A Mesoscale Discussion of the 7 April 2008 Convective Event in South Central Kansas: Implications for Operational Meteorologists

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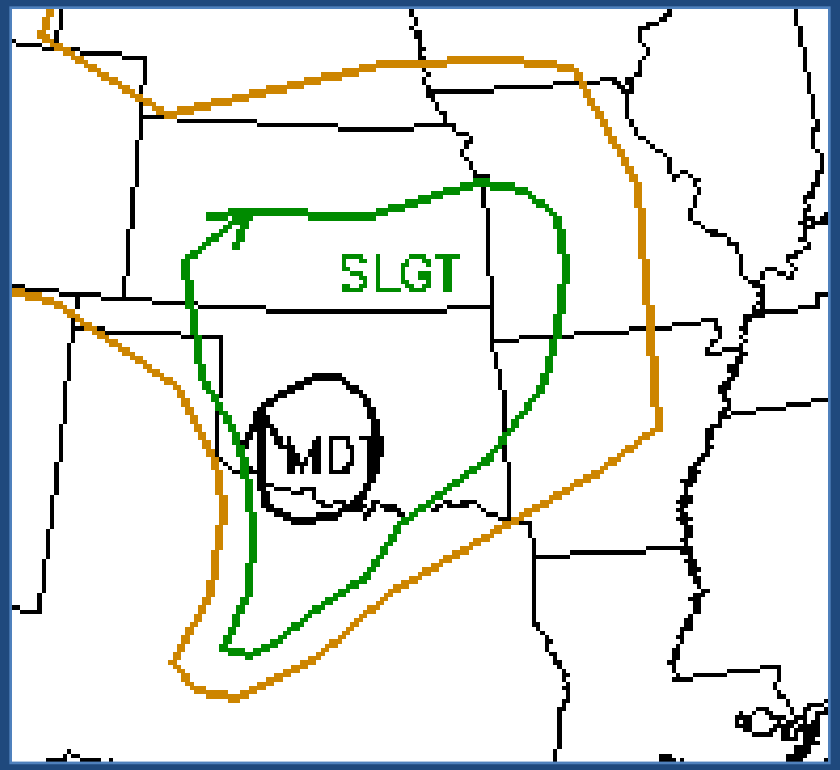
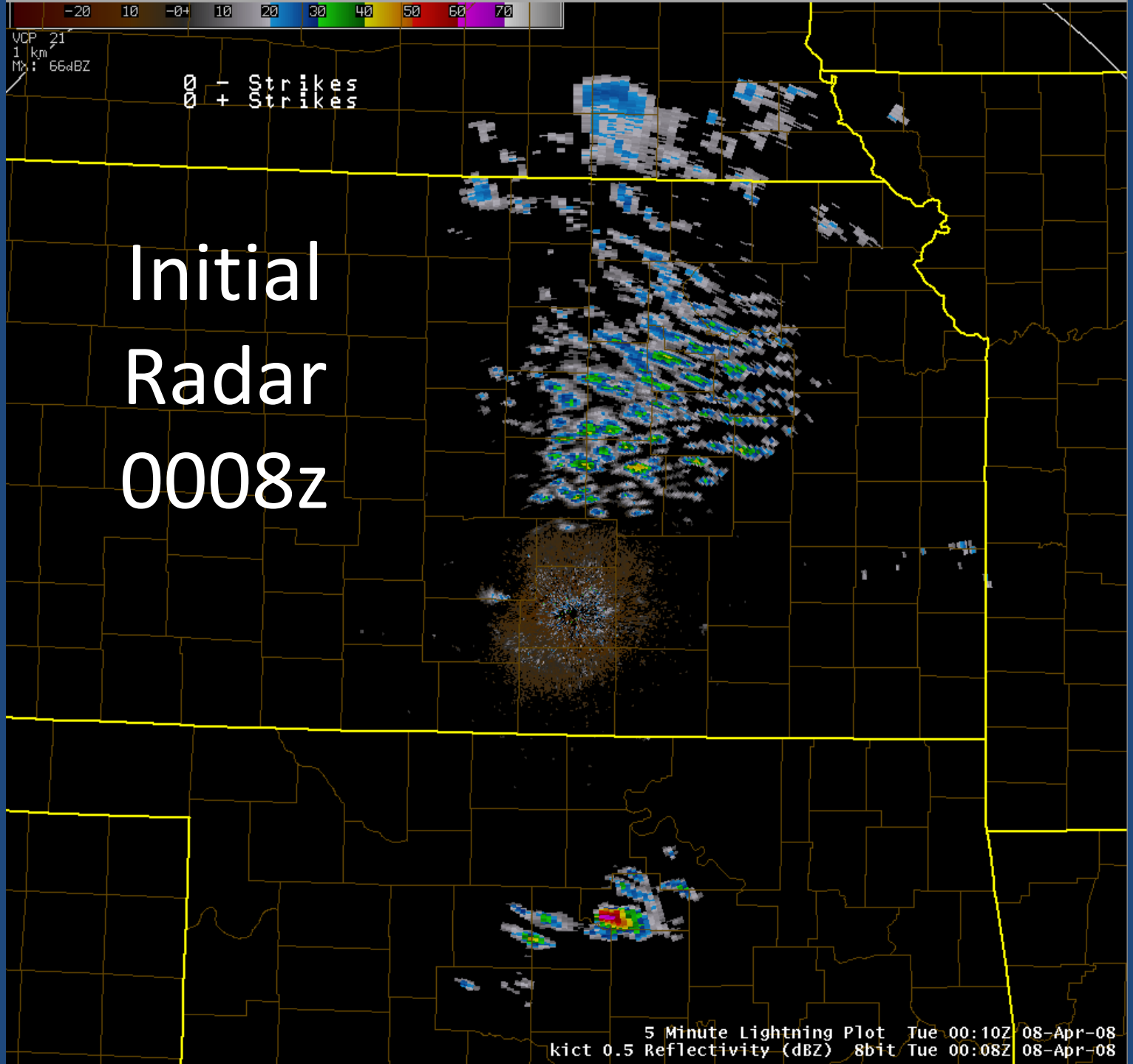
NWS Wichita KS

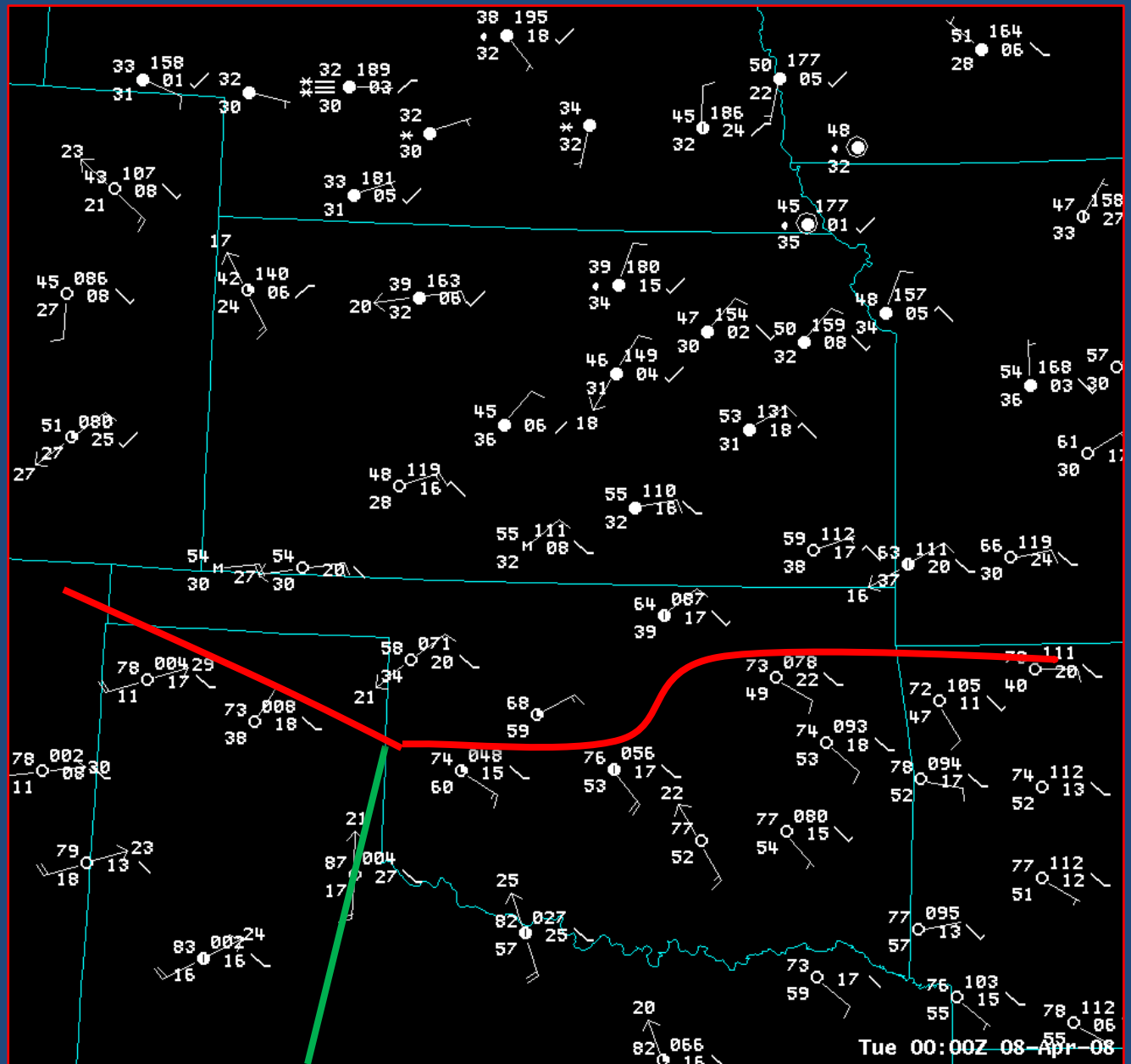
Initial Briefing

- Small hail observed in SE KS during afternoon
- Warm front to remain in OK during the night
- Better chance for (severe) hail as LLJ develops during the evening and increases overrunning

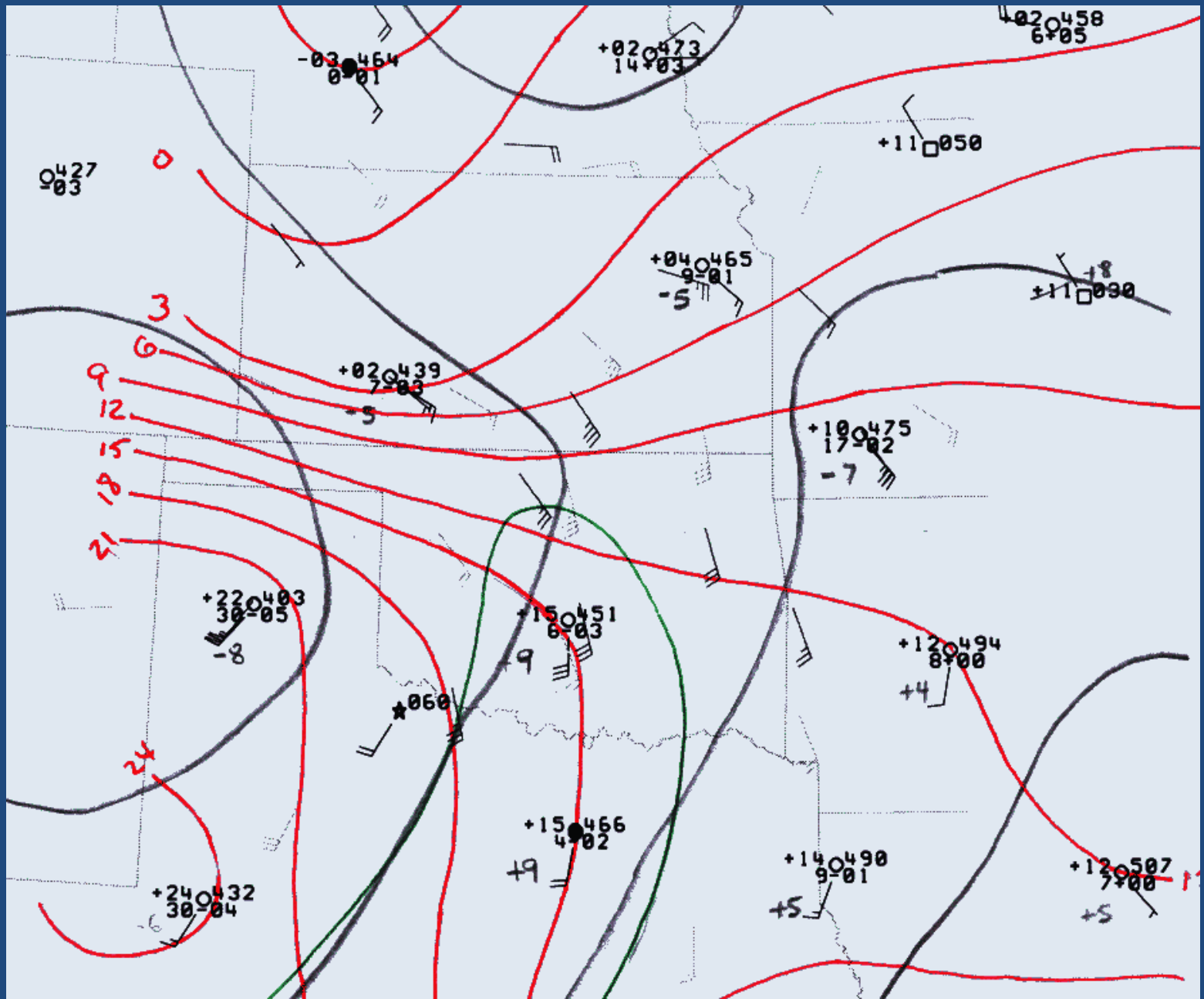



-20 10 -0+ 10 20 30 40 50 60 70
VCP 21
1 km
Mx: 66dBZ
0 - Strikes
0 + Strikes
Initial
Radar
0008z
5 Minute Lightning Plot Tue 00:10Z 08-Apr-08
kict 0.5 Reflectivity (dBZ) 8bit Tue 00:08Z 08-Apr-08

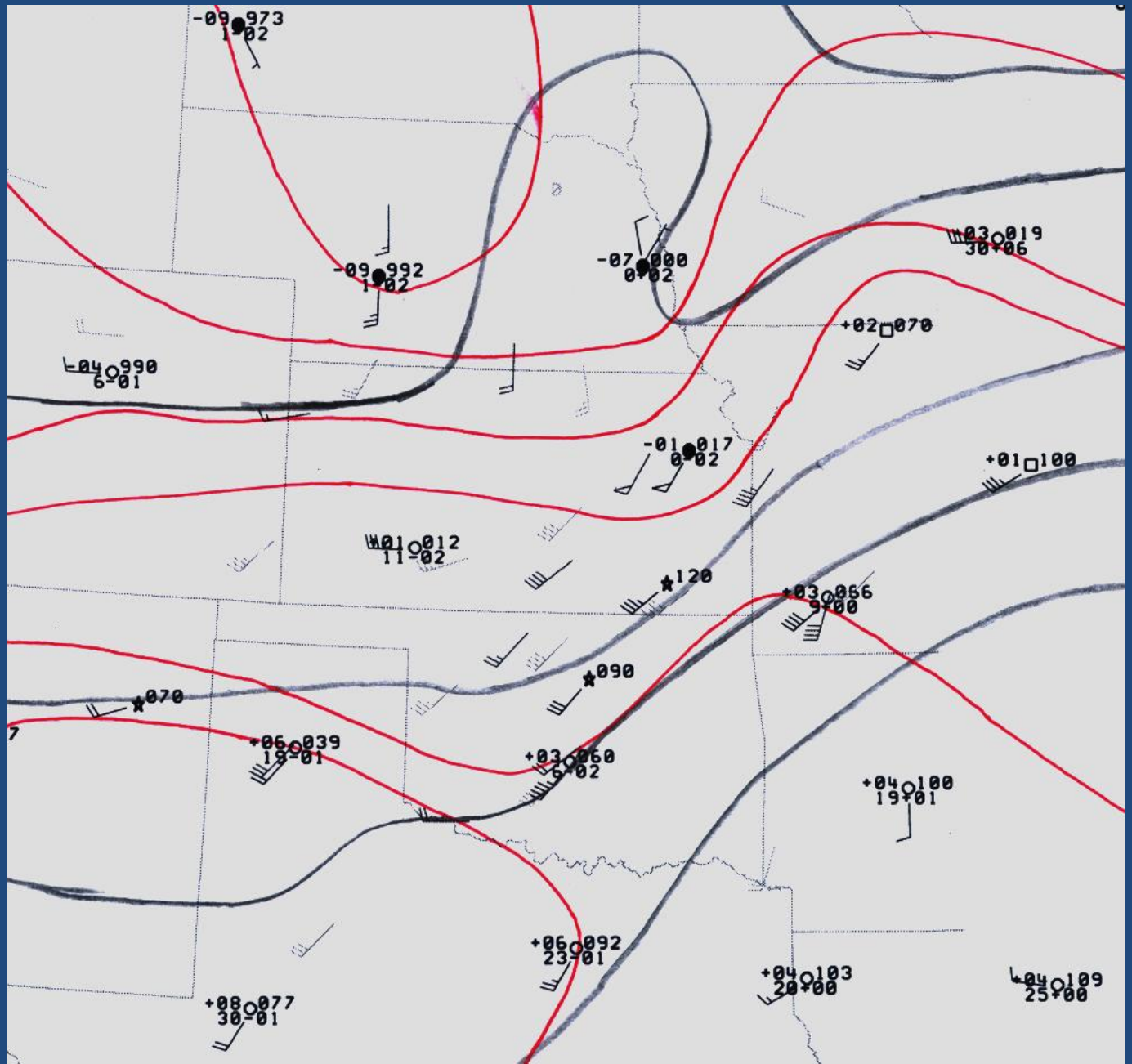
00z: SFC map



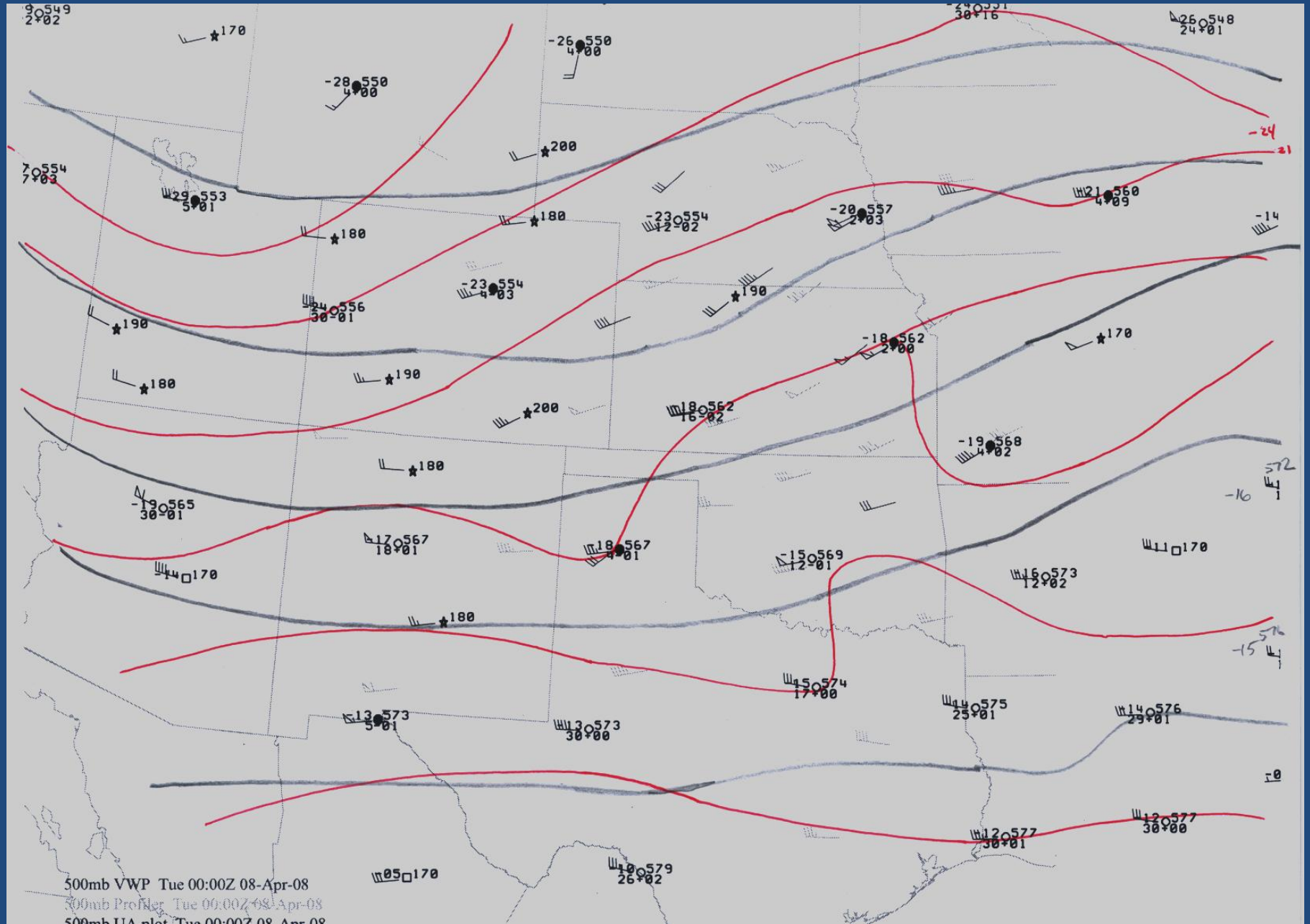
00z: 850mb

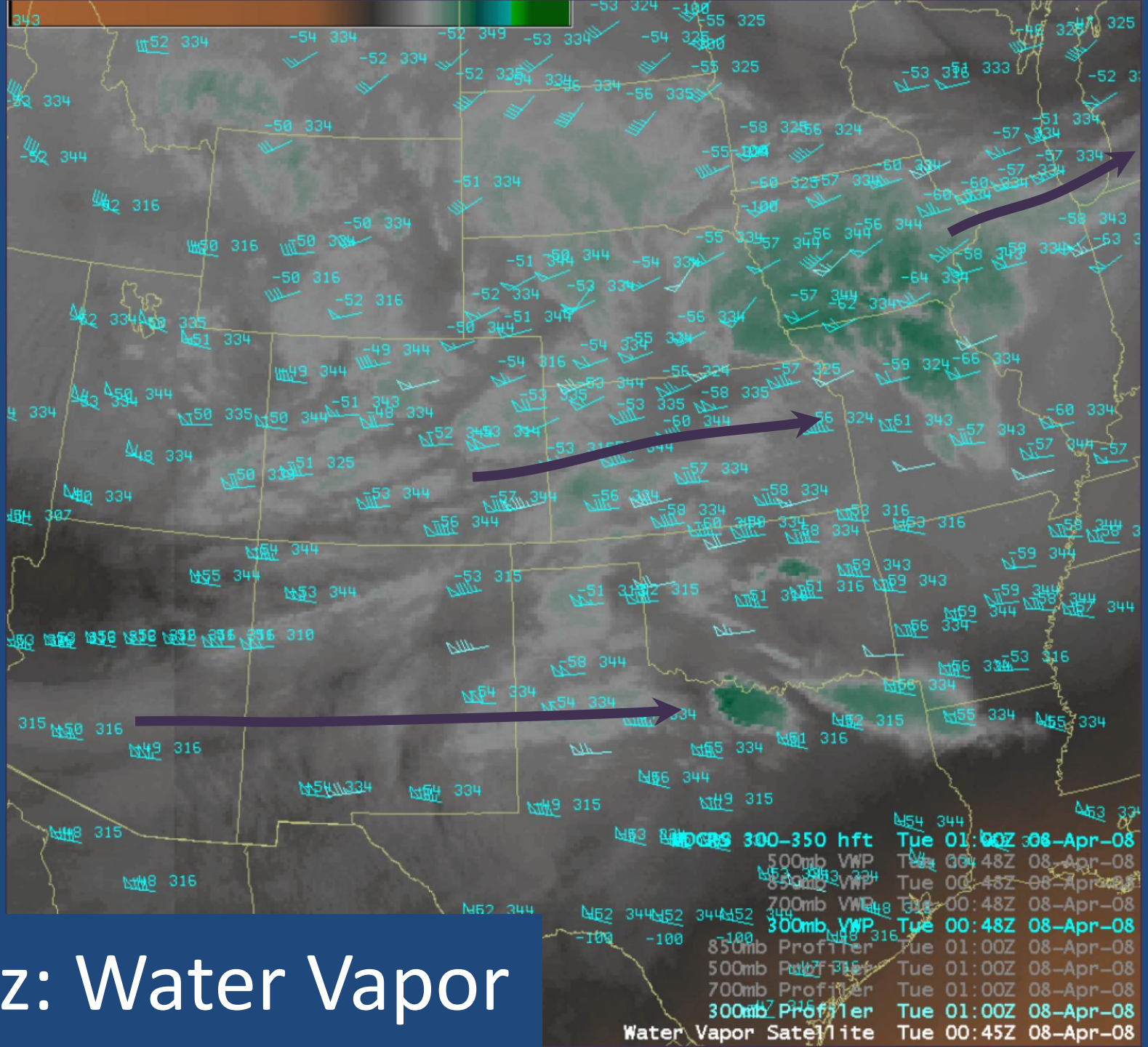


00z: 700mb


-09 973
1 02
-09 992
1 02
-07 000
0 02
03 019
30 06
+02 070
04 990
6 01
-01 017
0 02
+01 100
01 012
11 02
120
+03 066
3 00
090
070
+06 039
19 01
+03 060
6 02
+04 100
19 01
+06 092
23 01
+04 103
20 00
04 109
25 00
+08 077
30 01

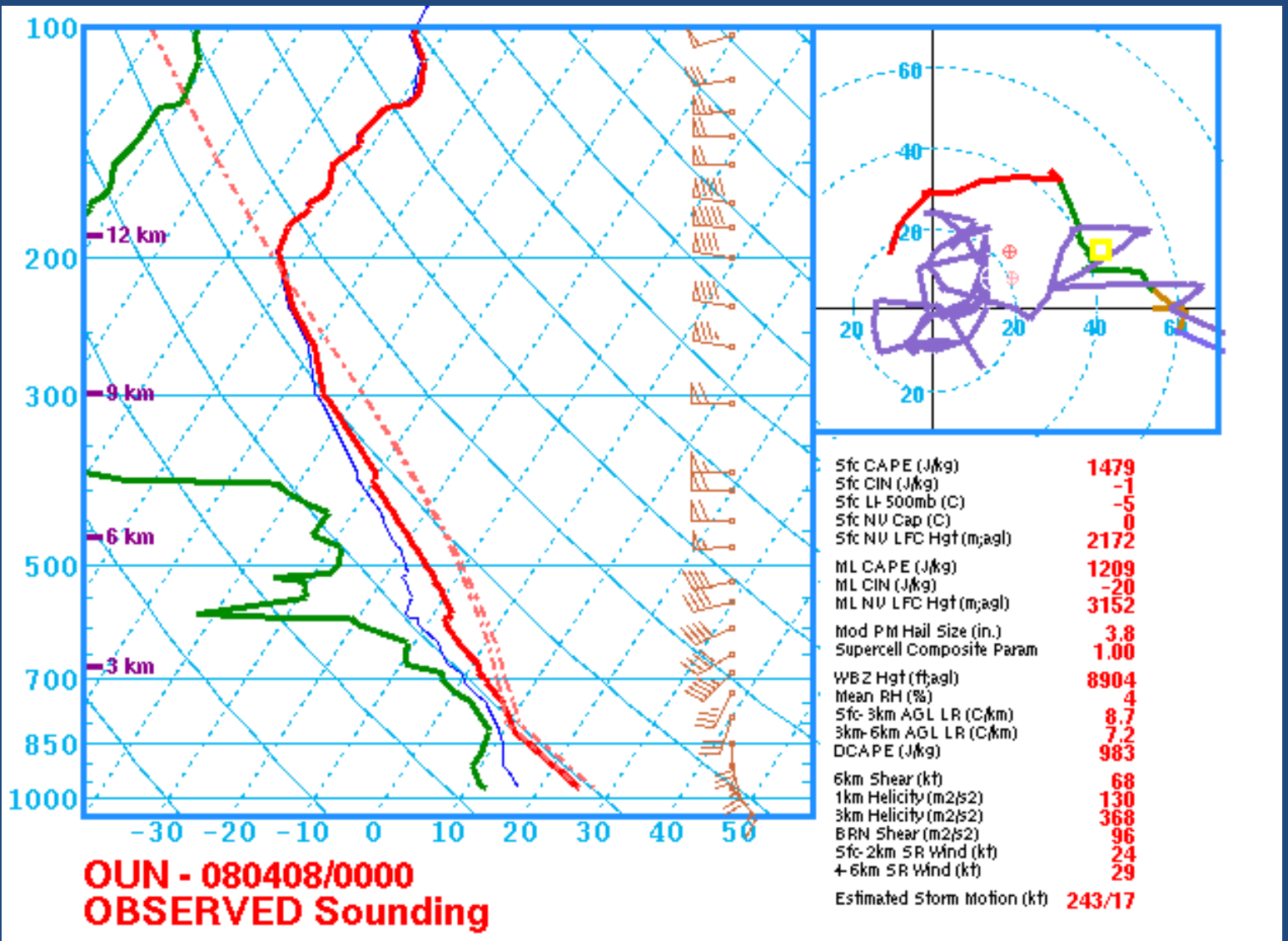
00z: 500mb


500mb VWP Tue 00:00Z 08-Apr-08
500mb Profiler Tue 00:00Z 08-Apr-08
500mb UA plot Tue 00:00Z 08-Apr-08



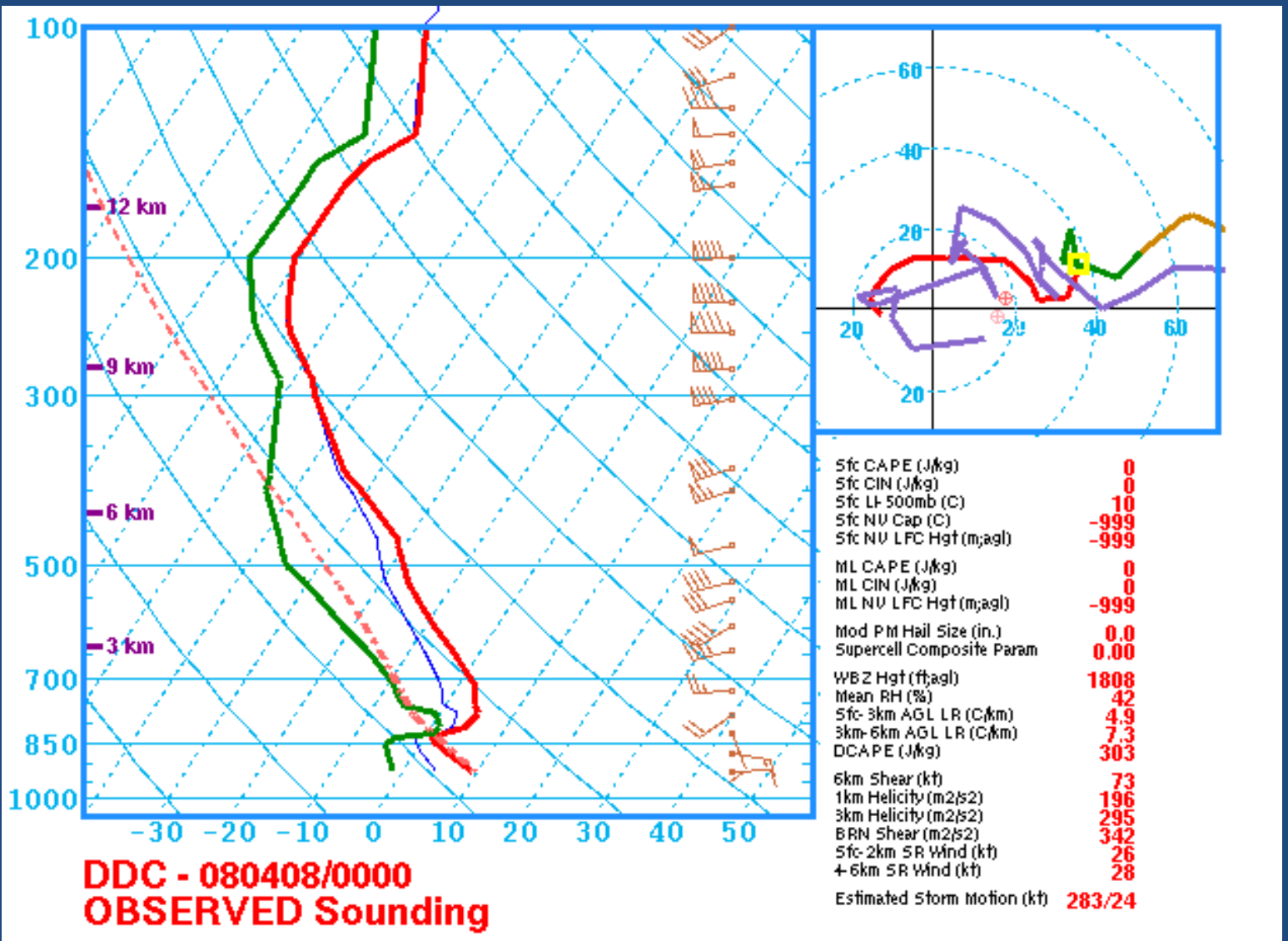
00z: Water Vapor

00z: OUN Sounding

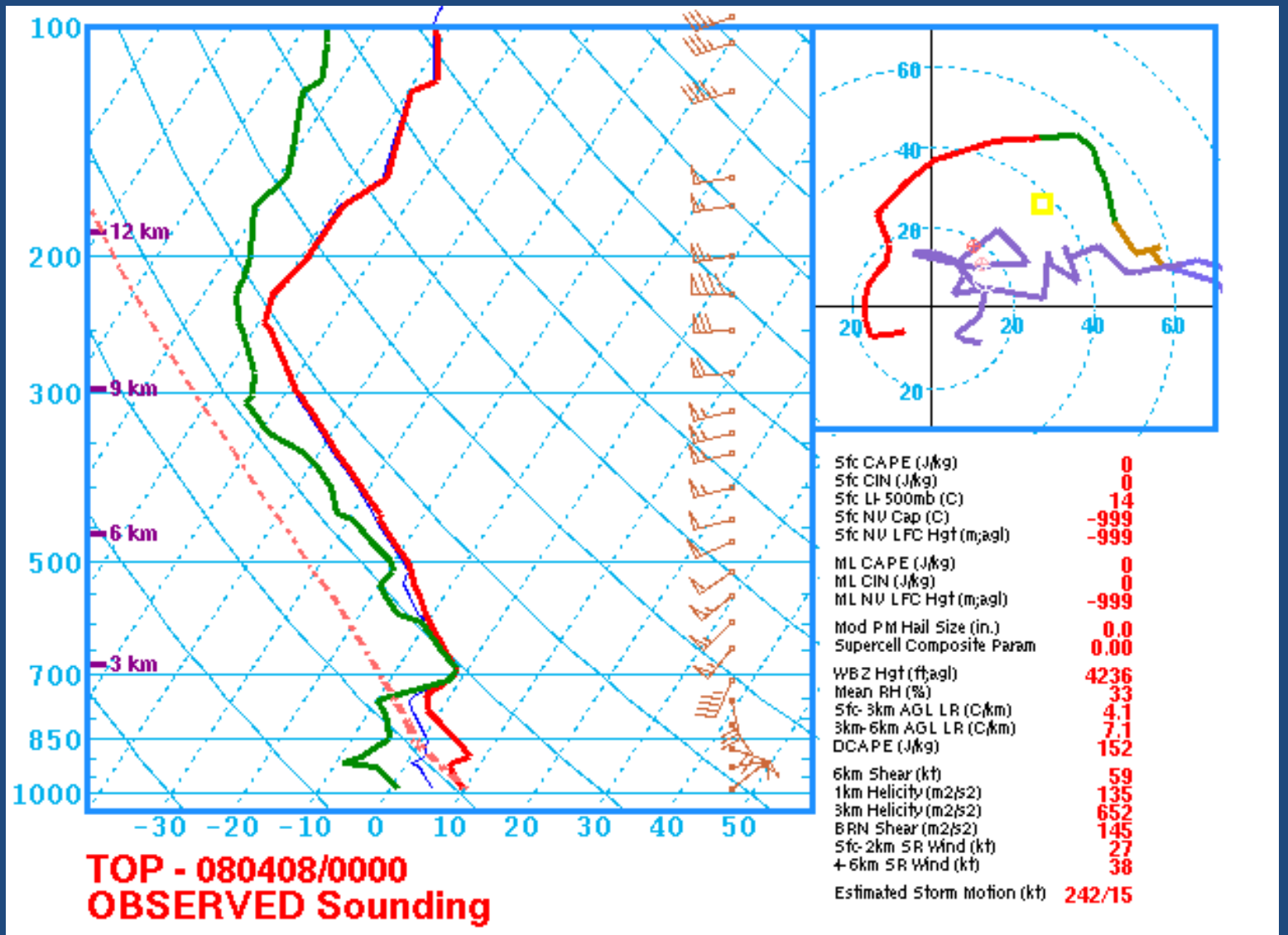


NWS/NCEP/SPC

00z: DDC Sounding

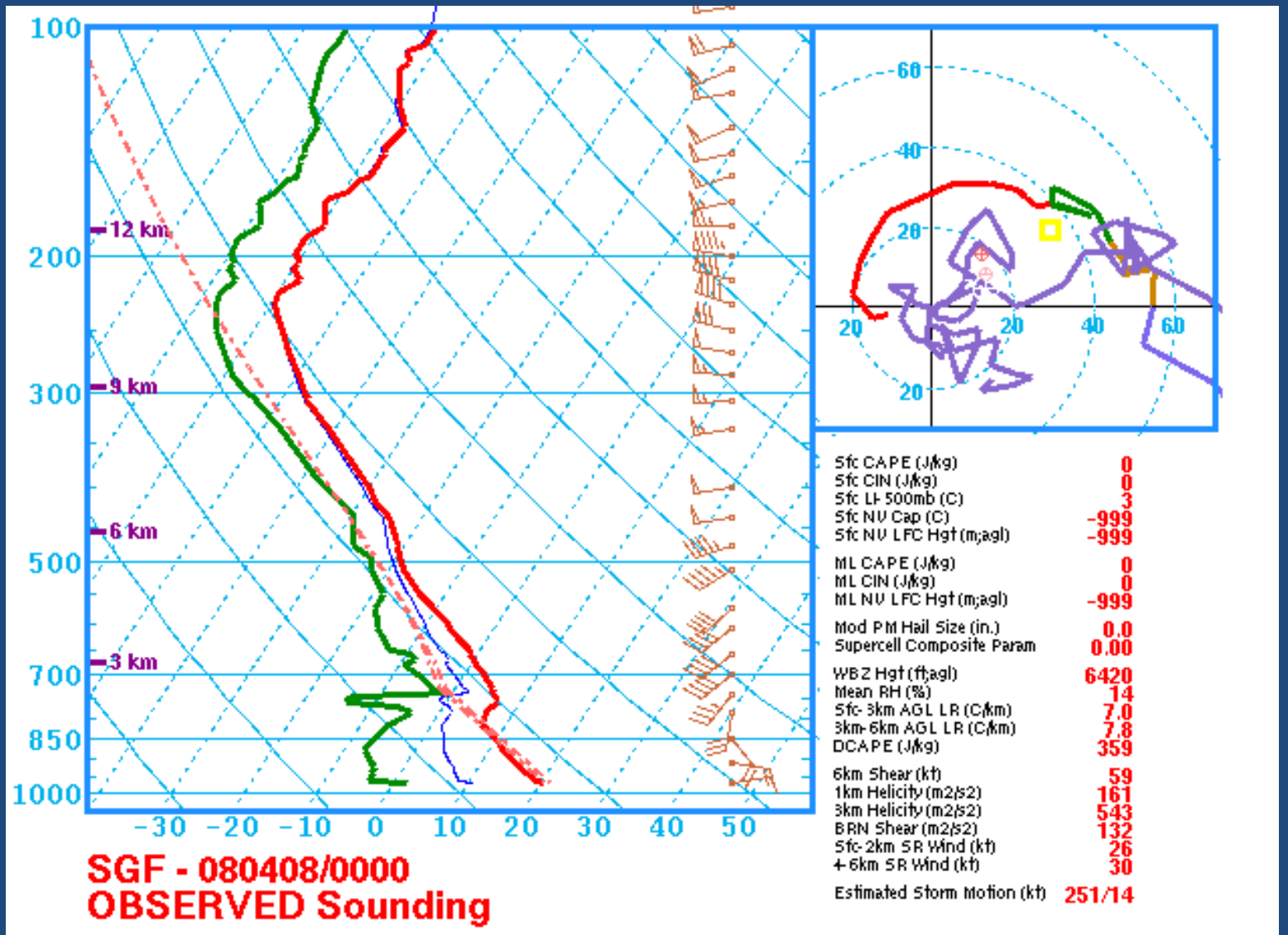


00z: TOP Sounding



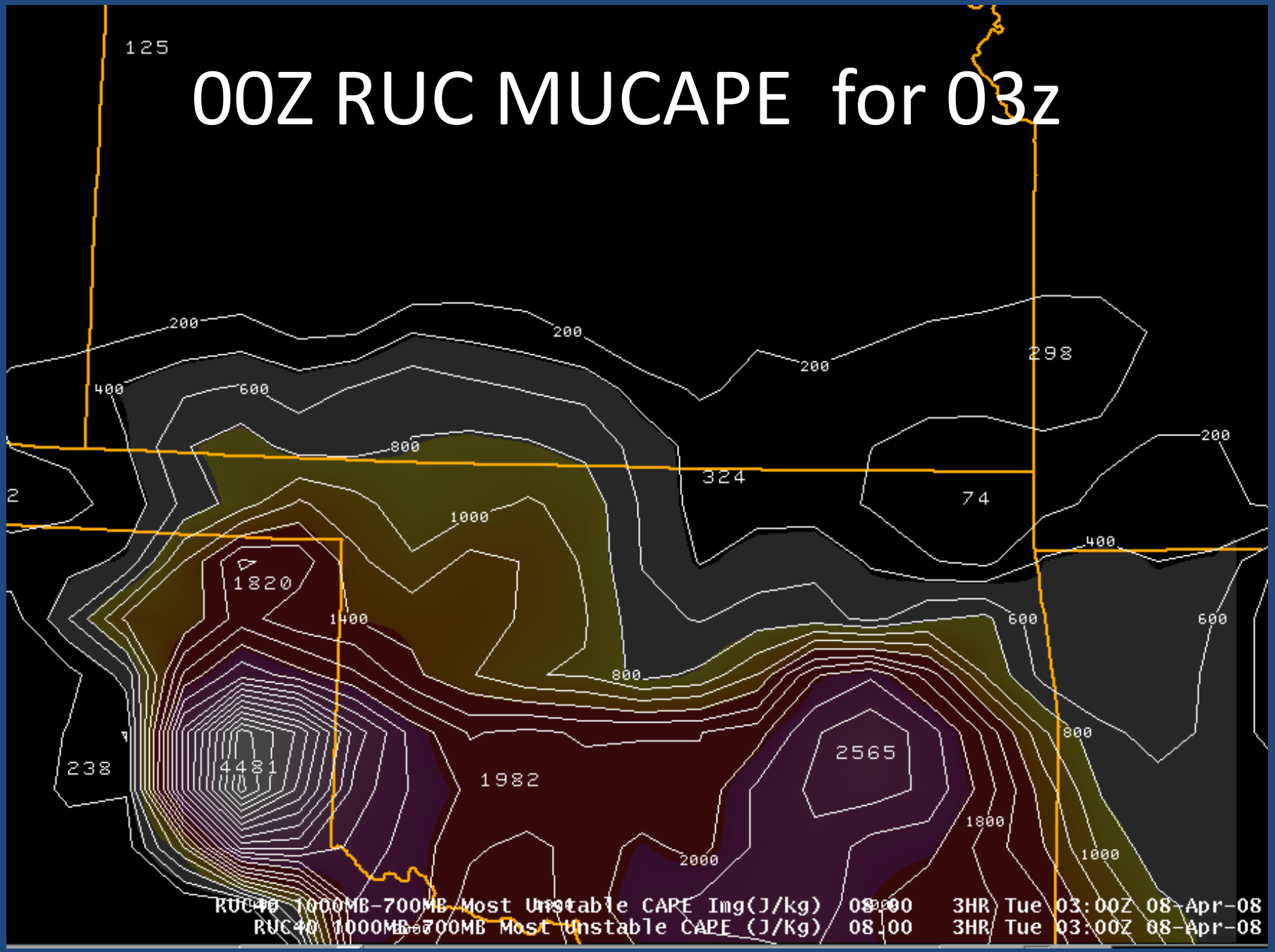
NWS/NCEP/SPC

00z: SGF Sounding



NWS/NCEP/SPC

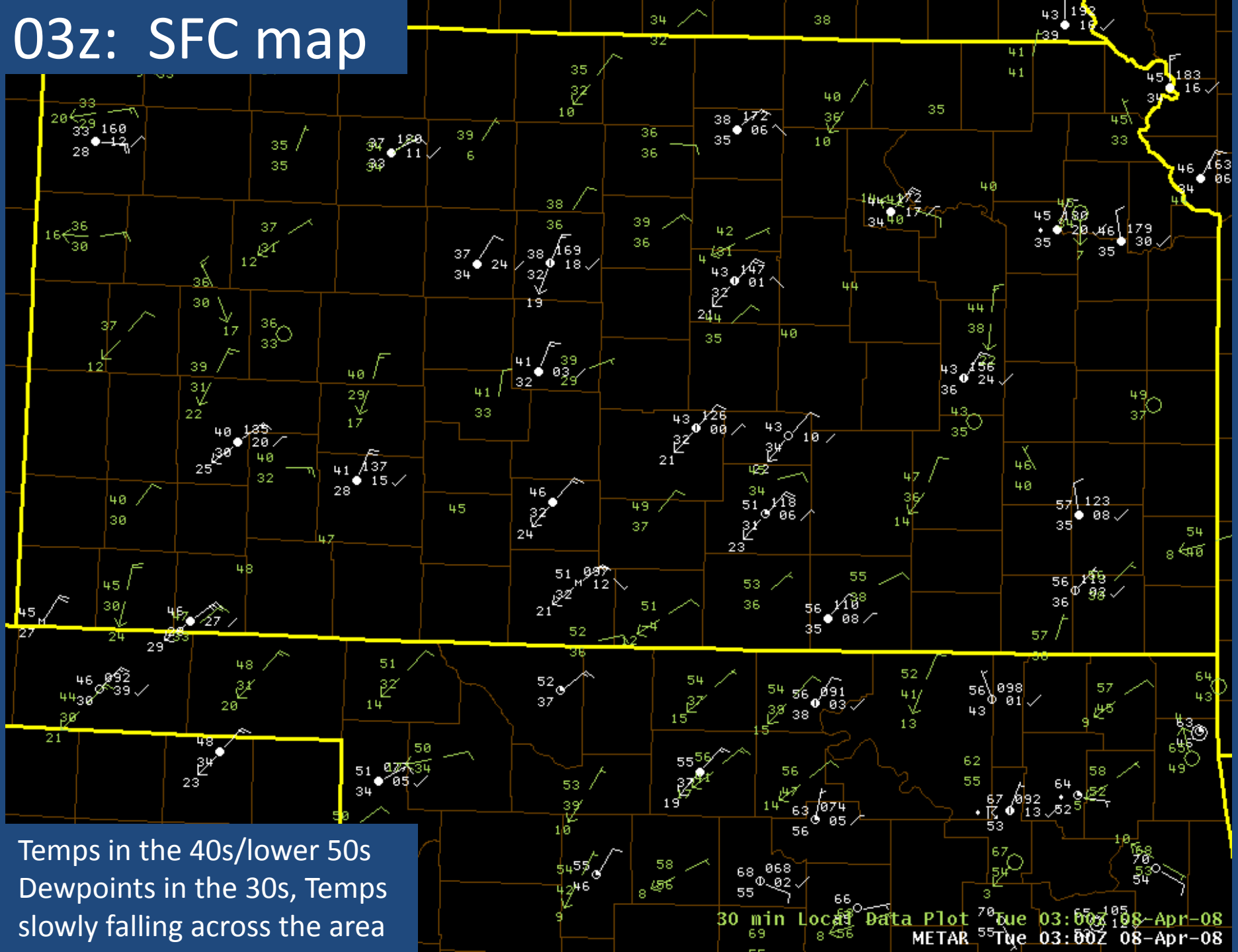
00Z RUC MUCAPE for 03z



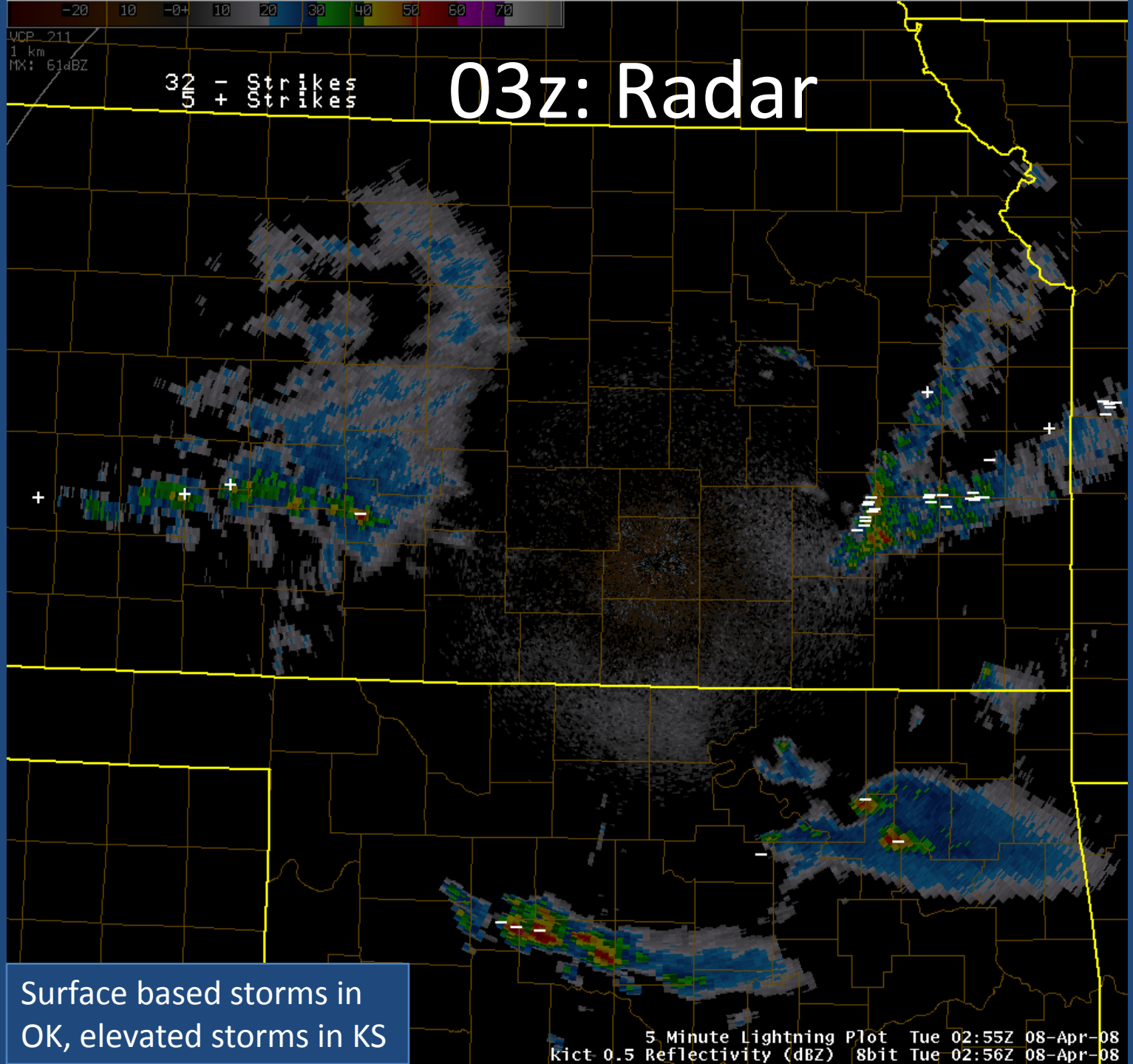
So what do YOU think?

- Hail?
- Wind?
- Tornado?
- Any severe?

03z: SFC map

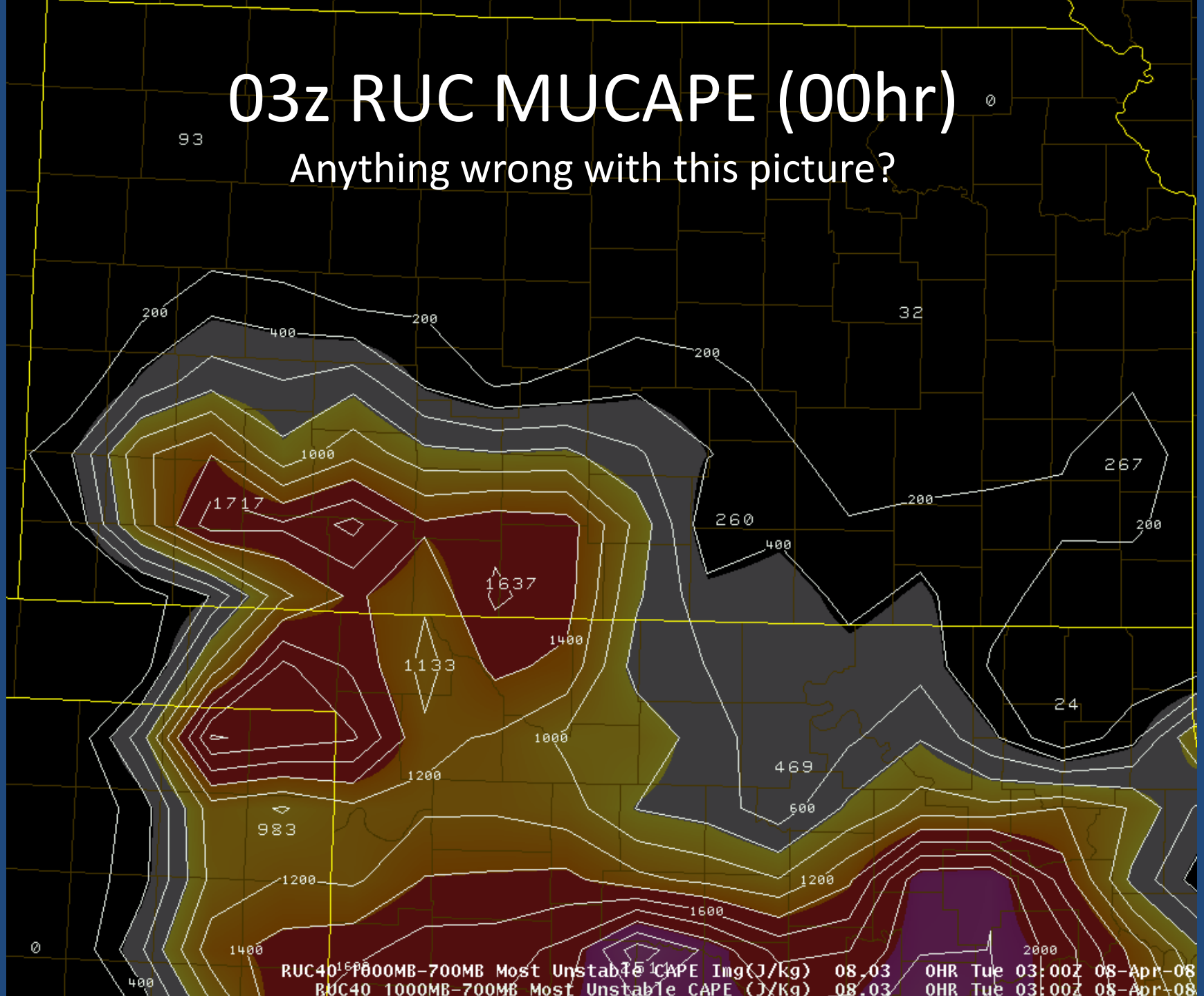


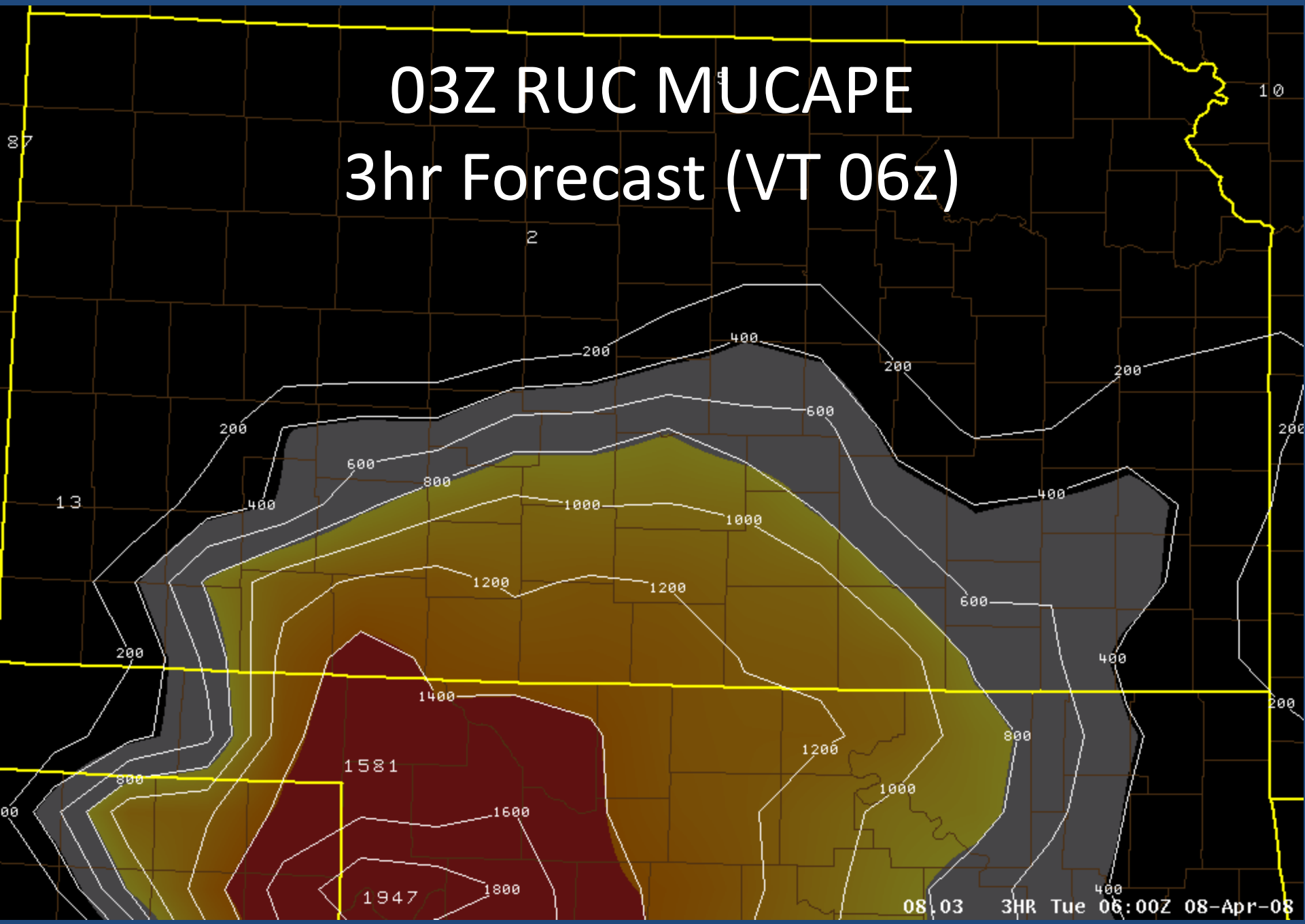
Temps in the 40s/lower 50s
Dewpoints in the 30s, Temps slowly falling across the area


-20 10 -0+ 10 20 30 40 50 60 70
VCP 211
1 km
MX: 61dBZ
32 - Strikes
5 + Strikes
03z: Radar
Surface based storms in OK, elevated storms in KS
5 Minute Lightning Plot Tue 02:55Z 08-Apr-08
kict 0.5 Reflectivity (dBZ) 8bit Tue 02:56Z 08-Apr-08

03z RUC MUCAPE (00hr)

Anything wrong with this picture?



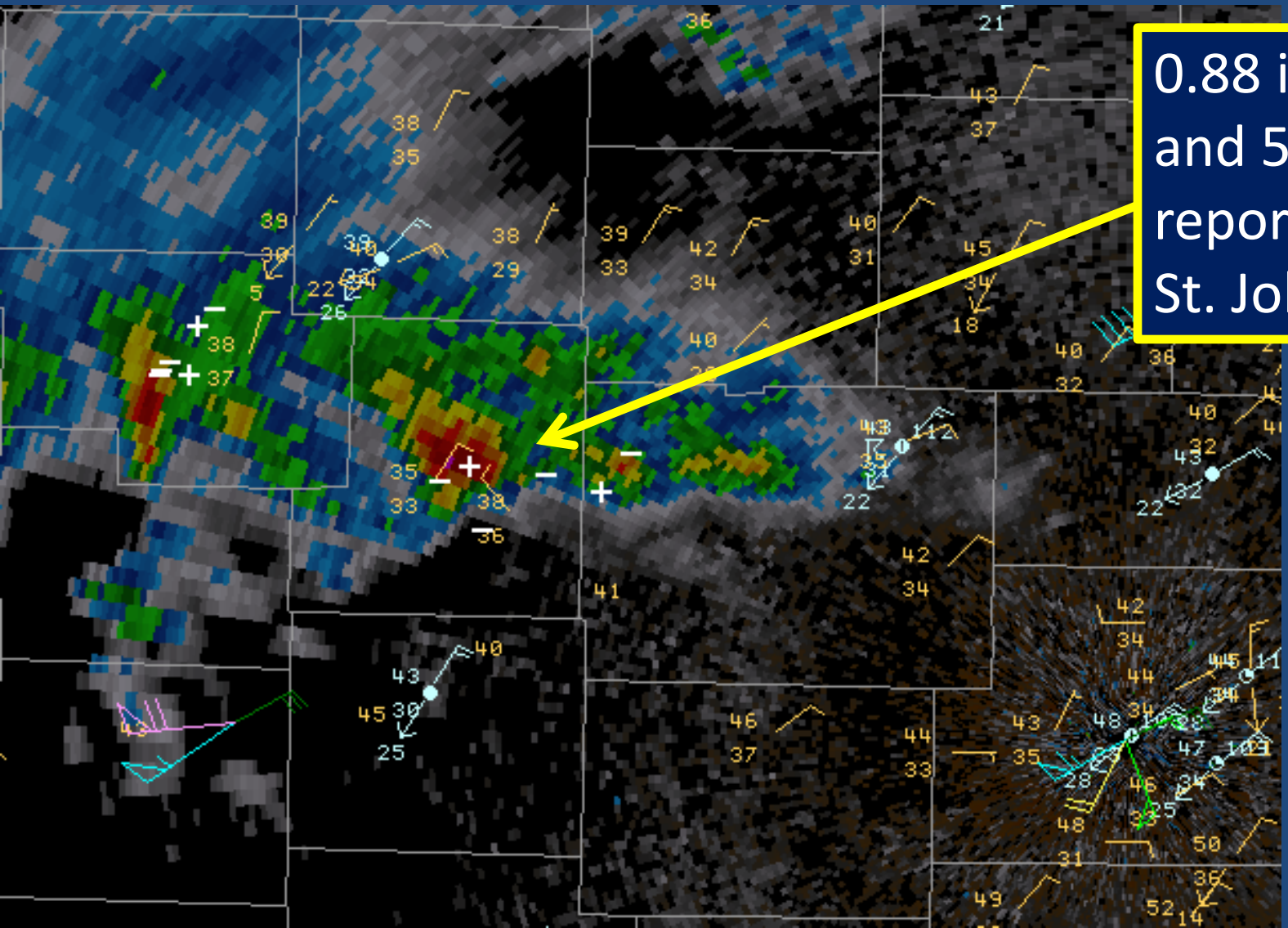

03Z RUC MUCAPE
3hr Forecast (VT 06z)
200
400
600
800
1000
1200
1400
1581
1600
1800
1947
08.03 3HR Tue 06:00Z 08-Apr-08

So what do YOU think now?

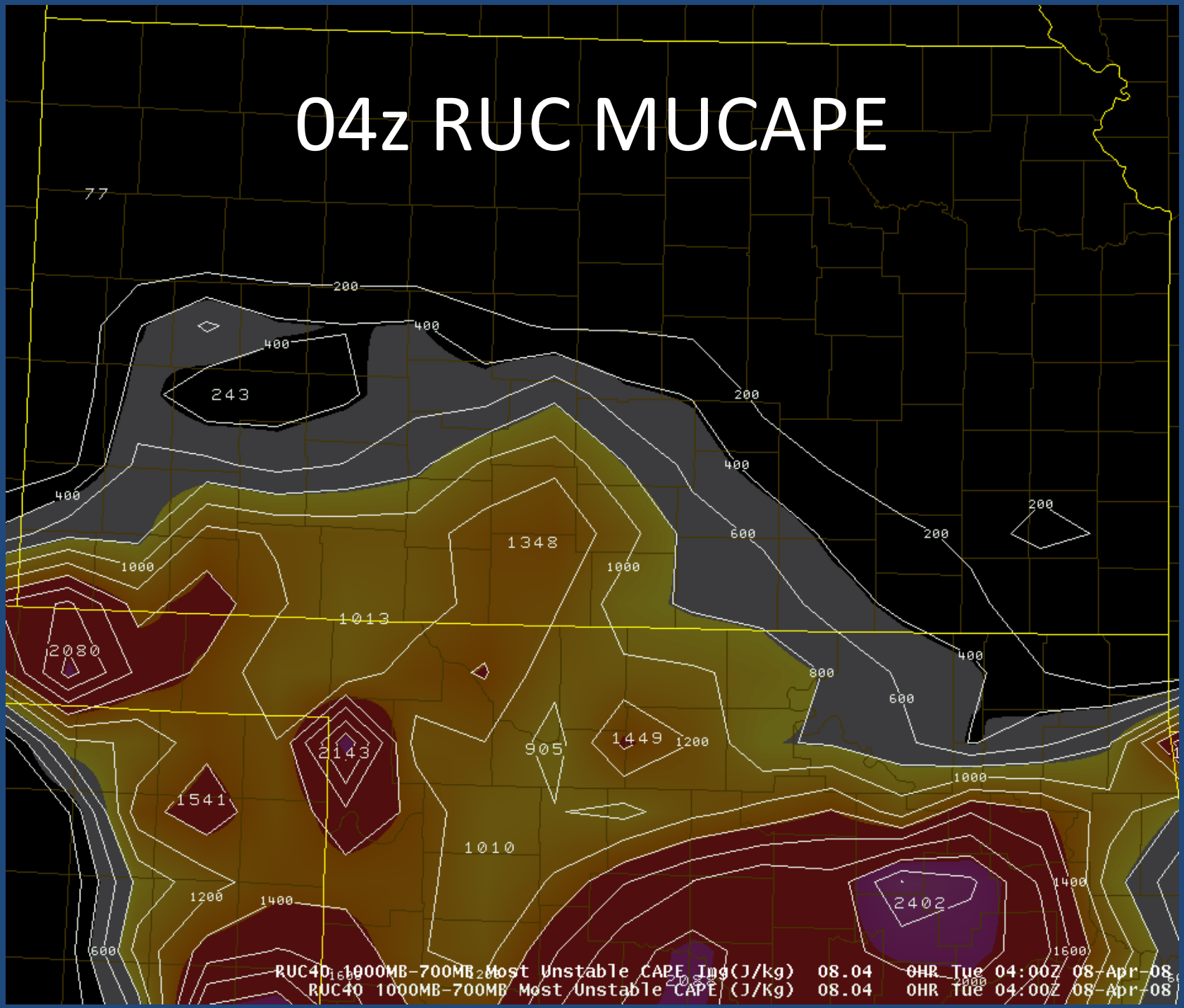
- Hail?
- Wind?
- Tornado?
- Any severe?

0350z: DDC LSR

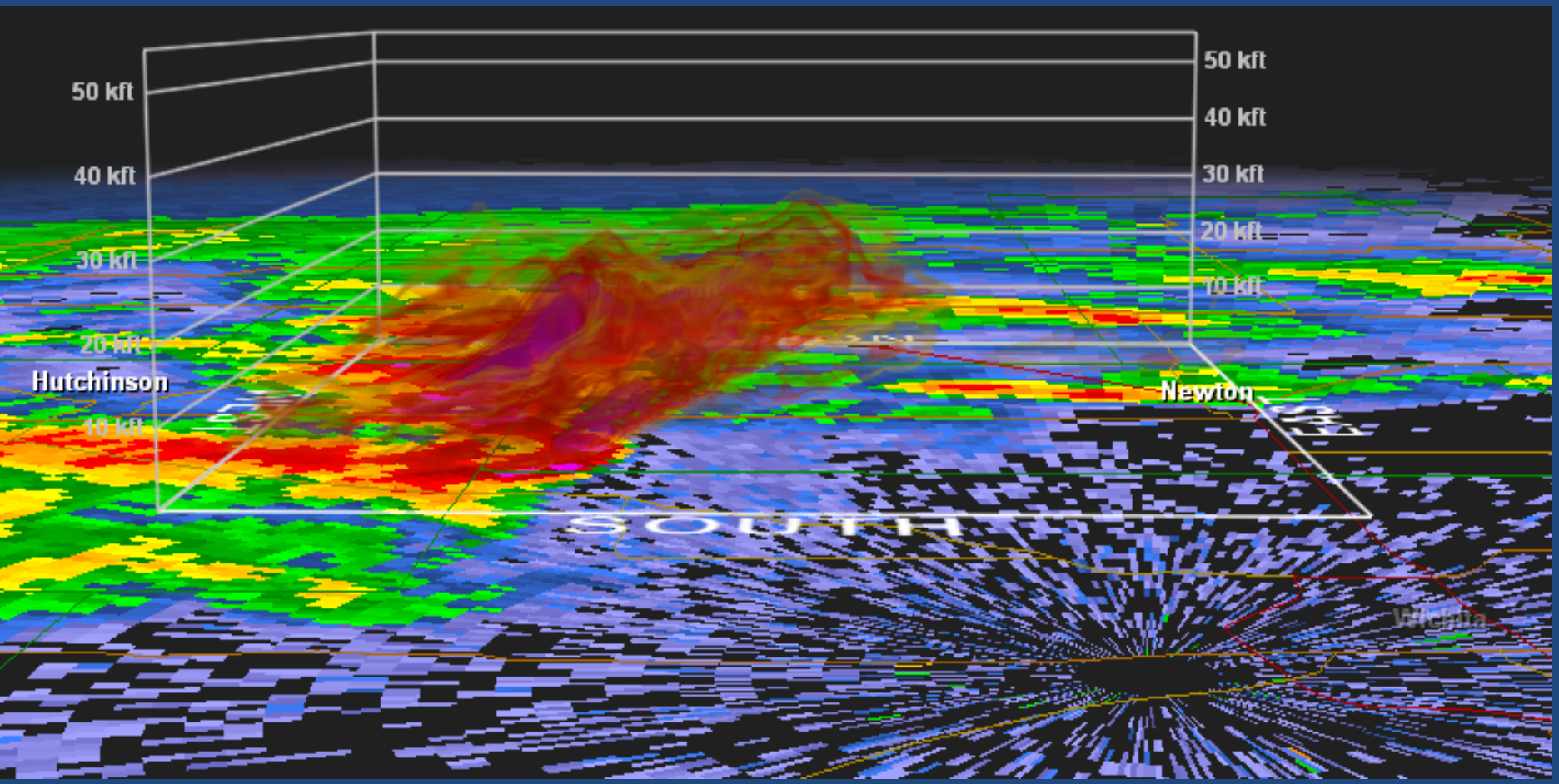
(Houston, we have problem)

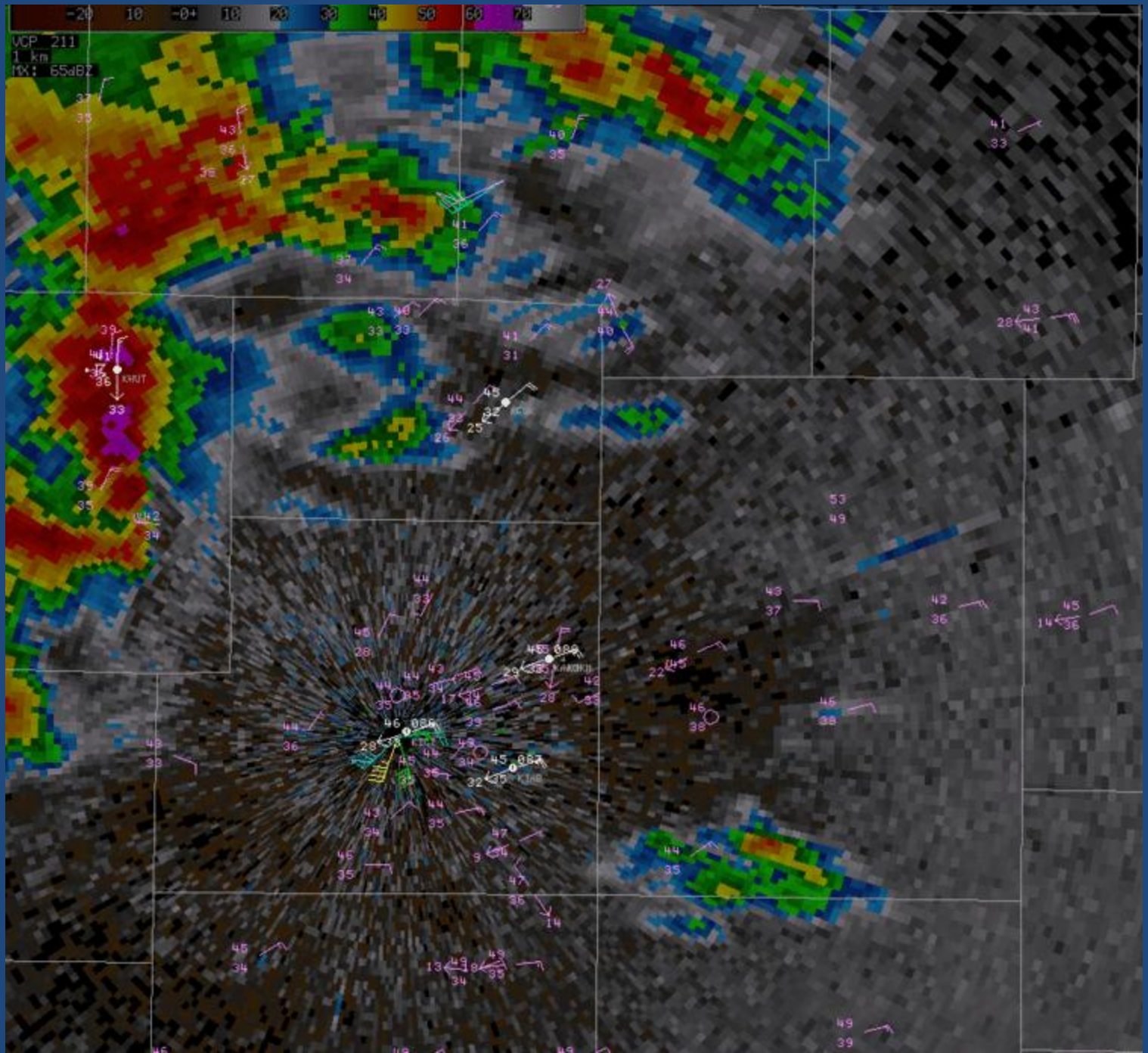


04z RUC MUCAPE

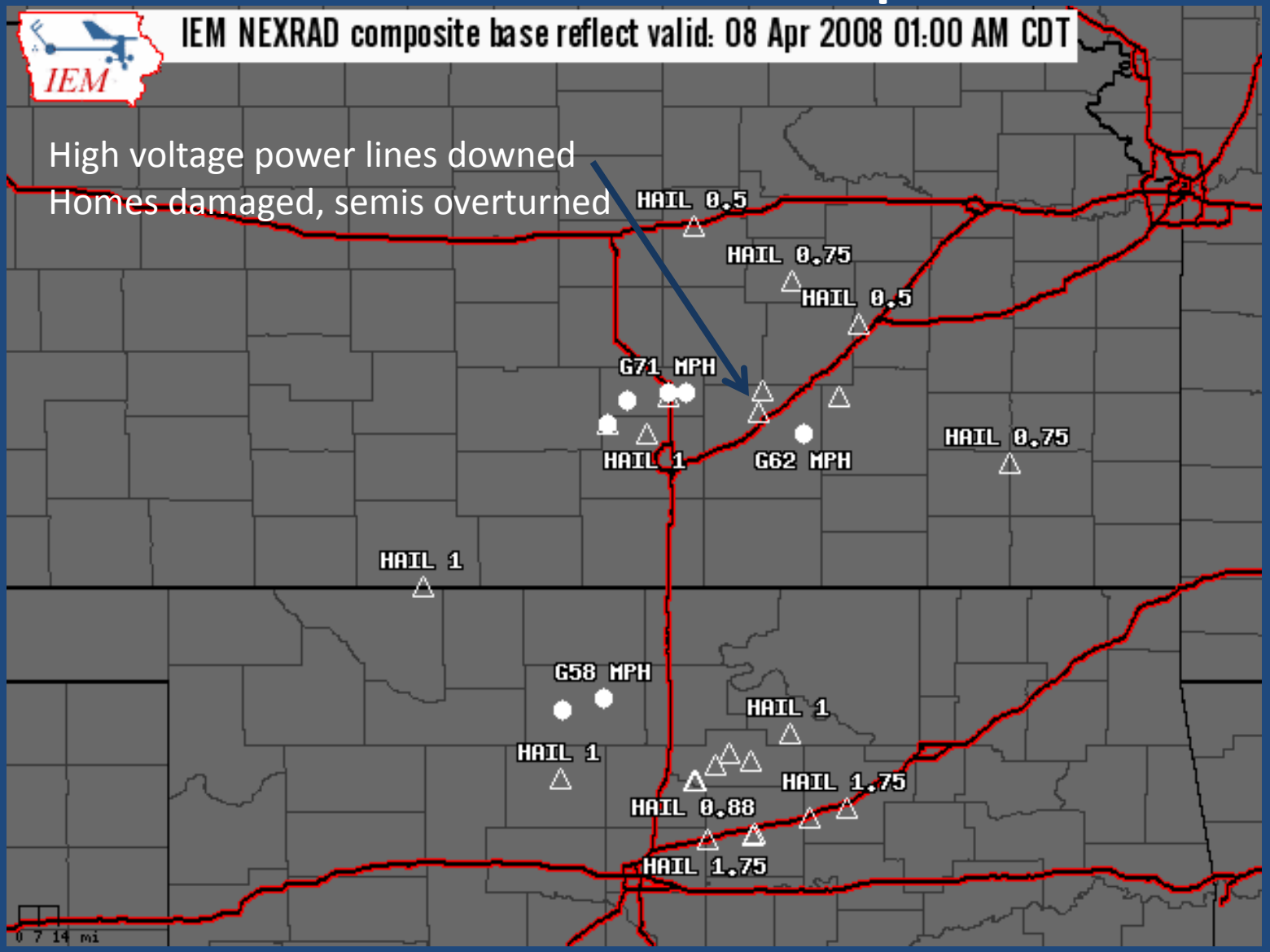


05z: Radar
(Houston, we have a big problem)

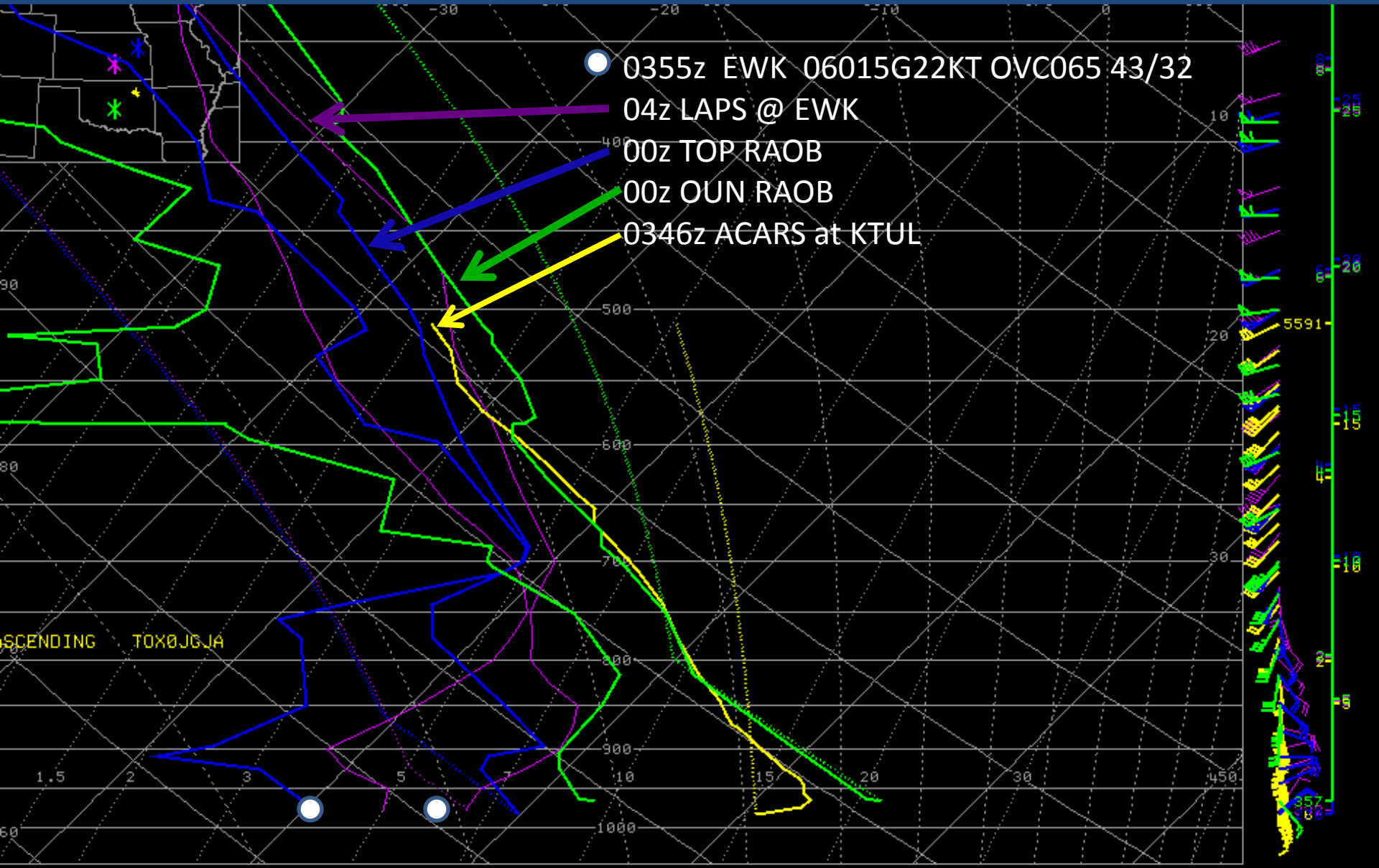



VCP 211
1 km
MX: 65dBZ
KHRT

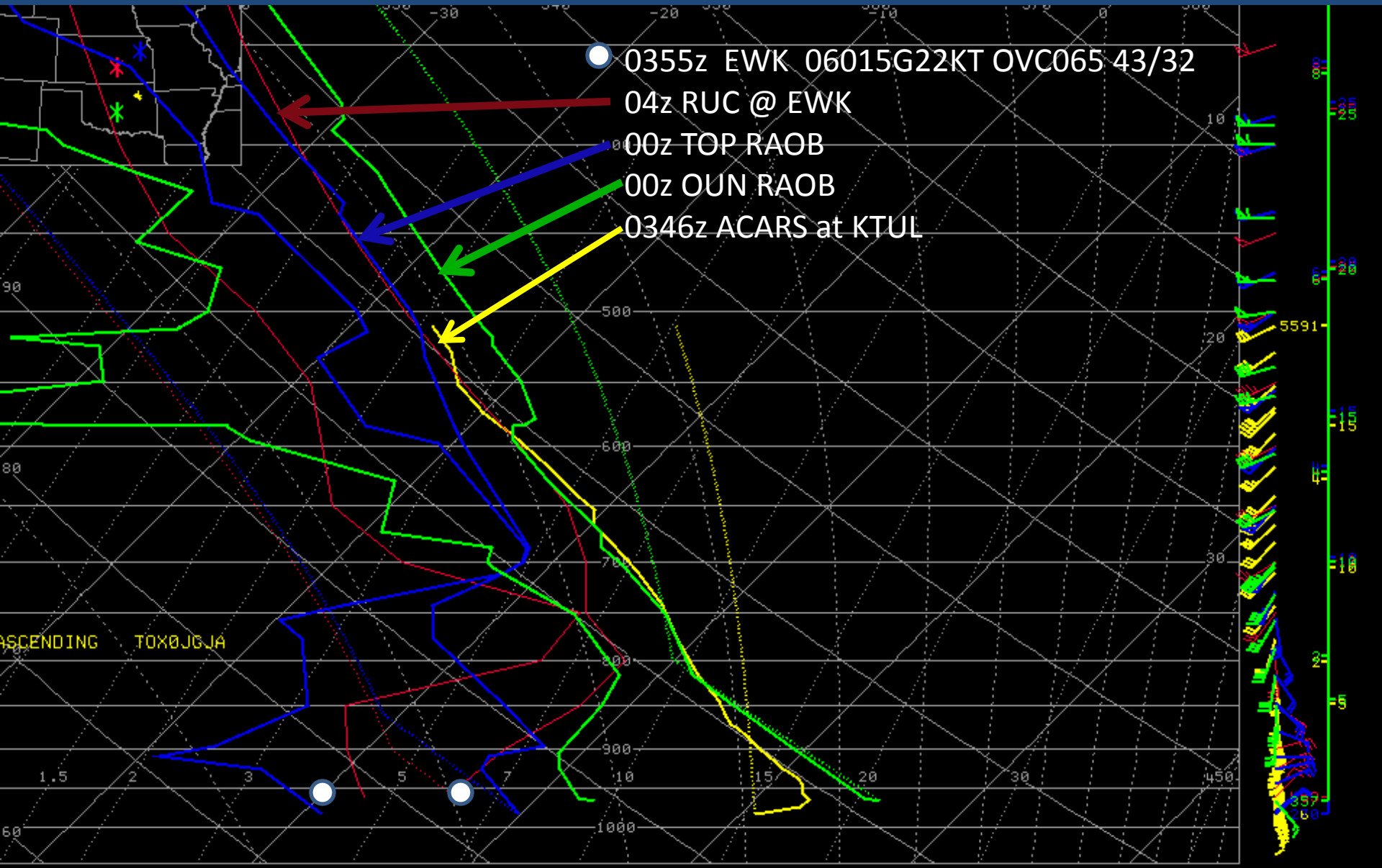
Plotted Storm Reports



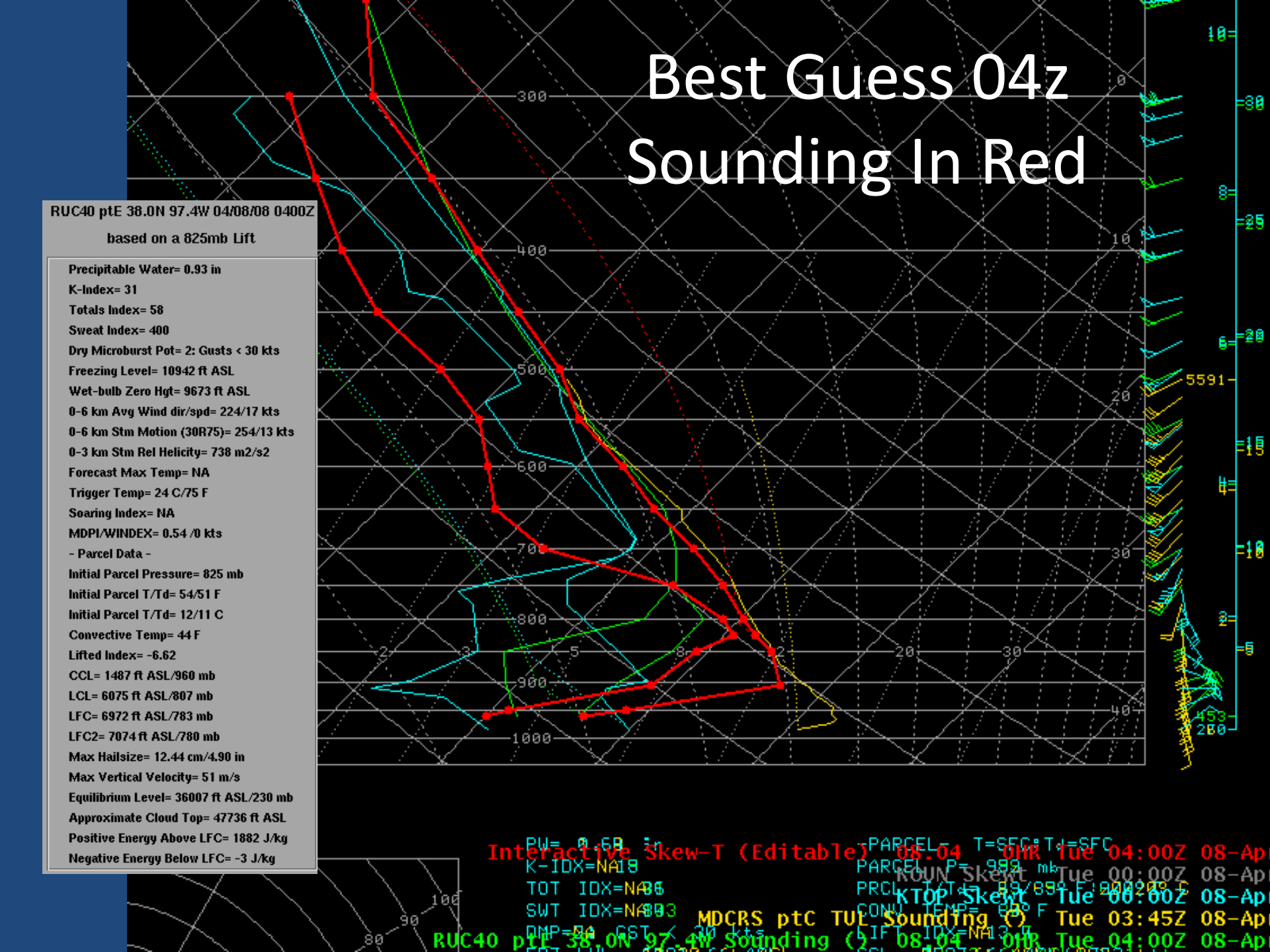
LAPS 04z Sounding



RUC 04z Sounding



Best Guess 04z Sounding In Red

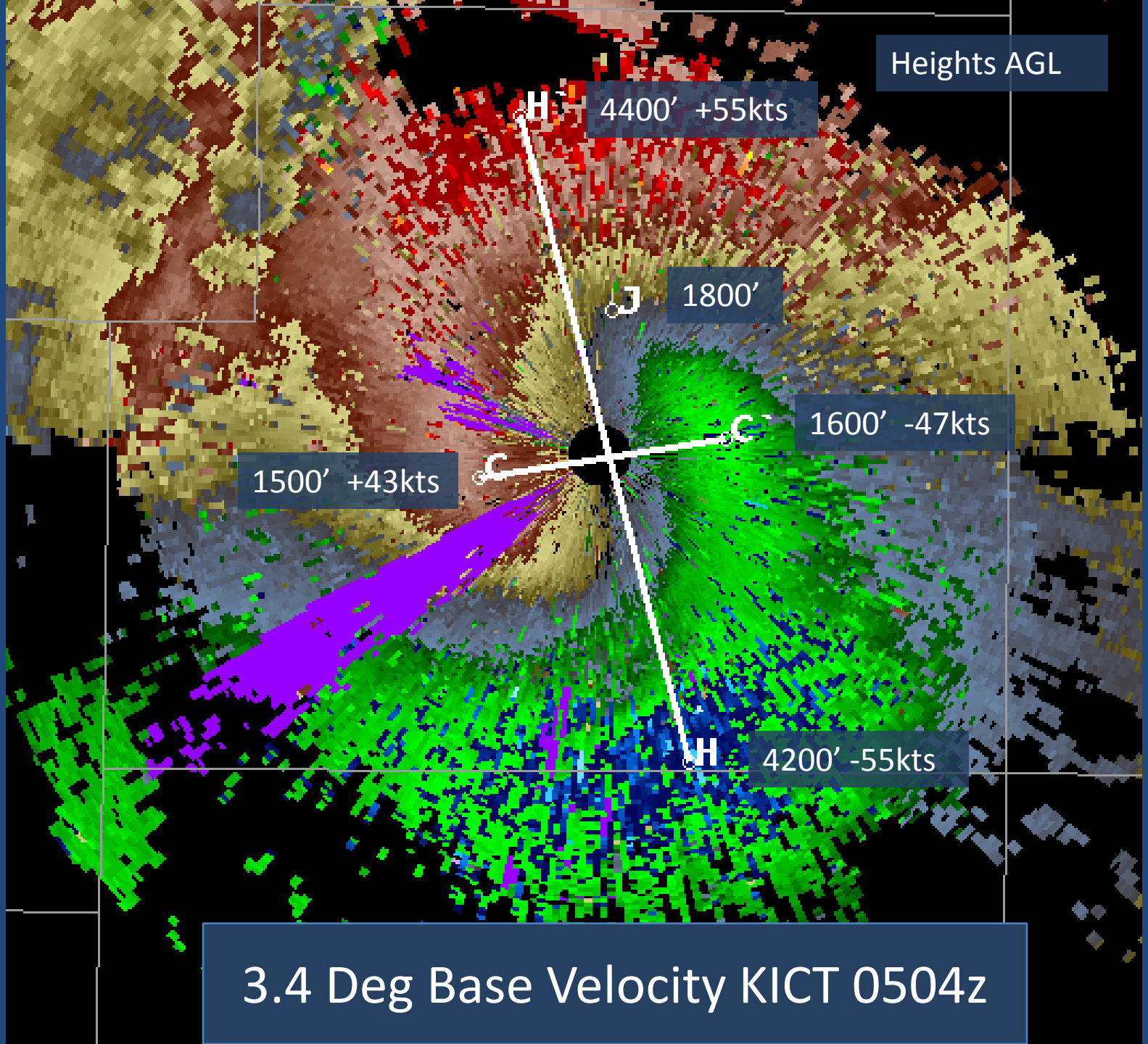


HVLK1 Dir/Spd (kts)

Height (m) AGL	00z	01z	02z	03z	04z	0448z
2500	255/31	267/29	201/20	E190/25	E190/40	E190/55
2250	255/28	263/23	198/22		E190/37	
2000	251/28	251/18	206/22	E220/22	195/45	E190/50
1750	249/28	248/17	210/25	E185/30	E190/33	E190/50
1500	221/18	209/16	209/27	177/30	177/39	E160/40
1250	207/19	187/17	181/24	169/31	162/33	E150/35
1000	166/19	E180/25	176/26	150/31		
750	115/19	E155/20	150/27	E100/22		
500	94/17	E90/22	E80/25	E60/30	E50/30	E45/40
sfc						

HBRK1 Dir/Spd (kts)

Height (m) AGL	00z	01z	02z	03z	04z	0448z
2500	224/42	227/50	238/29	242/21	E255/15	
2250	212/37	226/45	233/33	E230/27	228/28	
2000	213/37	204/36	E230/35	E230/25	E220/30	
1750	E210/30	184/29	E210/35	E205/30	195/24	
1500	178/28	183/26	179/28	E215/35		
1250	152/30	159/28	170/32	E180/30		
1000	128/32	E120/27	E130/30	138/28		
750	92/35	E90/32	E115/30	E100/30	E95/27	
500	86/36	72/36	71/25	E70/30	E70/37	E80/45
sfc						


Heights AGL
H
4400’ +55kts
J
1800’
C
1600’ -47kts
C
1500’ +43kts
H
4200’ -55kts
3.4 Deg Base Velocity KICT 0504z

Meteorological Observations

- Initial conceptual plan was incorrect, despite later RUC/LAPS data suggesting it was still on target
- Instability much higher than initially thought
- It appears that the initial high wind was the result of a core collapse
- Subsequent severe wind may have been a function of midlevel wind diverted down and/or synergistic interaction with gravity waves
- Gravity wave train extended into SW KS (wavelength = 23nm, period = 27min)
- Surface temperatures only cooled about 5F with storm passage, which suggests low level evaporative cooling was not the primary factor, mid level dry air may have been

Operational Observations

- Monitoring observational data are critical for validating model data, but it may not be sufficient
- Warning process:
  - Observation of severe wind in DDC CWA
  - Radar indicated a very large storm w/ high velocities at 0.5 slice
  - Warning team correctly discounted conceptual model and warned
  - Team correctly continued to warn downstream storms despite initial significant lag in severe reports
  - NOTE: Incorrect Mesoscale Situational Awareness can be worse than no environmental data in warning decisions (Wolf/Howerton)
- Use higher base velocity slices as a proxy to VWP and to monitor changes in winds over time.