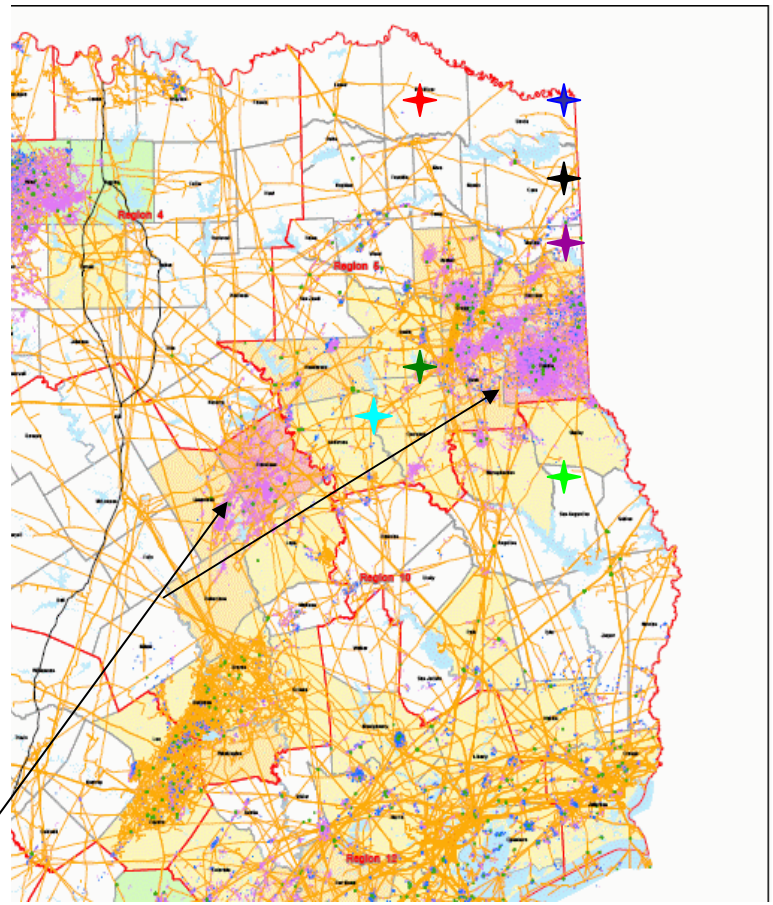
Rural monitoring network and emission inventories

- Hypothesis: NOx emissions from oil and gas production responsible for rural night-time ozone titration
- Determine if base cases for current SIP modeling capture the rural ozone titration at sites near natural gas production operations

Modeled NOx Emissions 8/17/99



Nat'l Gas Production, Gas Compressors, and Pipelines from TCEQ Chief Engineer's Office



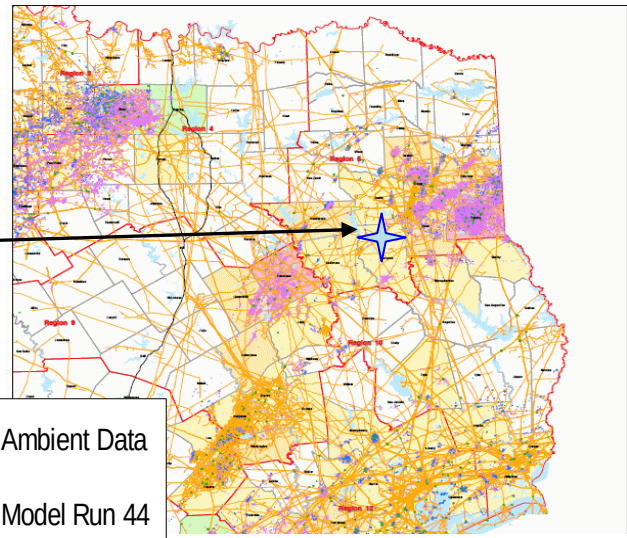
Given locations of wells, more NOx expected here.

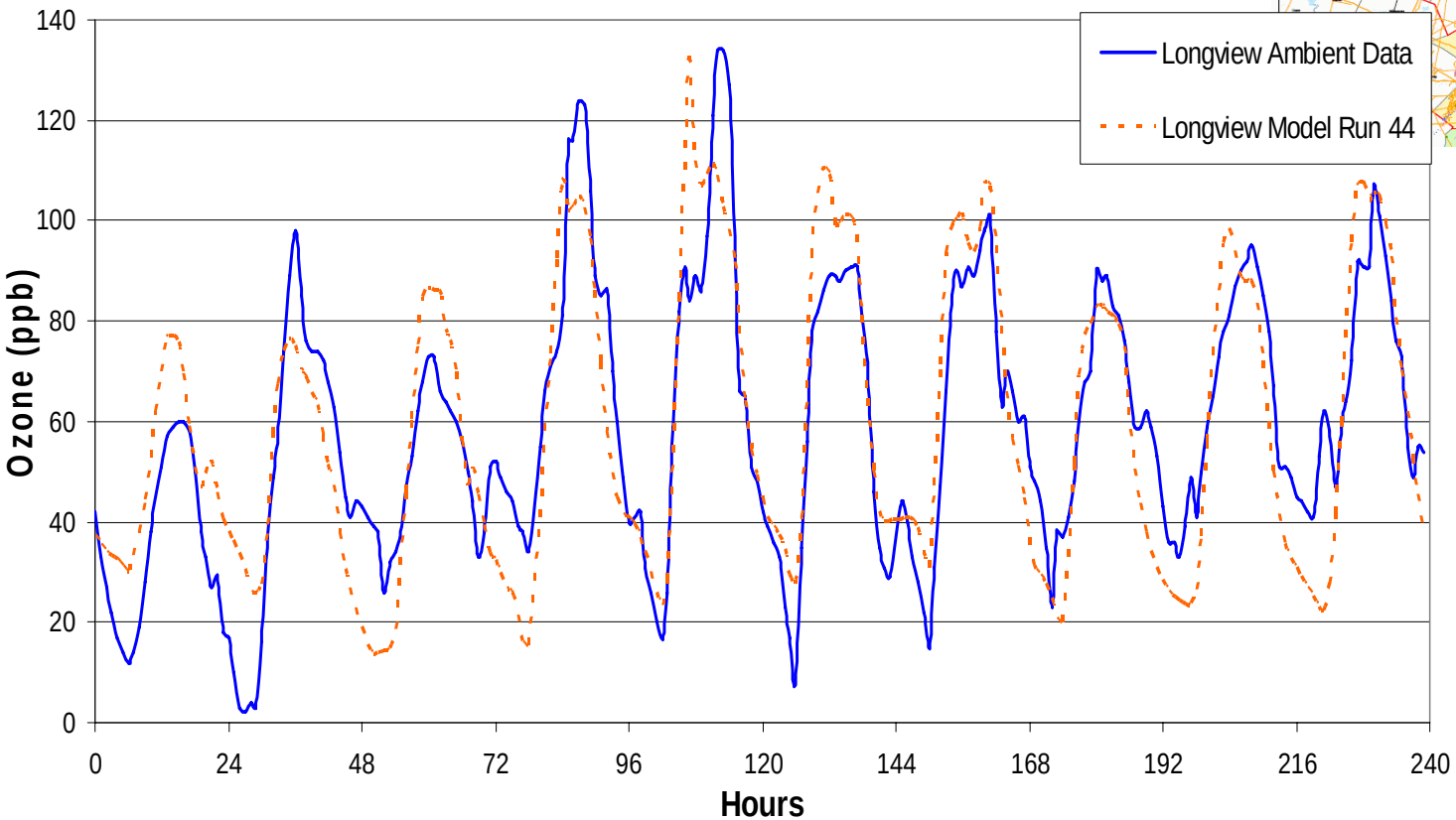
Are these emissions currently captured in modeling?

DFW base case (1999) SIP modeling results shown

CAMx Results vs. Ambient Data – Longview Site
Aug. 13-22 1999

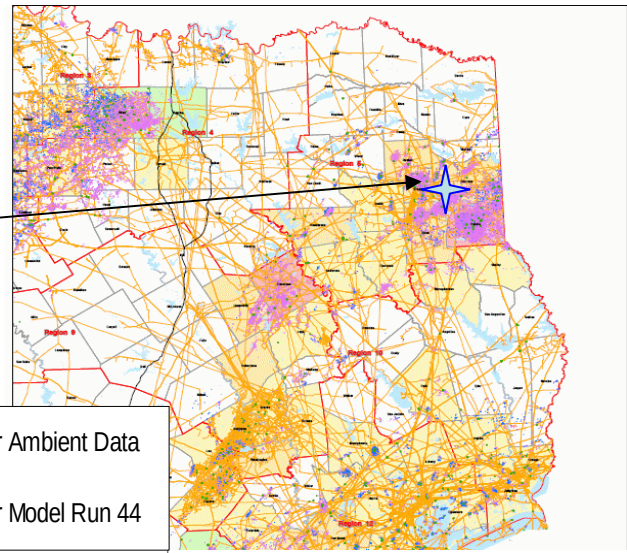
Note: Longview is not in the most intense gas production region

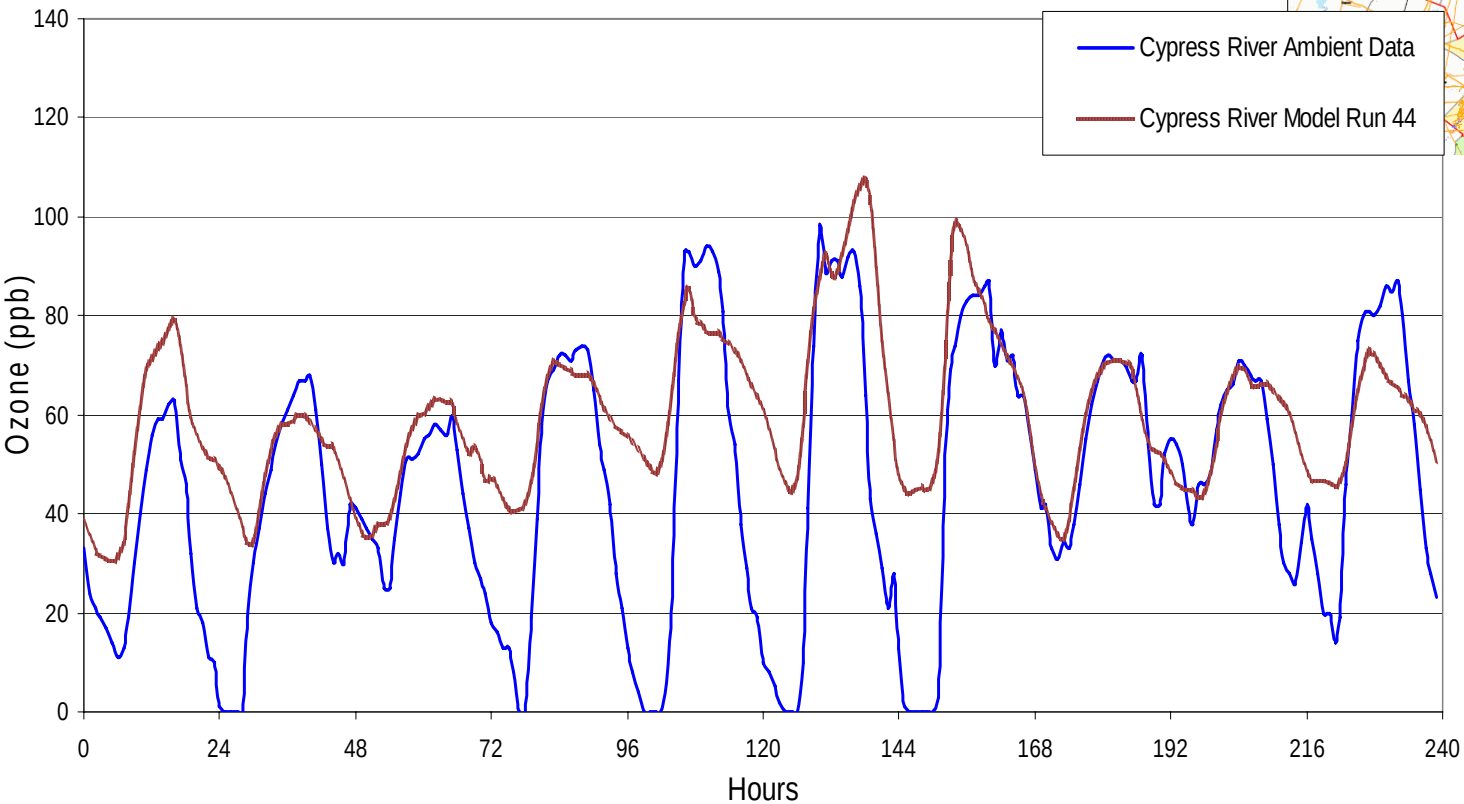




CAMx Results vs. Ambient Data – Cypress River Site
Aug. 13-22 1999

Note: Cypress River is located near the gas production region





Findings from Rural Monitoring Network

- Emissions Inventories
  - TexAQS II results suggest possible underestimation of NOx in rural Northeast Texas.
    - CAMx SIP (Dallas – Forth Worth area, August 13-21, 1999) runs show lack of NOx titration at night in comparison to ambient data from rural sites.
    - Recent surveys show large number of natural gas compressors present in the area
    - CAMx model may not have accurate low-level NOx emissions inventories for this area

CAMx Sensitivity Analyses

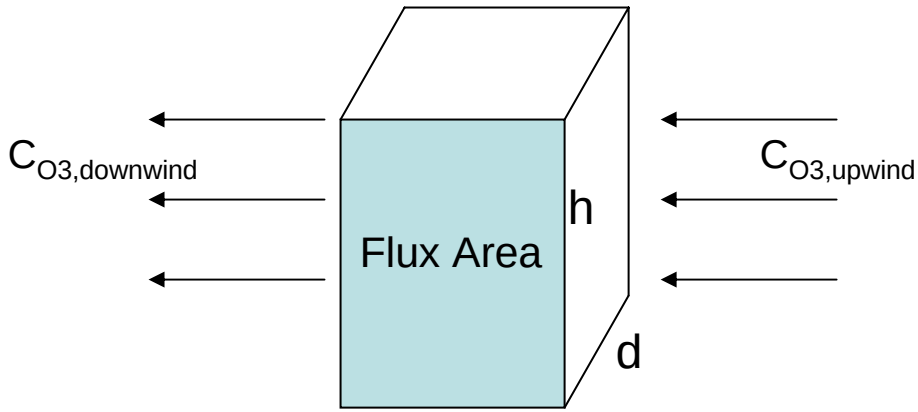
- Accurate account of background O_3 is critical in formulating, revising, and implementation of the SIP
  - Sensitivity runs include:
    - Increasing low-level NOx emissions
    - Looking at the accuracy of other O_3 scavengers
    - Possible vertical mixing issues/landcover/deposition
    - Sensitivity to meteorology inputs

Preliminary analysis of data from rural sites

- Spatial distributions of rural ozone concentrations
- Analysis of diurnal patterns in ozone data
- <u>Use of rural network to characterize regional transport of ozone</u>

Ozone Flux Calculations Using Surface Monitor Data

- Methodology:
  - Define upwind and downwind planes and identify surface monitors
  - Estimate perpendicular wind speed, mixing height and ozone concentrations at these monitors
  - Results are flux of excess ozone (plume – background) in molecules/s
  - CAMx Process Analysis is also capable of flux calculations
  - Flux = avg. wind speed*dC_{O3}*area
    - $dC_{O3} = C_{O3,downwind} - C_{O3,upwind}$
    - Area = mixing height (h)*horizontal width of plume (d)
    - Assumes uniform concentration in mixing height



Flux Calculation Comparison

- Aircraft Lidar Data vs. Ground Monitoring Network Calculations
  - -Since aircraft flights/Lidar data are infrequent; how reliable are other estimation techniques?
  - -Can the surface monitors provide reasonable flux estimates?

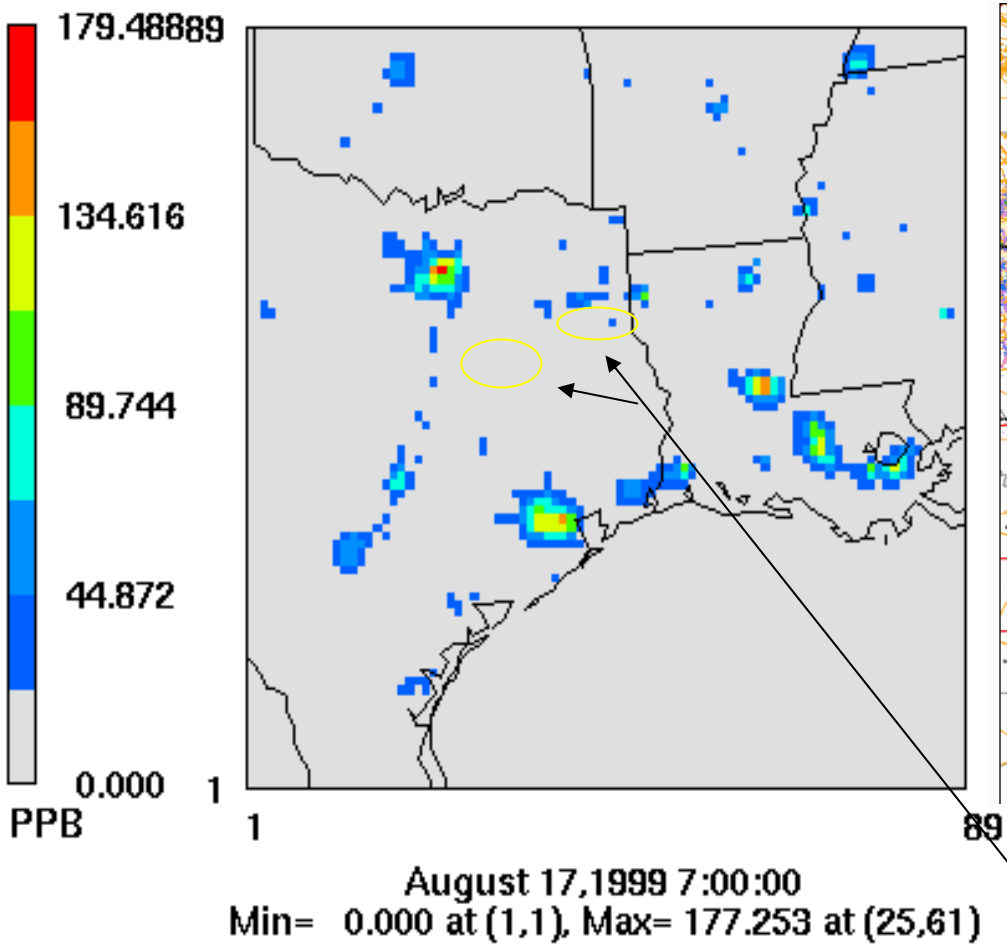
Metro area	Date	Wind direction	Wind speed (m/s)	Time (UTC)	Background O3 (ppb)	Ozone Flux (molec./s)	Ozone Flux (ground network) (molec./s)
Houston	12-Aug	S	4.8	23:04 - 23:34	~30	**4.0*10E26**	**2.2*10E26**
Houston	14-Aug	S	4	22:59 - 23:26	~35	**4.6*10E26**	**4.1*10E26**
Houston	30-Aug	N	4.4	22:18 - 22:50	~60	**4.4*10E26**	**4.0*10E26**
DFW	13-Sep	N	4.1	21:50 - 22:30	~60	**1.4*10E26**	**1.3*10E26**

Preliminary analysis of data from rural sites

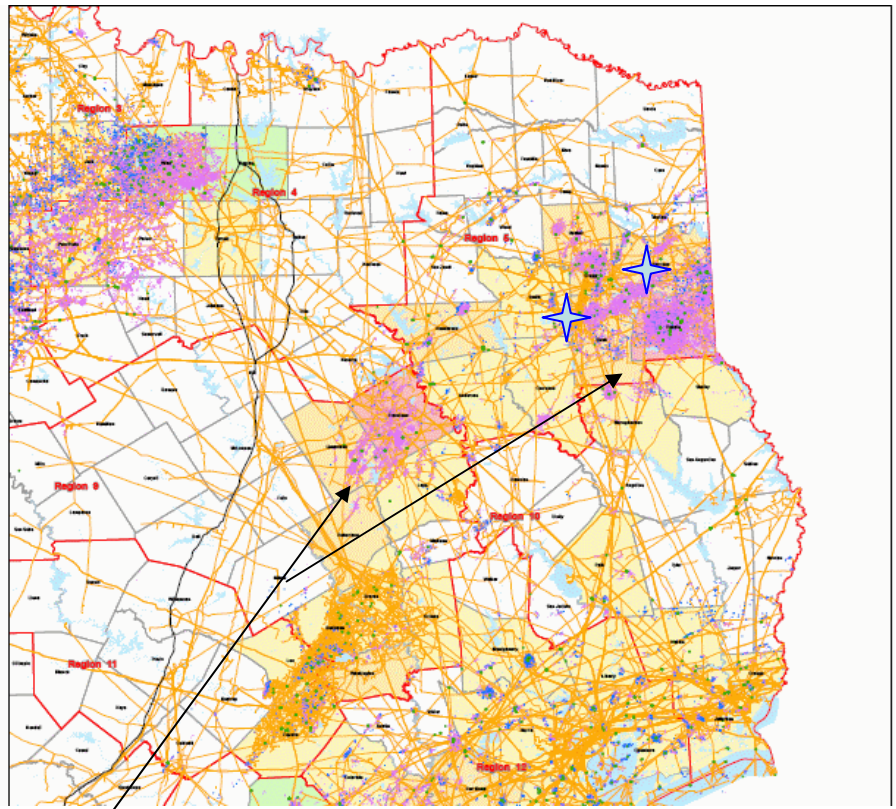
- Spatial distributions of rural ozone concentrations
- Analysis of diurnal patterns in ozone data
- Use of rural network to characterize regional transport of ozone
- Analyses continuing

Modeled NOx Concentrations 8/17/99

7 AM



Nat'l Gas Production, Gas Compressors, and Pipelines from TCEQ Chief Engineer's Office



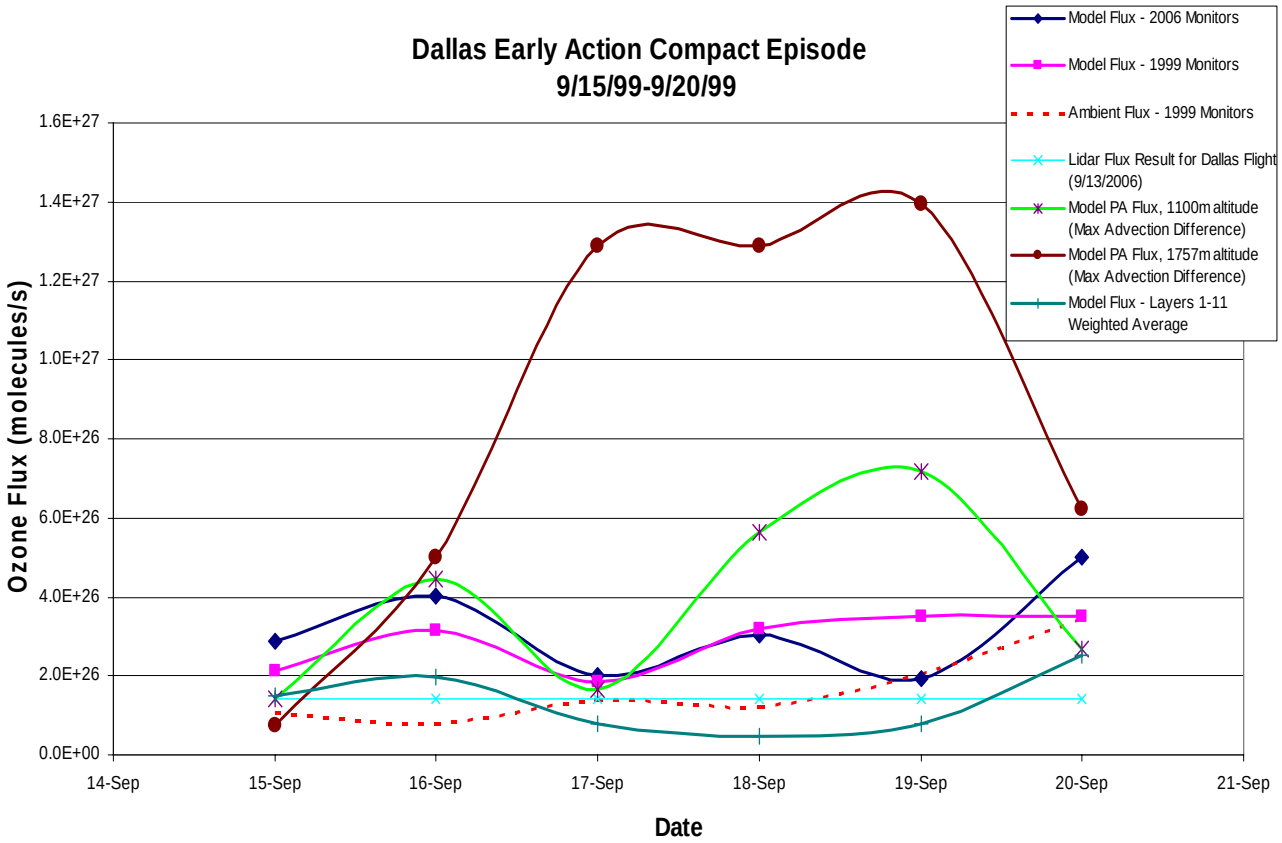
Given locations of wells, more NOx expected here.

Are these emissions currently captured in modeling?

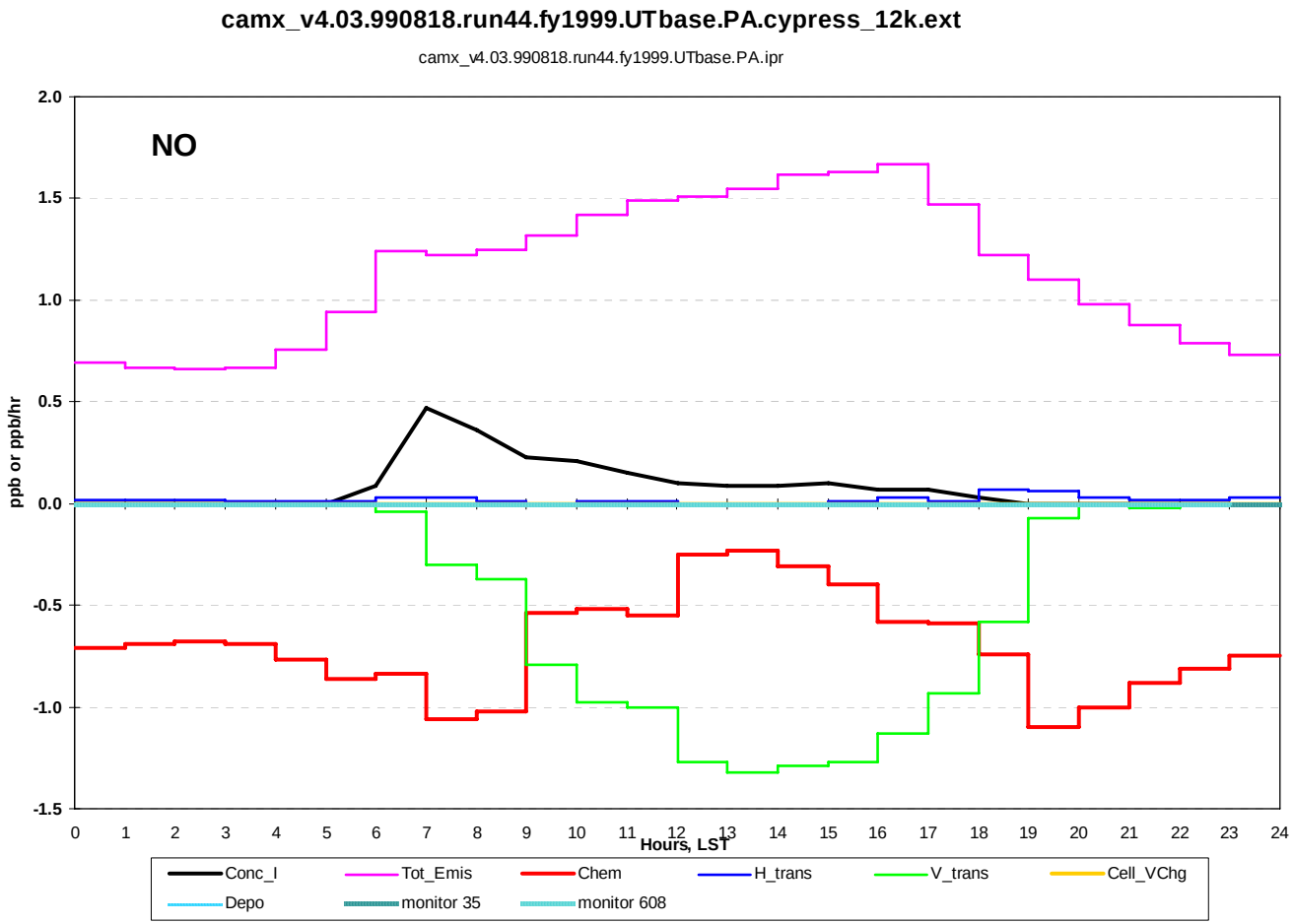
DFW base case (1999) SIP modeling results shown

Flux Calculation Comparison

- In addition to surface monitors, how reliable are flux calculations from photochemical modeling?
- Compare flux calculations of surface monitors with similar calculations from CAMx grid cell data
- CAMx Process Analysis tool can perform flux calculations

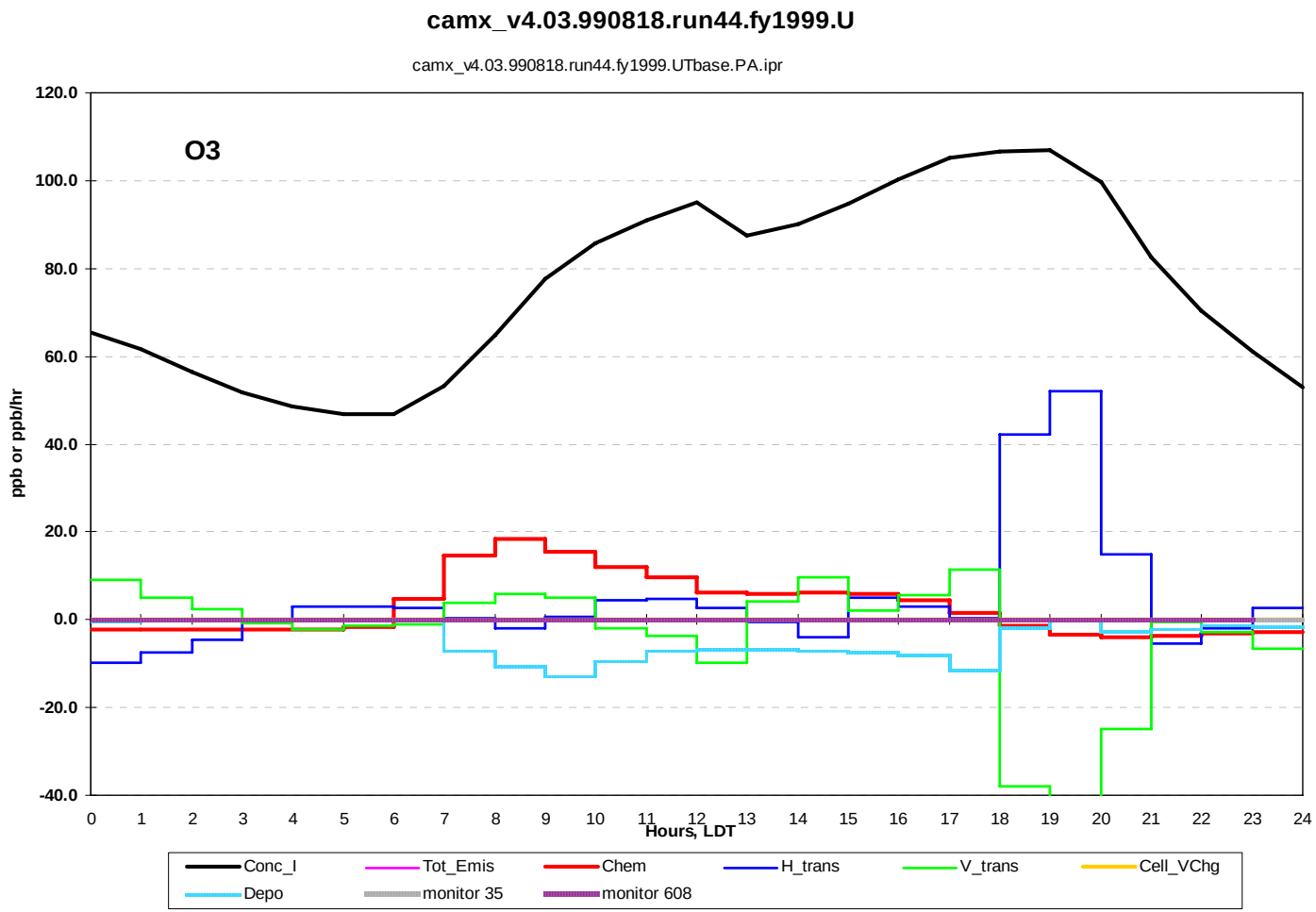


Process Analysis Results – Cypress River 8/18/1999

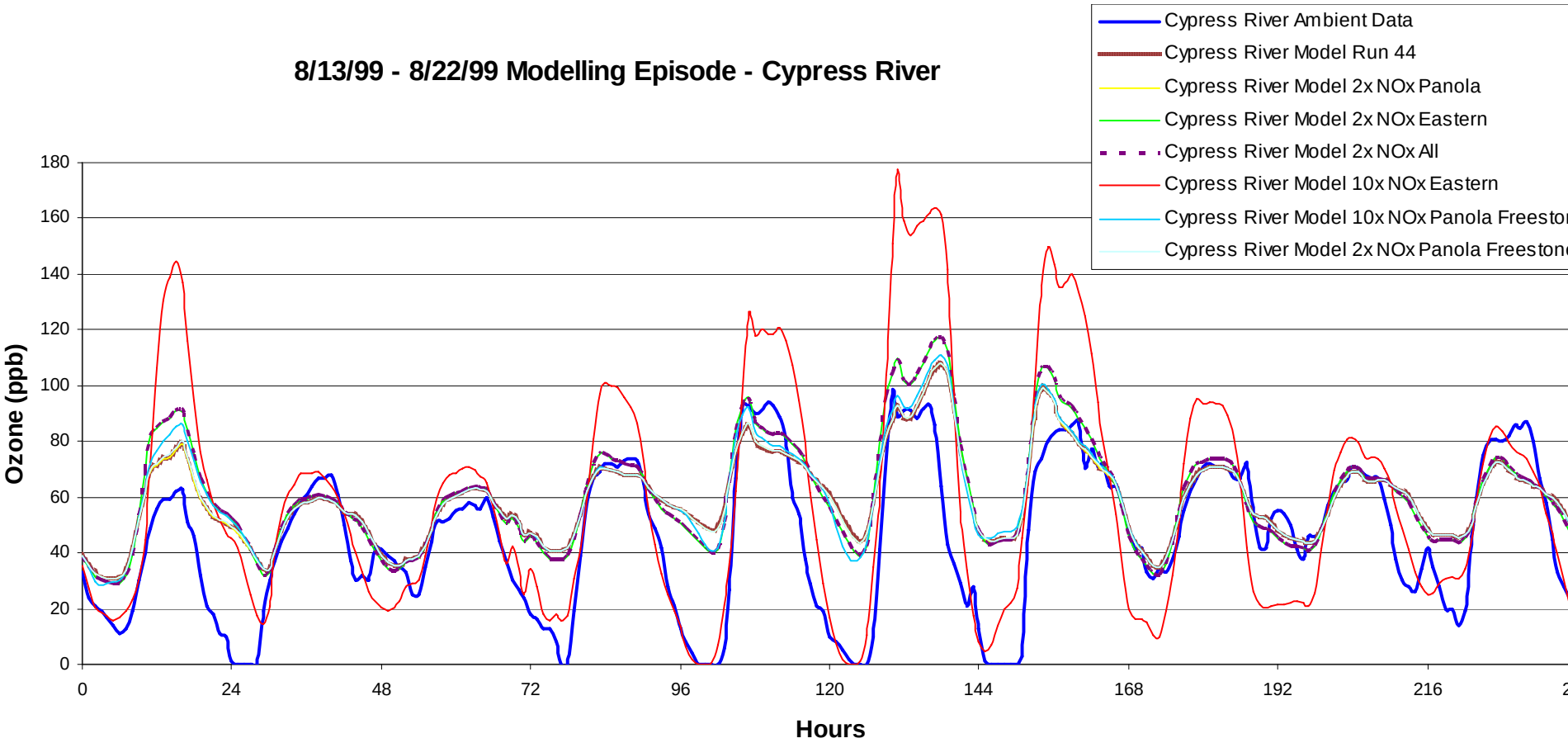


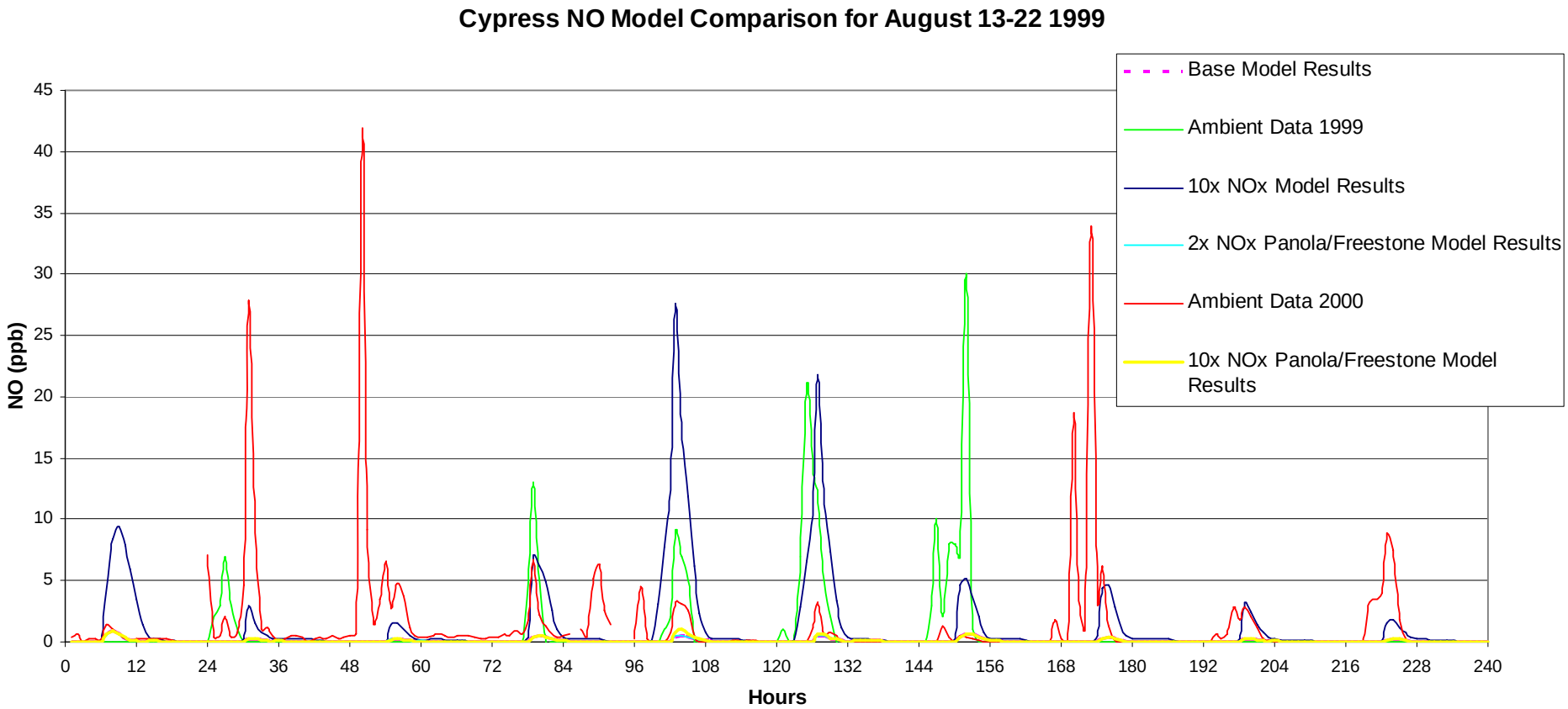
•Nighttime NO consumption is primarily due to chemistry near the surface at almost the exact same rate at which it is emitted

Process Analysis Results – Cypress River 8/18/1999



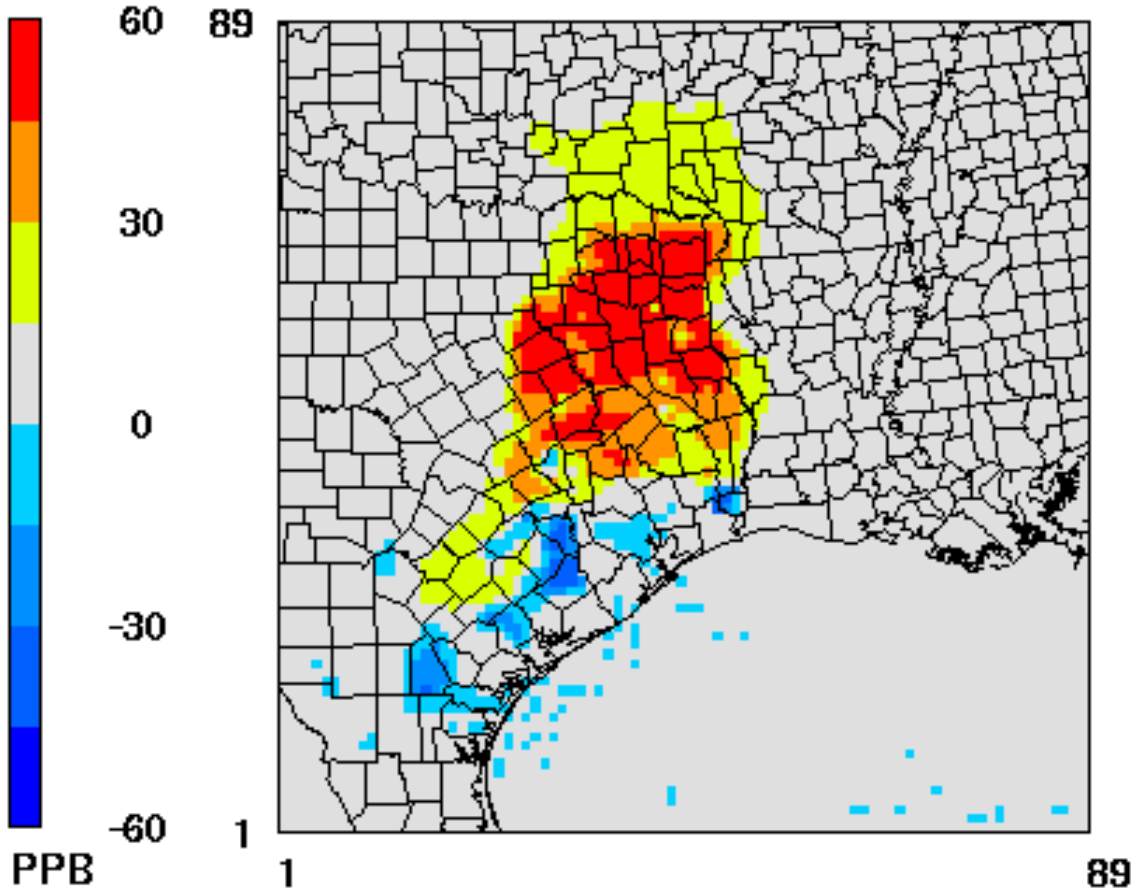
•Ozone concentrations are reduced primarily by vertical and horizontal transport at night – very little consumption by chemistry


8/13/99 - 8/22/99 Modelling Episode - Cypress River
Cypress River Ambient Data
Cypress River Model Run 44
Cypress River Model 2x NOx Panola
Cypress River Model 2x NOx Eastern
Cypress River Model 2x NOx All
Cypress River Model 10x NOx Eastern
Cypress River Model 10x NOx Panola Freeston
Cypress River Model 2x NOx Panola Freeston
Ozone (ppb)
0
20
40
60
80
100
120
140
160
180
0
24
48
72
96
120
144
168
192
216
Hours


Cypress NO Model Comparison for August 13-22 1999
NO (ppb)
Hours
0
5
10
15
20
25
30
35
40
45
0
12
24
36
48
60
72
84
96
108
120
132
144
156
168
180
192
204
216
228
240
Base Model Results
Ambient Data 1999
10x NOx Model Results
2x NOx Panola/Freestone Model Results
Ambient Data 2000
10x NOx Panola/Freestone Model Results

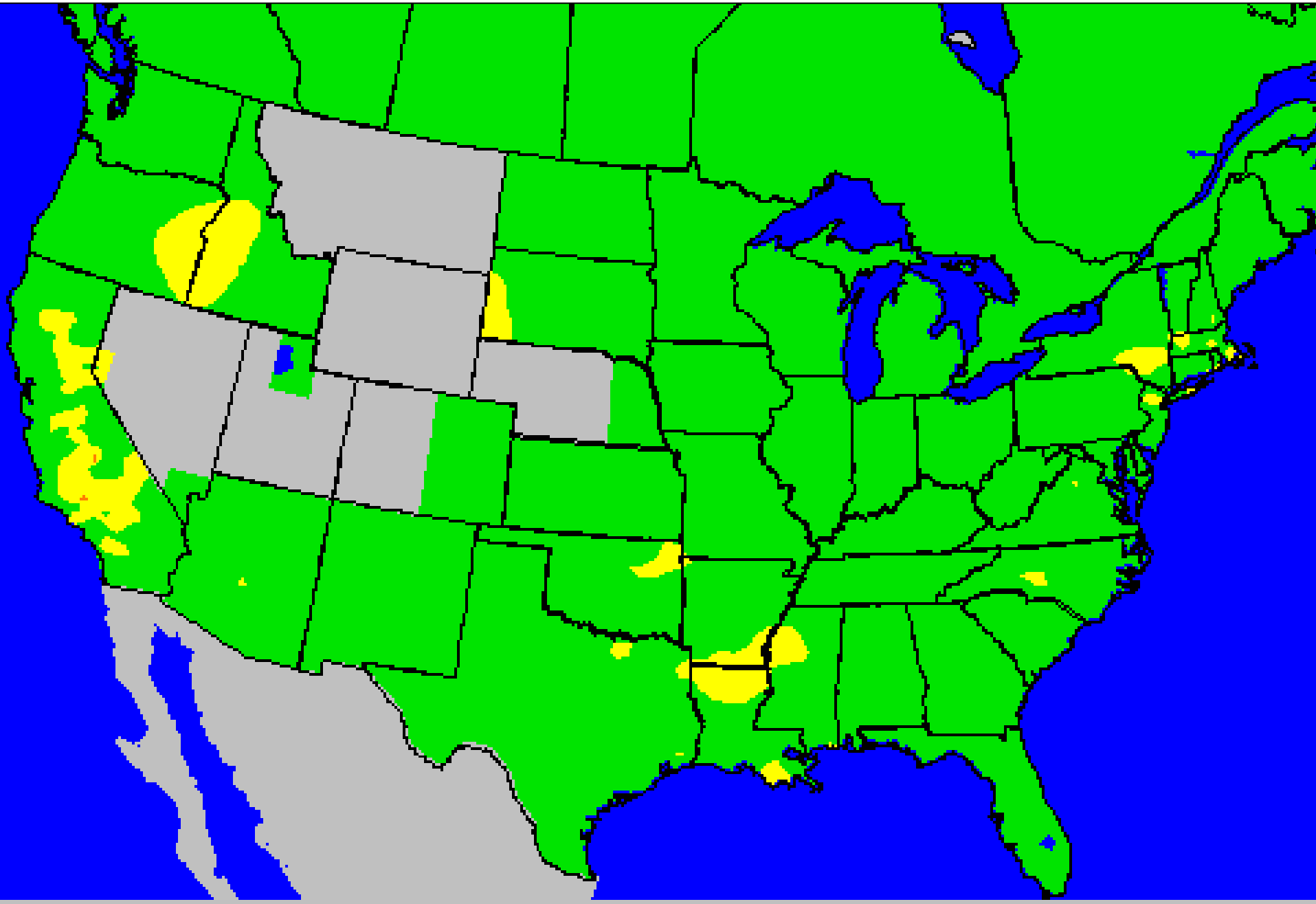
Layer 1 Difference in O3 Levels

August 18, 1999 Hour 17

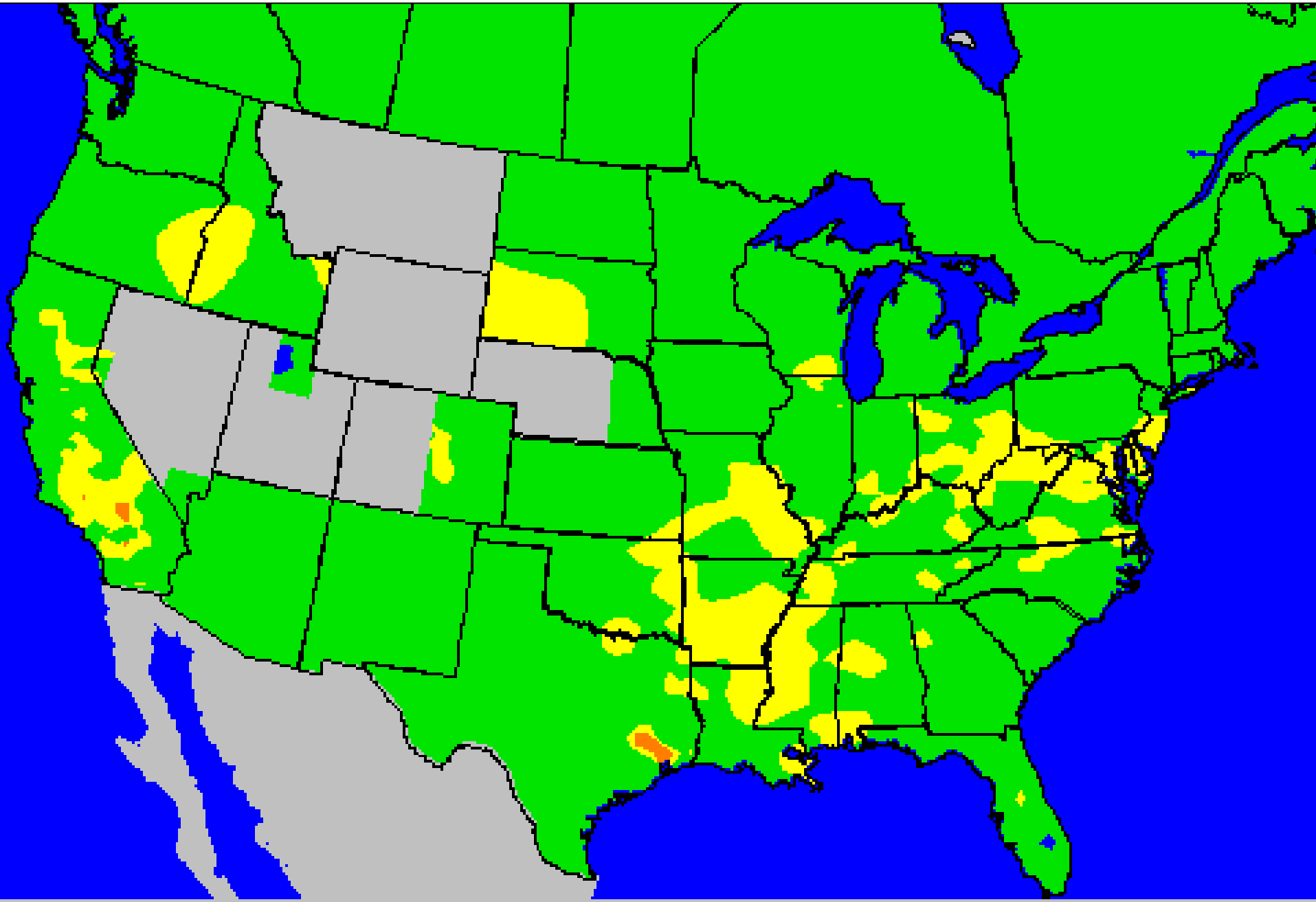


August 18,1999 16:00:00

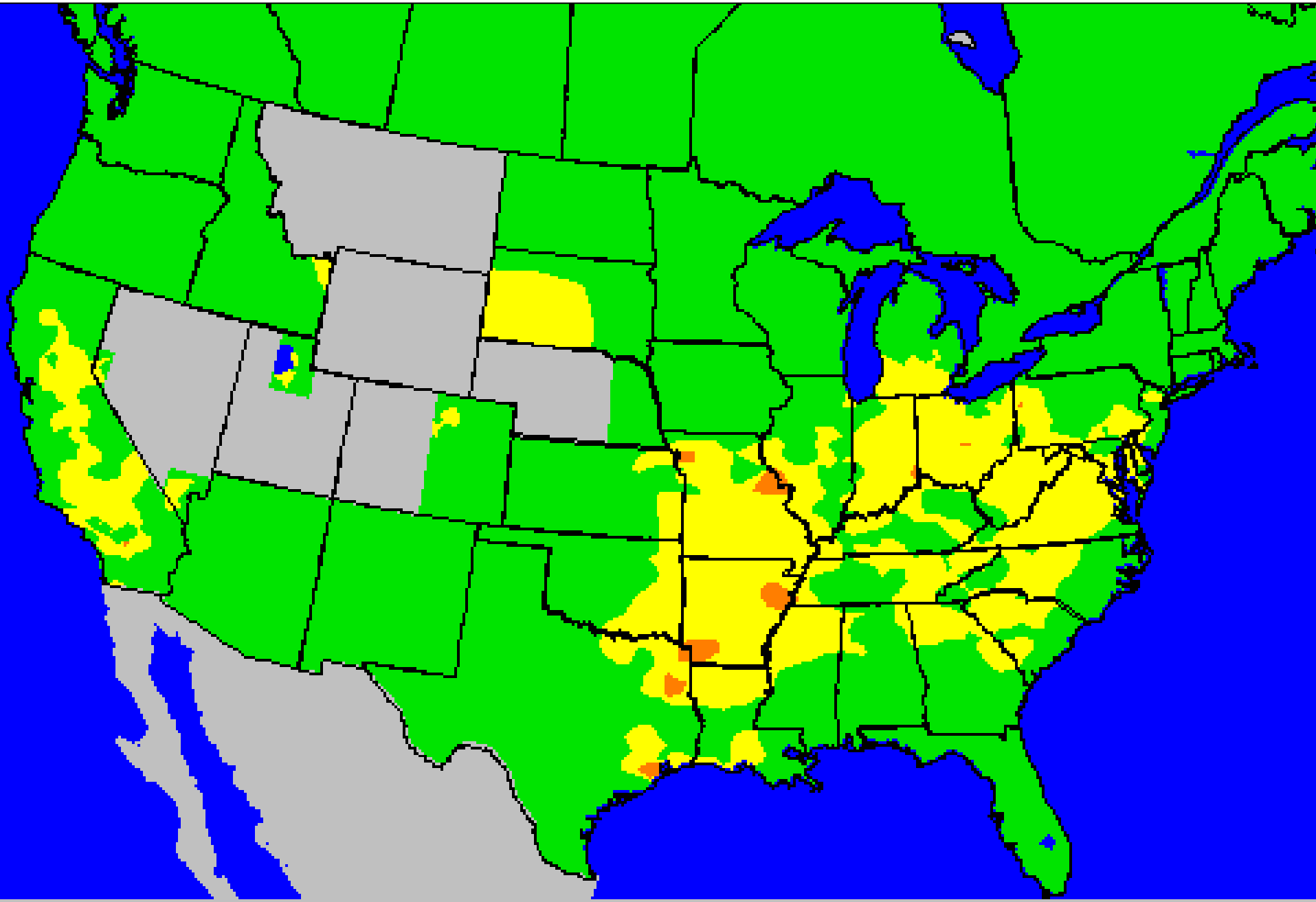
Min= -41 at (50,37), Max= 86 at (41,55)



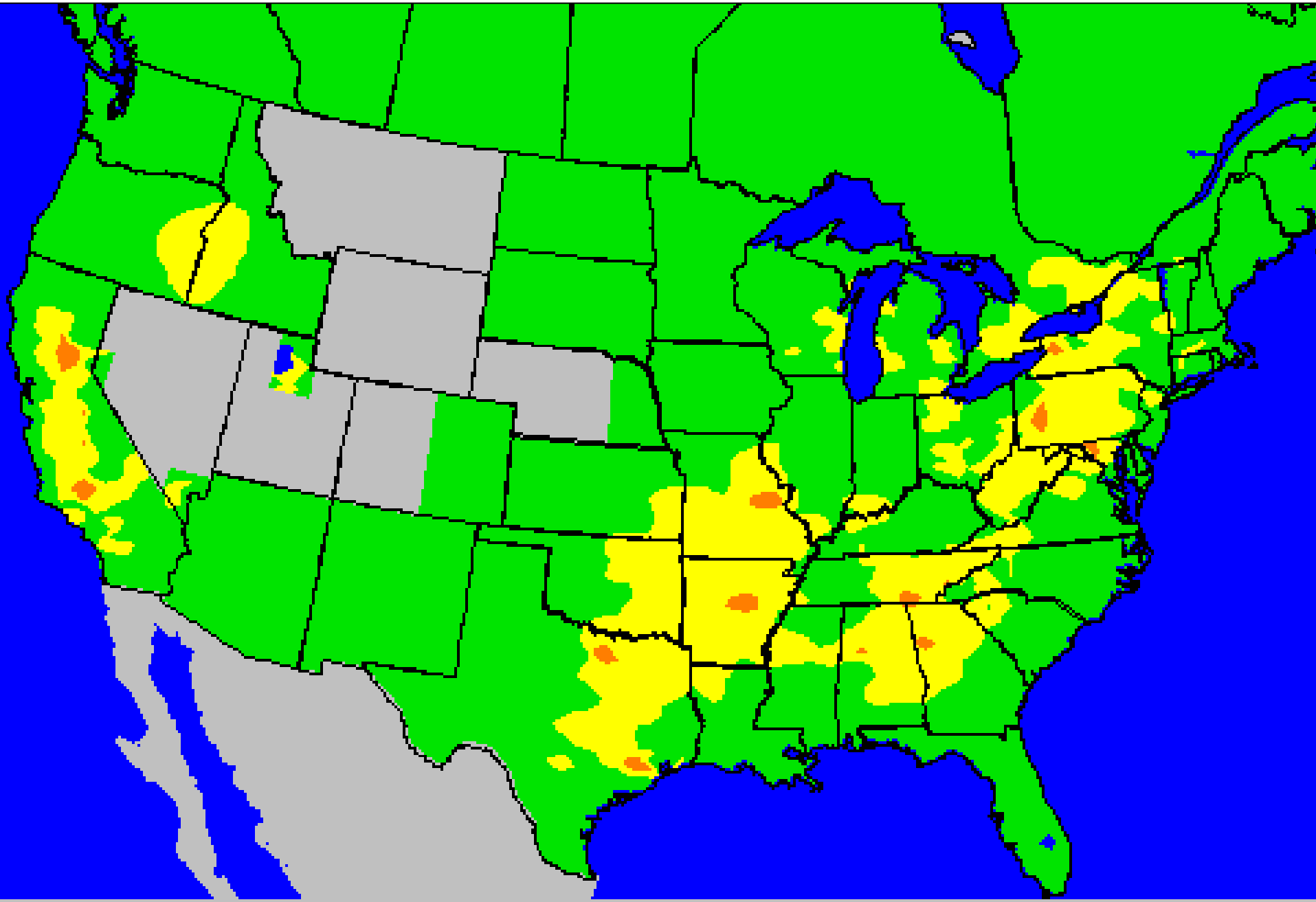
August 15, 2006



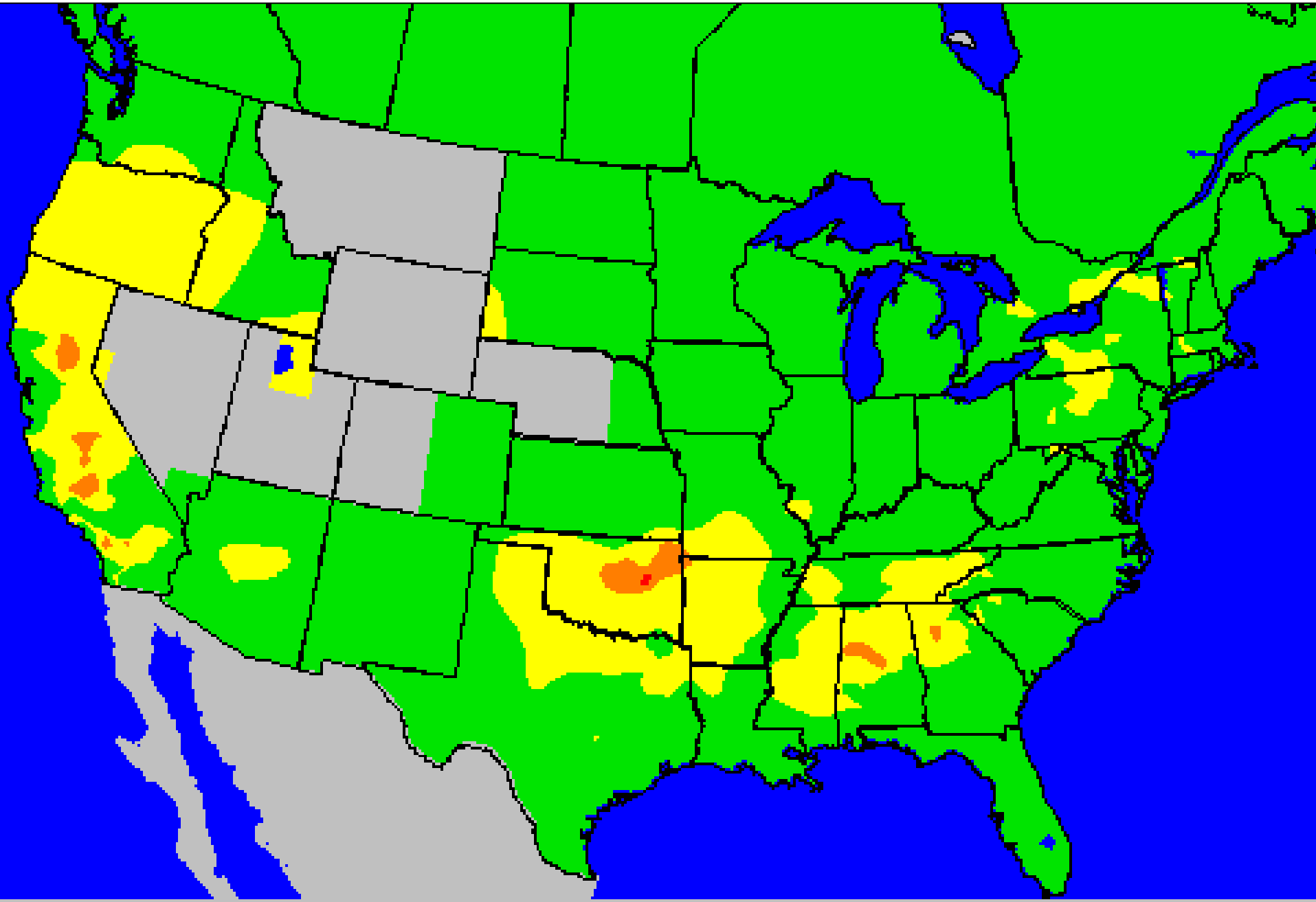
August 16, 2006



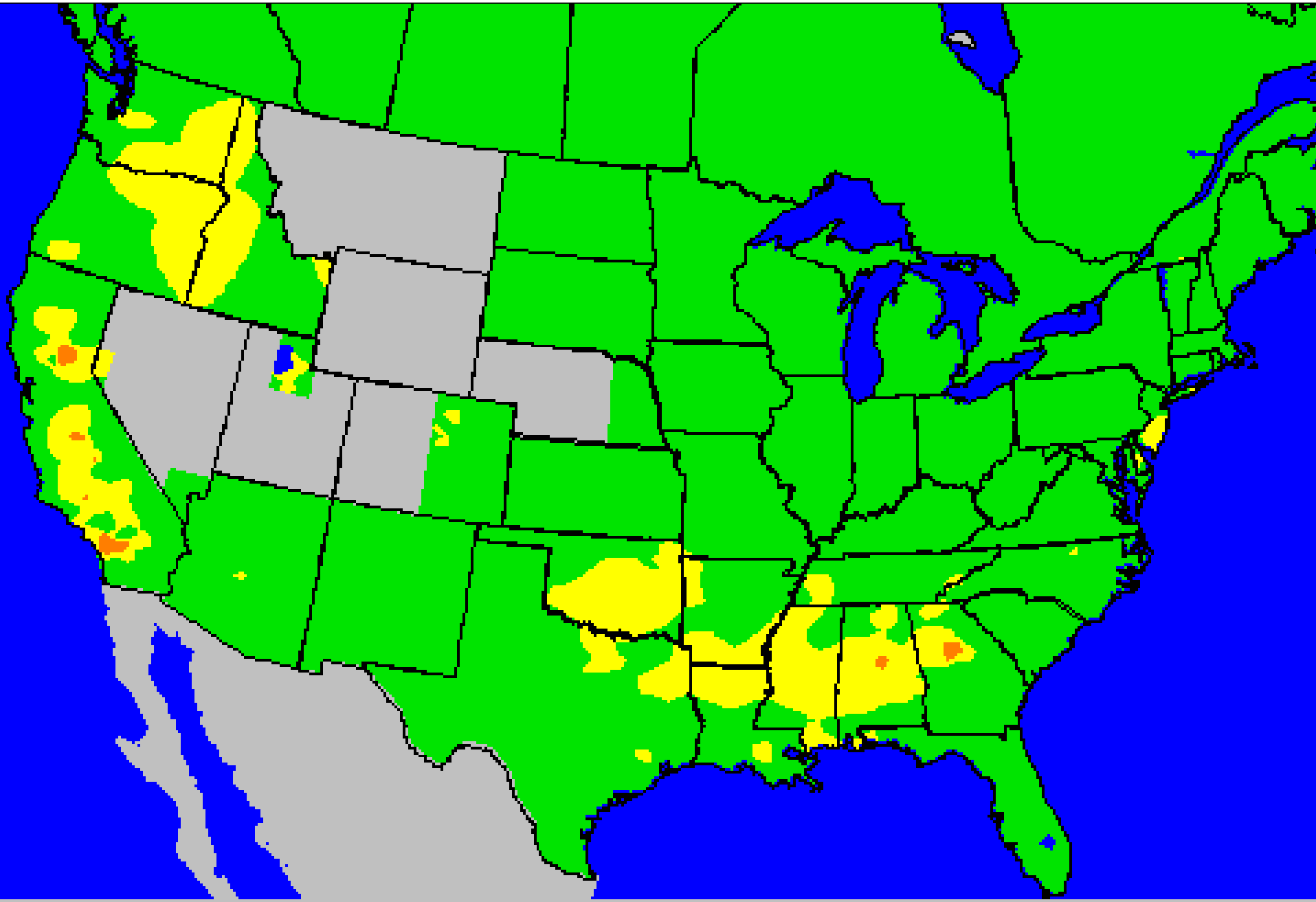
August 17, 2006



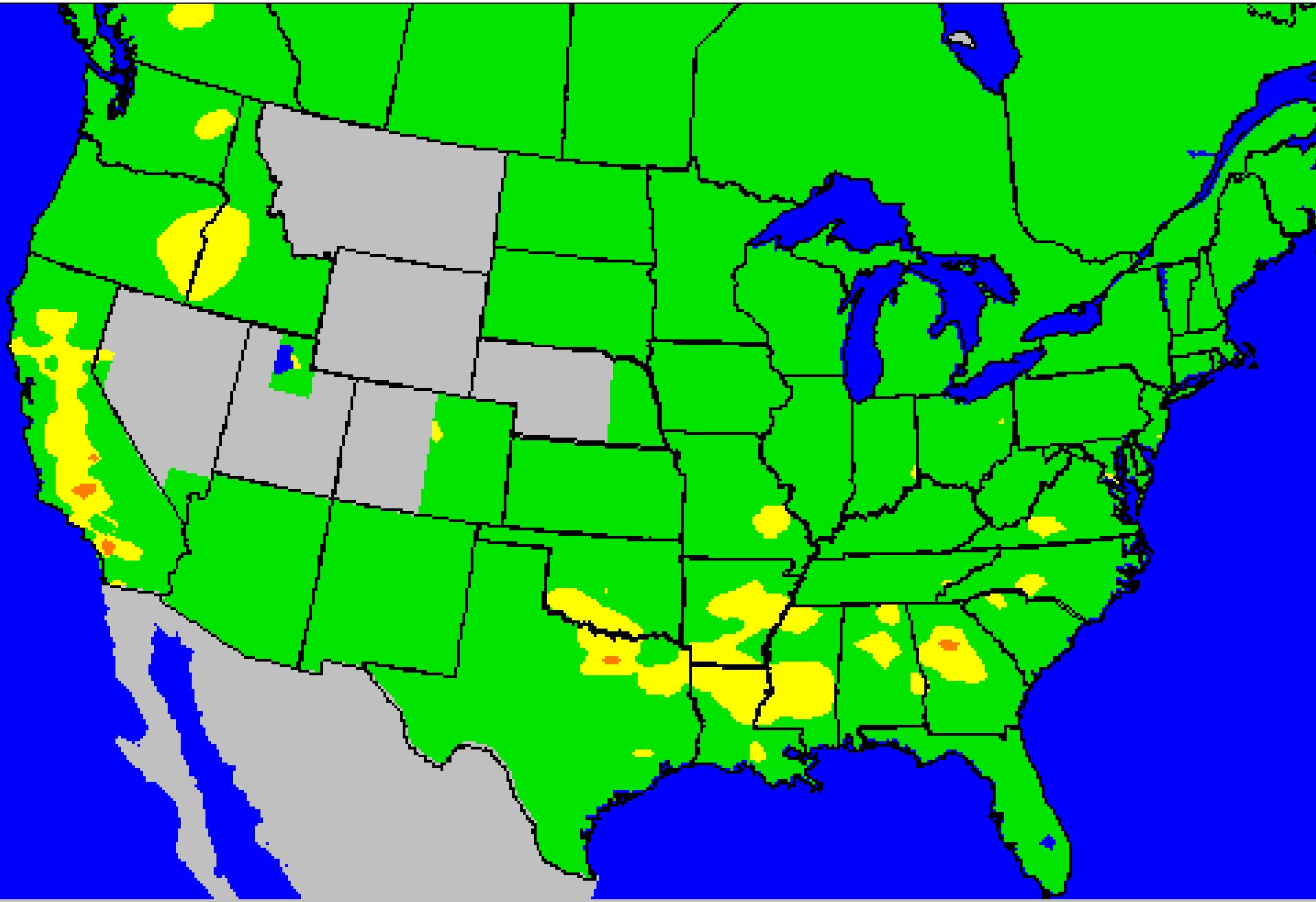
August 18, 2006



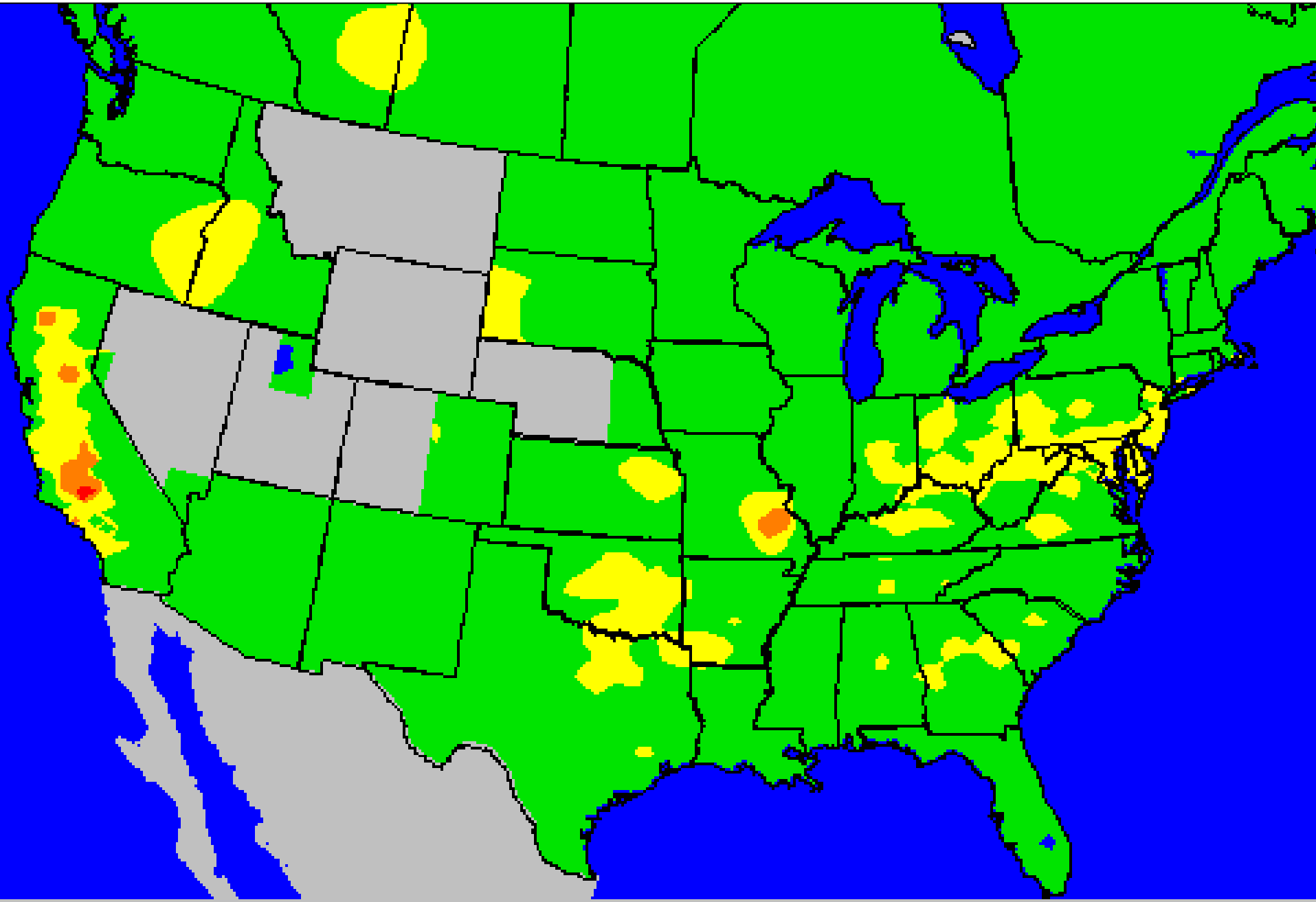
August 19, 2006



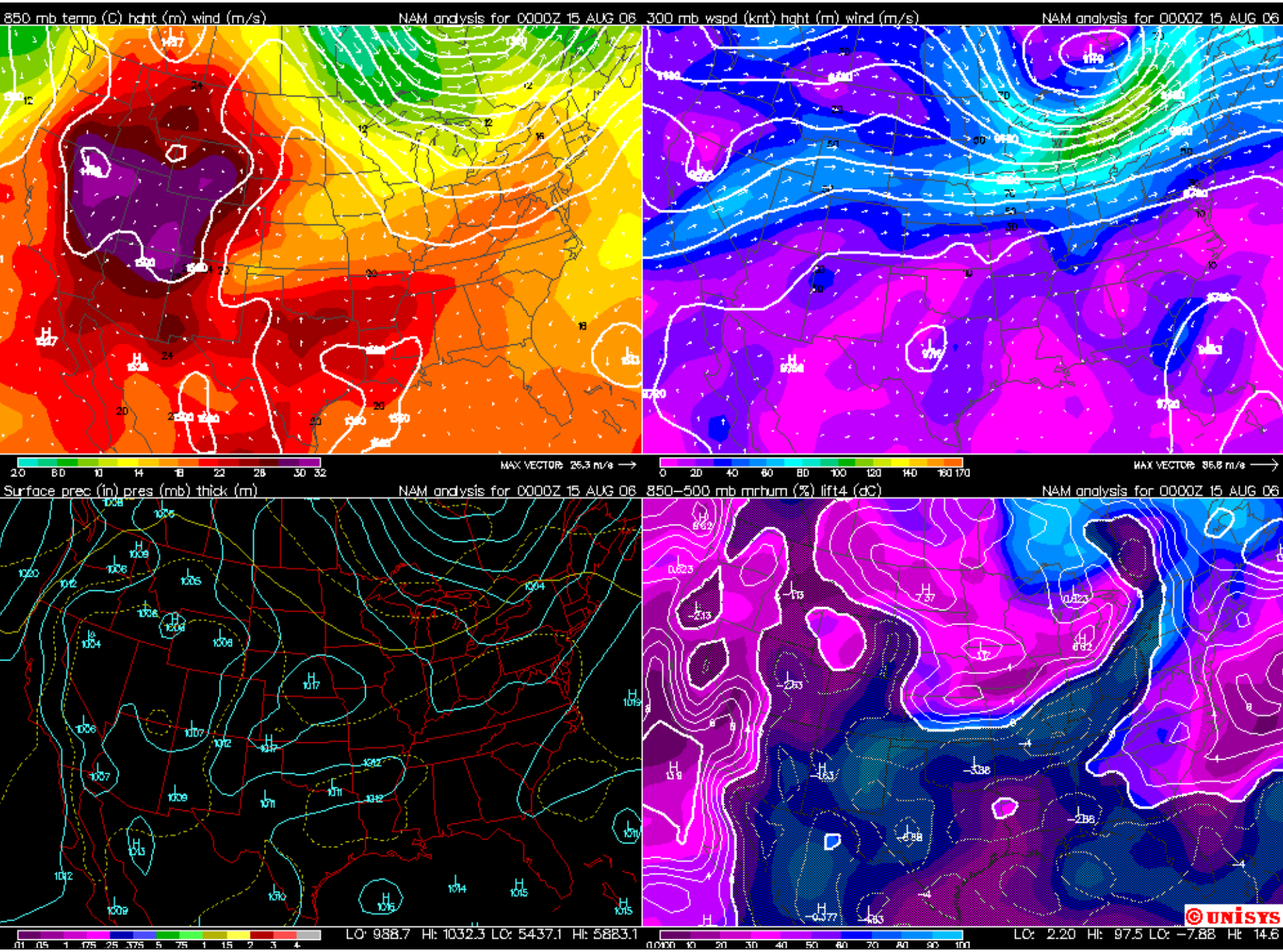
August 20, 2006



August 21, 2006



August 22, 2006


850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 15 AUG 06
MAX VECTOR 25.3 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 15 AUG 06
MAX VECTOR 86.8 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 15 AUG 06
LO: 988.7 HI: 1032.3 LO: 5437.1 HI: 5883.1
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 15 AUG 06
LO: 2.20 HI: 97.5 LO: -7.88 HI: 14.6
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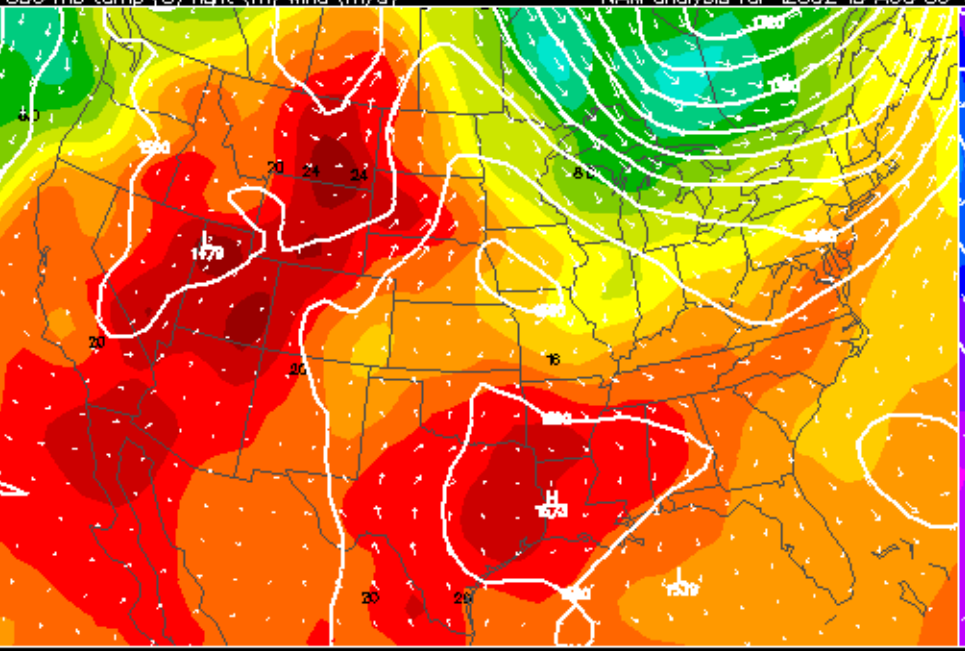
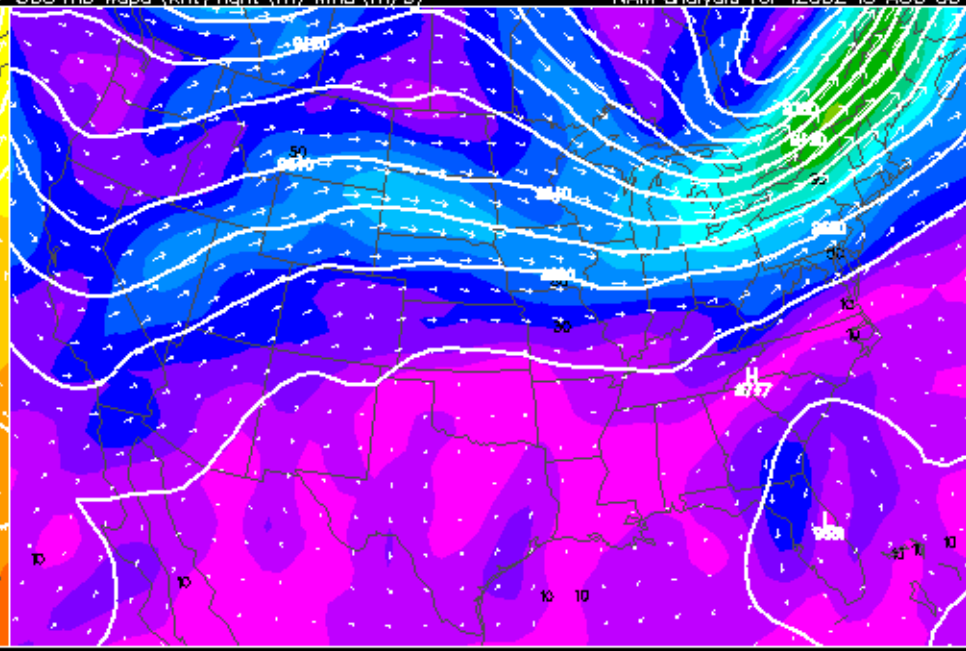
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 15 AUG 06



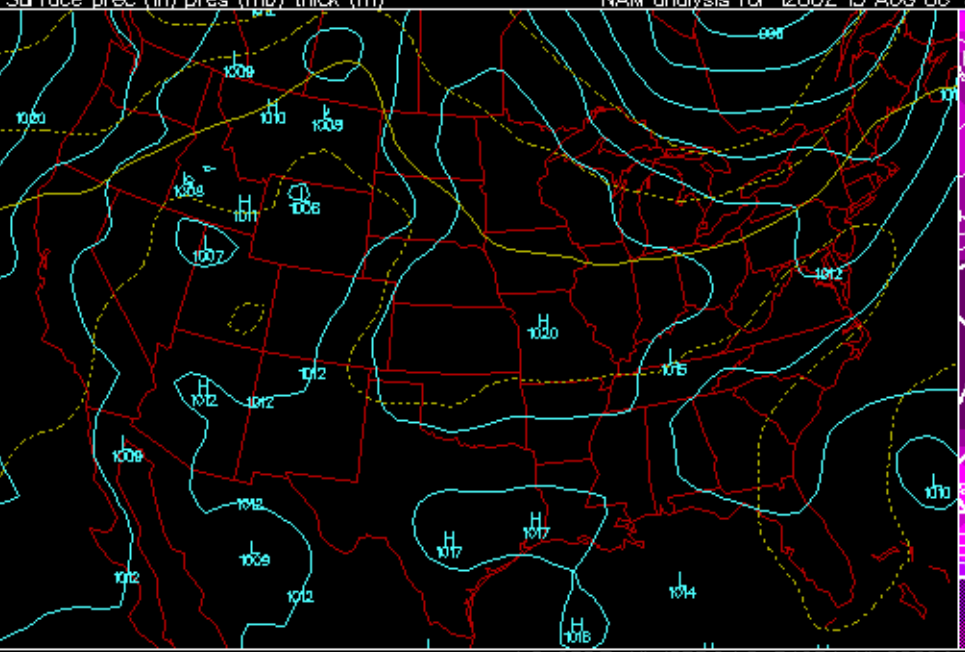
0 2.0 4.0 6.0 8.0 10 12 14 16 18 20 22 24 26 MAX VECTOR: 24.8 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 15 AUG 06



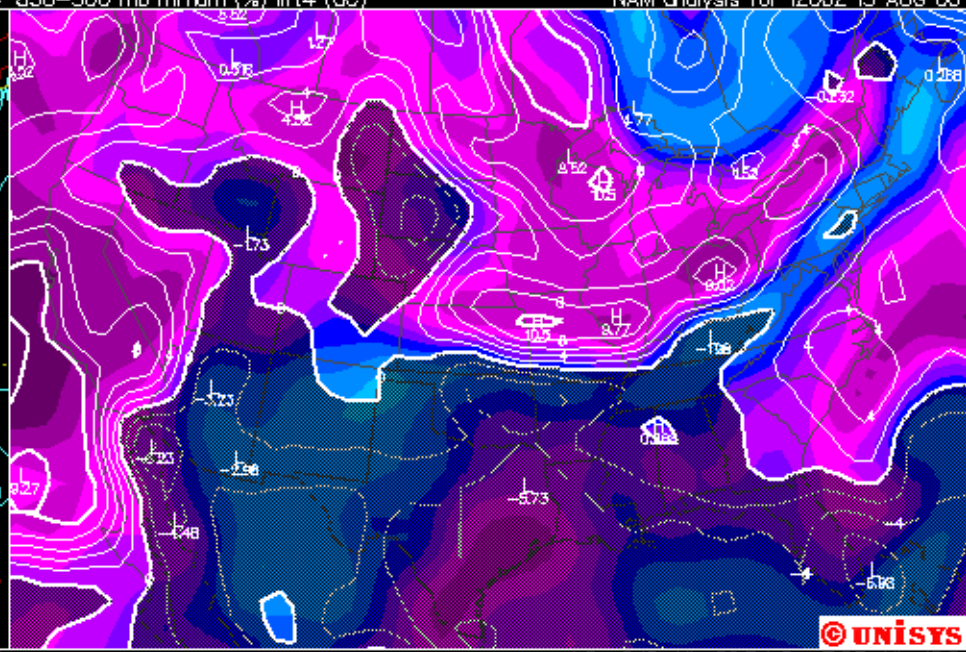
0 10 20 30 40 50 60 70 80 90 100 110 120 MAX VECTOR: 56.8 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 15 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 988.7 HI: 1033.2 LO: 5423.1 HI: 5822.1

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 15 AUG 06



0.0100 10 20 30 40 50 60 70 80 90 100 LO: 2.10 HI: 99.8 LO: −7.23 HI: 16.8

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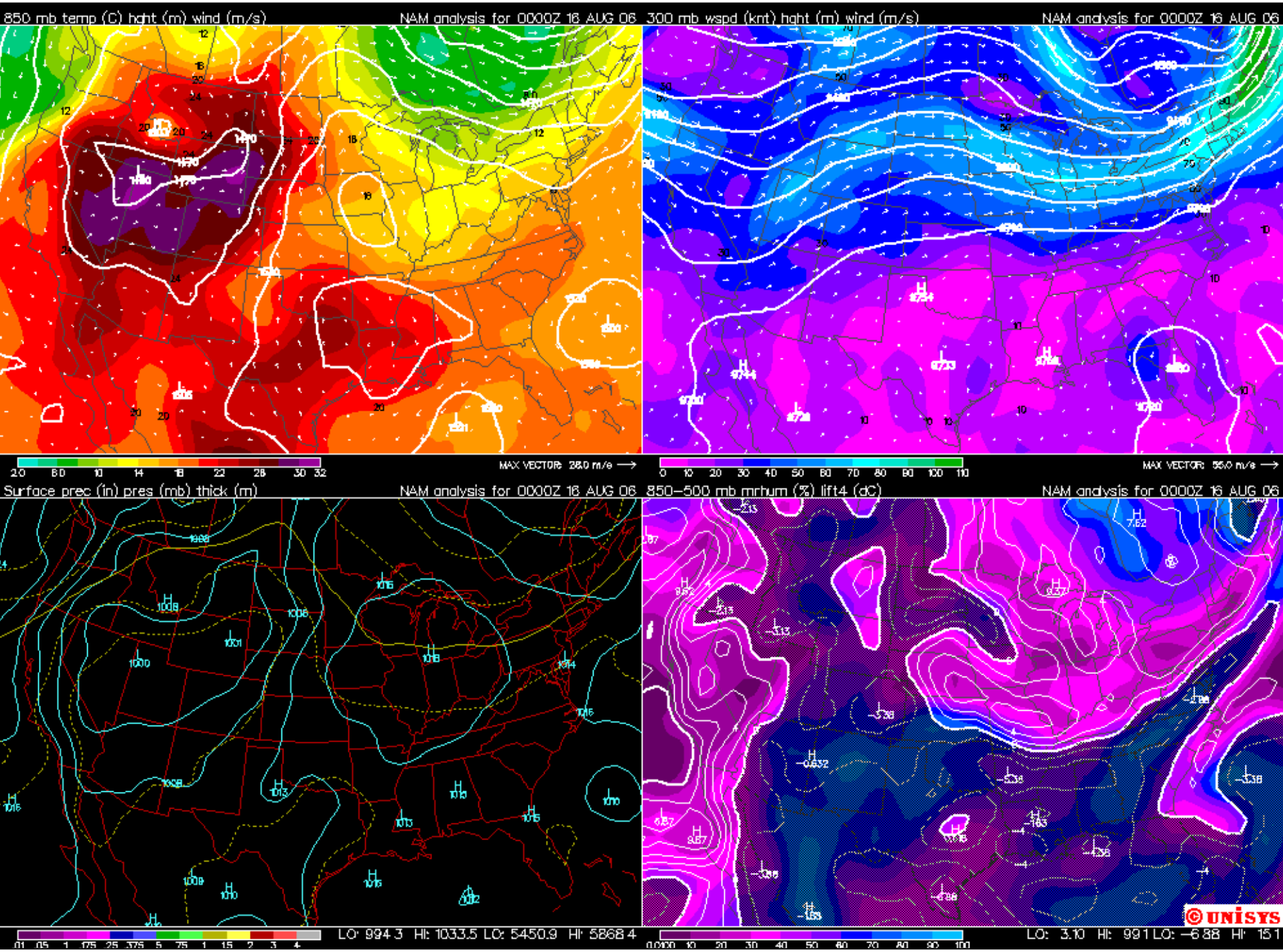
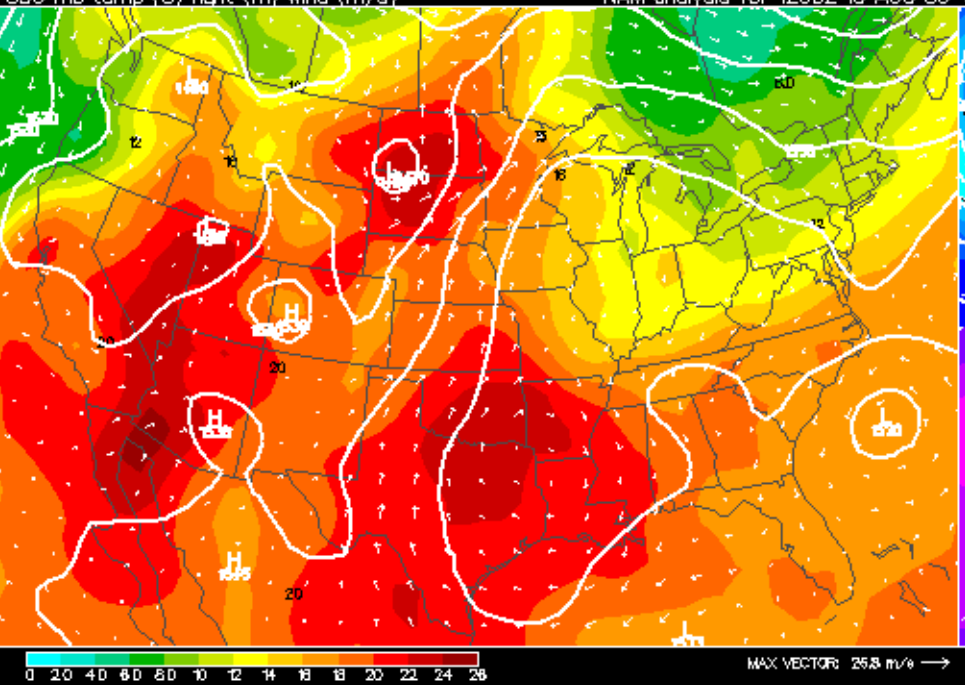
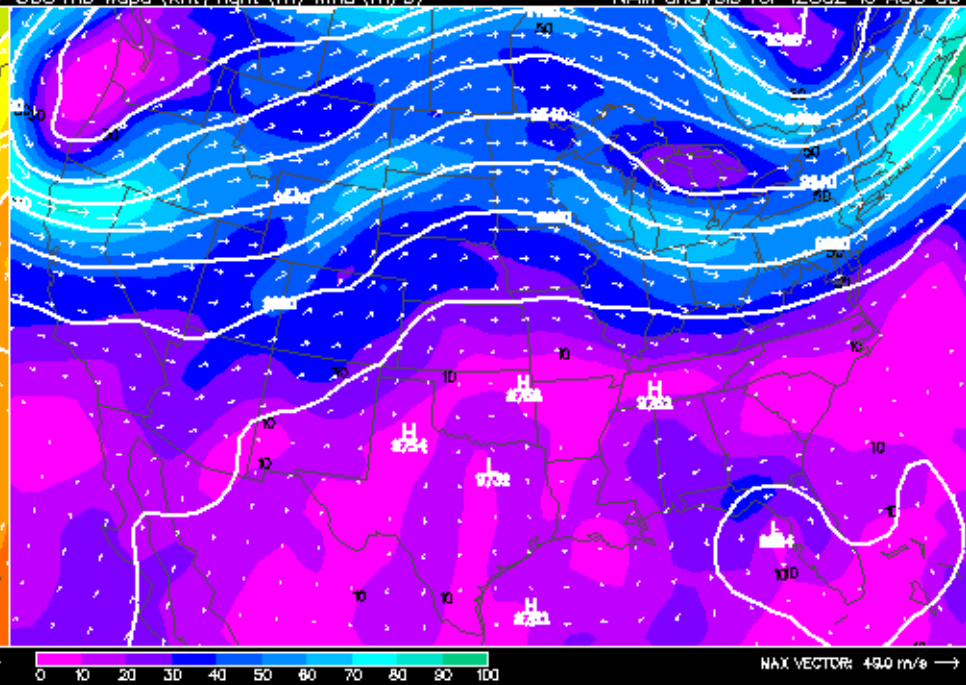

850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 16 AUG 06
MAX VECTOR: 28.0 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 16 AUG 06
MAX VECTOR: 55.0 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 16 AUG 06
LO: 994.3 HI: 1033.5 LO: 5450.9 HI: 5868.4
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 16 AUG 06
LO: 3.10 HI: 99.1 LO: -6.88 HI: 15.1
© UNISYS

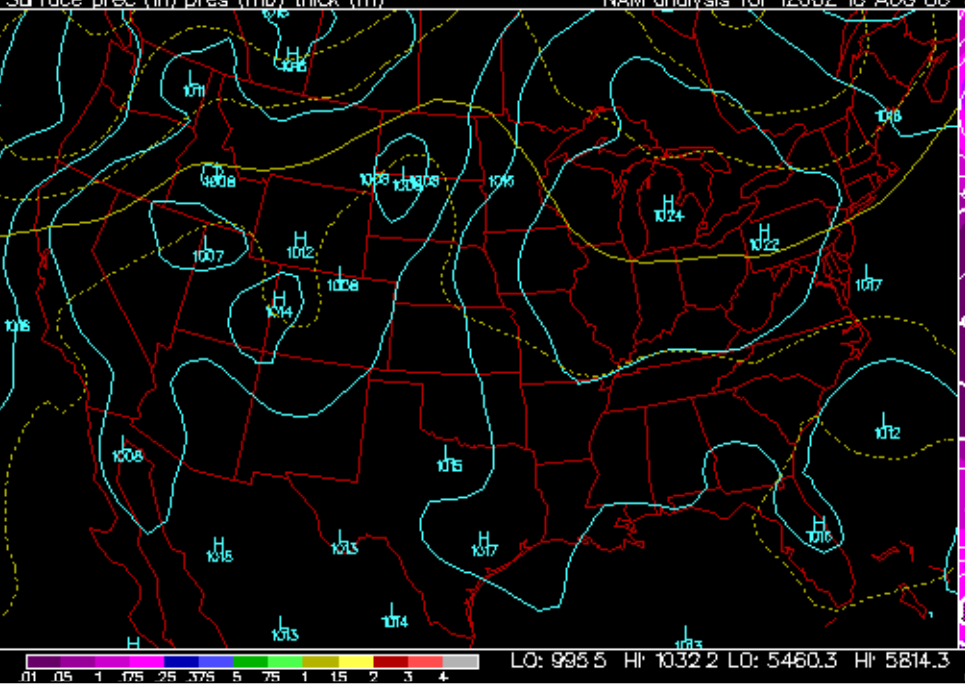
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 16 AUG 06



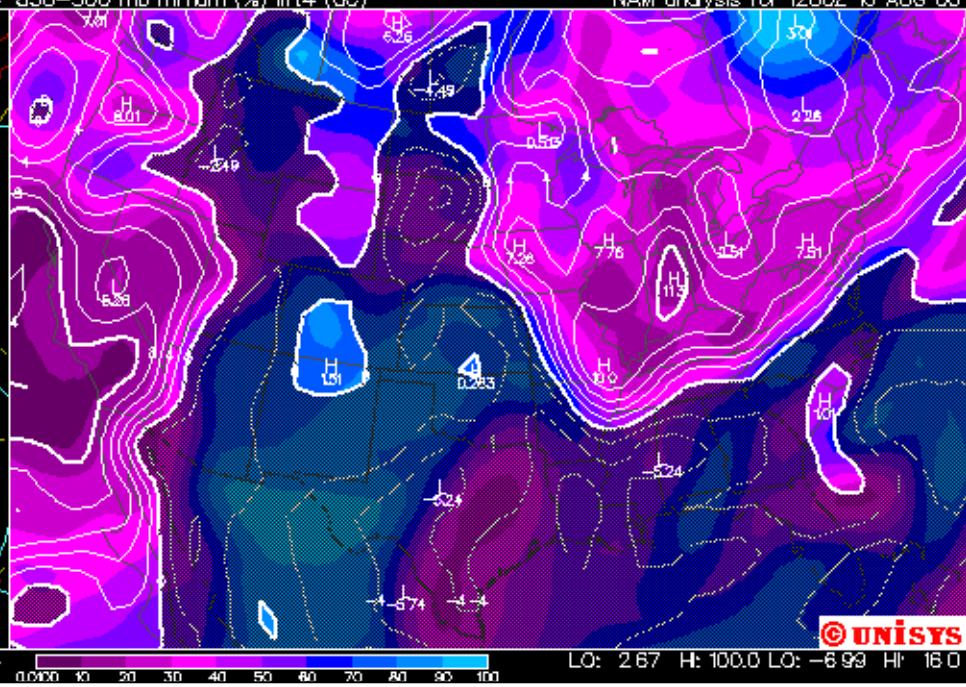
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 16 AUG 06



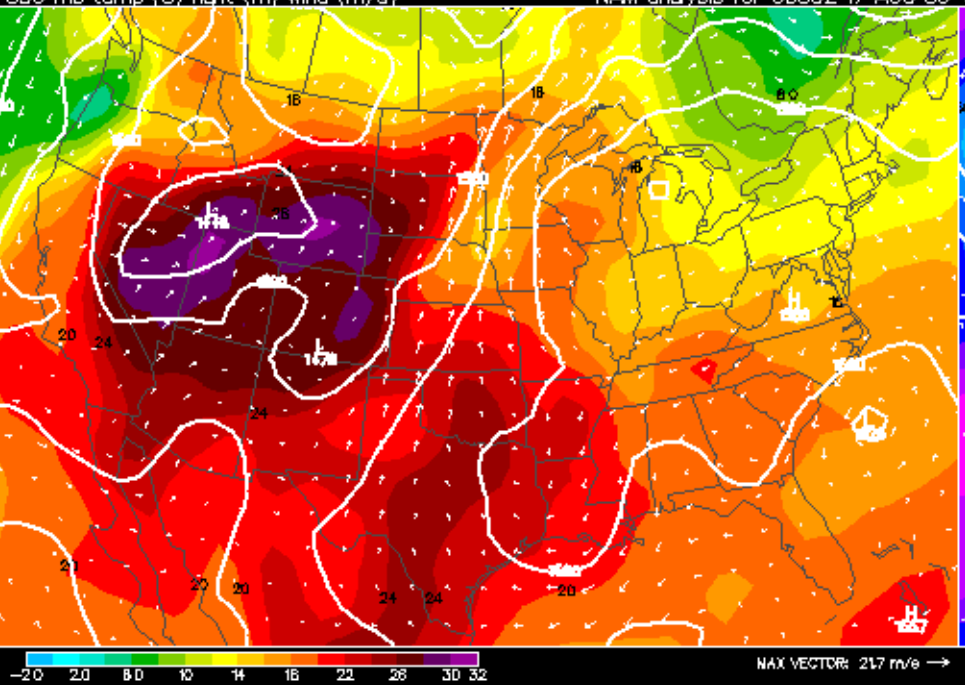
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 16 AUG 06



850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 16 AUG 06

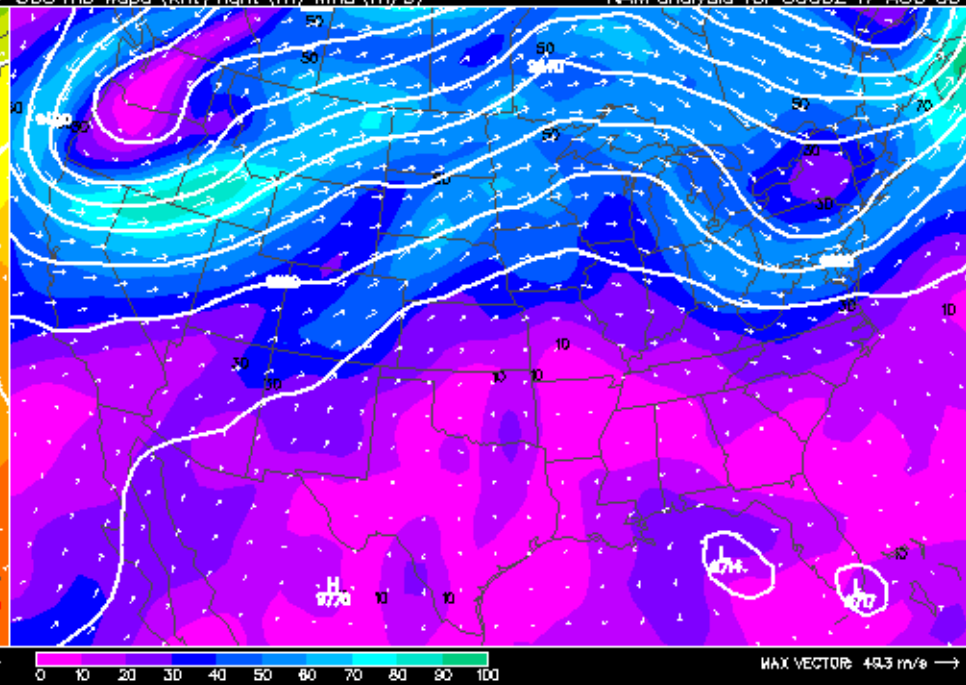


850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 17 AUG 06



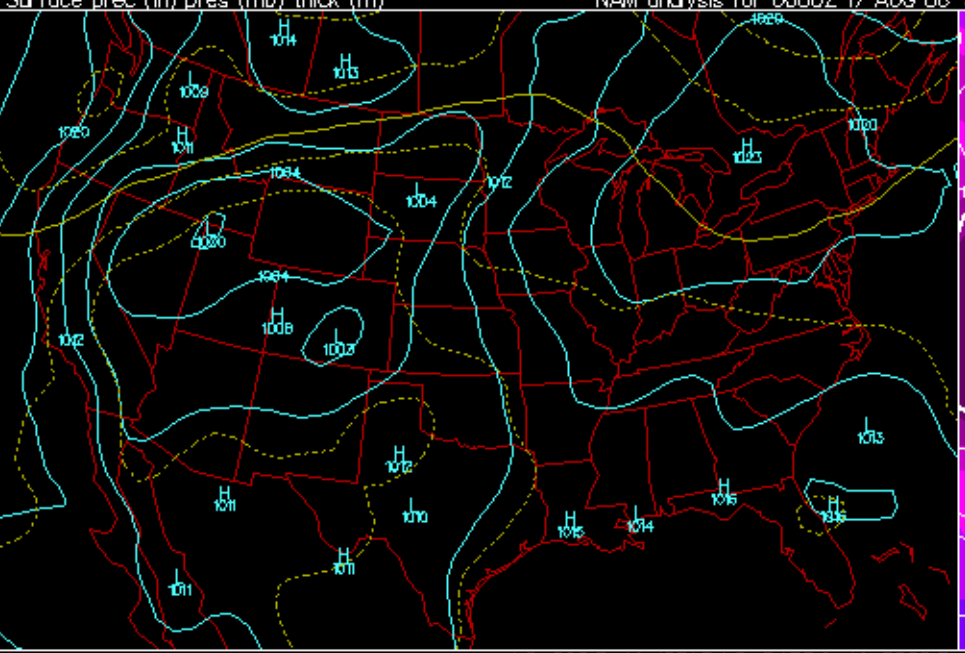
−20 2.0 8.0 10 14 16 22 28 30 32 MAX VECTOR: 21.7 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 17 AUG 06



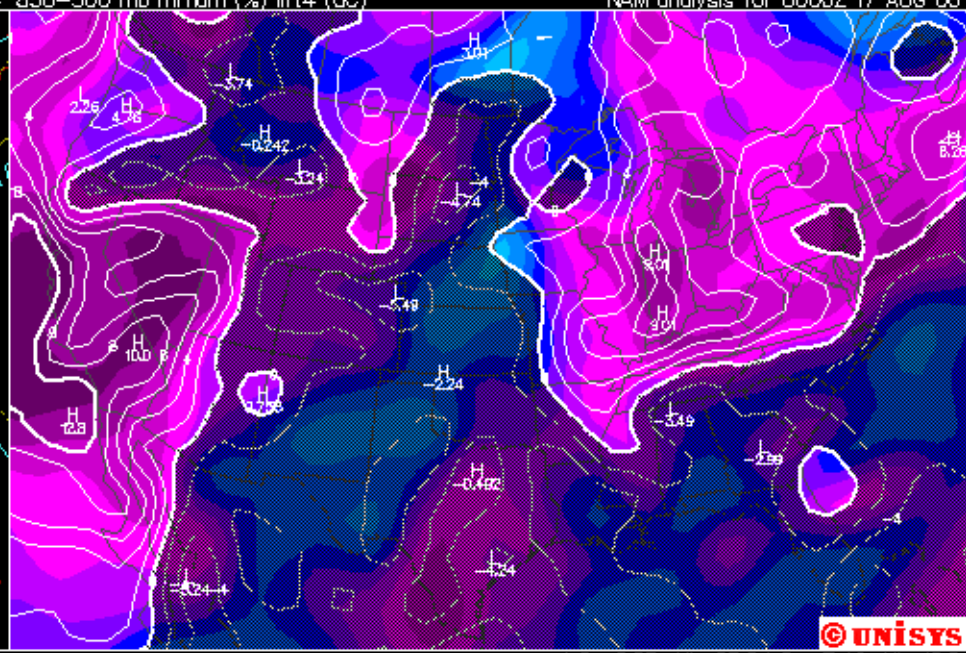
0 10 20 30 40 50 60 70 80 90 100 MAX VECTOR: 49.3 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 17 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 998.5 HI: 1031.8 LO: 5455.0 HI: 5862.5

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 17 AUG 06



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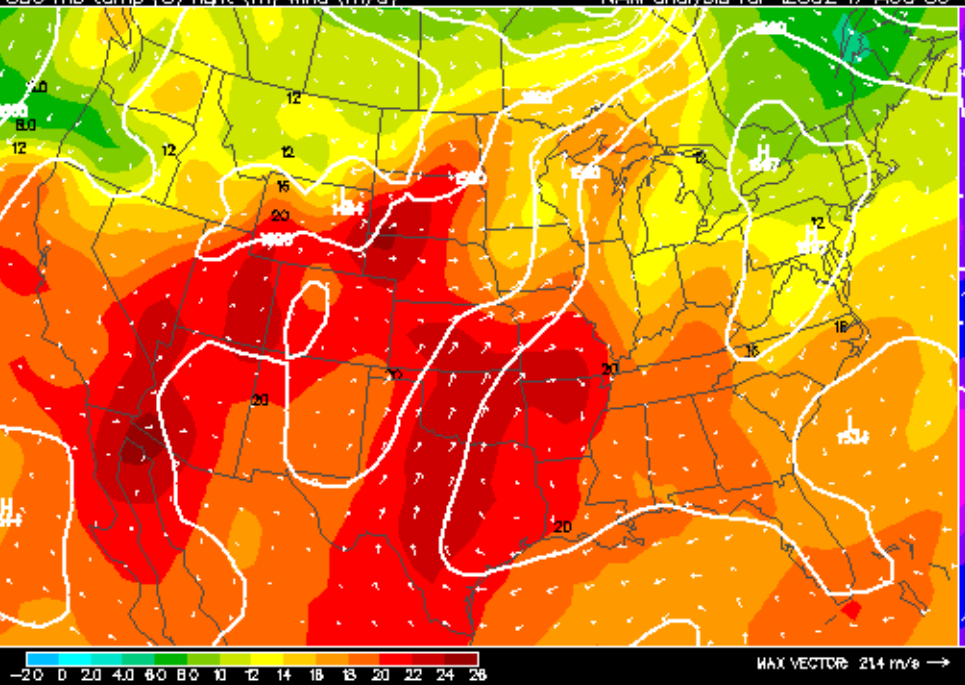
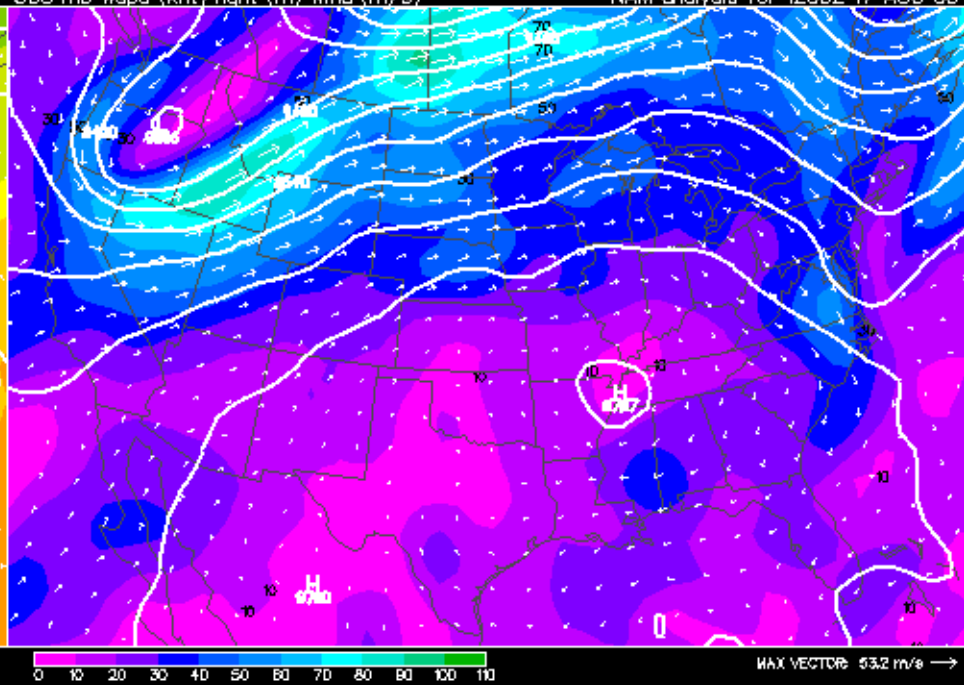
0.0100 10 20 30 40 50 60 70 80 90 100 LO: 2.85 HI: 98.2 LO: −7.49 HI: 16.0

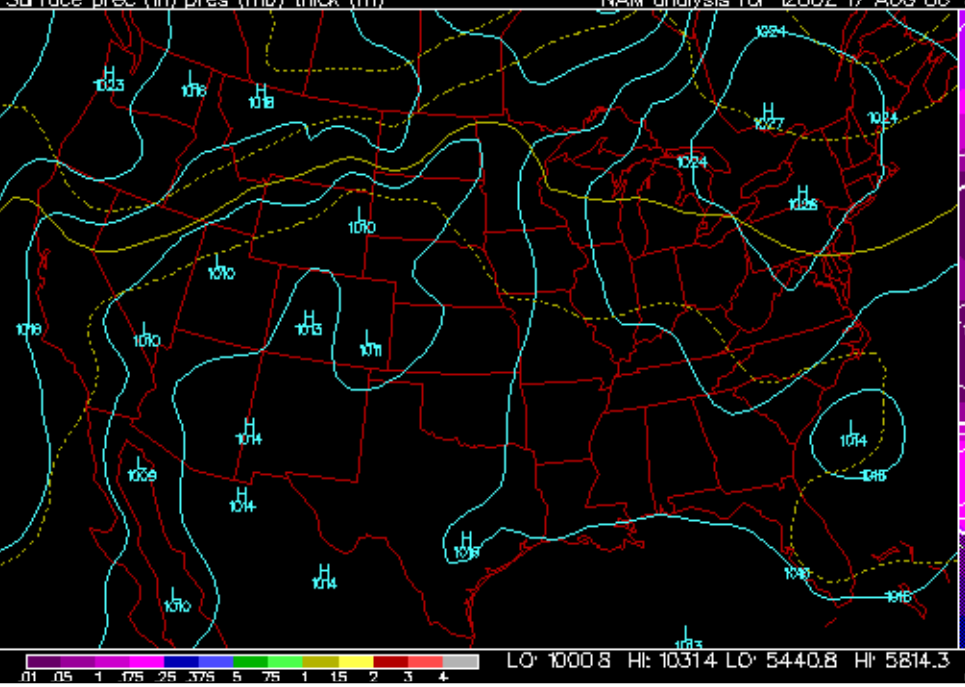
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 17 AUG 06



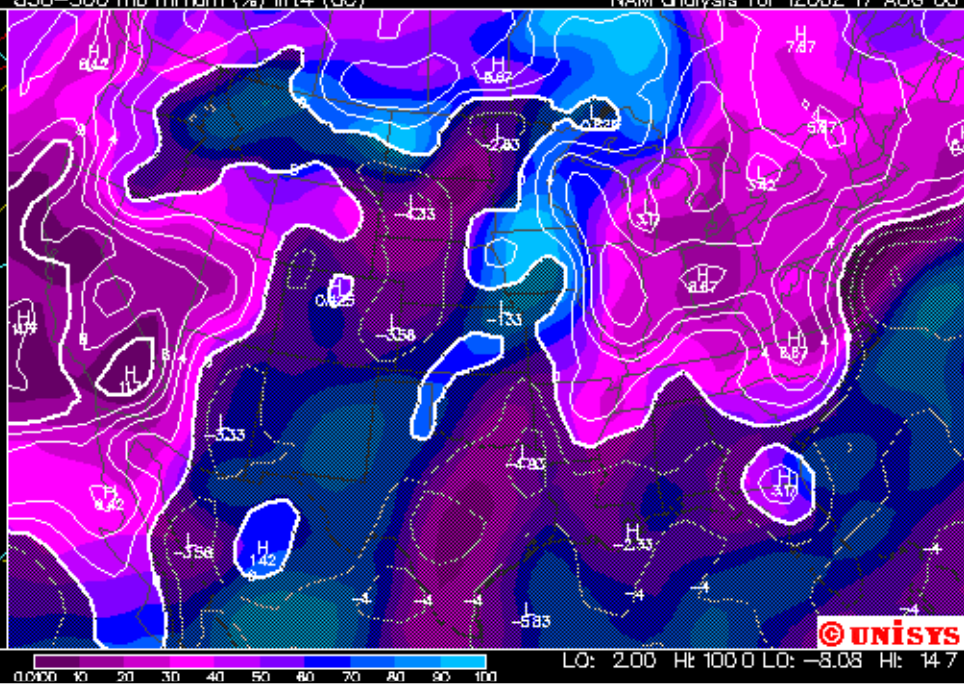
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 17 AUG 06



Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 17 AUG 06



850-500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 17 AUG 06



850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 18 AUG 06

0 4.0 8.0 12 16 20 24 28 32 MAX VECTOR: 22.9 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 18 AUG 06

0 10 20 30 40 50 60 70 80 90 100 110 MAX VECTOR: 53.1 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 18 AUG 06

.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 1000.1 HI: 1031.9 LO: 5454.6 HI: 5888.1

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 18 AUG 06

0.0000 10 20 30 40 50 60 70 80 90 100 LO: 2.67 HI: 98.7 LO: −9.16 HI: 13.8

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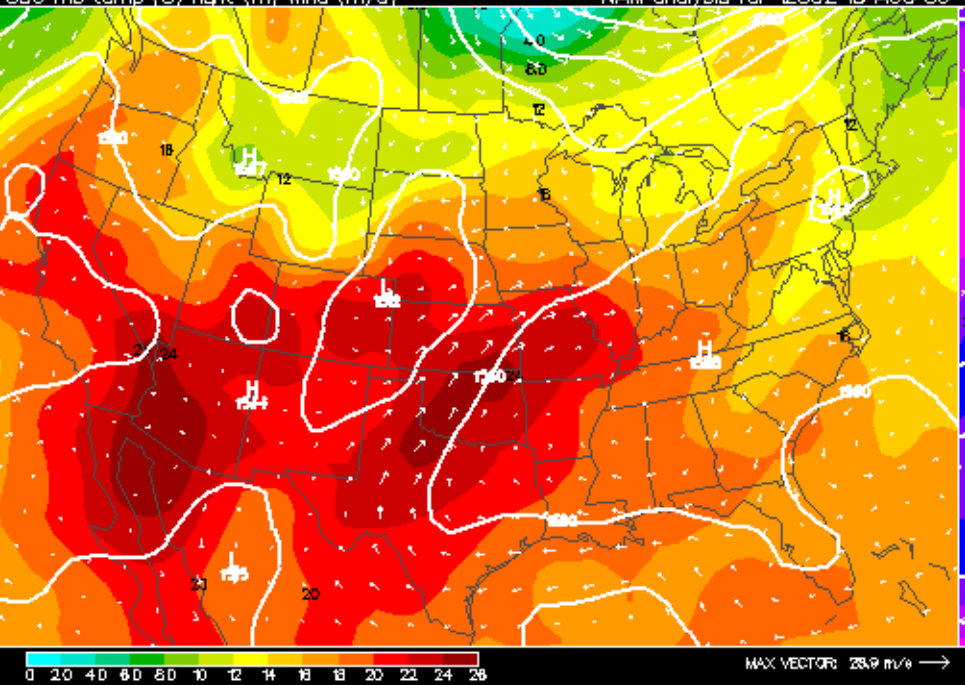
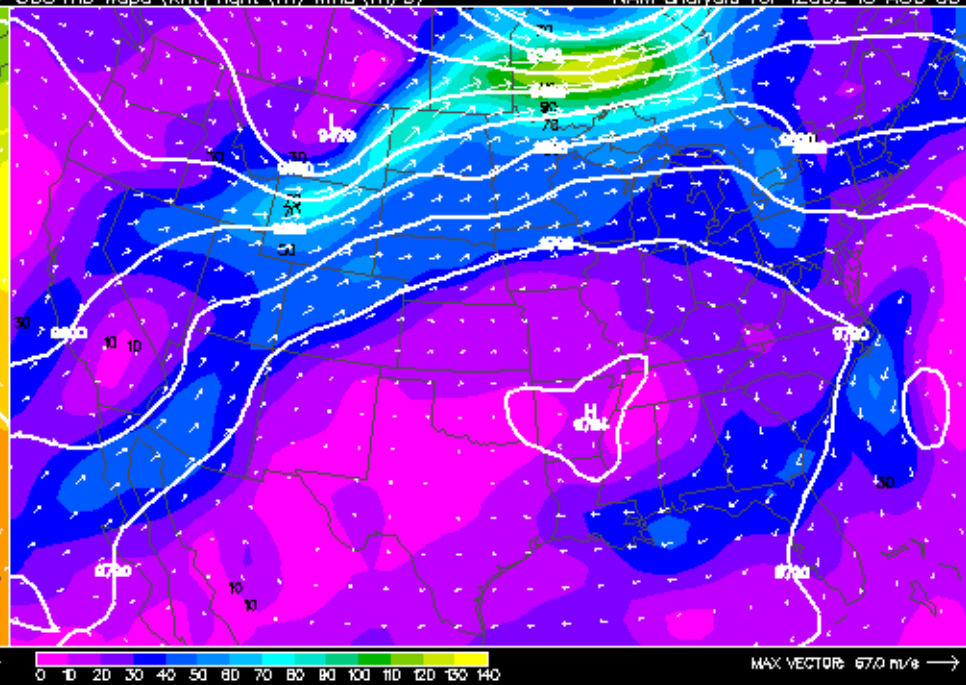
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 18 AUG 06



0 2.0 4.0 6.0 8.0 10 12 14 16 18 20 22 24 26

MAX VECTOR: 28.9 m/s

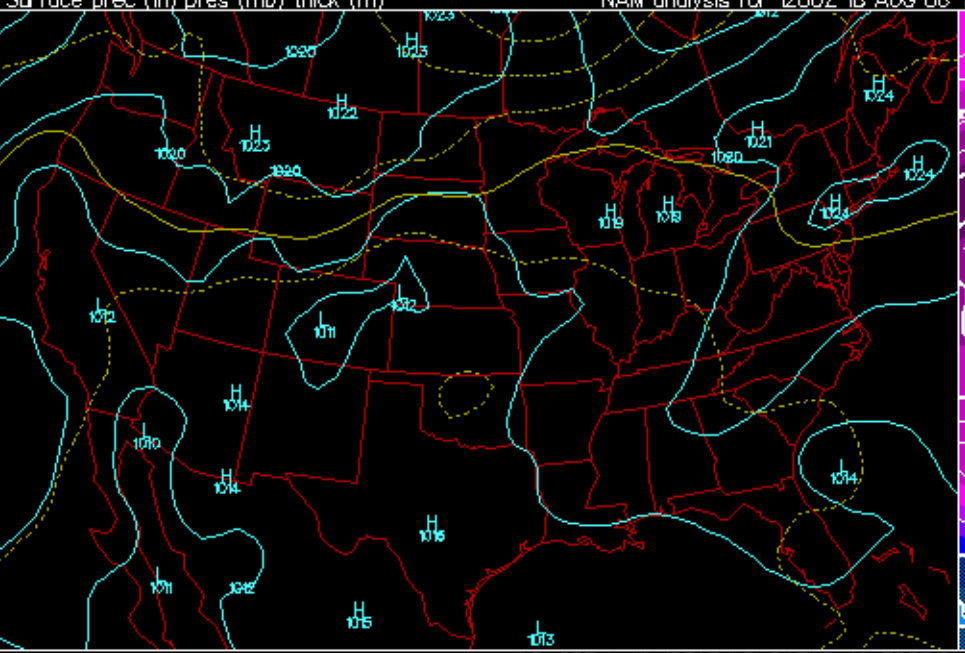
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 18 AUG 06



0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

MAX VECTOR: 67.0 m/s

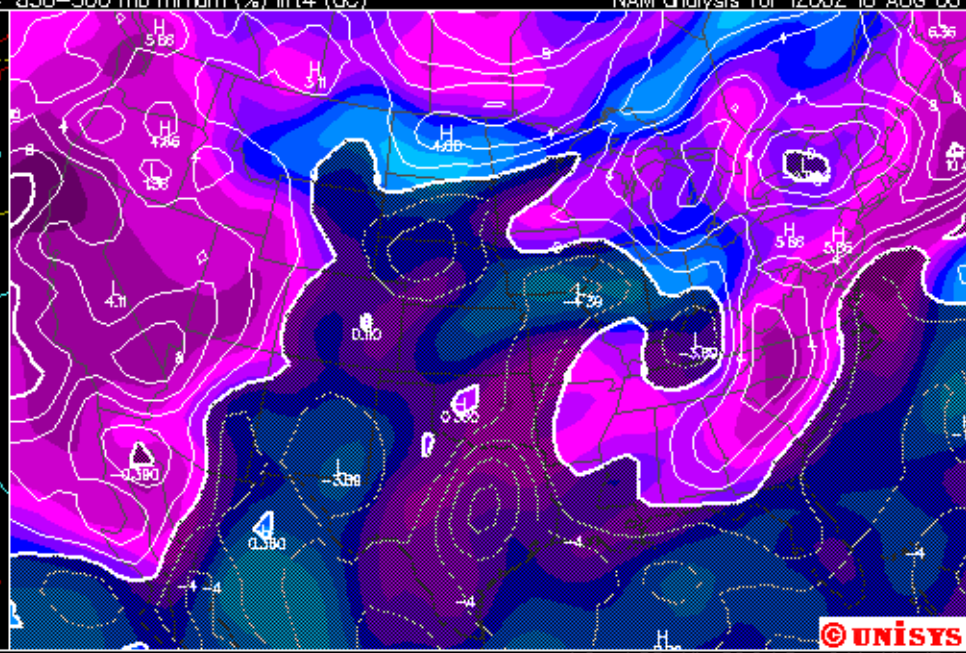
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 18 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4

LO: 998.4 HI: 1031.3 LO: 5431.6 HI: 5823.6

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 18 AUG 06



0.0100 10 20 30 40 50 60 70 80 90 100

LO: 4.55 HI: 99.9 LO: −9.14 HI: 15.4

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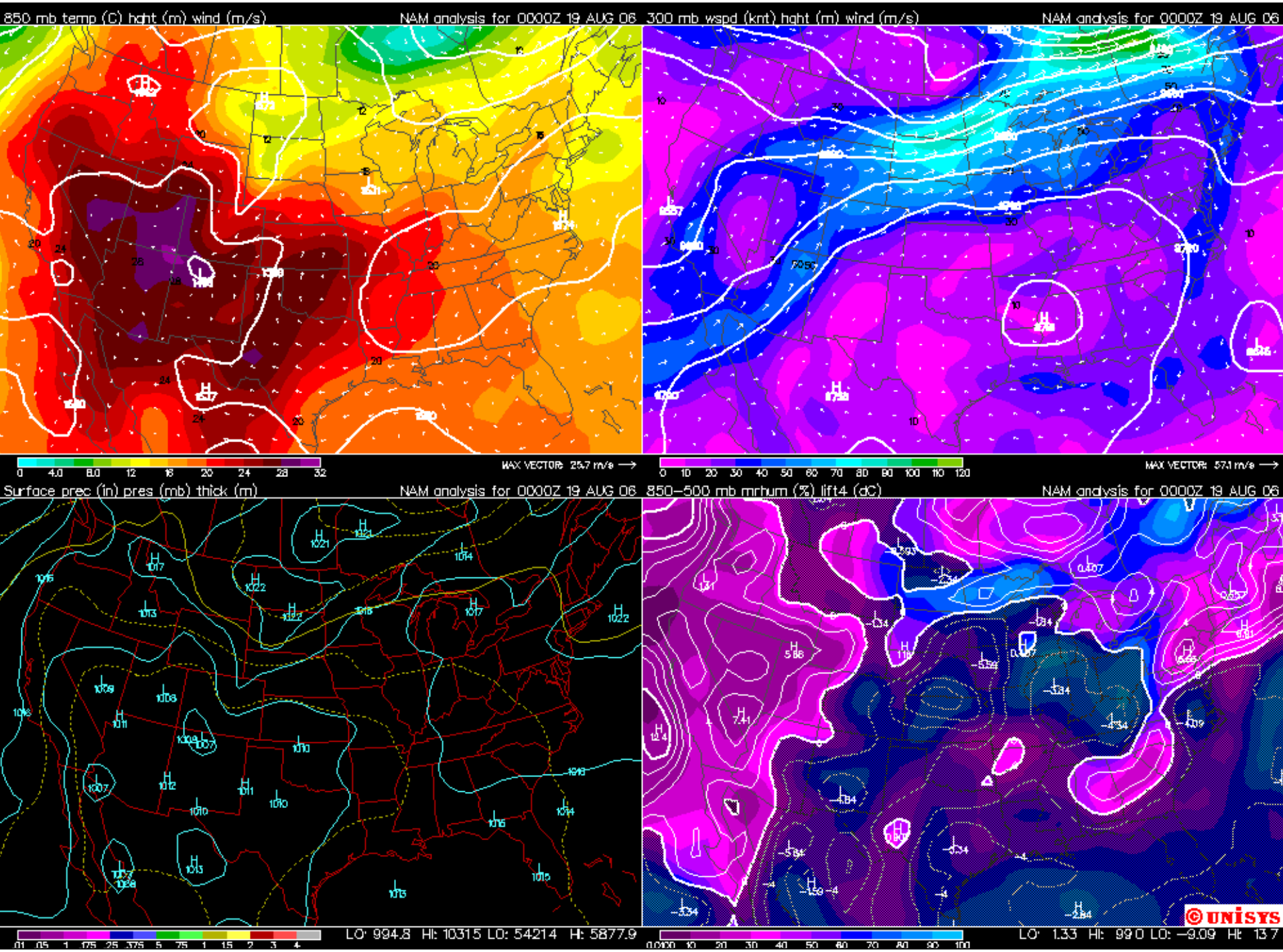
850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 19 AUG 06
MAX VECTOR: 25.7 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 19 AUG 06
MAX VECTOR: 57.1 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 19 AUG 06
LO: 994.8 HI: 1031.5 LO: 5421.4 HI: 5877.9
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 19 AUG 06
LO: 1.33 HI: 99.0 LO: -9.09 HI: 13.7
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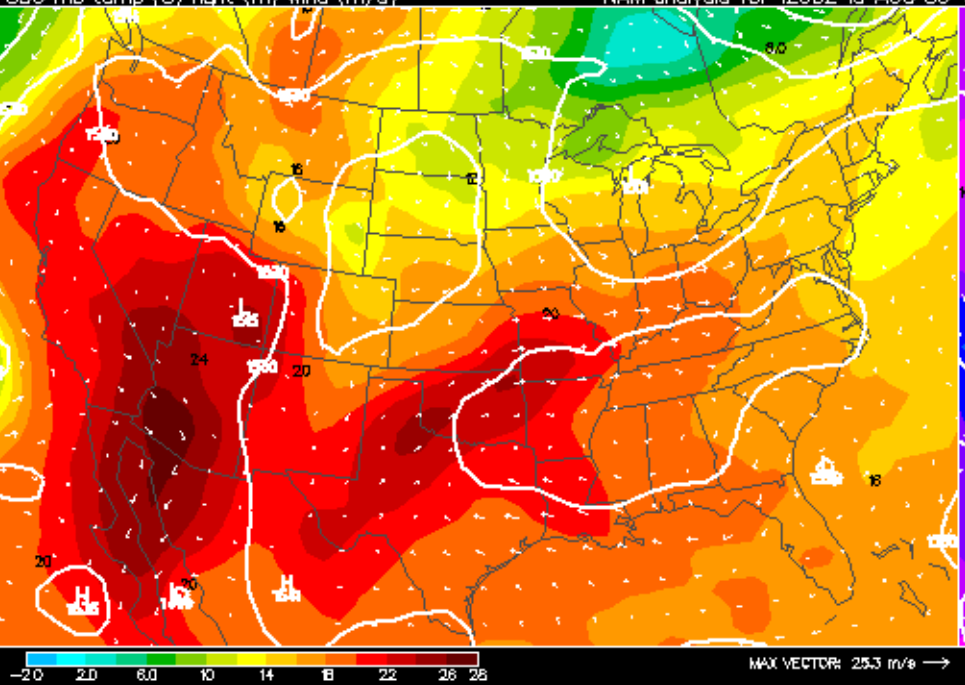
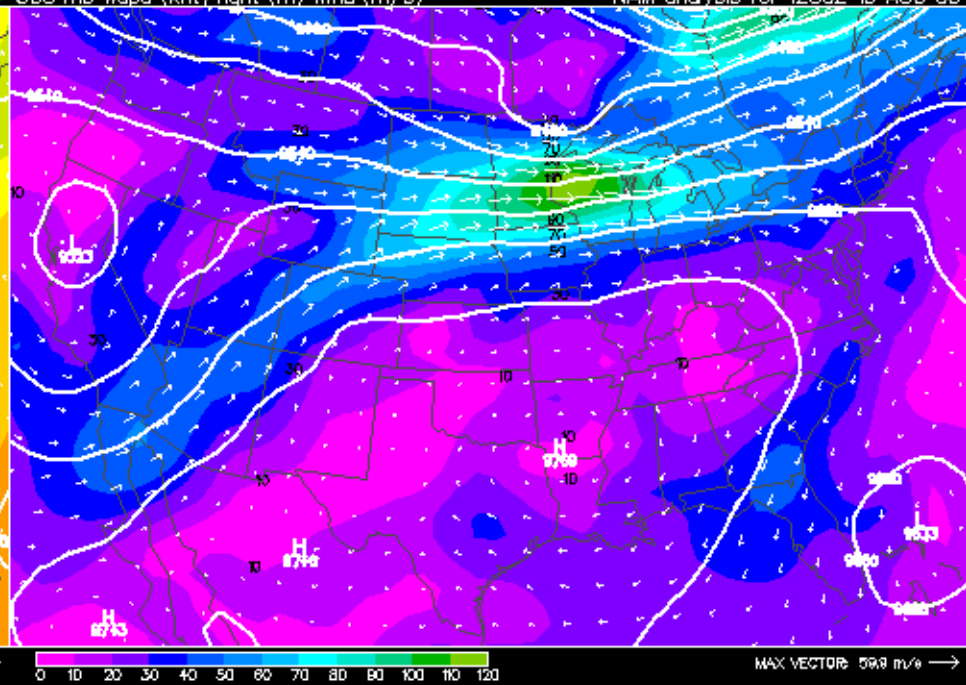
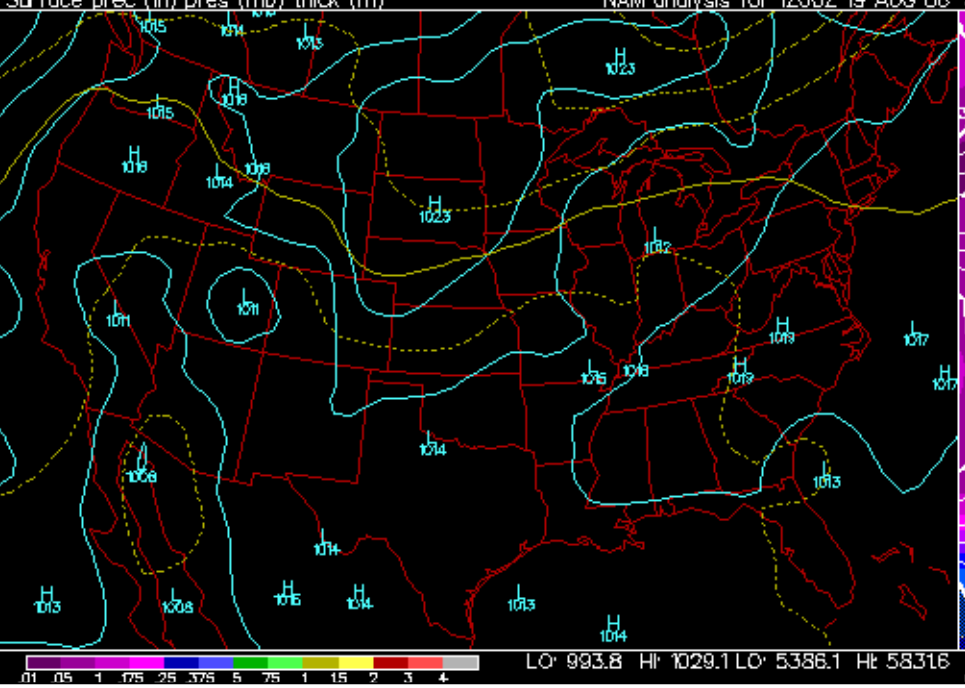
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 19 AUG 06



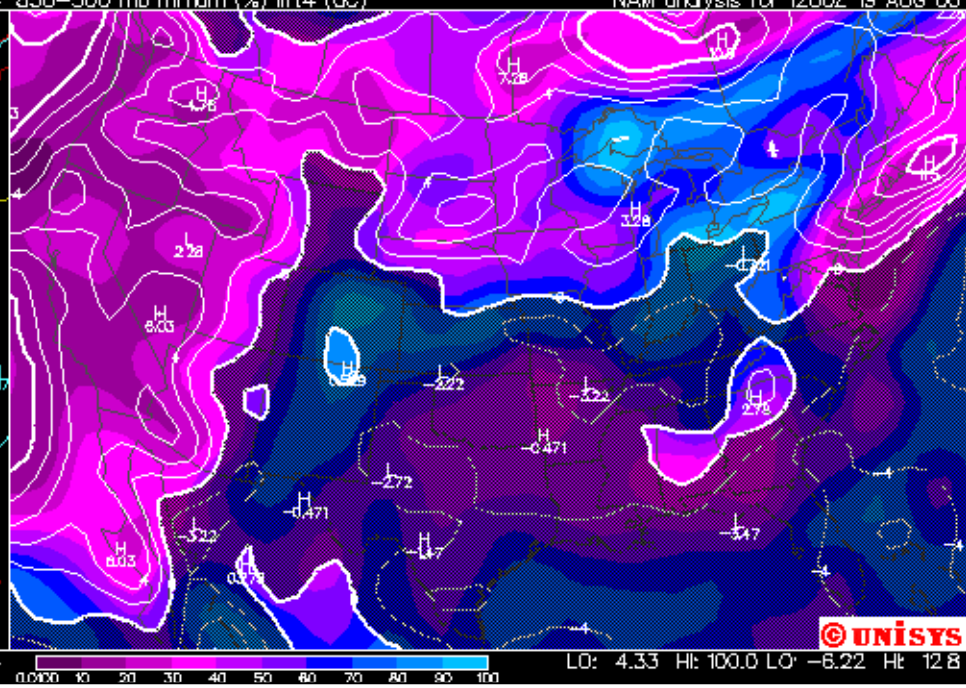
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 19 AUG 06



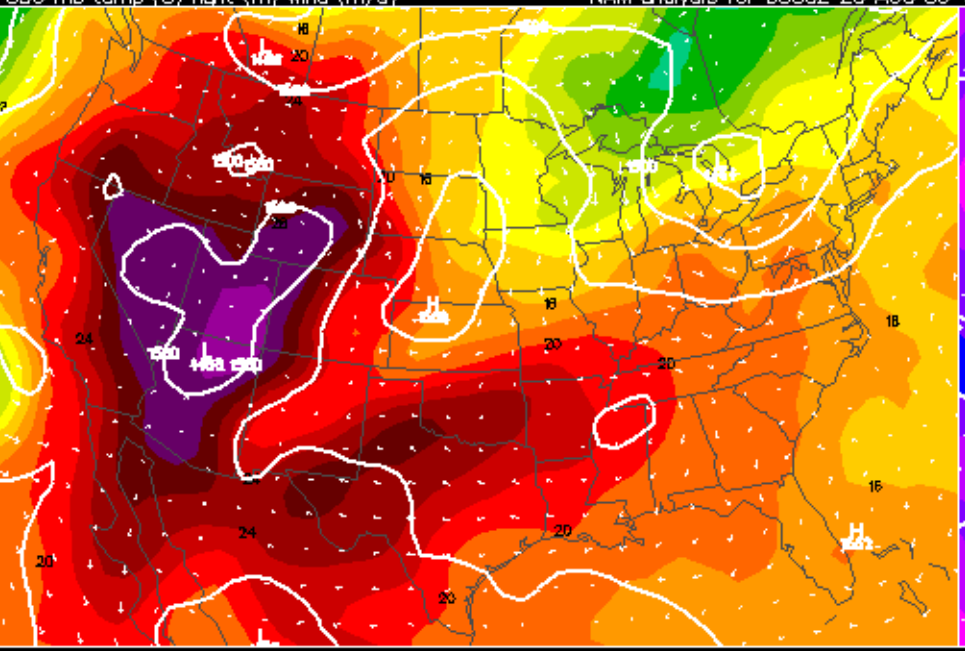
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 19 AUG 06



850-500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 19 AUG 06

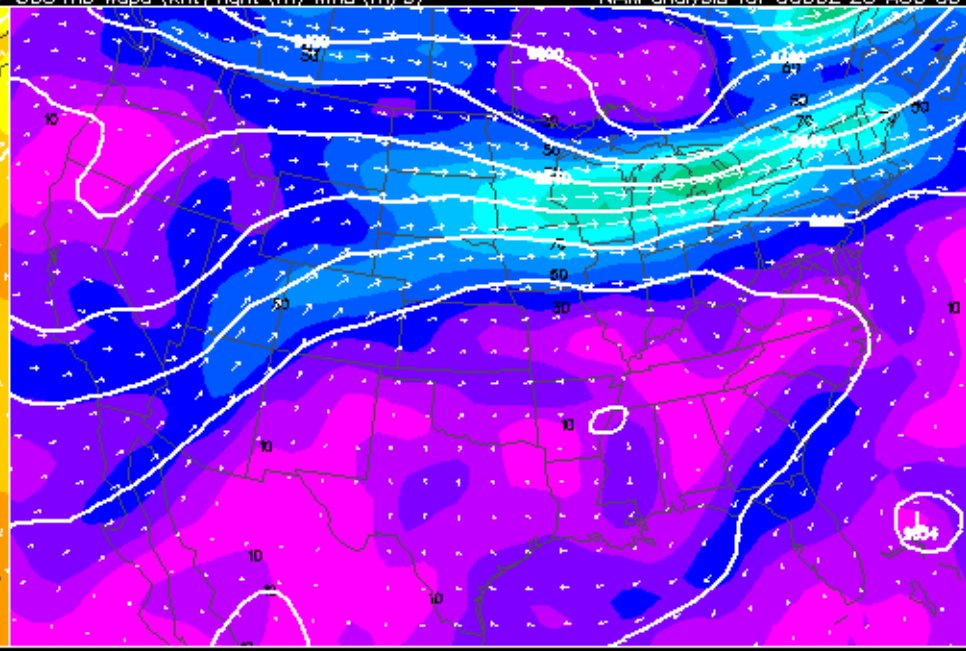


850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 20 AUG 06



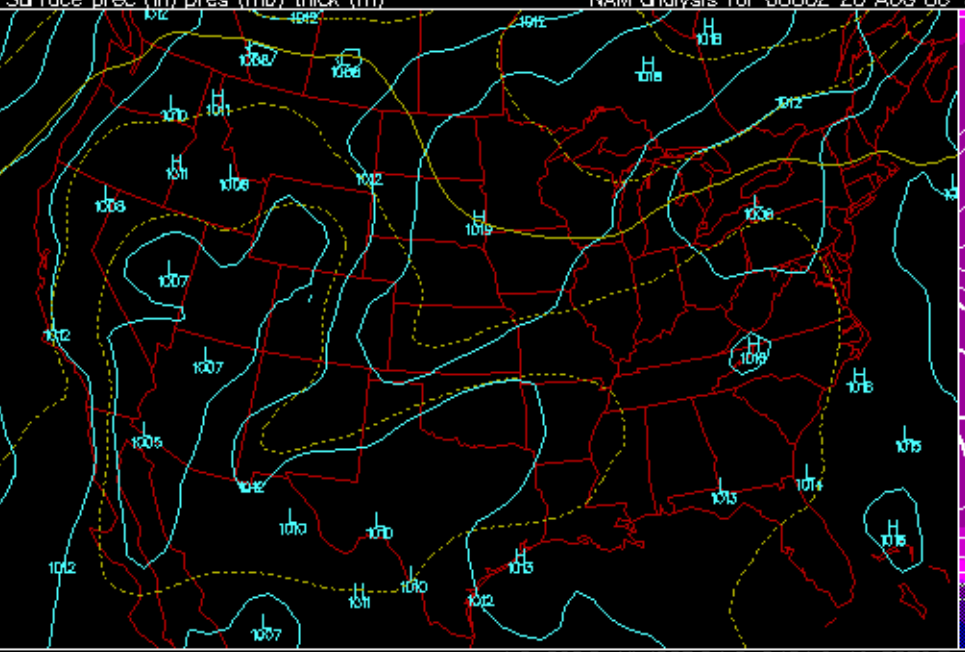
−20 2.0 8.0 10 14 16 22 28 30 32 MAX VECTOR: 22.5 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 20 AUG 06



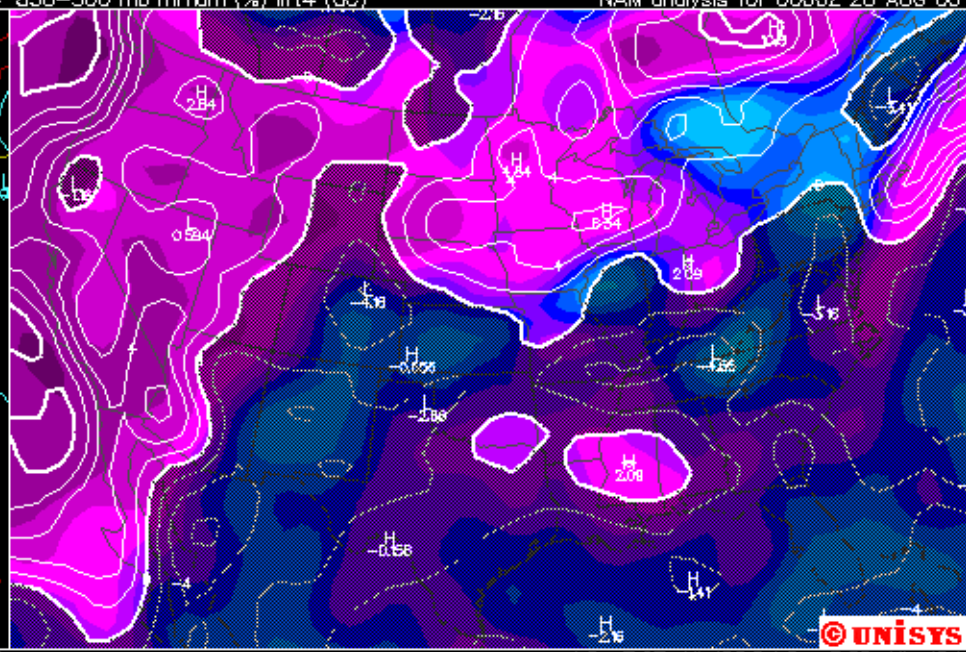
0 10 20 30 40 50 60 70 80 90 100 MAX VECTOR: 50.5 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 20 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 999.0 HI: 1028.2 LO: 5404.2 HI: 5879.7

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 20 AUG 06



0.0100 10 20 30 40 50 60 70 80 90 100 LO: 7.67 HI: 100.0 LO: −8.66 HI: 12.1

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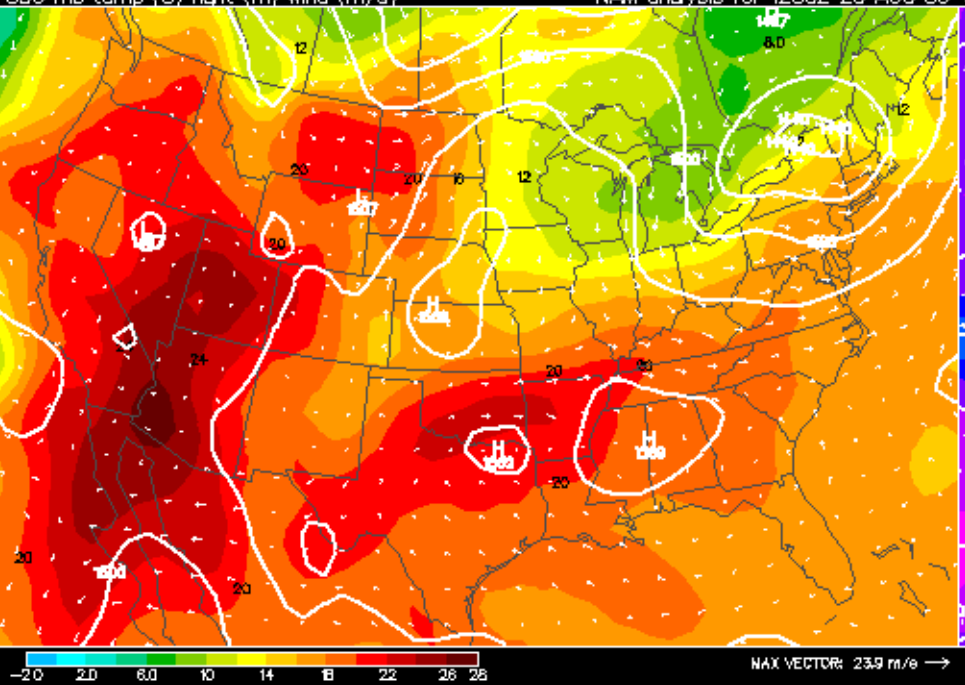
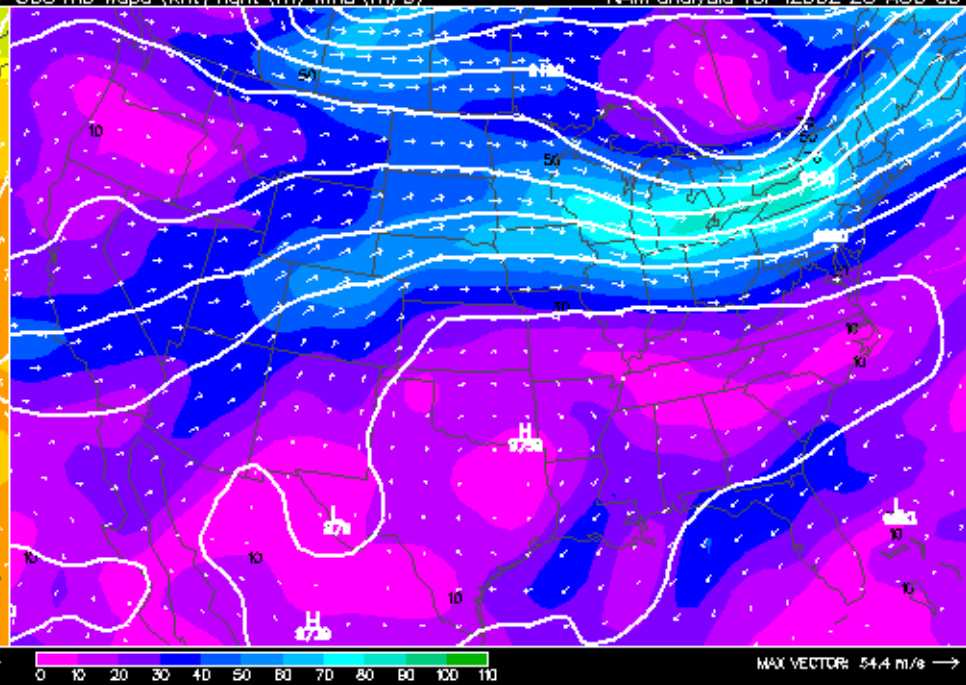
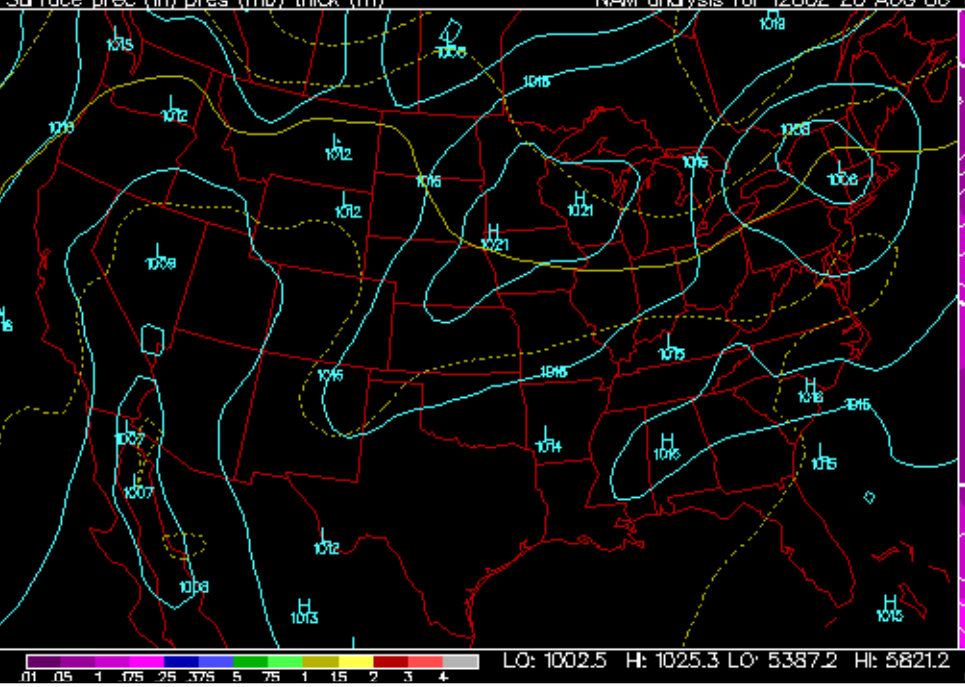
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 20 AUG 06



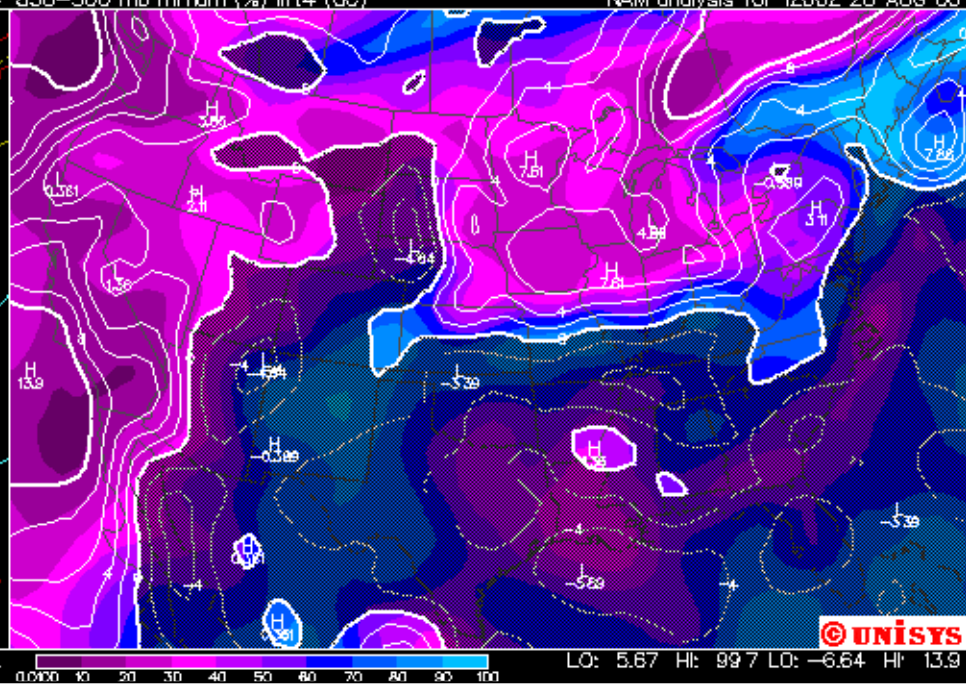
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 20 AUG 06



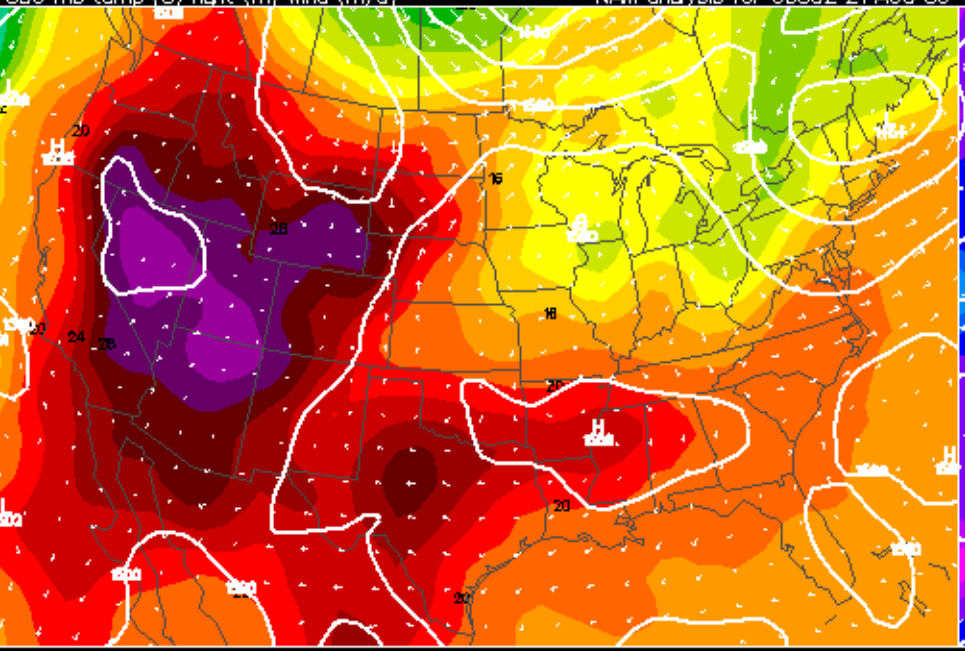
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 20 AUG 06



850-500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 20 AUG 06

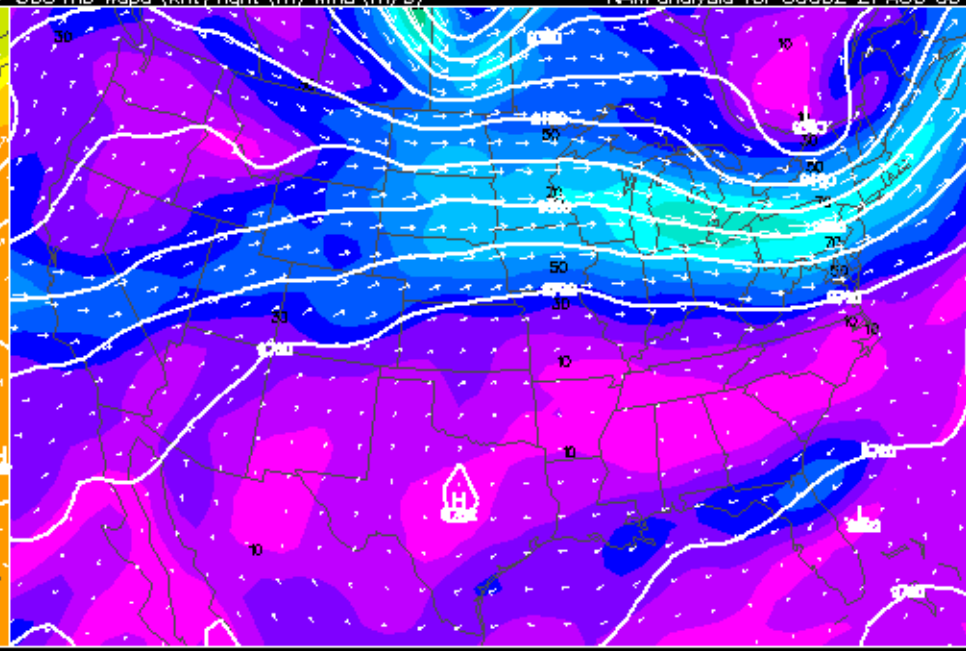


850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 21 AUG 06



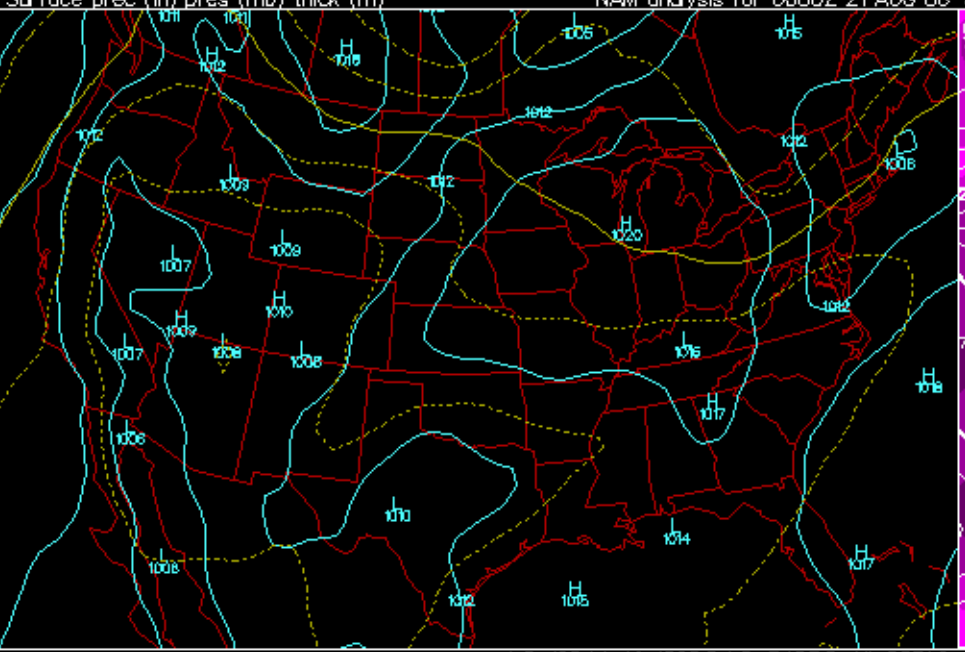
-20 -2.0 8.0 10 14 16 22 28 30 32 MAX VECTOR: 24.1 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 21 AUG 06



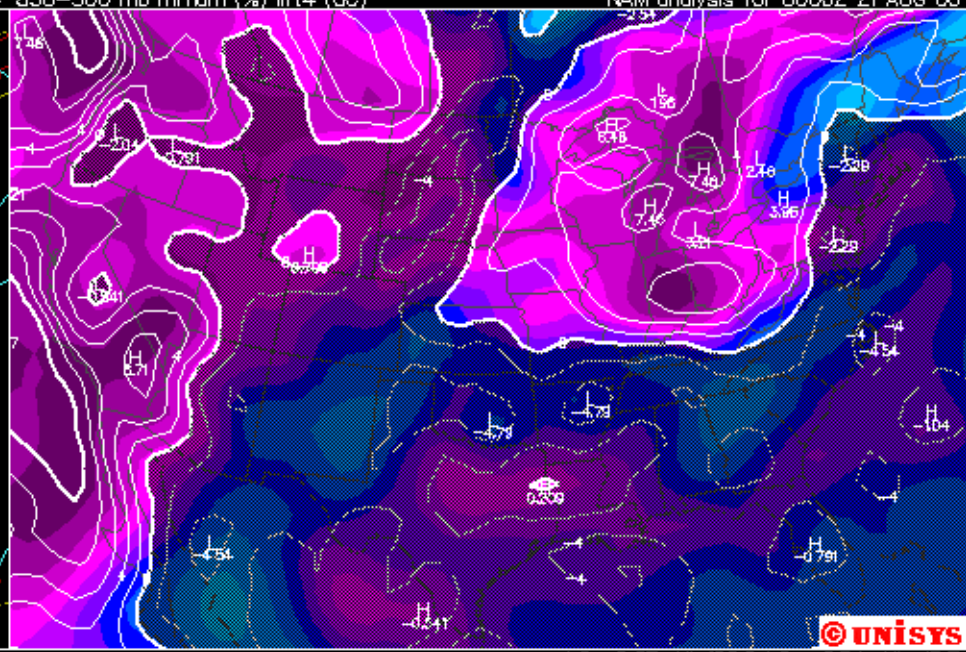
0 10 20 30 40 50 60 70 80 90 100 MAX VECTOR: 47.9 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 21 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 1004.1 HI: 1026.0 LO: 5403.0 HI: 5881.0

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 21 AUG 06



0.0100 10 20 30 40 50 60 70 80 90 100 LO: 2.67 HI: 100.0 LO: -6.54 HI: 13.7

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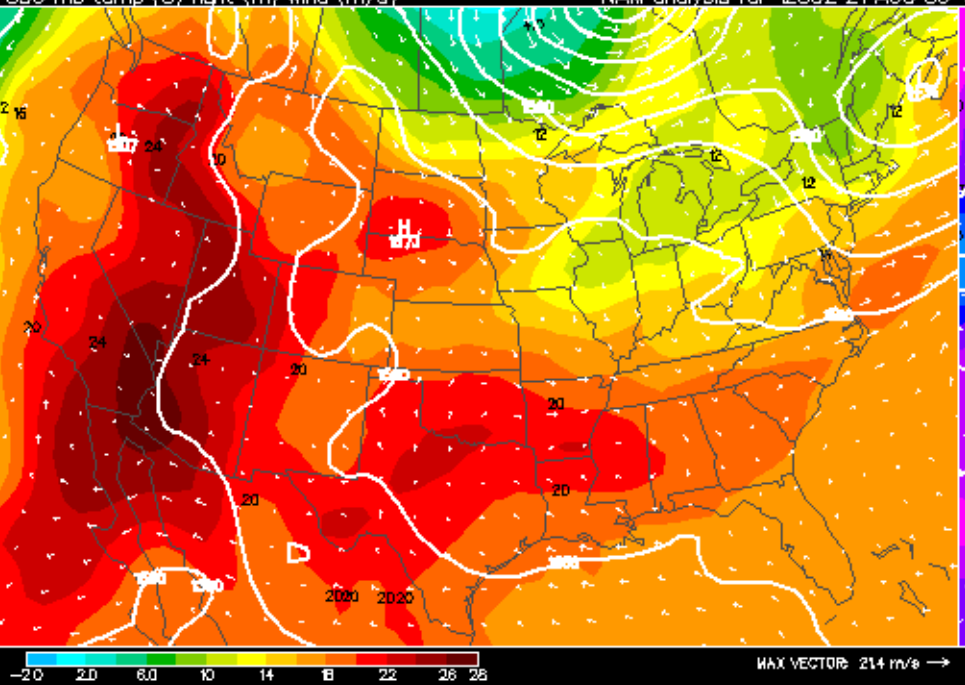
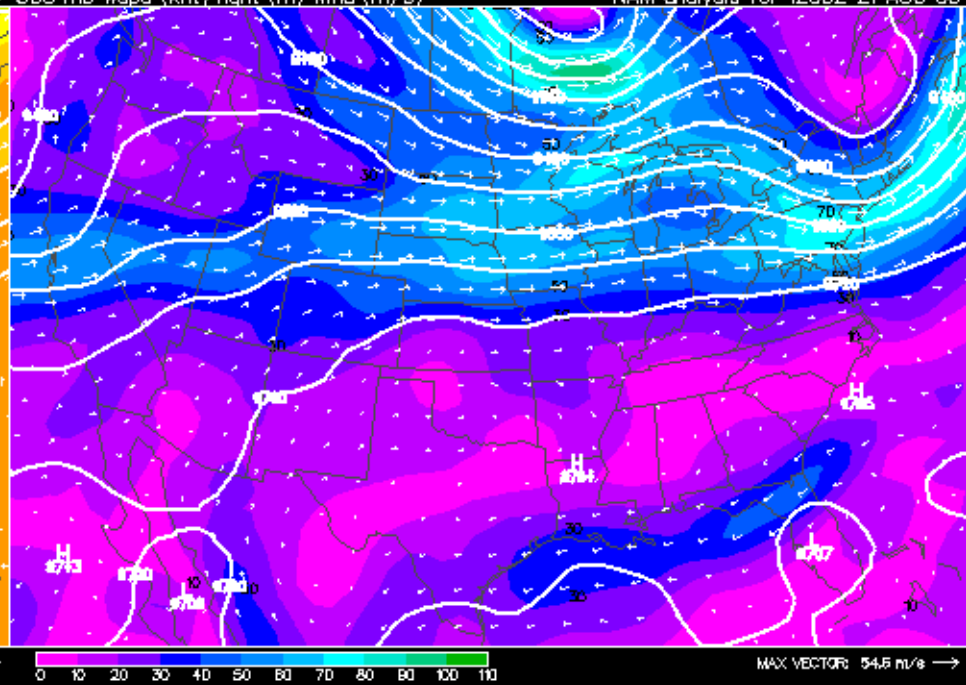
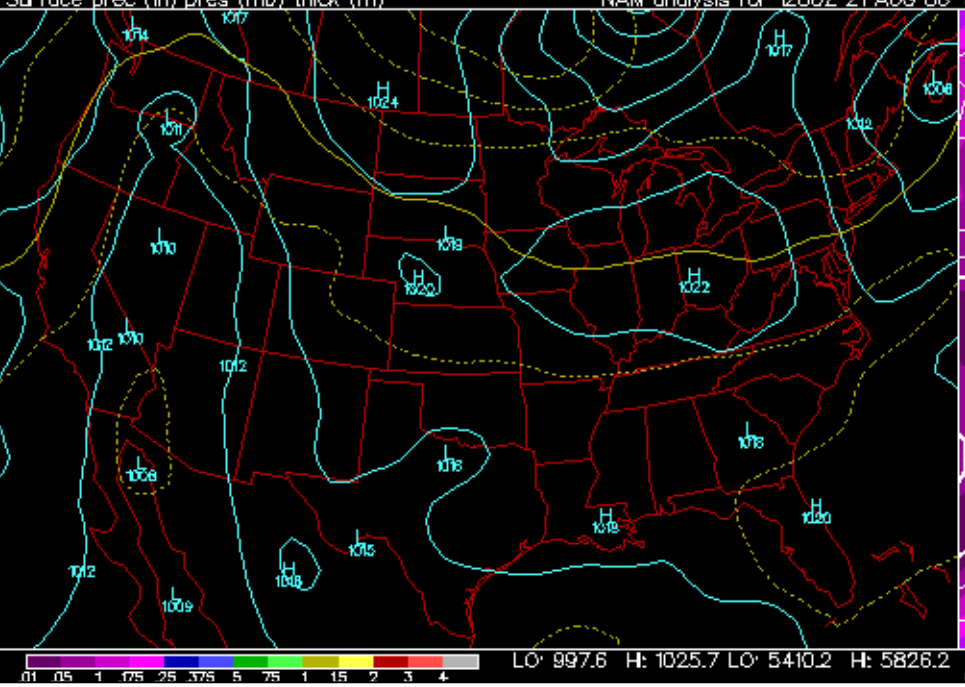
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 21 AUG 06



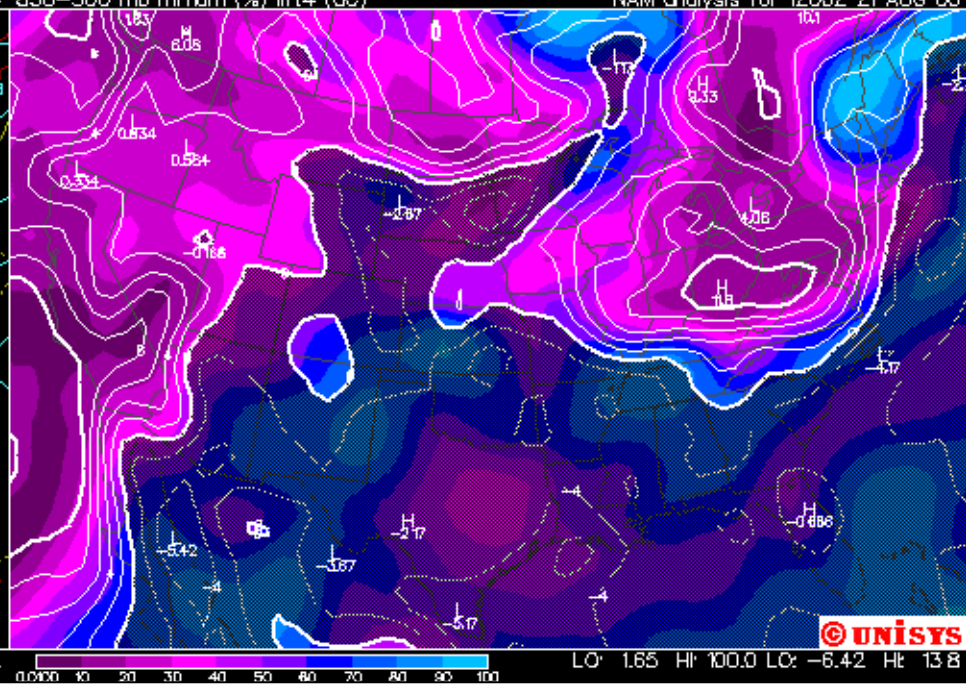
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 21 AUG 06



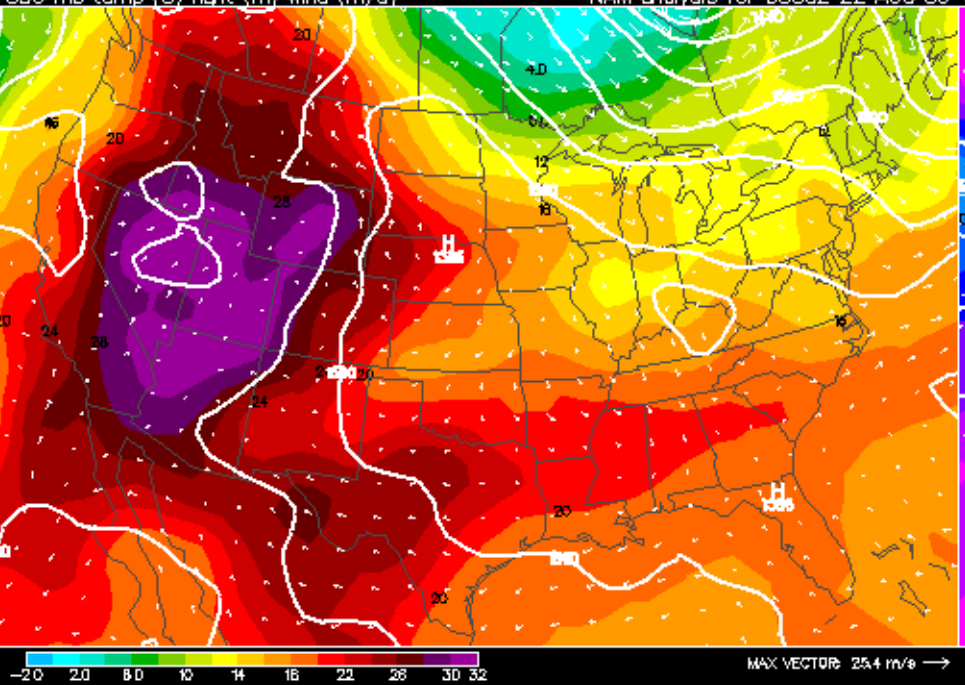
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 21 AUG 06



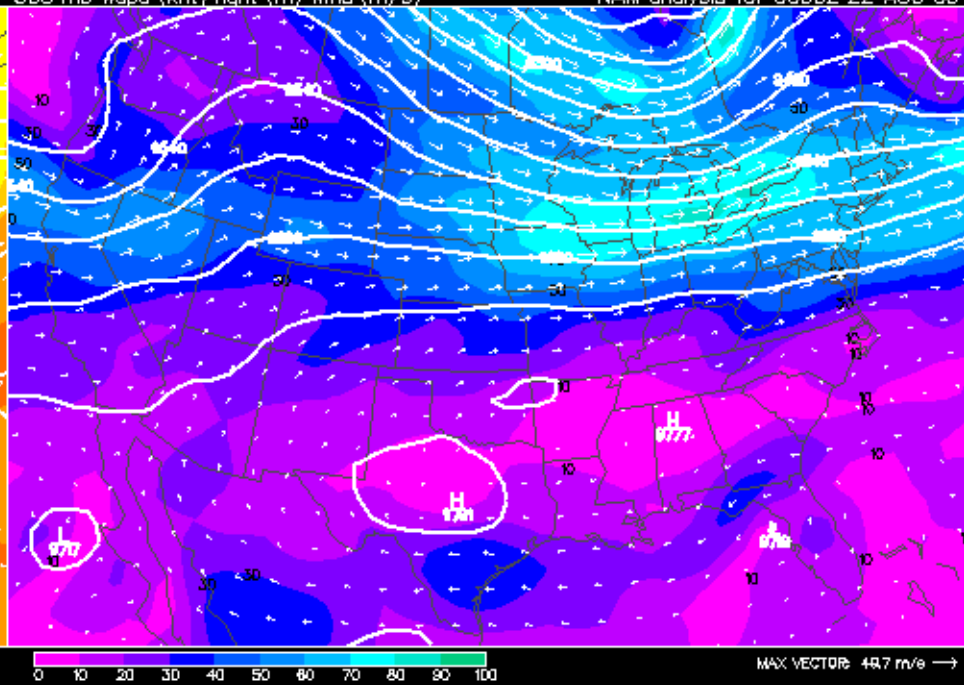
850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 21 AUG 06



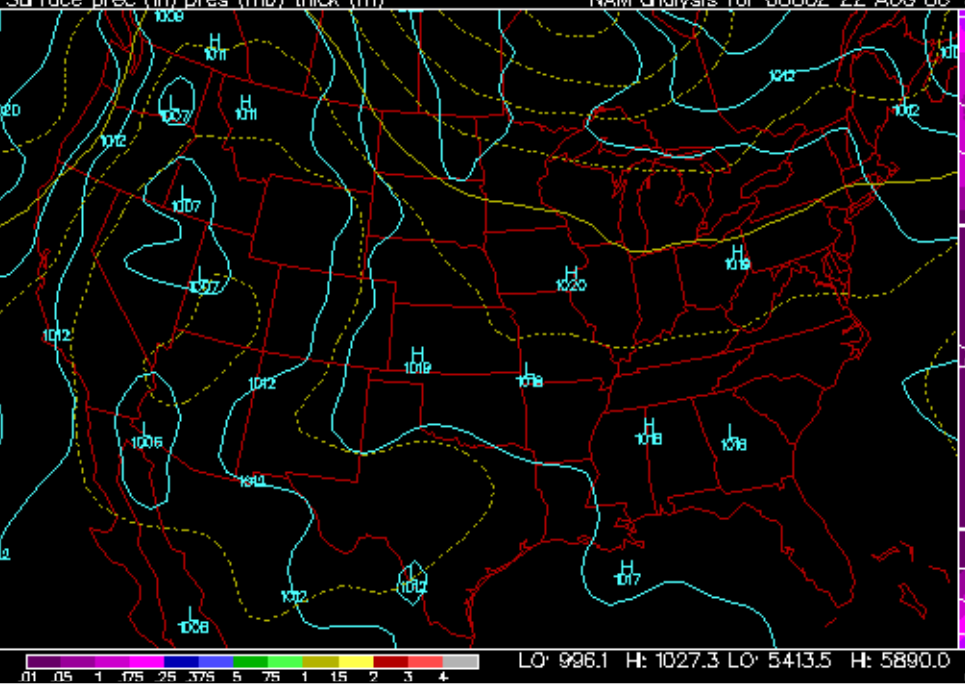
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 22 AUG 06



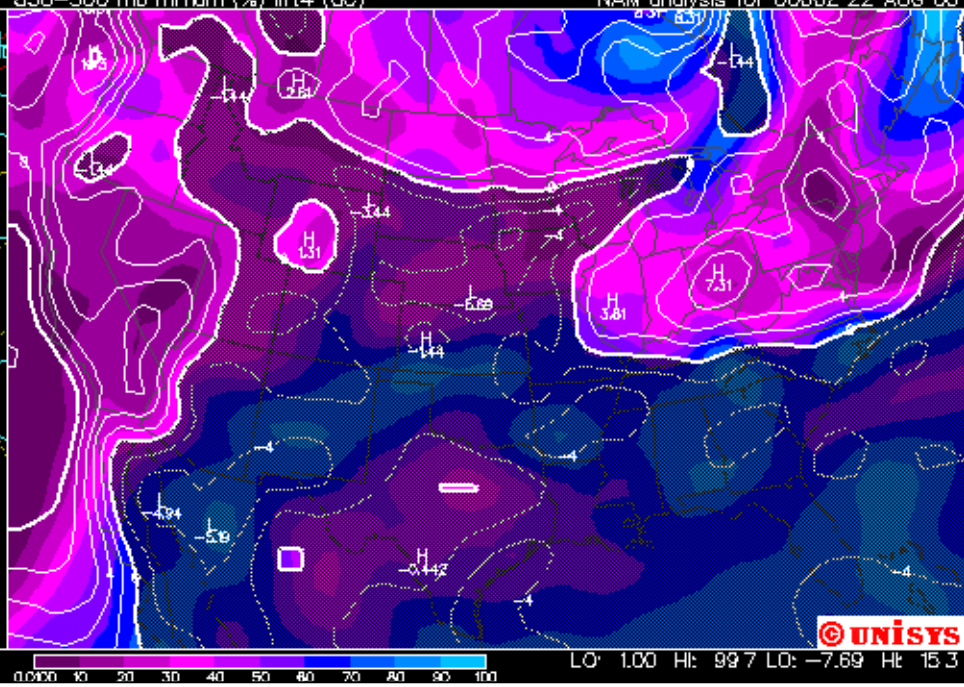
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 22 AUG 06



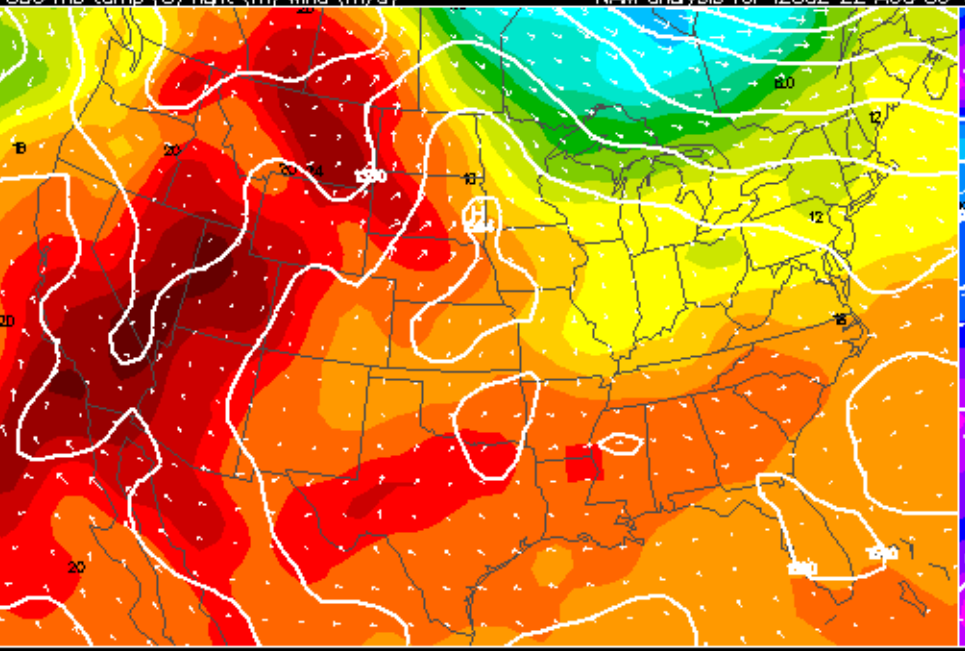
Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 22 AUG 06



850-500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 22 AUG 06

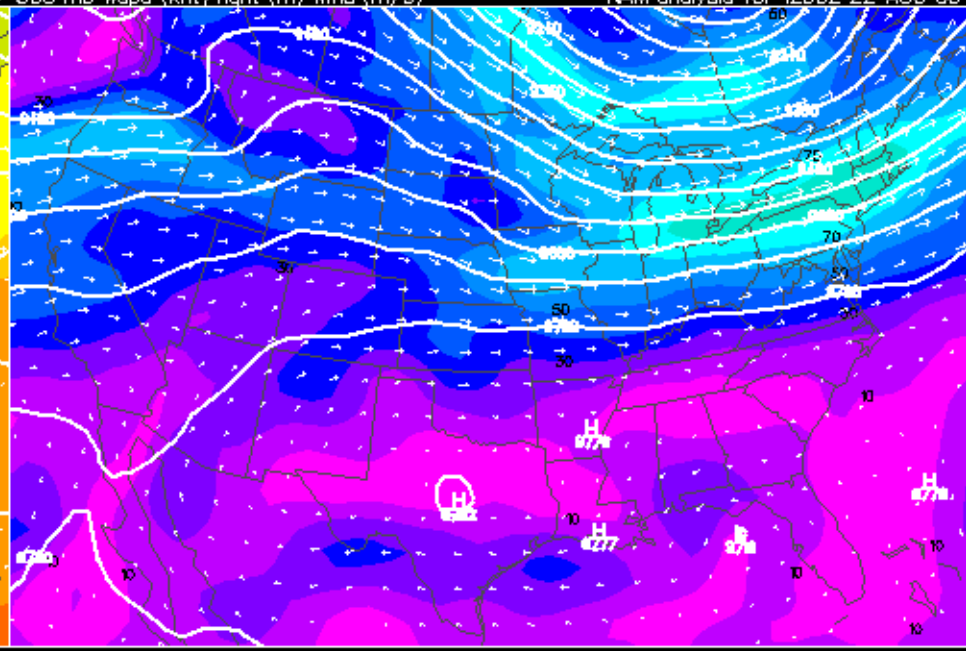


850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 22 AUG 06



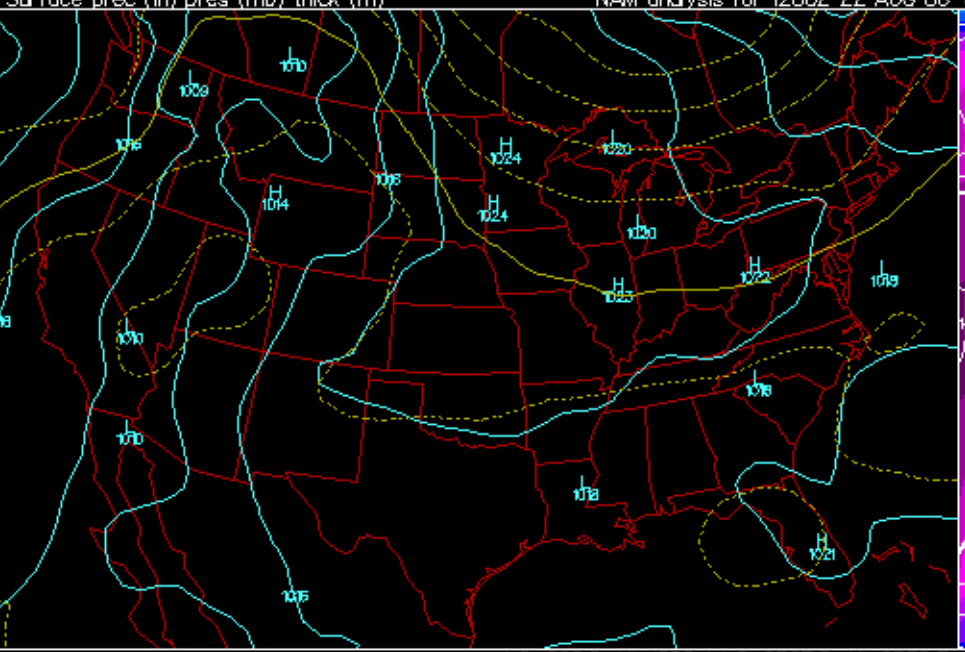
-20 -2.0 6.0 10 14 18 22 26 28 MAX VECTOR: 23.0 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 22 AUG 06



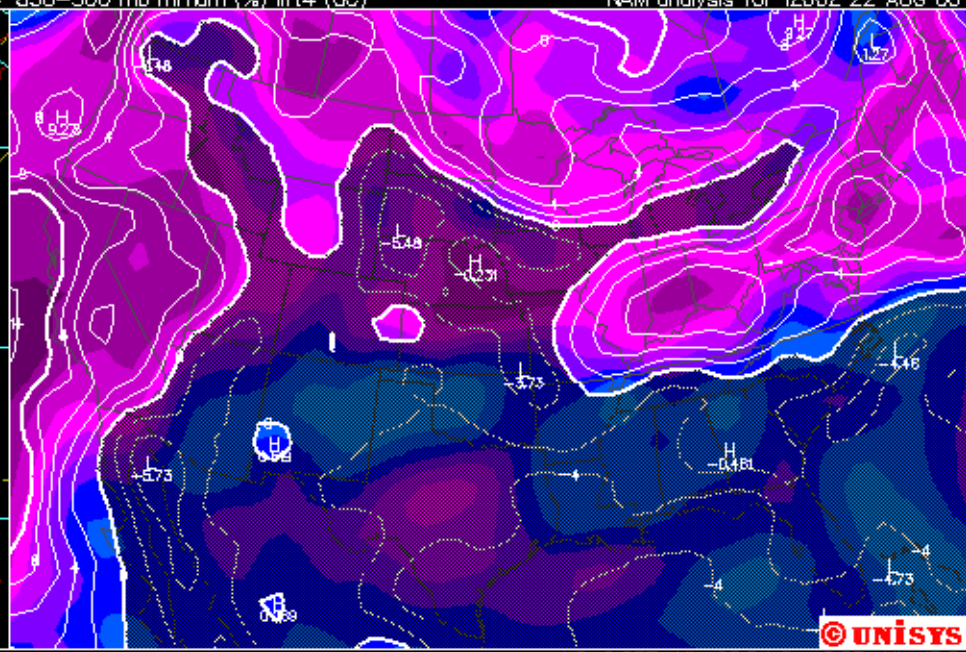
0 10 20 30 40 50 60 70 80 90 MAX VECTOR: 45.3 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 22 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4 LO: 995.0 HI: 1028.4 LO: 5397.8 HI: 5832.3

850-500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 22 AUG 06



0.0100 10 20 30 40 50 60 70 80 90 100 LO: 0.587 HI: 99.6 LO: -6.23 HI: 15.8

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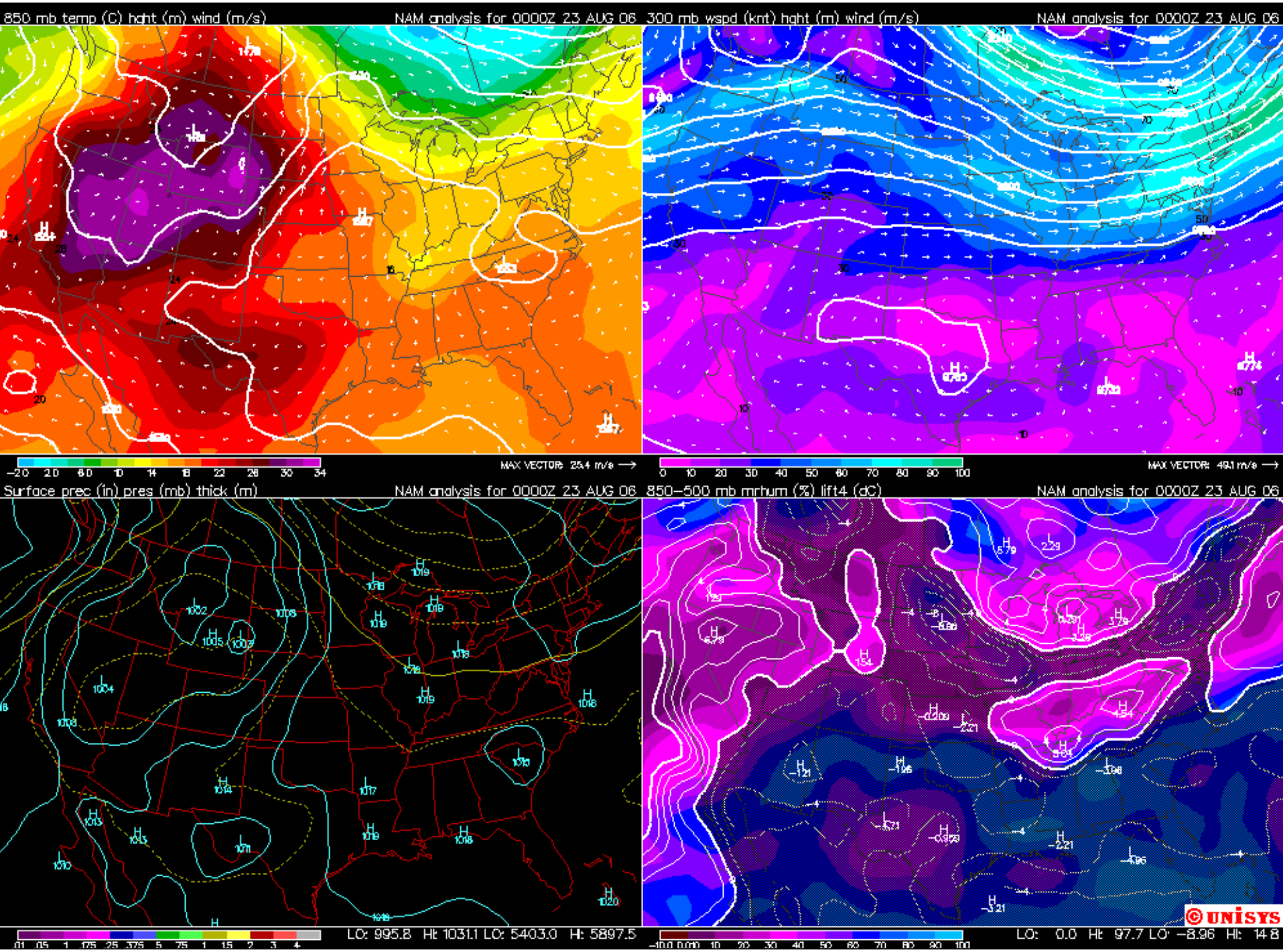
850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 23 AUG 06
MAX VECTOR: 25.4 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 23 AUG 06
MAX VECTOR: 49.1 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 23 AUG 06
LO: 995.8 HI: 1031.1 LO: 5403.0 HI: 5897.5
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 23 AUG 06
LO: 0.0 HI: 97.7 LO: -8.96 HI: 14.8
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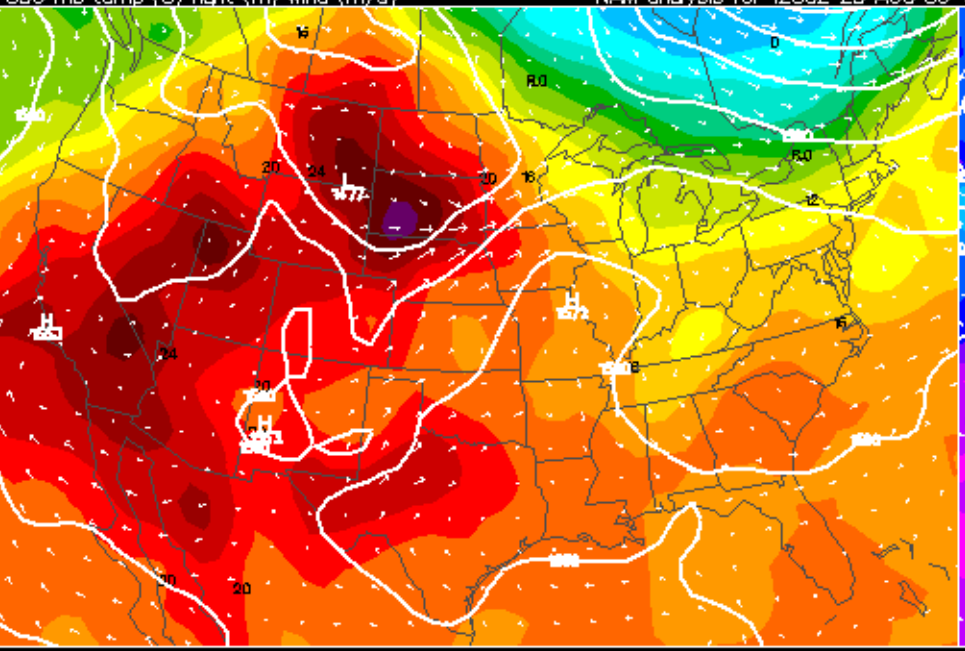
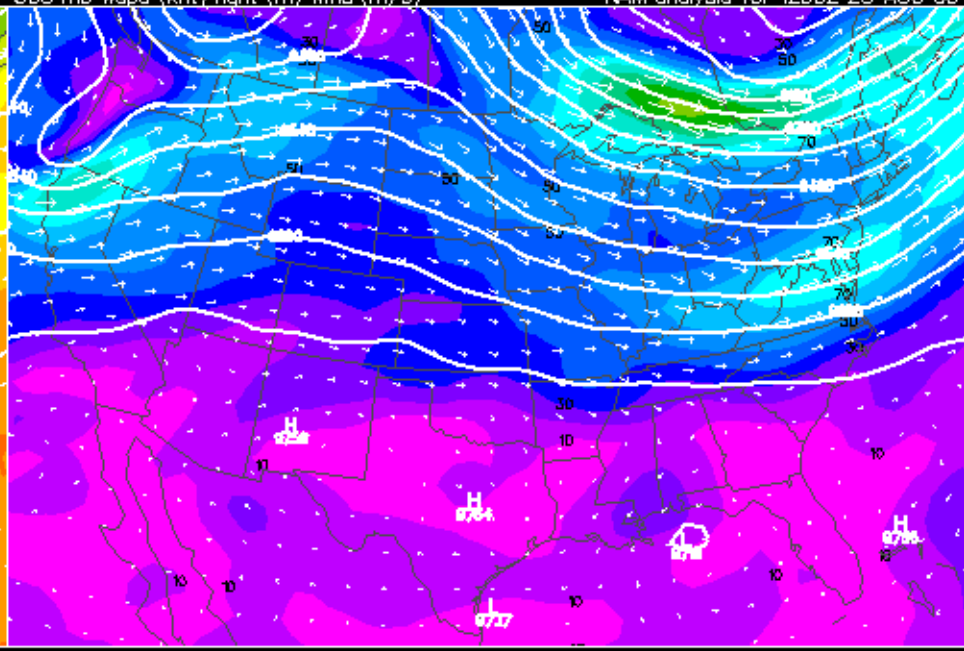
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 23 AUG 06



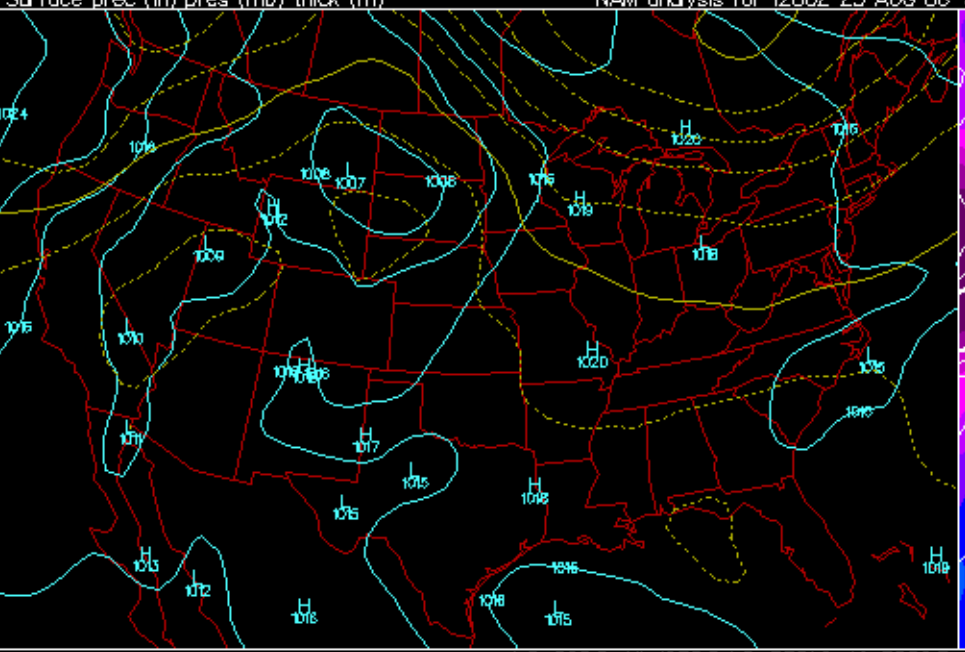
MAX VECTOR: 25.3 m/s

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 23 AUG 06



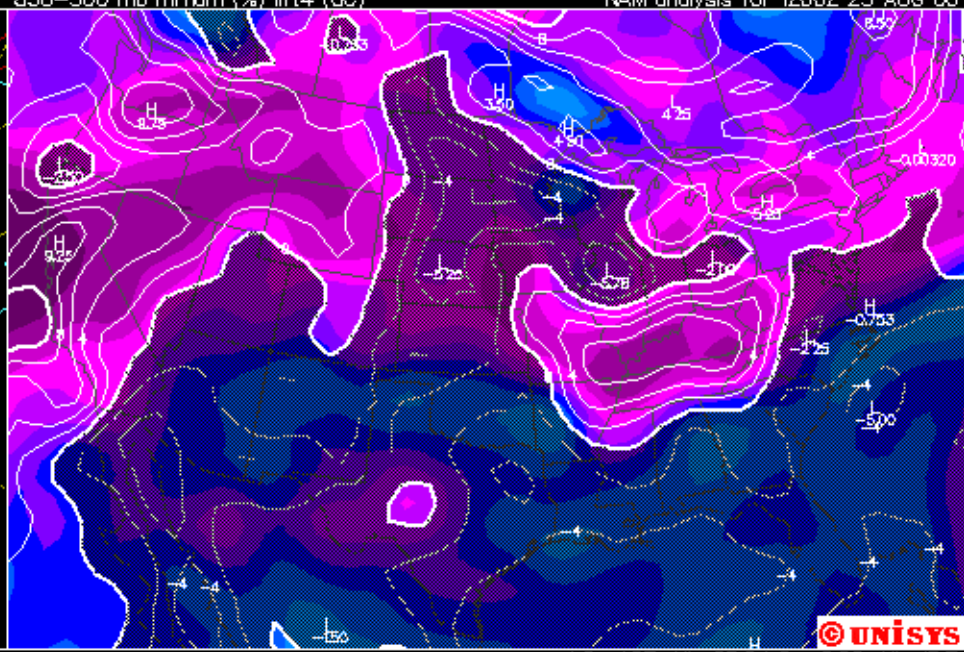
MAX VECTOR: 58.5 m/s

Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 23 AUG 06



LO: 995.0 HI: 1032.2 LO: 5391.0 HI: 5839.5

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 23 AUG 06



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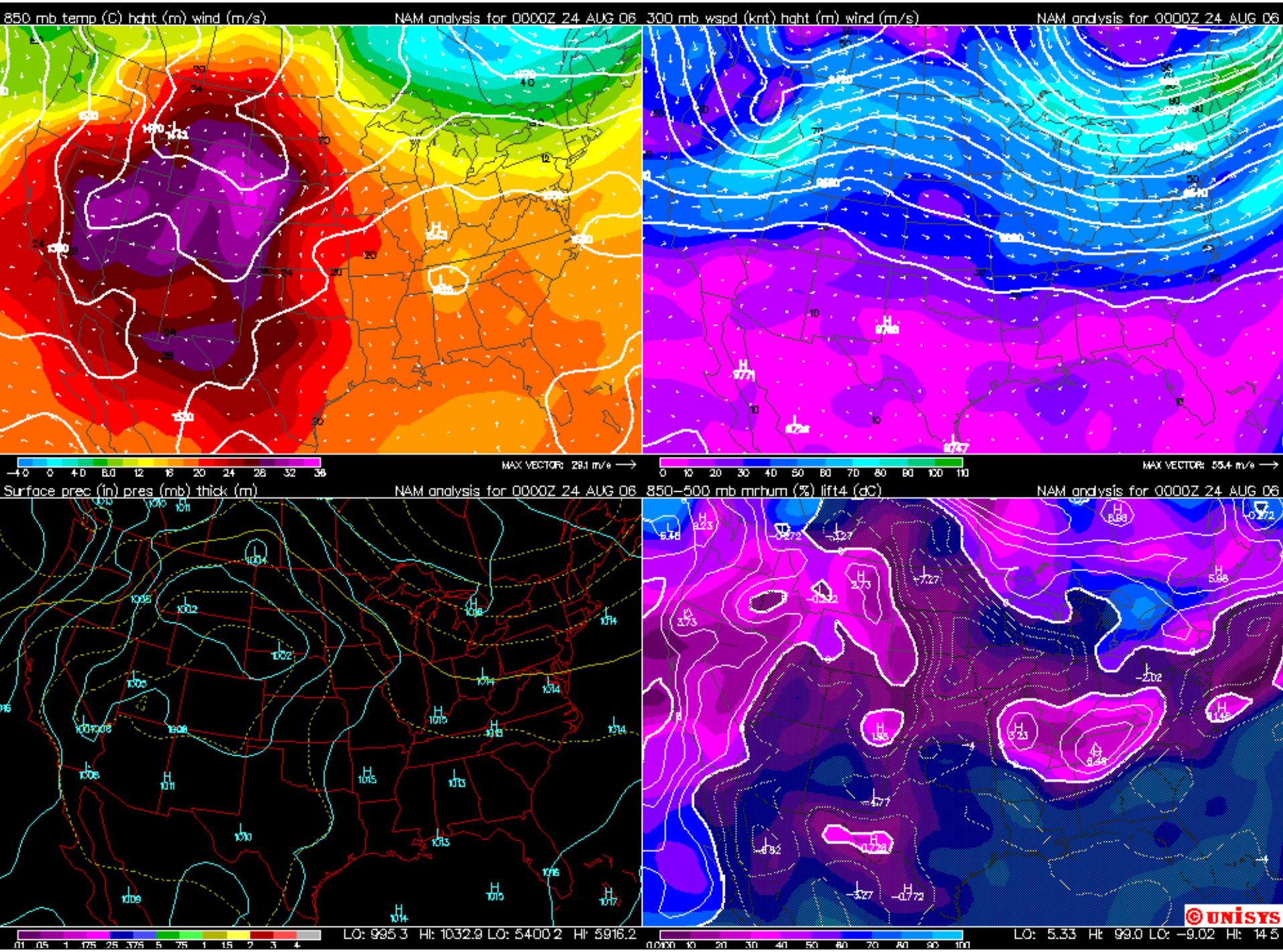
LO: 16.7 HI: 98.0 LO: -6.50 HI: 15.7


850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 24 AUG 06
MAX VECTOR: 29.1 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 24 AUG 06
MAX VECTOR: 55.4 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 24 AUG 06
LO: 995.3 HI: 1032.9 LO: 5400.2 HI: 5916.2
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 24 AUG 06
LO: 5.33 HI: 99.0 LO: -9.02 HI: 14.5
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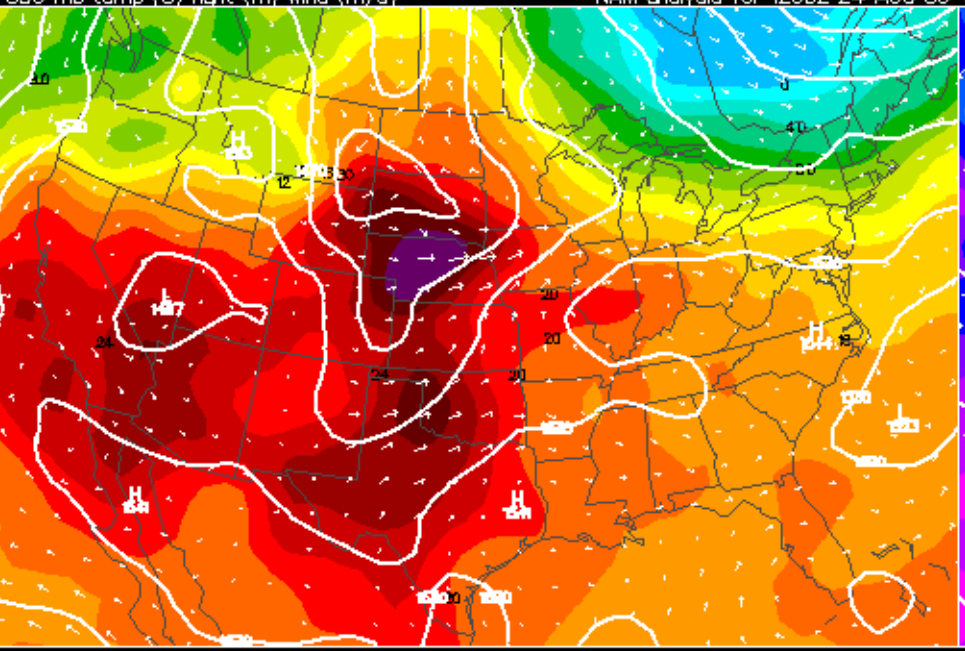
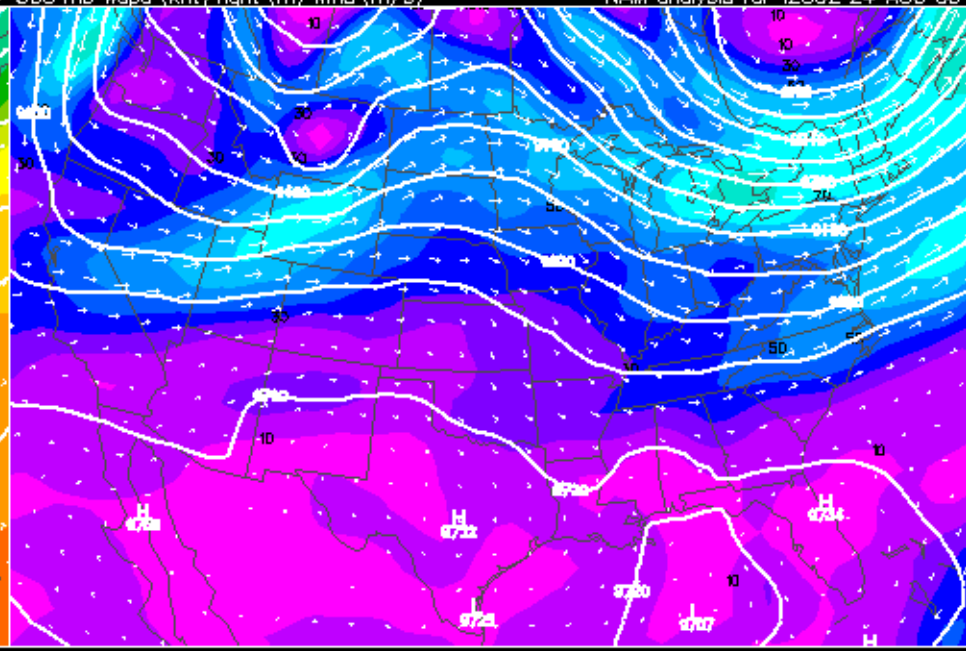
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 24 AUG 06



-6.0 -2.0 2.0 6.0 10 14 18 22 26 30

MAX VECTOR: 27.4 m/s

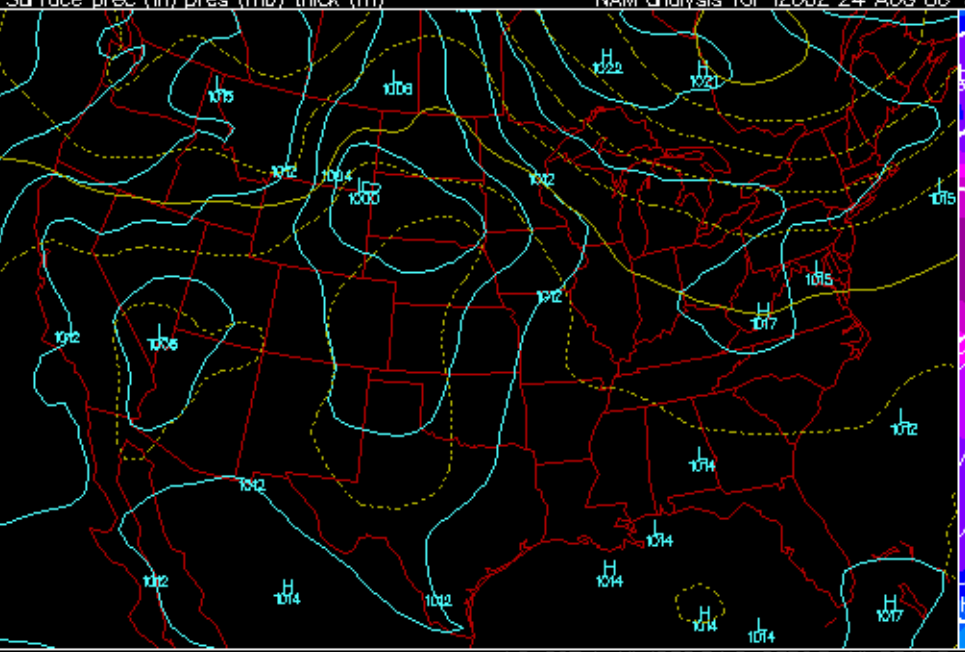
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 24 AUG 06



0 10 20 30 40 50 60 70 80 90 100 110 120

MAX VECTOR: 57.1 m/s

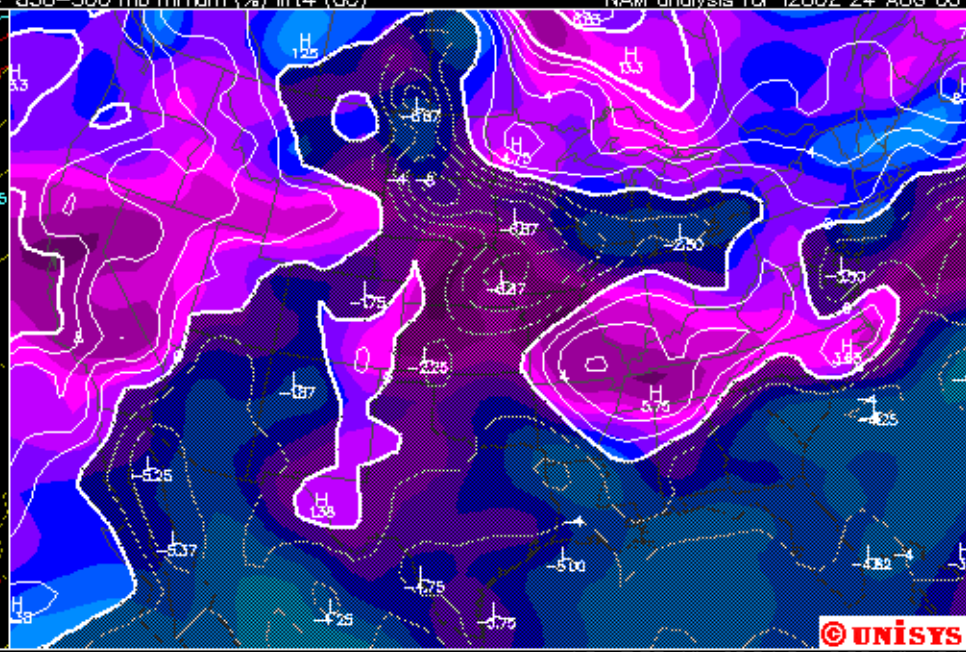
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 24 AUG 06



.01 .05 .1 .175 .25 .375 .5 .75 1 1.5 2 3 4

LO: 997.4 HI: 1032.3 LO: 5382.3 HI: 5843.3

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 24 AUG 06



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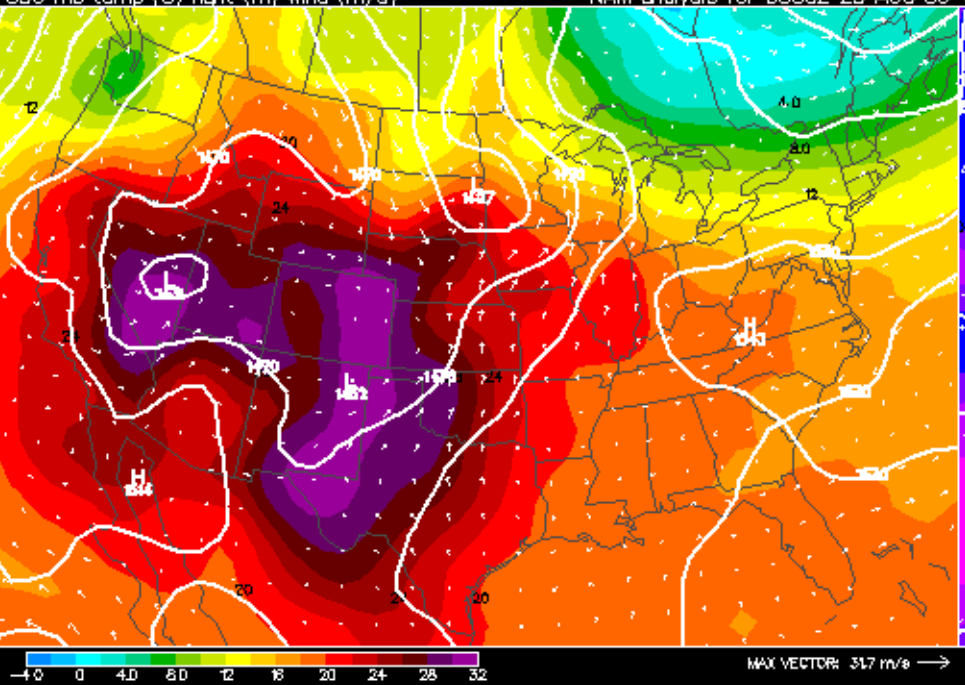
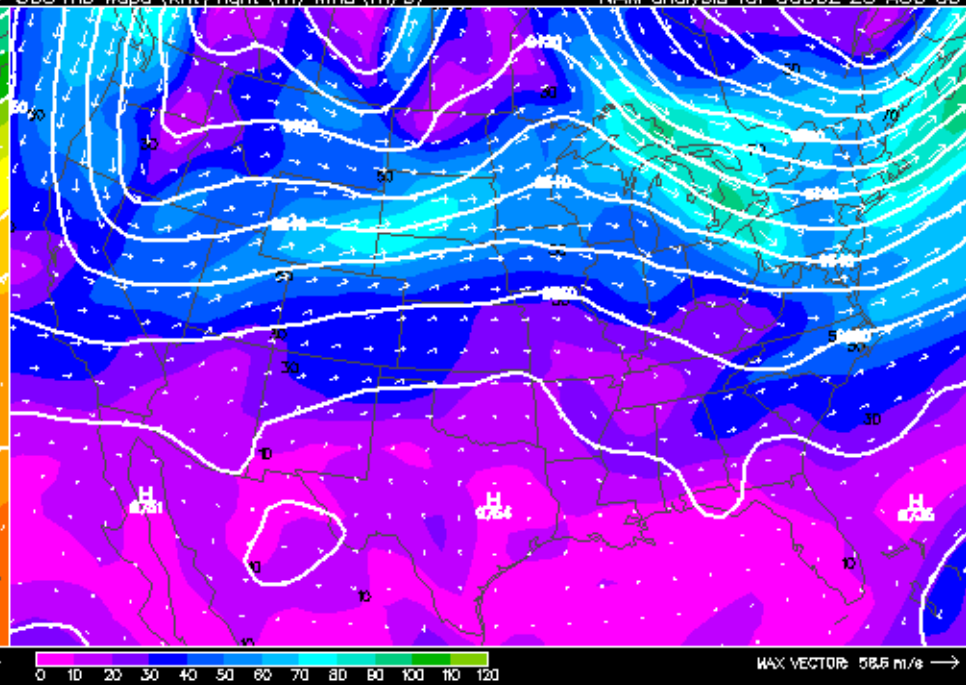
0.0000 10 20 30 40 50 60 70 80 90 100

LO: 7.33 HI: 99.0 LO: -9.00 HI: 18.1

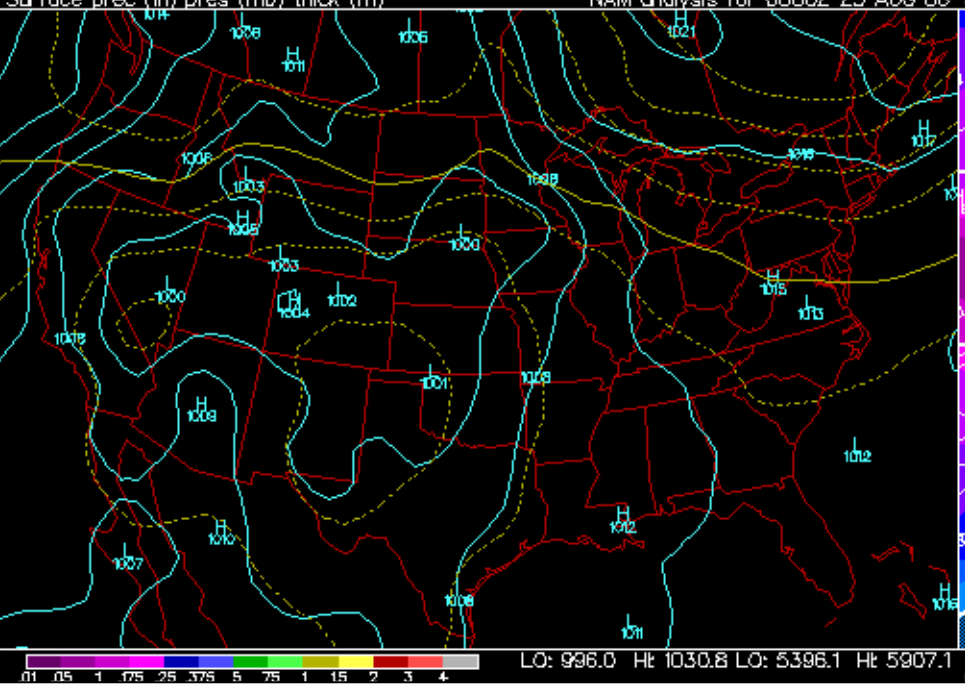
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 25 AUG 06



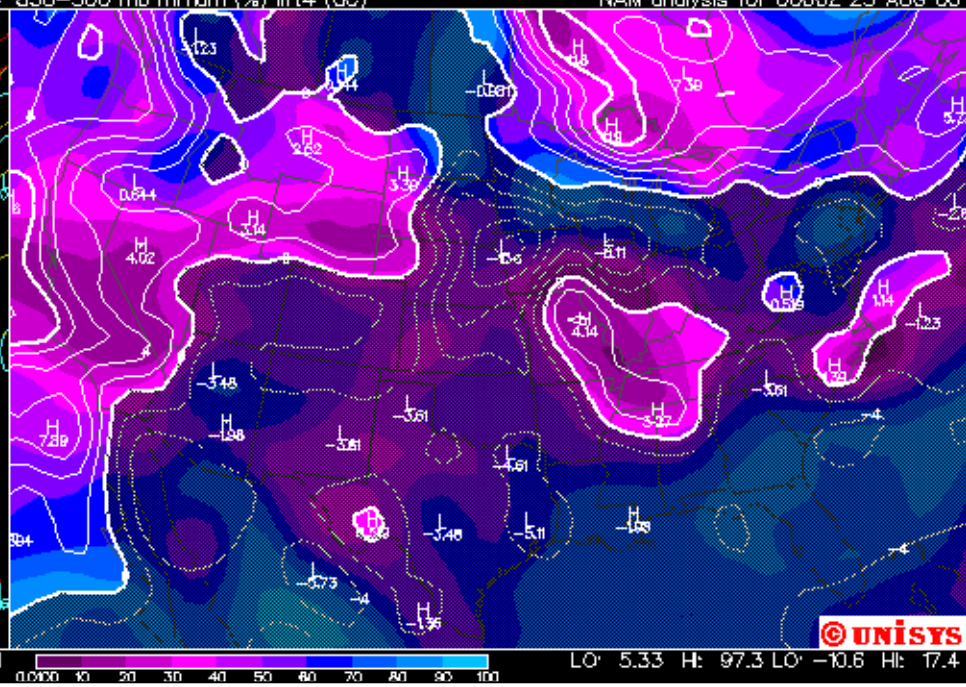
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 25 AUG 06

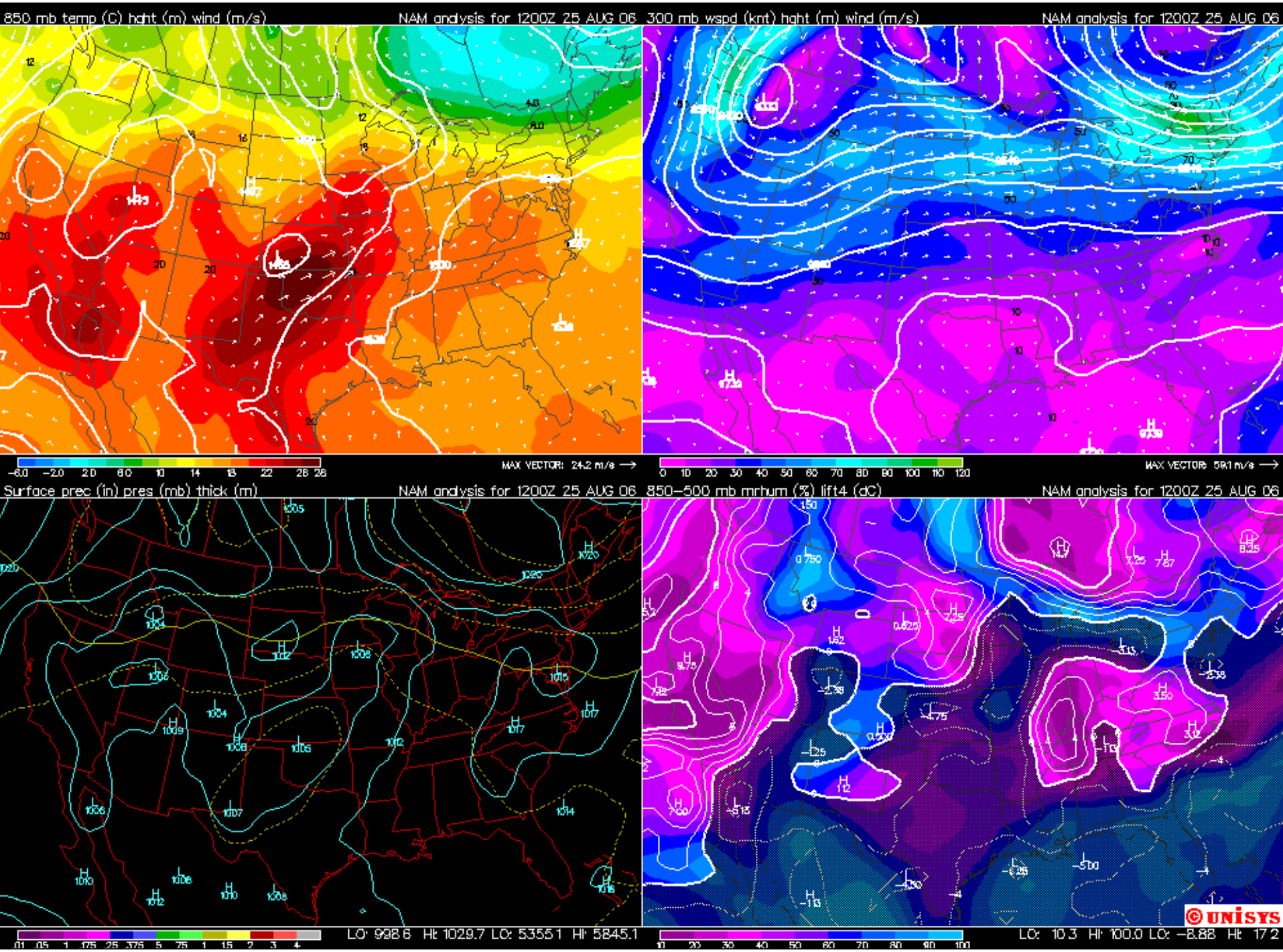


Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 25 AUG 06



850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 25 AUG 06




850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 1200Z 25 AUG 06
MAX VECTOR: 24.2 m/s
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 1200Z 25 AUG 06
MAX VECTOR: 59.1 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 1200Z 25 AUG 06
LO: 998.6 HI: 1029.7 LO: 5355.1 HI: 5845.1
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 1200Z 25 AUG 06
LO: 10.3 HI: 100.0 LO: -8.88 HI: 17.2
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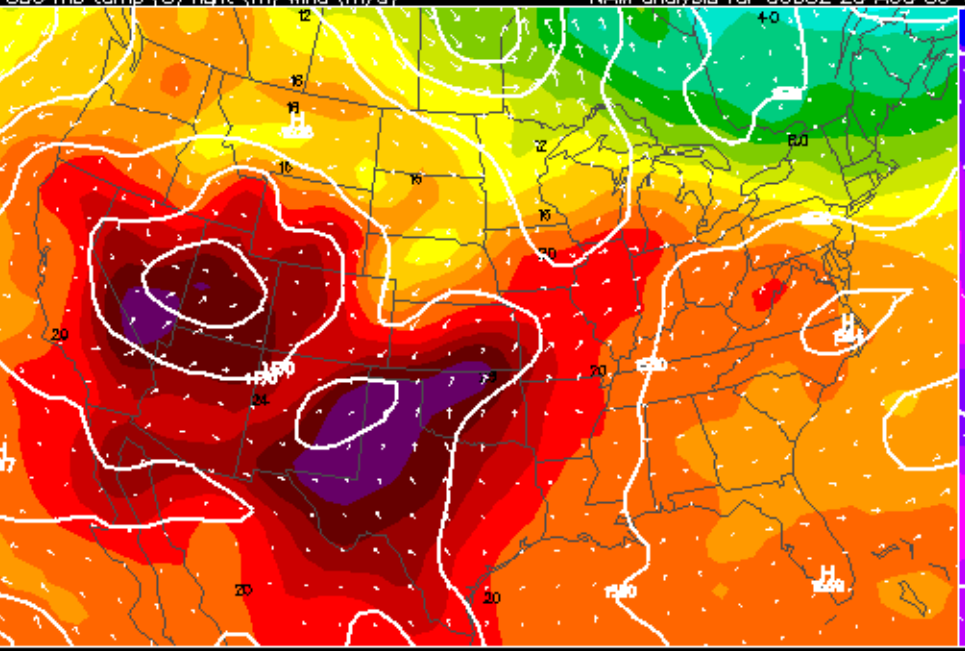
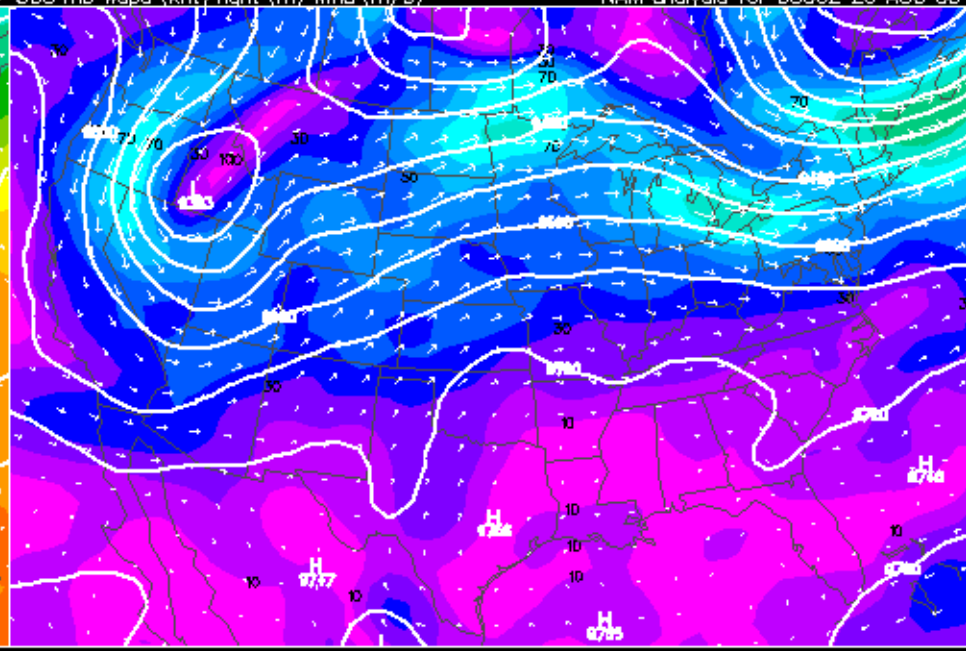
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 0000Z 26 AUG 06



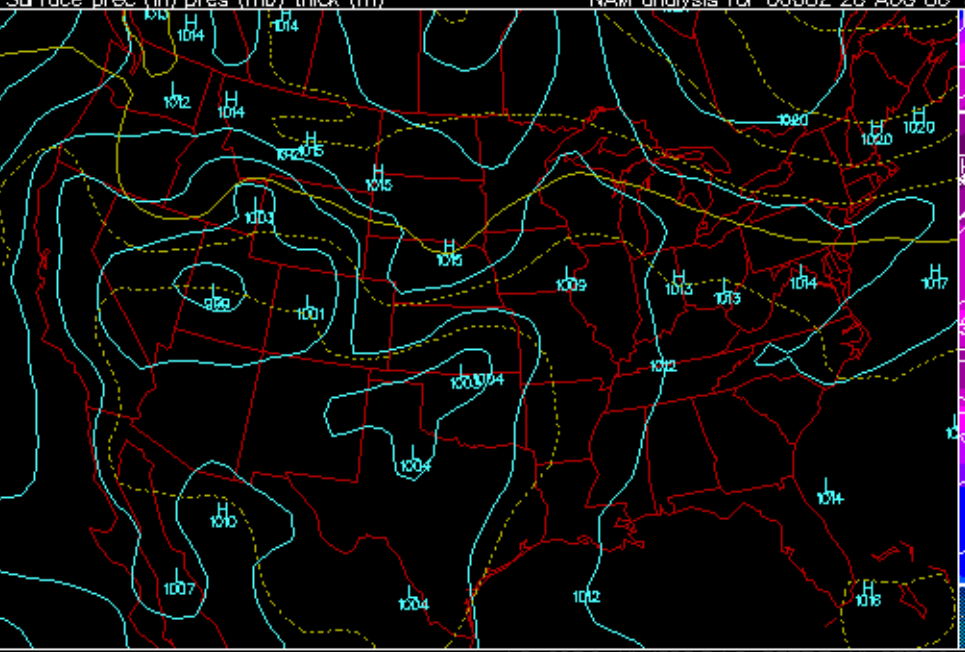
MAX VECTOR: 23.3 m/s →

300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 0000Z 26 AUG 06



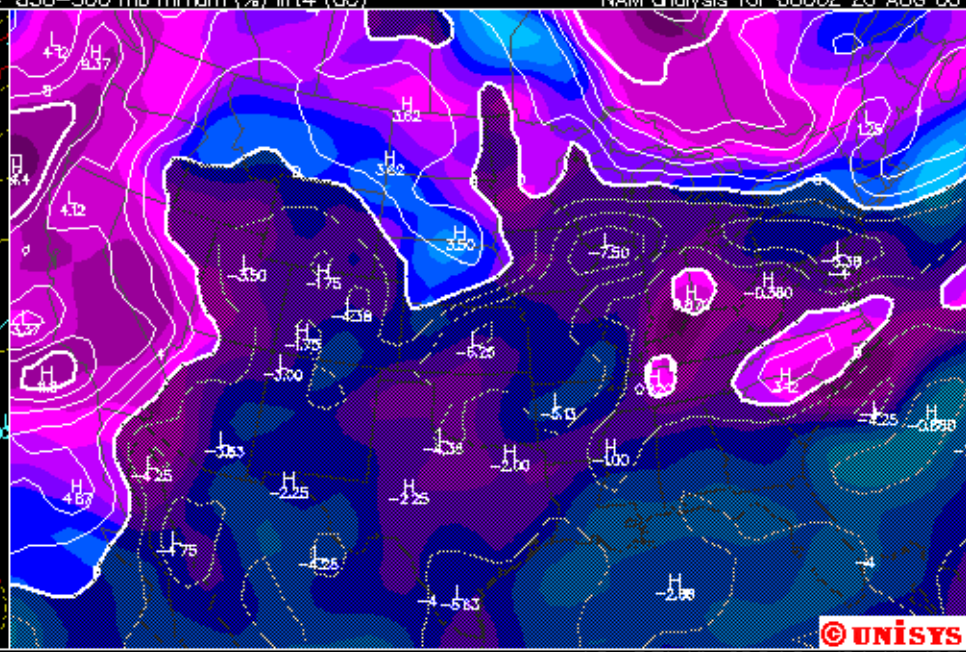
MAX VECTOR: 56.3 m/s →

Surface prec (in) pres (mb) thick (m) NAM analysis for 0000Z 26 AUG 06



LO: 998.9 HI: 1028.8 LO: 5377.7 HI: 5875.2

850–500 mb mrhum (%) lift4 (dC) NAM analysis for 0000Z 26 AUG 06



LO: 3.71 HI: 98.0 LO: −10.1 HI: 16.7

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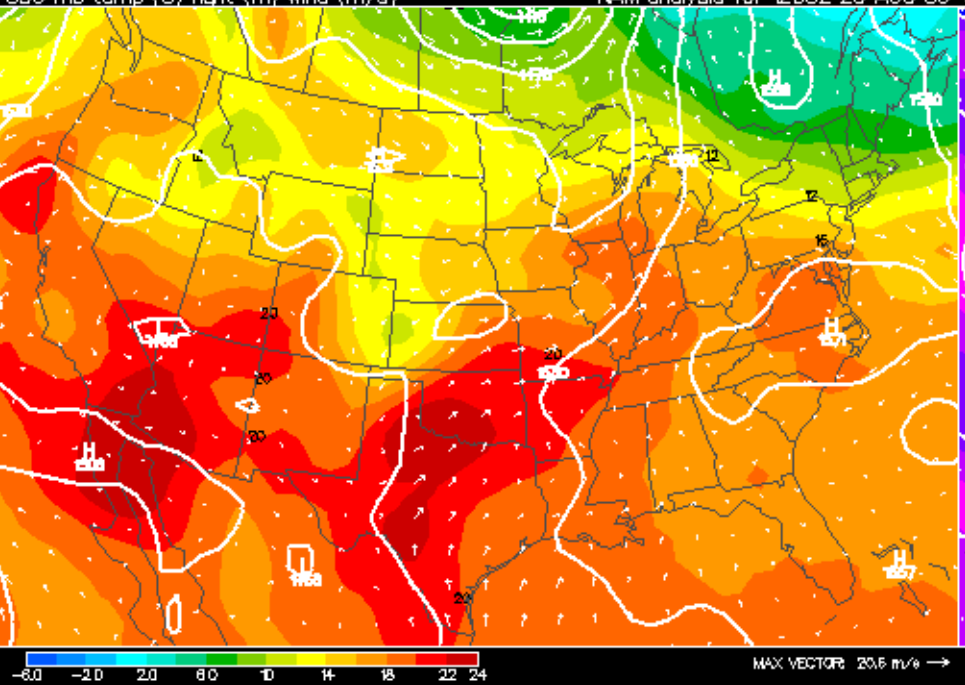
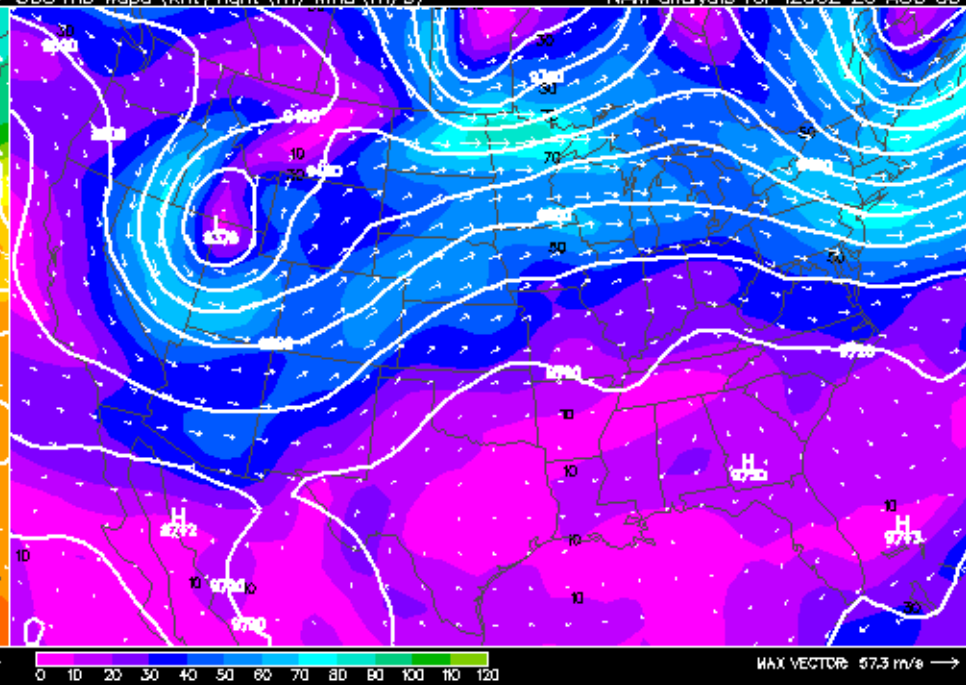
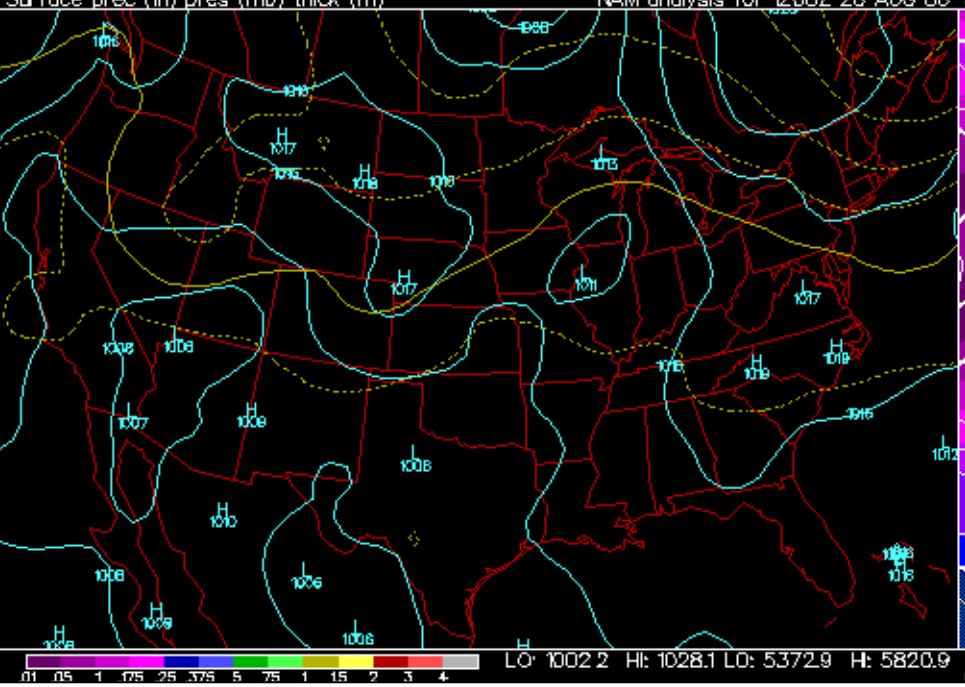
850 mb temp (C) hght (m) wind (m/s) NAM analysis for 1200Z 26 AUG 06



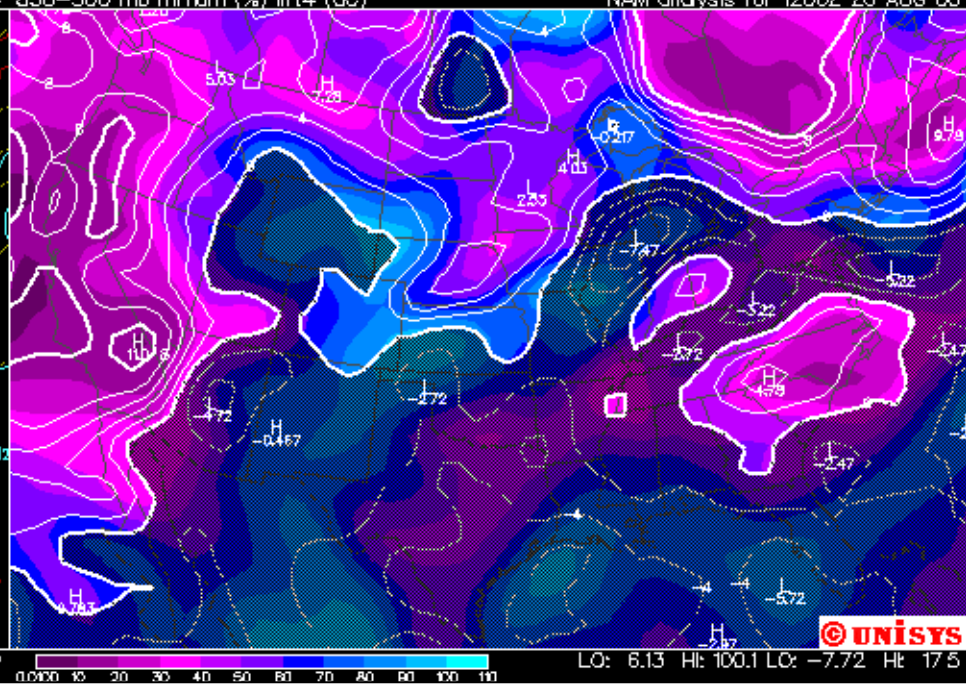
300 mb wspd (knt) hght (m) wind (m/s) NAM analysis for 1200Z 26 AUG 06

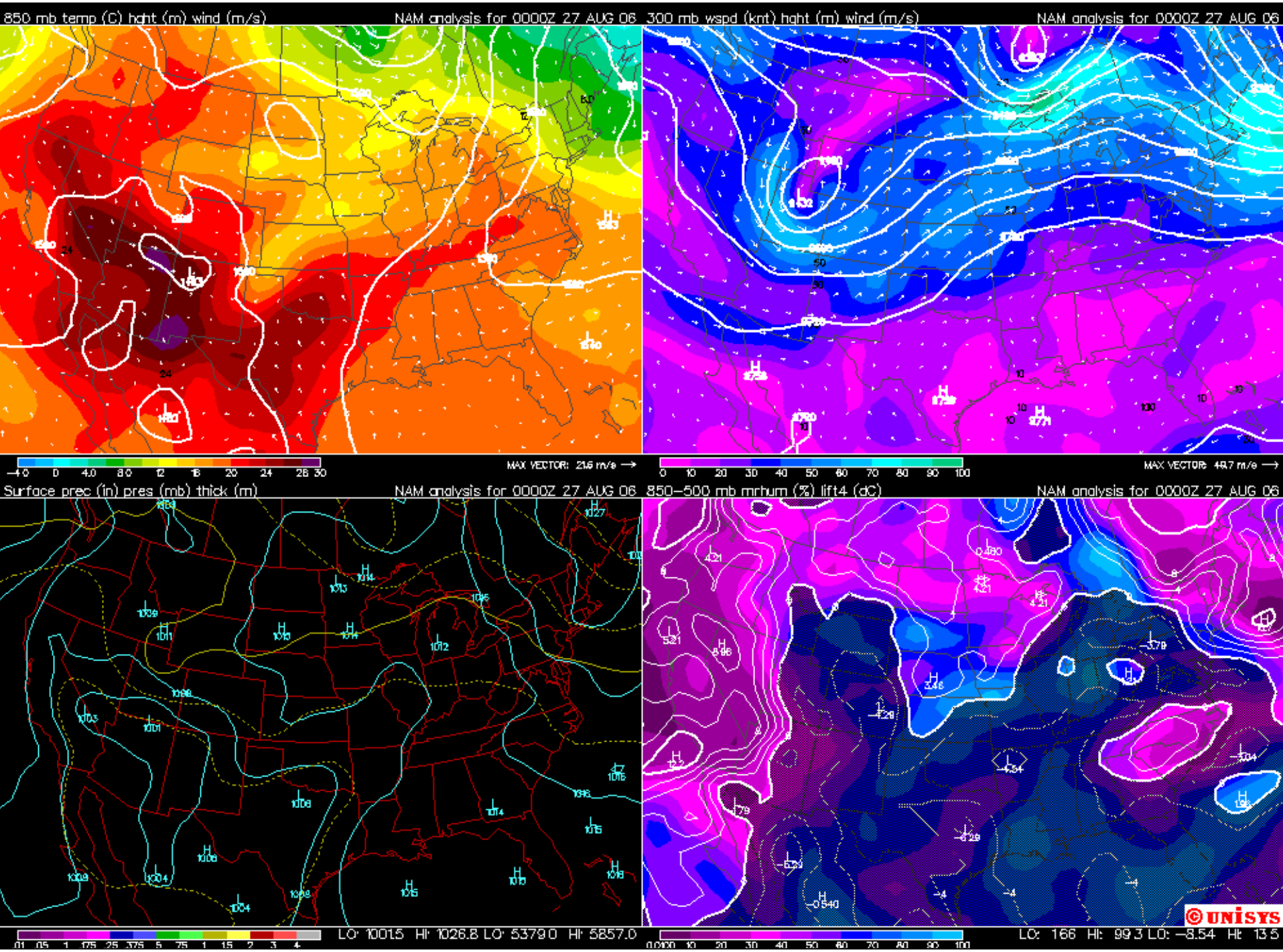


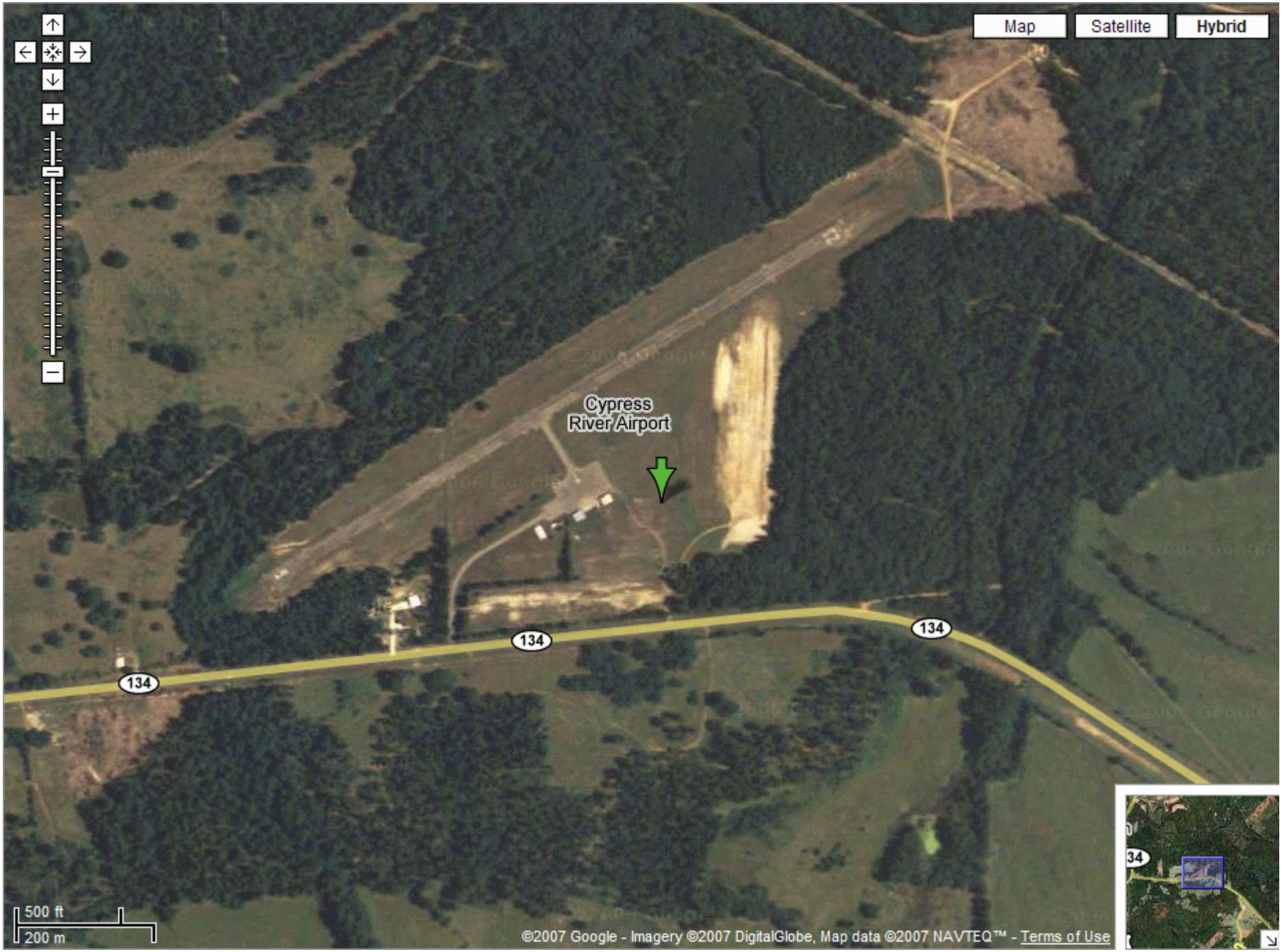
Surface prec (in) pres (mb) thick (m) NAM analysis for 1200Z 26 AUG 06



850-500 mb mrhum (%) lift4 (dC) NAM analysis for 1200Z 26 AUG 06




850 mb temp (C) hght (m) wind (m/s)
NAM analysis for 0000Z 27 AUG 06
300 mb wspd (knt) hght (m) wind (m/s)
NAM analysis for 0000Z 27 AUG 06
MAX VECTOR: 21.6 m/s
MAX VECTOR 49.7 m/s
Surface prec (in) pres (mb) thick (m)
NAM analysis for 0000Z 27 AUG 06
850-500 mb mrhum (%) lift4 (dC)
NAM analysis for 0000Z 27 AUG 06
LO: 1001.5 HI: 1026.8 LO: 5379.0 HI: 5857.0
LO: 16.6 HI: 99.3 LO: -8.54 HI: 13.5
© UNISYS


Map
Satellite
Hybrid
Cypress
River Airport
134
134
134
500 ft
200 m
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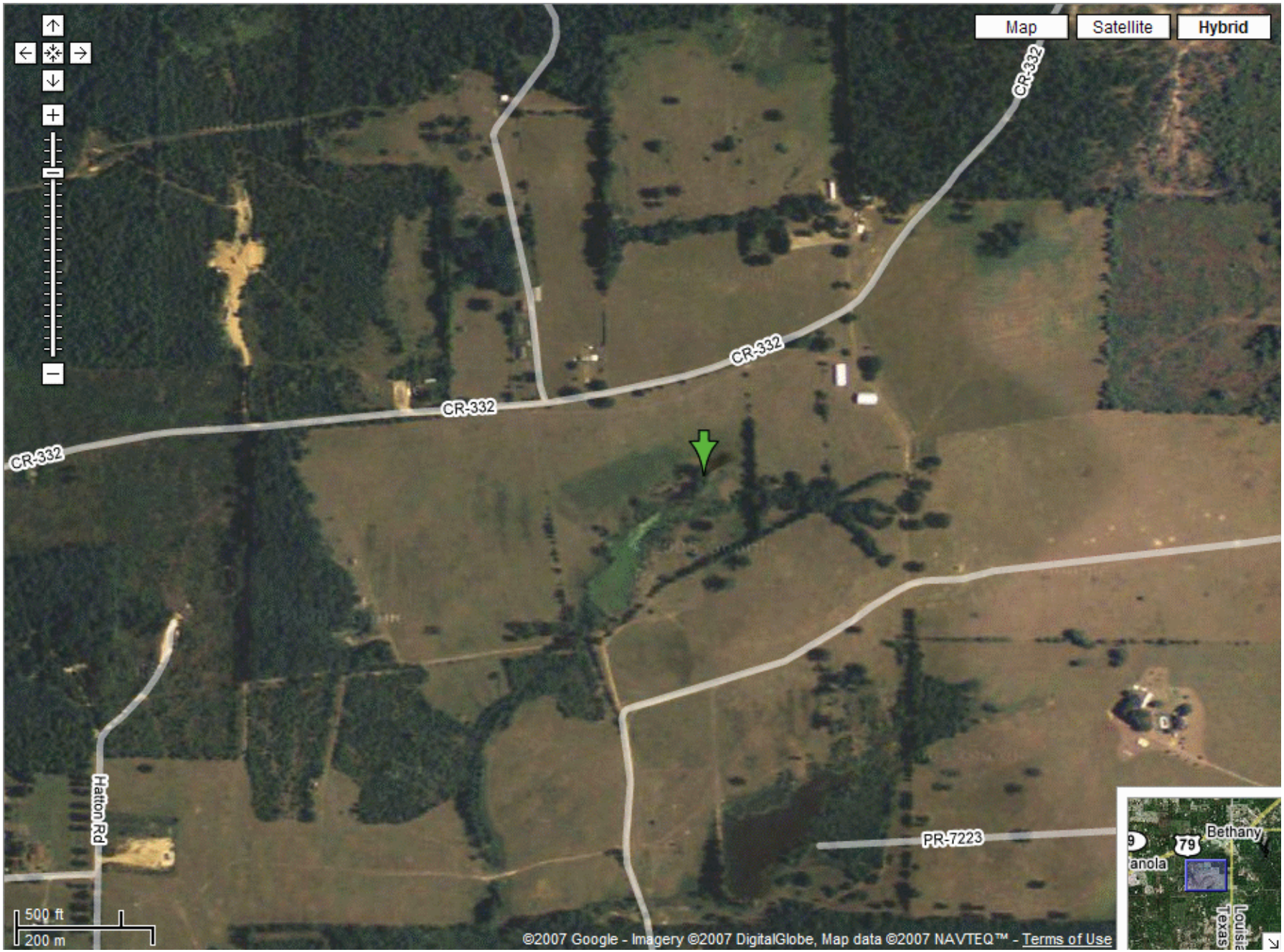

Panola Aerial view