WSR-88D Storm Relative Motion May Pinpoint Boundaries

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One of the prime WSR-88D Storm Relative Motion (SRM) velocity product is for detecting shear regions, such as mesocyclones, TVS, and upper level divergence. But another SRM application may include tracking boundaries, like cold fronts, marine pushes, thermal troughs, etc. If base velocity data does not provide conclusive evidence on boundary locations, the SRM may be utilized for this purpose. A surface trough moving across eastern Washington on May 22nd, 1996, provides an example for another use of SRM.

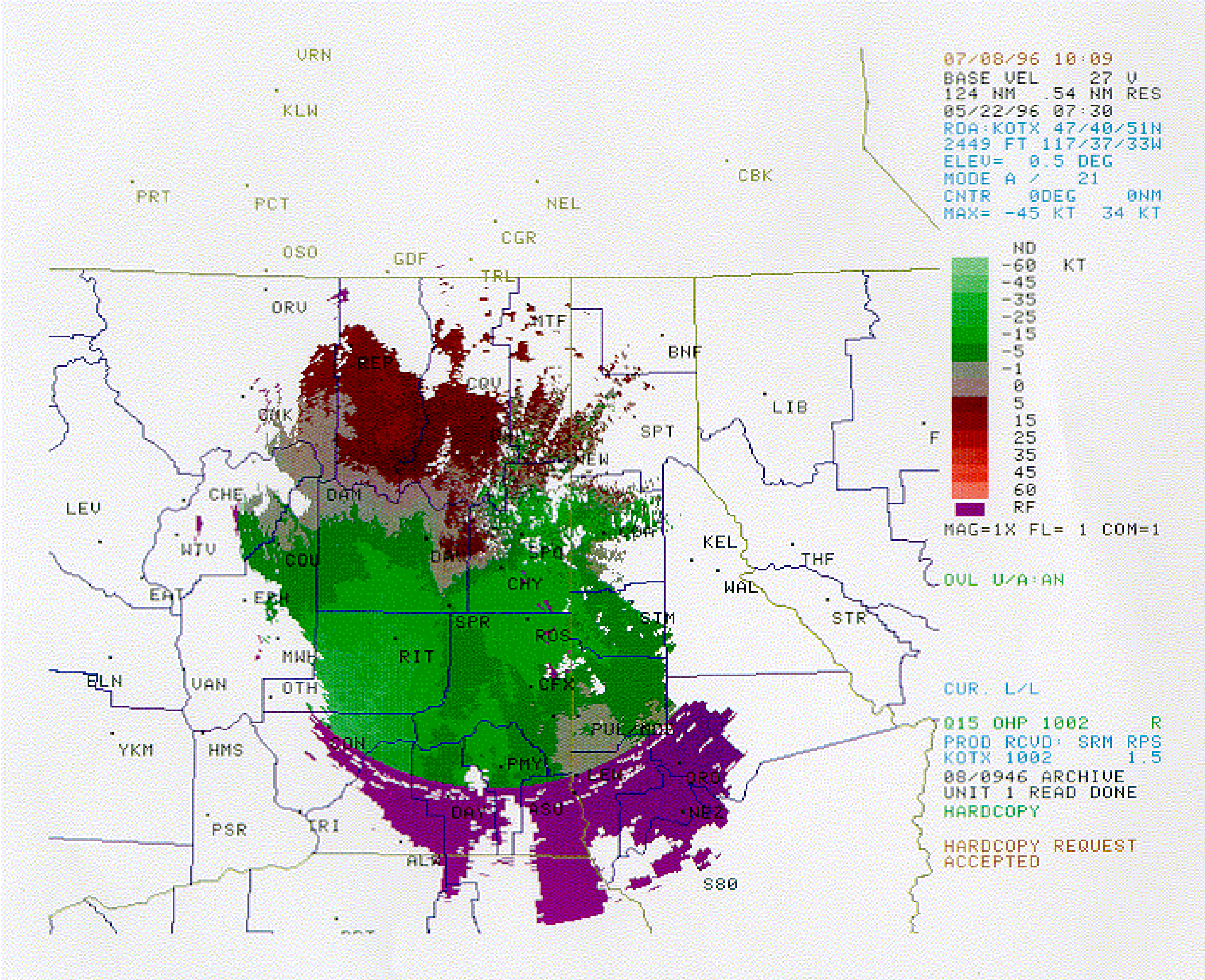
During the early morning of May 22nd, a surface trough was moving eastward across the region. The exact location of the trough was not evident from surface aviation observations or other types of data. The closest observations west of the Spokane airport (GEG), besides Fairchild Air Force Base (SKA) 5 miles west, are Moses Lake (MWH) and Ephrata (EPH) at 85 and 90 miles, respectively. The WSR-88D may help pinpoint the frontal location. Unfortunately, the base velocity gave only a hint of the surface trough location (Figure 1), a small area of convergence near Davenport (DAV). Surface east wind were present at the RDA site, but the 0.5° angle radar beam quickly rose above the inversion about 15 miles away. Hence, the velocity data showed little east wind ahead of the front near Davenport. The PUP operator may not conclude that the trough was at Davenport by examining the base velocity data.

When the default storm speed and direction is subtracted, the location of the surface trough on the SRM chart (Figure 2) becomes more evident. The zero isodop cuts across eastern Washington on a N-S line from Colville (CQV) to northeast of Dayton (DAY). The storm track algorithm calculated an average storm motion of 214° at 21kts. Since wind speed and direction were different ahead of the front, the SRM chart clearly showed the surface trough. The Composite Reflectivity (Figure 3) showed an area of moderate rain behind the surface trough. A storm center was identified west of Davenport with a forecast motion of 245° at 32kts, which differed from the average storm motion used in the SRM. (Recall that the average storm motion is determined by all storms detected from the previous volume scan).

The VAD wind profile data from 0814Z to 0913Z (Figure 4) showed east wind near the surface at 0814Z but veered to south at 5000 feet. The surface trough passed the RDA site around 0845Z, and the wind above ground level shifted to west at 20kts. For this particular event, the SRM chart was occasionally used to track the trough into the Idaho panhandle when velocity data failed to show any boundaries.

Before using the SRM chart to locate boundaries, remember the limitations. Recall that the SRM chart is derived by vector substraction of the estimated storm speed and direction. The storm track algorithm provides the default value for average storm speed and direction; however the PUP operator may enter a storm speed and direction on an one-time request only (see JS2-3-25). The purpose of the SRM chart is to detect shear regions, but the PUP operator may use it to find boundaries if other techniques give inconclusive information. In this case, the SRM graphic was used to find a boundary, and not to determine the shear for a particular convective storm.

Figure 1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05/22/96 07:30
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2449 FT 117/37/33W
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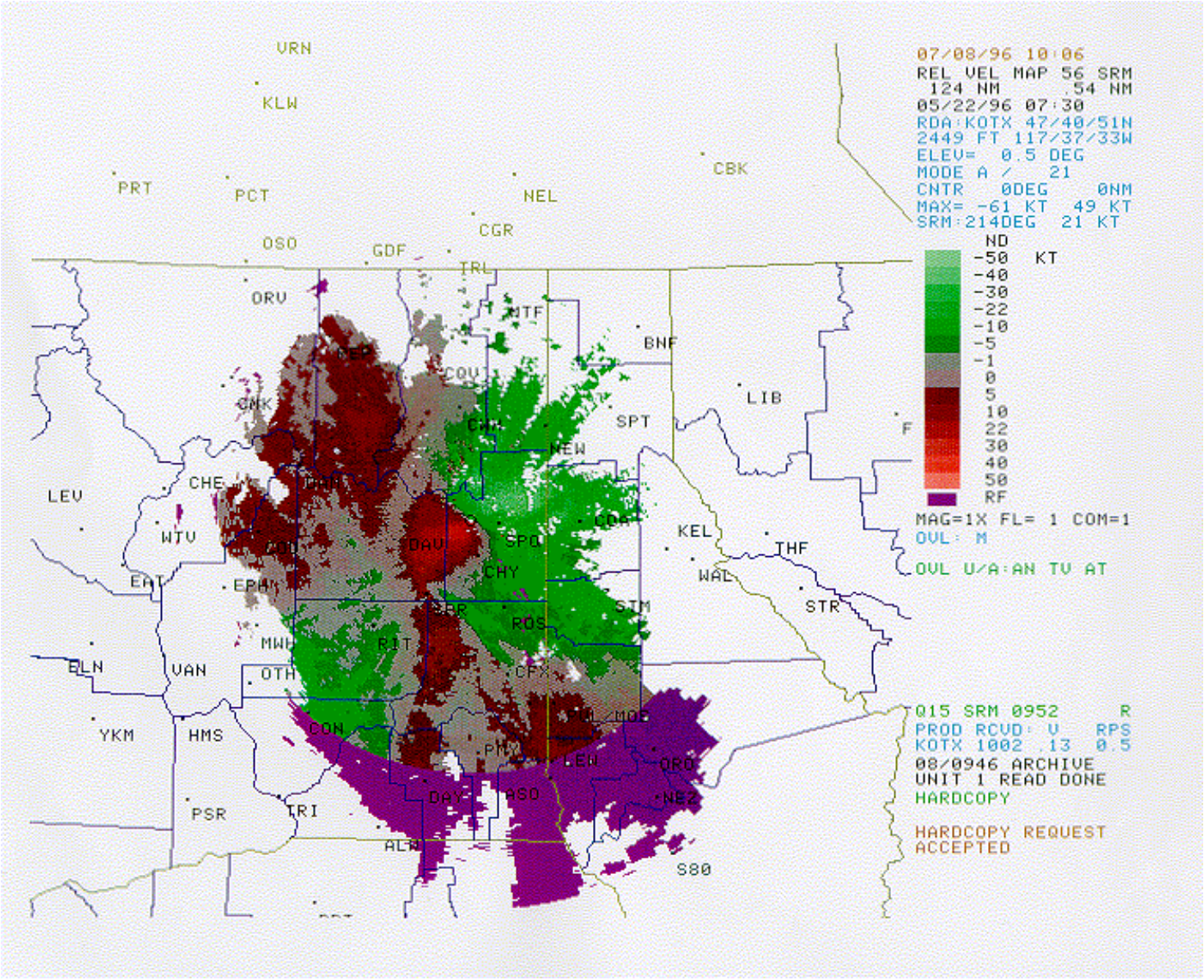
MODE A / 21
CNTR 0DEG 0NM
MAX= -45 KT 34 KT
ND
-60 KT
-45
-35
-25
-15
-5
-1
0
5
15
25
35
45
60
RF
MAG=1X FL= 1 COM=1
OVL U/A:AN
CUR. L/L
Q15 OHP 1002 R
PROD RCVD: SRM RPS
KOTX 1002 1.5
08/0946 ARCHIVE
UNIT 1 READ DONE
HARDCOPY
HARDCOPY REQUEST
ACCEPTED

Figure 2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124 NM .54 NM
05/22/96 07:30
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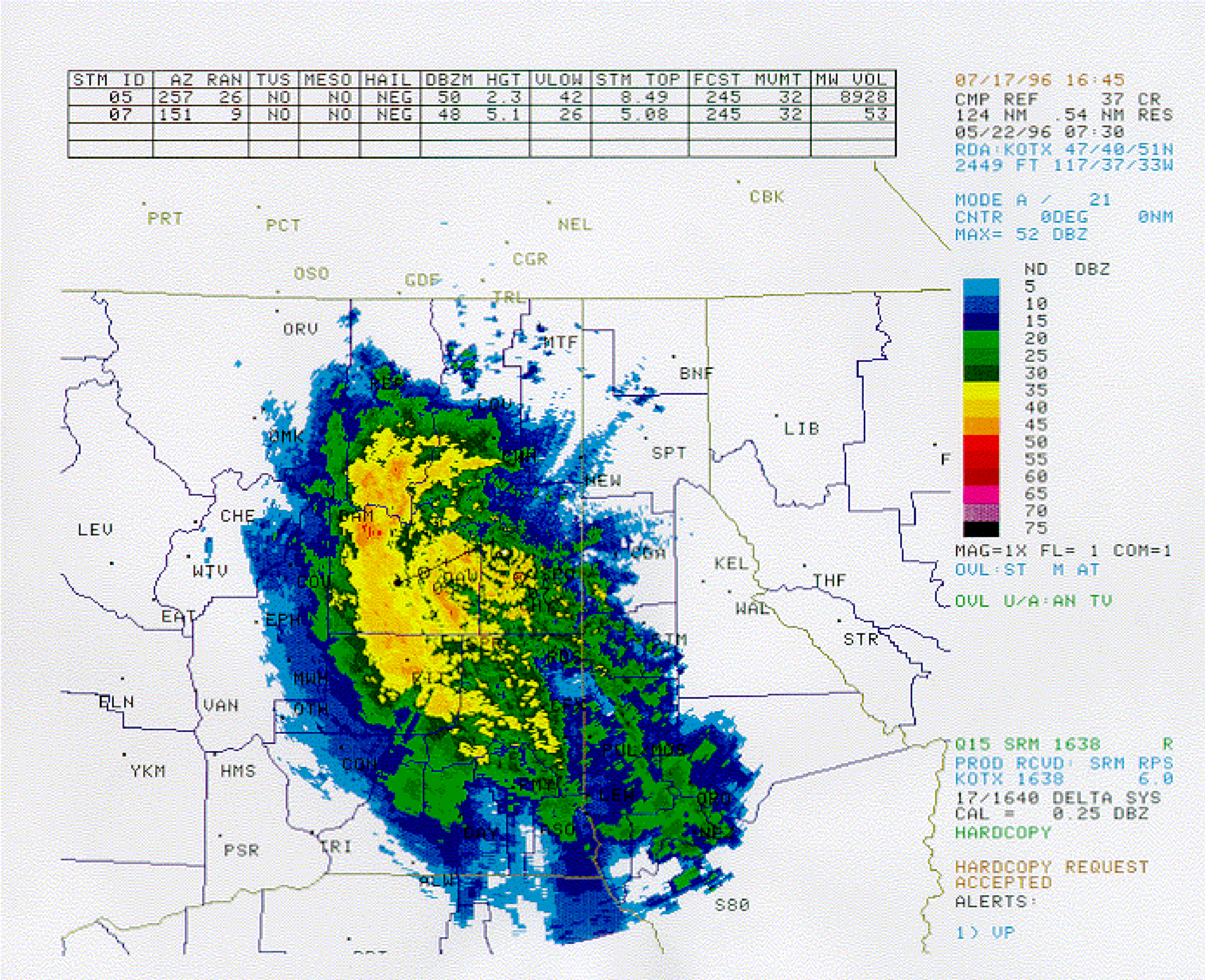
ELEV= 0.5 DEG
MODE A / 21
CNTR 0DEG 0NM
MAX= -61 KT 49 KT
SRM:214DEG 21 KT
ND
-50 KT
-40
-30
-22
-10
-5
-1
0
5
10
22
30
40
50
RF
MAG=1X FL= 1 COM=1
OVL: M
OVL U/A:AN TV AT
015 SRM 0952 R
PROD RCVD: V RPS
KOTX 1002 .13 0.5
08/0946 ARCHIVE
UNIT 1 READ DONE
HARDCOPY
HARDCOPY REQUEST
ACCEPTED
VRN
KLW
PRT
PCT
NEL
CBK
OSO
GDF
CGR
IRL
ORV
MTF
BNF
COU
LIB
SPT
CMK
LEV
CHE
WTV
EAT
EPH
DAV
SPO
CHY
KEL
THF
WAL
STR
STM
ROS
MWH
RIT
ELN
VAN
OTH
CPX
YKM
HMS
CON
PMV
LEN
ORO
DAY
ASO
NE2
PSR
TRI
ALW
S80

Figure 3


STM ID | AZ RAN | TVS | MESO | HAIL | DBZM HGT | VLOW | STM TOP | FCST MVMT | MW VOL
05 | 257 26 | NO | NO | NEG | 50 2.3 | 42 | 8.49 | 245 32 | 8928
07 | 151 9 | NO | NO | NEG | 48 5.1 | 26 | 5.08 | 245 32 | 53
07/17/96 16:45
CMP REF 37 CR
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05/22/96 07:30
RDA:KOTX 47/40/51N
2449 FT 117/37/33W
MODE A / 21
CNTR 0DEG 0NM
MAX= 52 DBZ
ND DBZ
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
MAG=1X FL= 1 COM=1
OVL:ST M AT
OVL U/A:AN TV
Q15 SRM 1638 R
PROD RCVD: SRM RPS
KOTX 1638 6.0
17/1640 DELTA SYS
CAL = 0.25 DBZ
HARDCOPY
HARDCOPY REQUEST
ACCEPTED
ALERTS:
1) VP
PRT
PCT
NEL
CBK
CGR
OSO
GDF
TRL
ORV
MTF
BNF
LIB
SPT
LEV
CHE
WTV
KEL
THF
EAT
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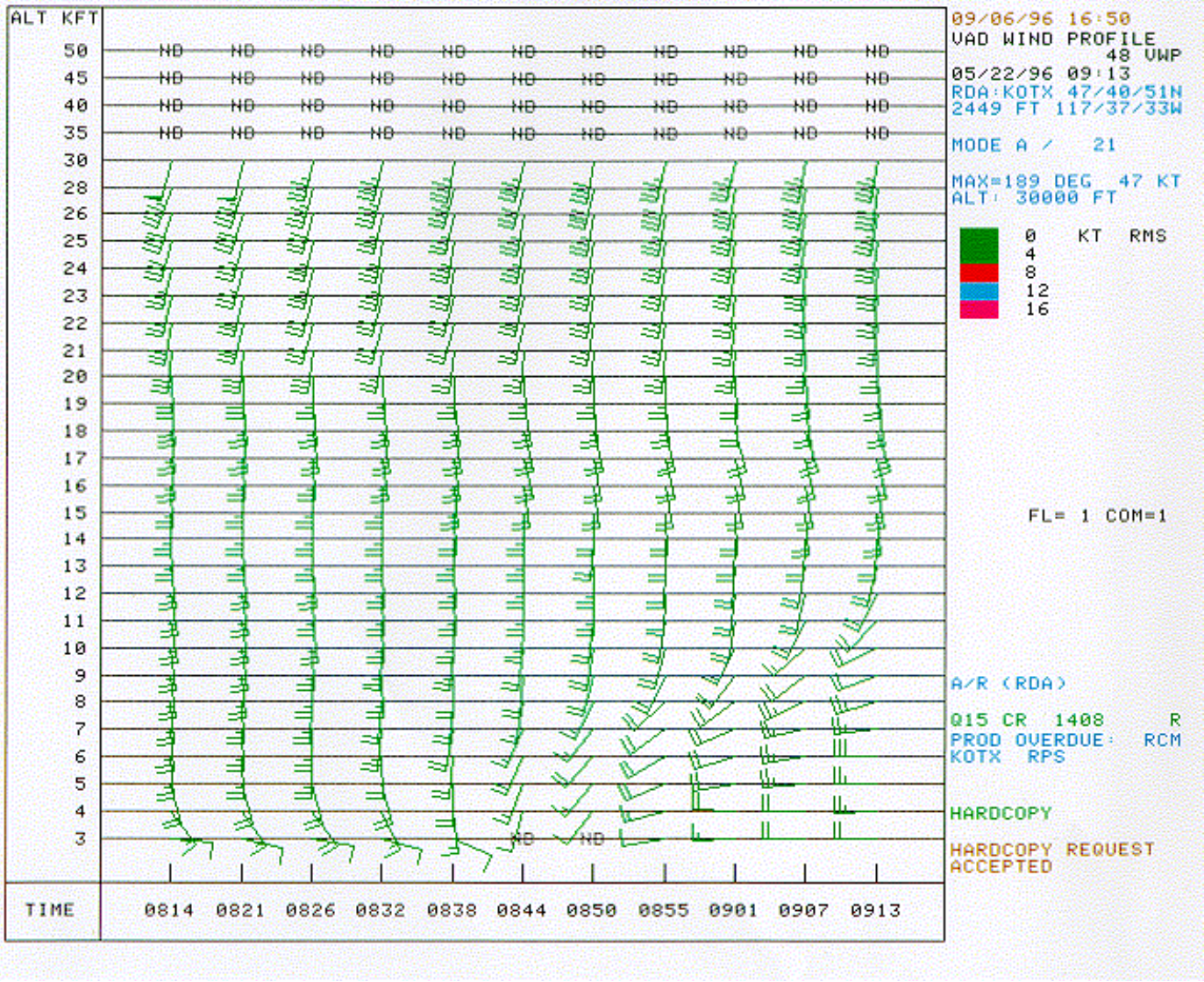
WAL
STR
ELN
VAN
YKM
HMS
CON
PSR
TRI
S80

Figure 4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ND
TIME
0814 0821 0826 0832 0838 0844 0850 0855 0901 0907 0913
09/06/96 16:50
VAD WIND PROFILE
48 VWP
05/22/96 09:13
RDA:KOTX 47/40/51N
2449 FT 117/37/33W
MODE A / 21
MAX=189 DEG 47 KT
ALT: 30000 FT
0 KT RMS
4
8
12
16
FL= 1 COM=1
A/R (RDA)
Q15 CR 1408 R
PROD OVERDUE: RCM
KOTX RPS
HARDCOPY
HARDCOPY REQUEST
ACCEPTED