An Elevated Supercell on 19 May 2002 – A Weather Event Simulation

Ron Miller, WFO Spokane WA

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Introduction

On the evening of May 19th, 2002, a long-lived supercell thunderstorm tracked across eastern Washington. The storm moved across a sparsely populated area after sunset, so no damage was reported. But the supercell was impressive from a structure and evolution standpoint.

Discussion

On the afternoon of May 19th, deep south-southeasterly flow existed over most of the Pacific Northwest with a large negative tilt trough offshore. This synoptic pattern is well known for being a favorable pattern for severe weather in the eastern Washington and northern Idaho area. This was well documented by Evenson and Johns in 1995.

Examination of the model forecasts for the afternoon (00Z 20 May) indicated good instability (Fig 1) over the Idaho panhandle with strong 0-6km shear (40-50kts). This pointed the forecasters to the possibility of organized convection over the panhandle. Low-level (0-3km) shear was also strong, further suggesting the possibility of organized lines. Over eastern Washington, stronger shear existed. But the drier low-levels minimized the available CAPE, with a large area of CIN present that would be difficult to overcome with daytime heating. An Eta forecast sounding from Moses Lake in the Columbia Basin (Fig 2) showed this less than impressive sounding..

Convection developed over the central Idaho mountains and moved north into the panhandle. An organized west-east line developed and produced severe wind damage in several locations. By the end of the event, the convective line had moved into Canada (Fig 3). Meanwhile, a lone thunderstorm developed over the mountains of northeast Oregon (see Fig 3) and moved towards the north-northwest into the low elevations of central Washington. While this area was unfavorable for initiating convection due to the strong cap, the thunderstorm that moved into this region was elevated and did not initially rely on the boundary layer.

As the storm continued to develop, it appears that the downdrafts generated by the storm were able to mix the low level air and thus remove the cap. The forecast straight-line hodograph (Fig 2) indicated that significant rotation was not to be expected unless the storm could move considerably left or right of the mean wind. At 0437Z some rotation was noted (Fig 4) but it was only in the weak mesocyclone category. Also note that the rotation was aloft, 16-21kft AGL. Several times during it's life the storm showed the classic structure of new updraft development. At 0449Z a new updraft is clearly evident on the southeast flank of the storm (Fig 5). Just 17 minutes later, a strong reflectivity gradient formed on the northeast side of the storm (Fig 6). This is an atypical region of the storm for this feature, but the low-level inflow was from the east-northeast as shown in the VWP (Fig 7). The storm reached full maturity at 0518Z (Fig 8) with 65 dbZ echoes present above 12kft AGL.

Summary

Due to the lack of severe weather spotter reports, this storm did not make for a good simulation in testing warning lead times and verification. However, the storm structure signatures provided an excellent training opportunity. The WES simulation focused more on the identification of these and other features, as well as the mechanics of issuing, updating, and ending the SVR messages.

References:

Evenson, E. C. and R. H. Johns: 1995: Some Climatological and Synoptic Aspects of Severe Weather Development in the Northwestern United States. Natl. Wea. Dig., 20, 34-50.

Figure 1

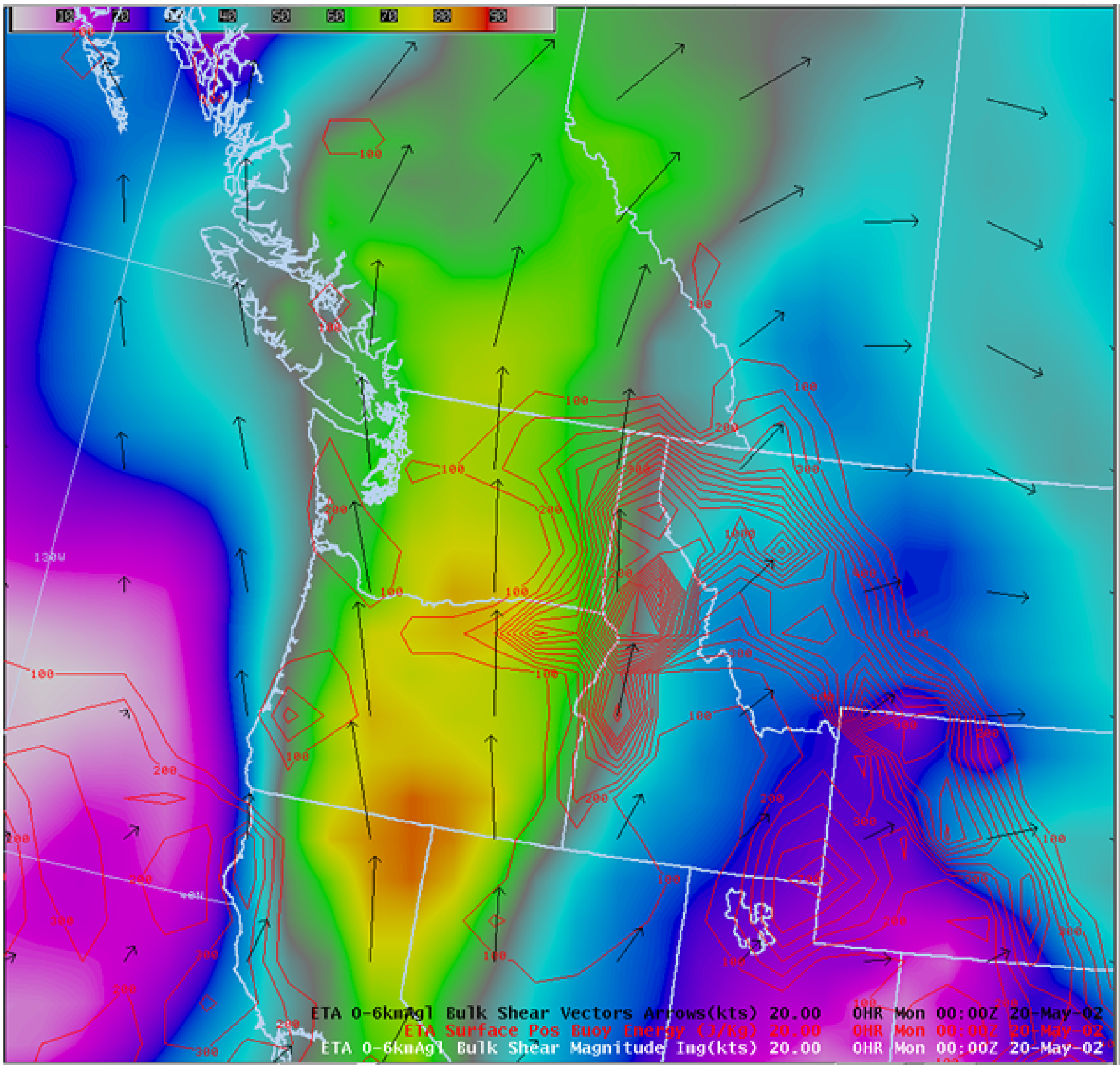

ETA 0-6kmAgl Bulk Shear Vectors Arrows(kts) 20.00 0HR Mon 00:00Z 20-May-02
ETA Surface Pos Buoy Energy (J/Kg) 20.00 0HR Mon 00:00Z 20-May-02
ETA 0-6kmAgl Bulk Shear Magnitude Img(kts) 20.00 0HR Mon 00:00Z 20-May-02

Figure 2

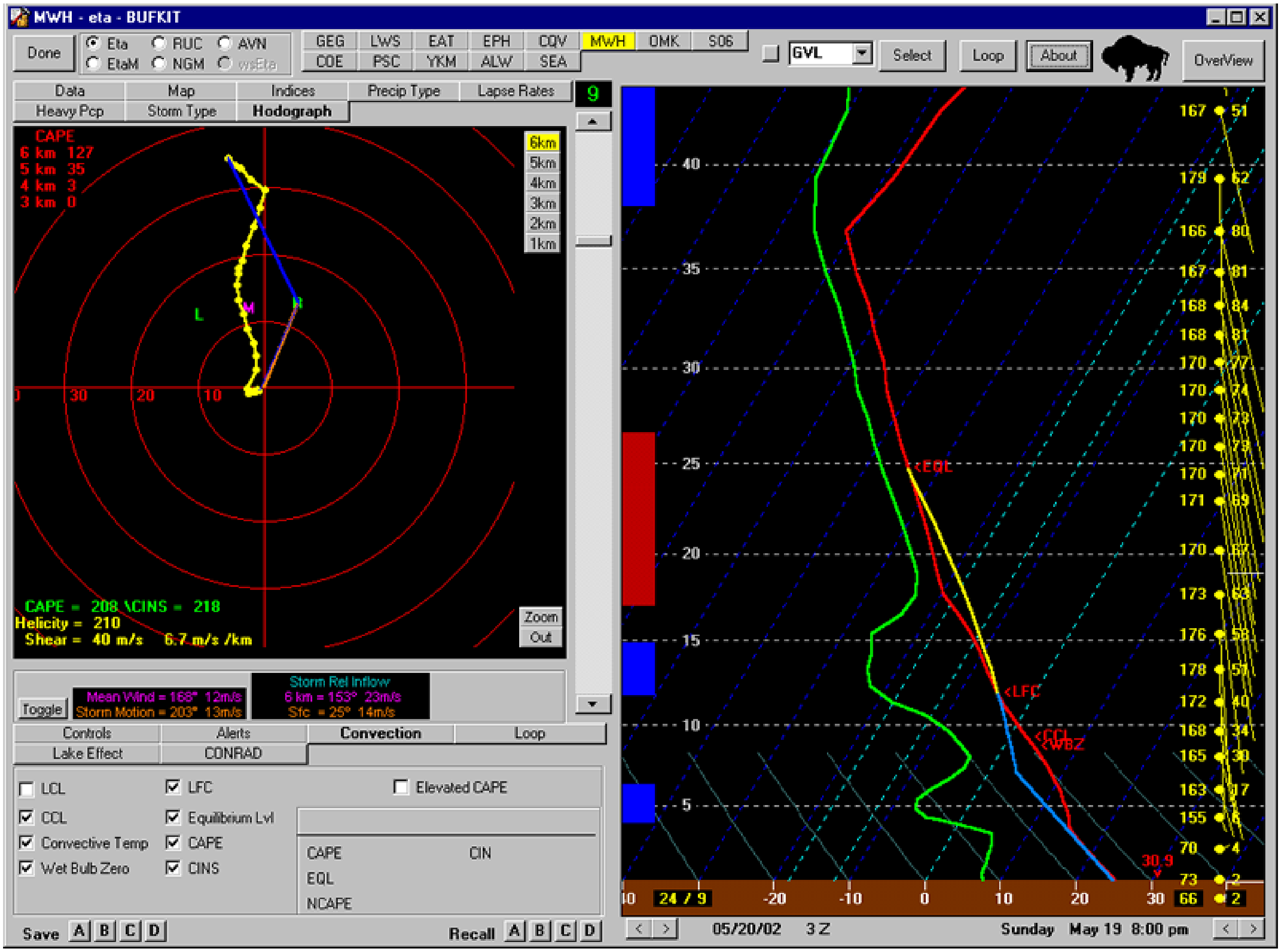

MWH - eta - BUFKIT
Done
Eta
EtaM
RUC
NGM
AVN
wsEta
GEG LWS EAT EPH CQV MWH OMK S06
COE PSC YKM ALW SEA
GVL
Select
Loop
About
OverView
Data
Map
Indices
Precip Type
Lapse Rates
Heavy Pcp
Storm Type
Hodograph
CAPE
6 km 127
5 km 35
4 km 3
3 km 0
6km 5km 4km 3km 2km 1km
CAPE = 208 \CINS = 218
Helicity = 210
Shear = 40 m/s 6.7 m/s /km
Zoom Out
Toggle
Mean Wind = 168° 12m/s
Storm Motion = 203° 13m/s
Storm Rel Inflow
6 km = 153° 23m/s
Sfc = 25° 14m/s
Controls
Alerts
Convection
Loop
Lake Effect
CONRAD
LCL
LFC
Elevated CAPE
CCL
Equilibrium Lvl
Convective Temp
CAPE
Wet Bulb Zero
CINS
CAPE
CIN
EQL
NCAPE
Save A B C D
Recall A B C D
EQL
LFC
CCL
WBZ
30.9
24 / 9
05/20/02 3 Z
Sunday May 19 8:00 pm

Figure 3

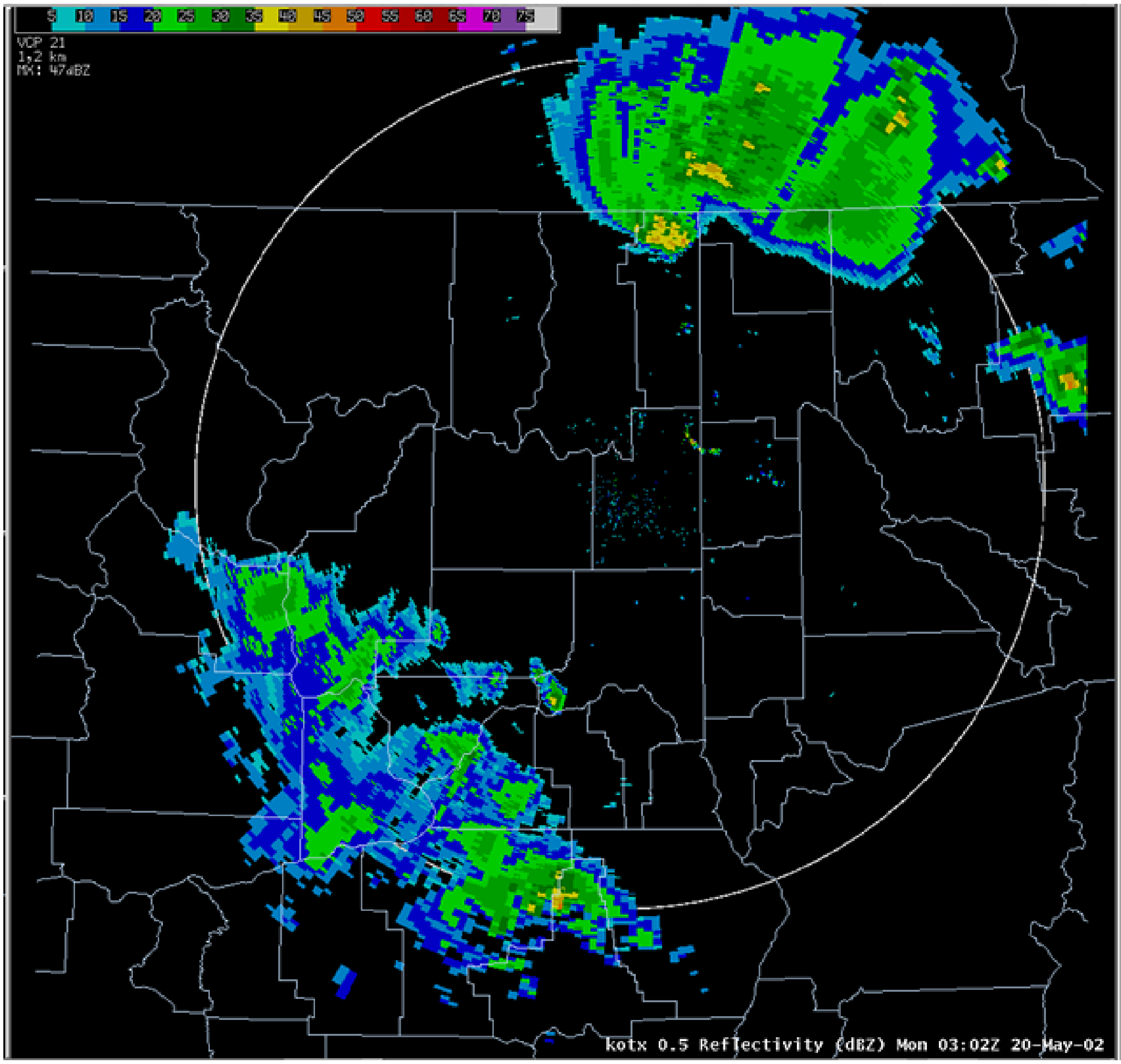

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
VCP 21
1,2 km
MX: 47dBZ
kotx 0.5 Reflectivity (dBZ) Mon 03:02Z 20-May-02

Figure 4

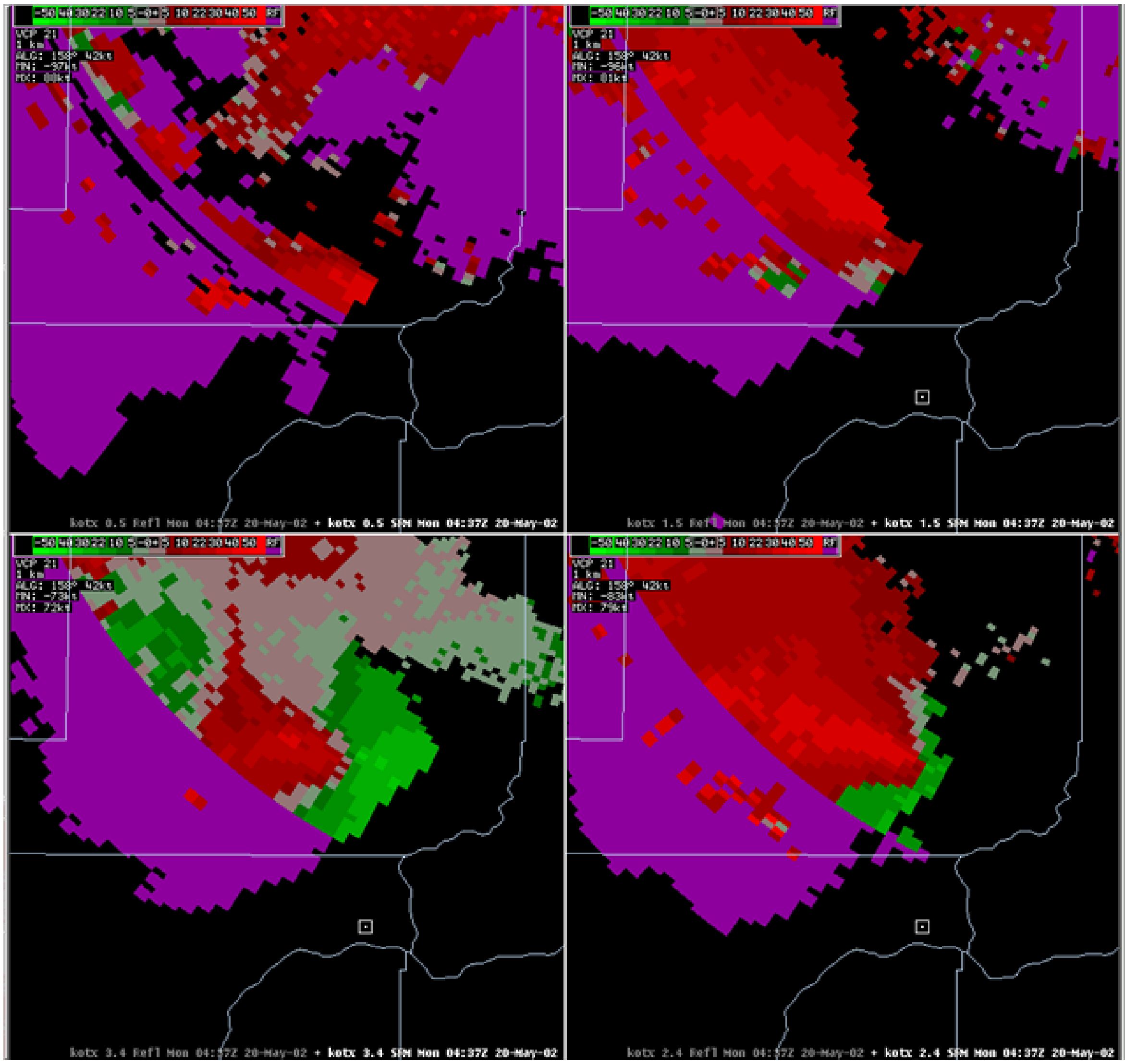

kotx 0.5 SRM Mon 04:37Z 20-May-02
kotx 1.5 SRM Mon 04:37Z 20-May-02
kotx 3.4 SRM Mon 04:37Z 20-May-02
kotx 2.4 SRM Mon 04:37Z 20-May-02

Figure 5

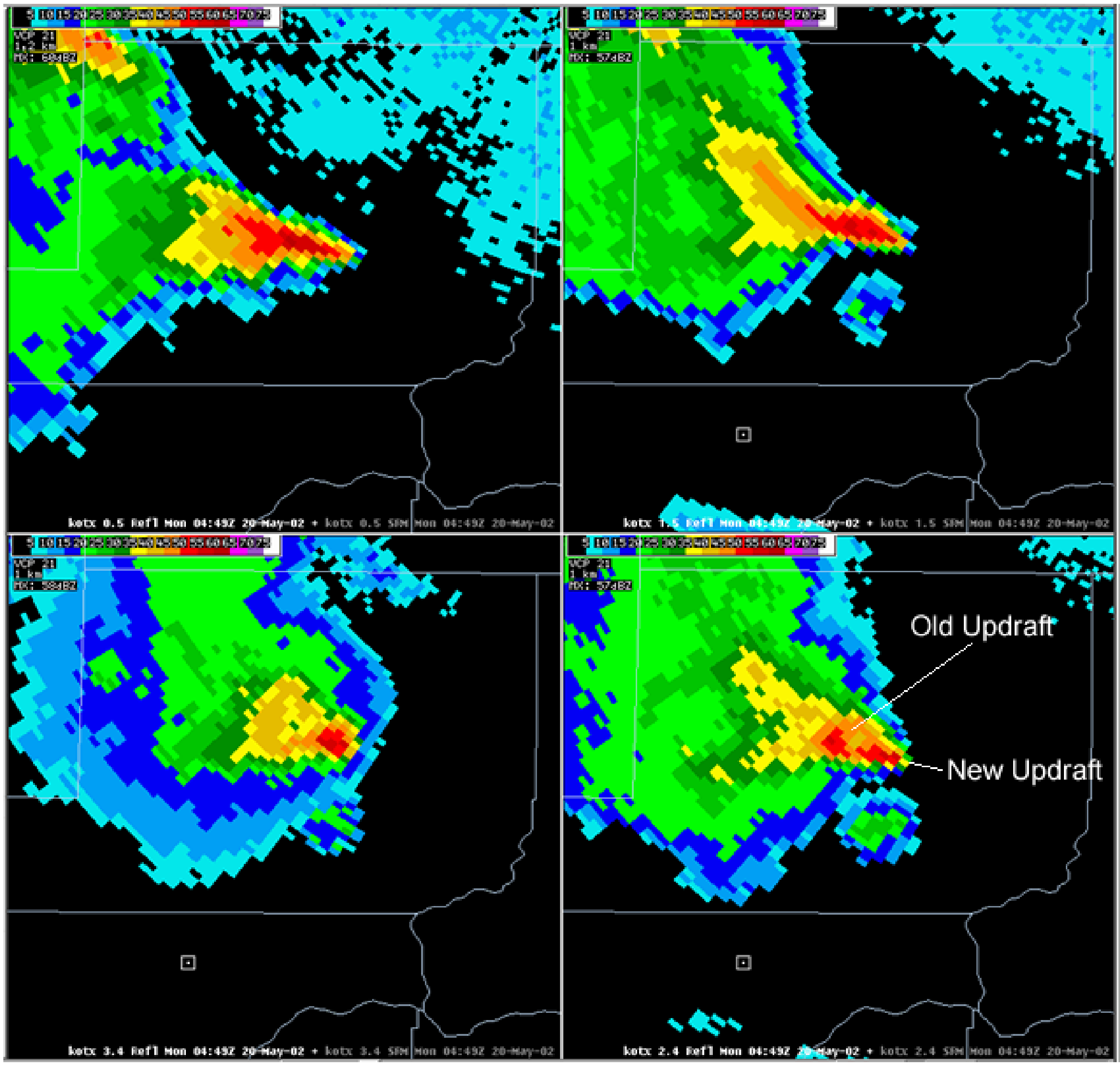

kotx 0.5 Refl Mon 04:49Z 20-May-02 + kotx 0.5 SRM Mon 04:49Z 20-May-02
kotx 1.5 Refl Mon 04:49Z 20-May-02 + kotx 1.5 SRM Mon 04:49Z 20-May-02
kotx 3.4 Refl Mon 04:49Z 20-May-02 + kotx 3.4 SRM Mon 04:49Z 20-May-02
Old Updraft
New Updraft
kotx 2.4 Refl Mon 04:49Z 20-May-02 + kotx 2.4 SRM Mon 04:49Z 20-May-02

Figure 6

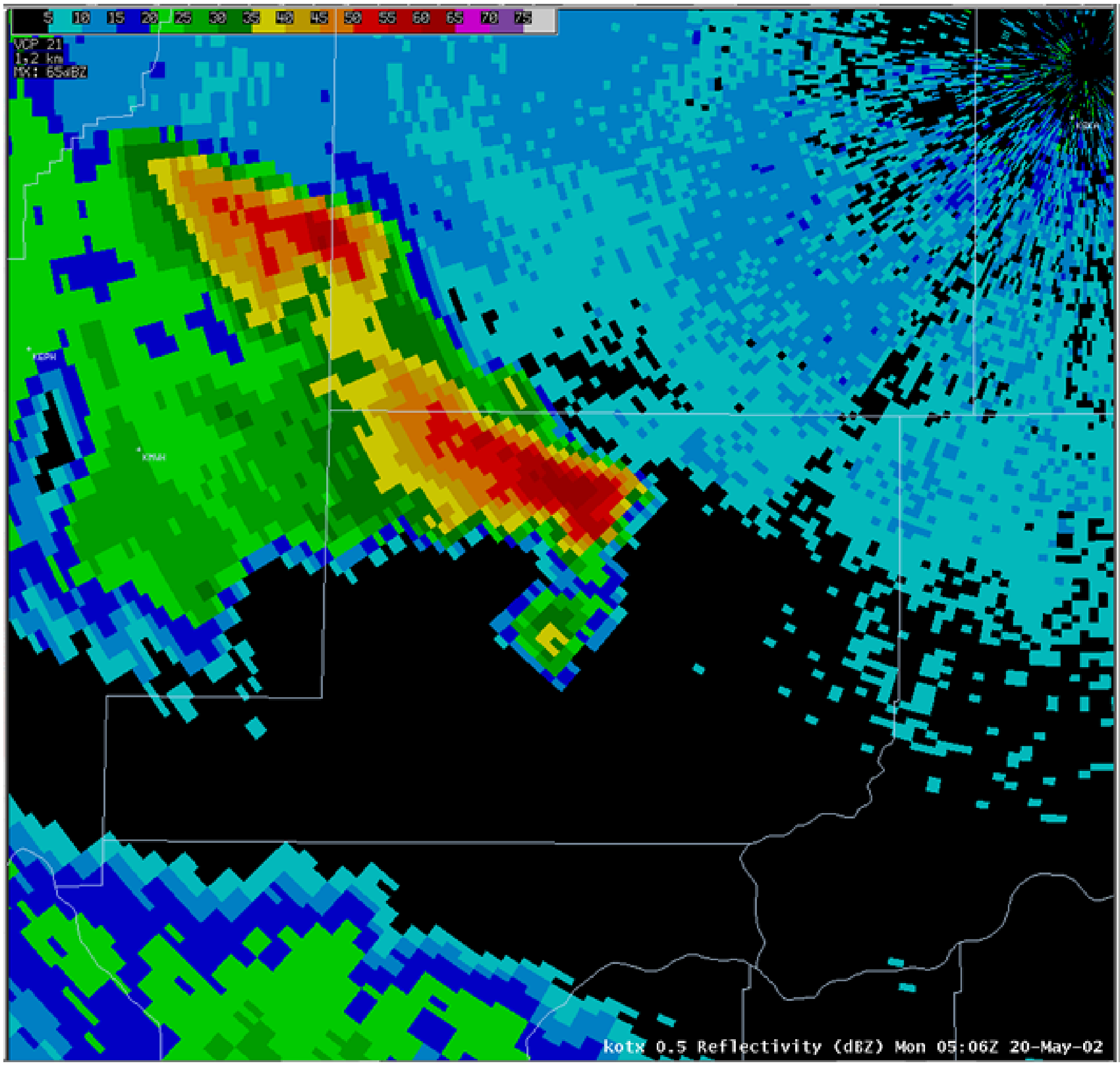

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
VCP 21
1.2 km
MX: 65dBZ
kotx 0.5 Reflectivity (dBZ) Mon 05:06Z 20-May-02

Figure 7

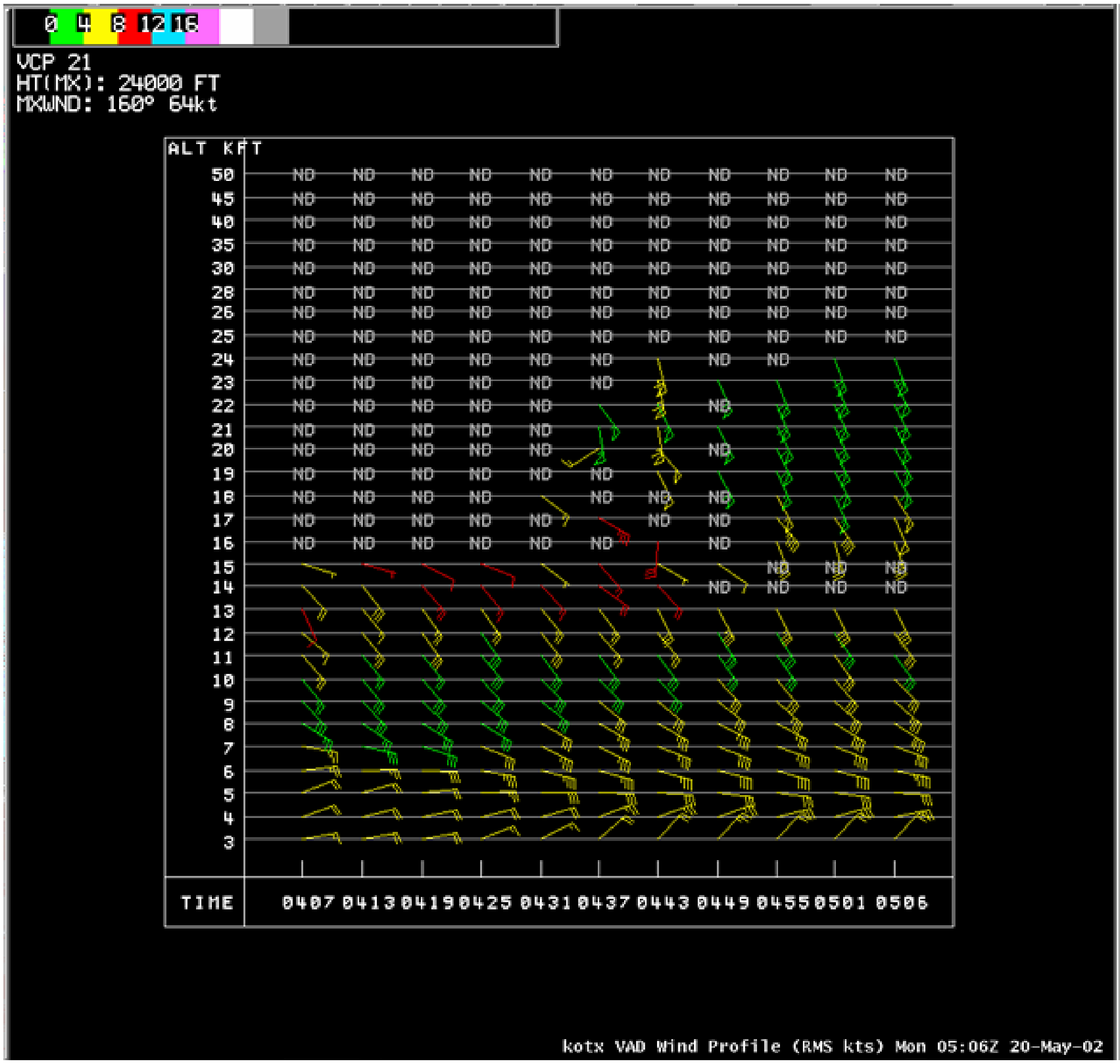
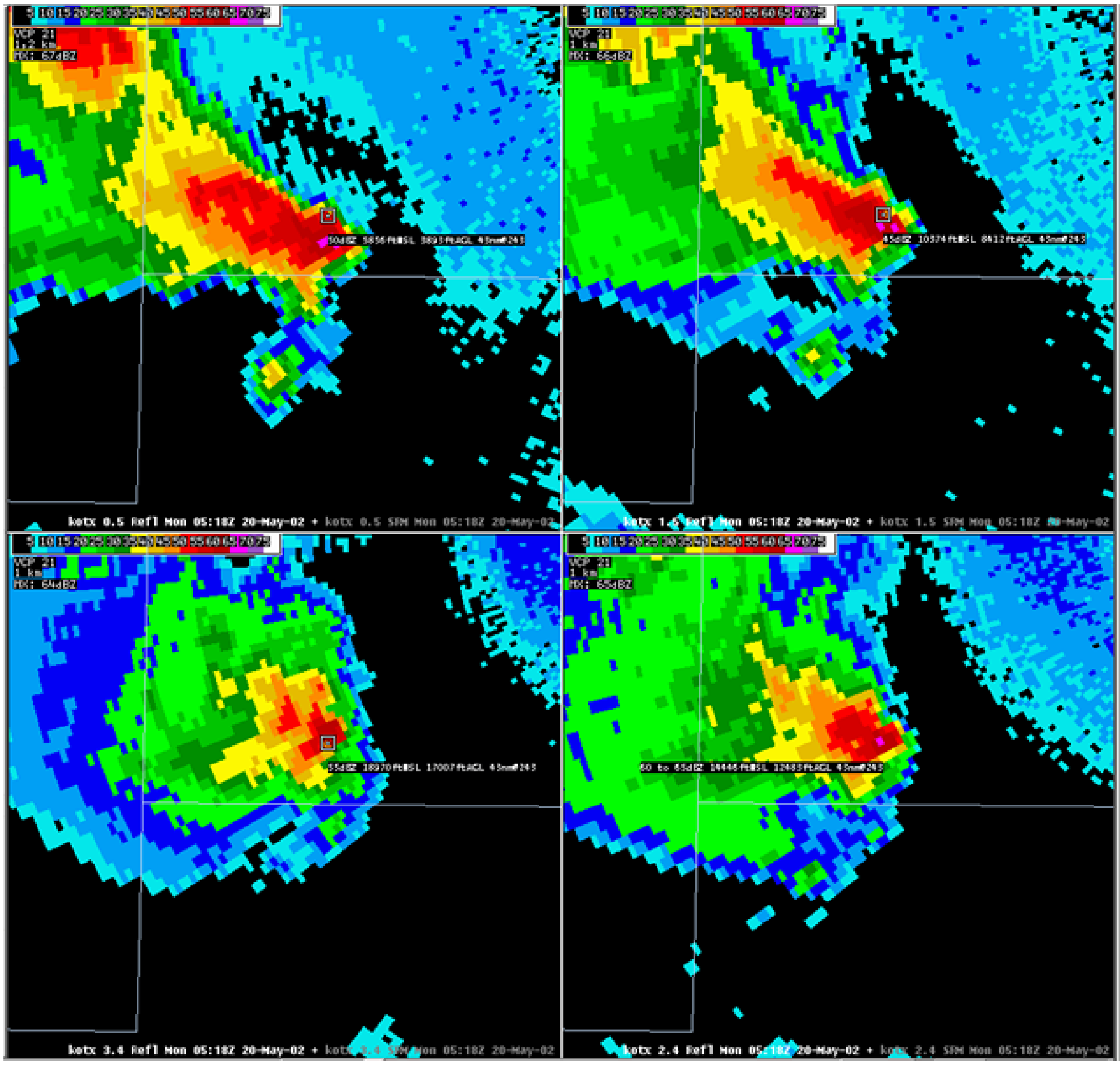

0 4 8 12 16
VCP 21
HT(MX): 24000 FT
MXWND: 160° 64kt
ALT KFT
50
45
40
35
30
28
26
25
24
23
22
21
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
ND
TIME
0407 0413 0419 0425 0431 0437 0443 0449 0455 0501 0506
kotx VAD Wind Profile (RMS kts) Mon 05:06Z 20-May-02

Figure 8



kotx 0.5 Refl Mon 05:18Z 20-May-02 + kotx 0.5 SRM Mon 05:18Z 20-May-02
kotx 1.5 Refl Mon 05:18Z 20-May-02 + kotx 1.5 SRM Mon 05:18Z 20-May-02
kotx 3.4 Refl Mon 05:18Z 20-May-02
kotx 2.4 Refl Mon 05:18Z 20-May-02 + kotx 2.4 SRM Mon 05:18Z 20-May-02