ORDA Data Quality Monitoring

Presented to the NEXRAD Technical Advisory Committee

21 March 2006

Norman, Oklahoma

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ROC Applications Branch

Introduction

- Data Quality is Still Good
- GMAP is Still Good
- ORDA is Still Good

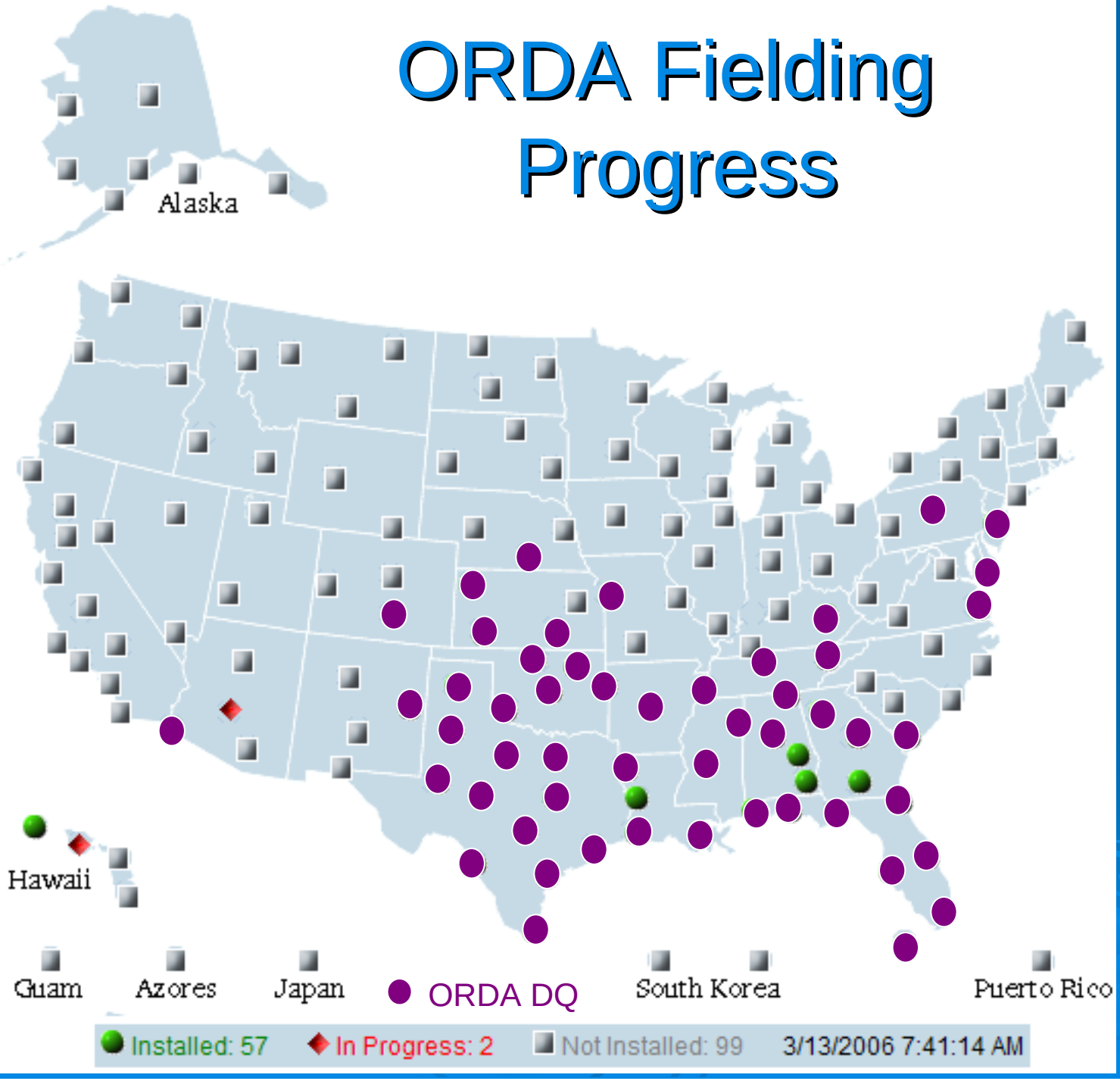
Overview

- Data Evaluated
- ORDA Fielding Progress
- Base Data Discussion
  - Reflectivity
  - Velocity
  - Spectrum Width
- Clutter Map Discussion
- Algorithm Discussion
- RFC Feedback
- Data Examples
- Conclusions
- Recommendations

Data Evaluated

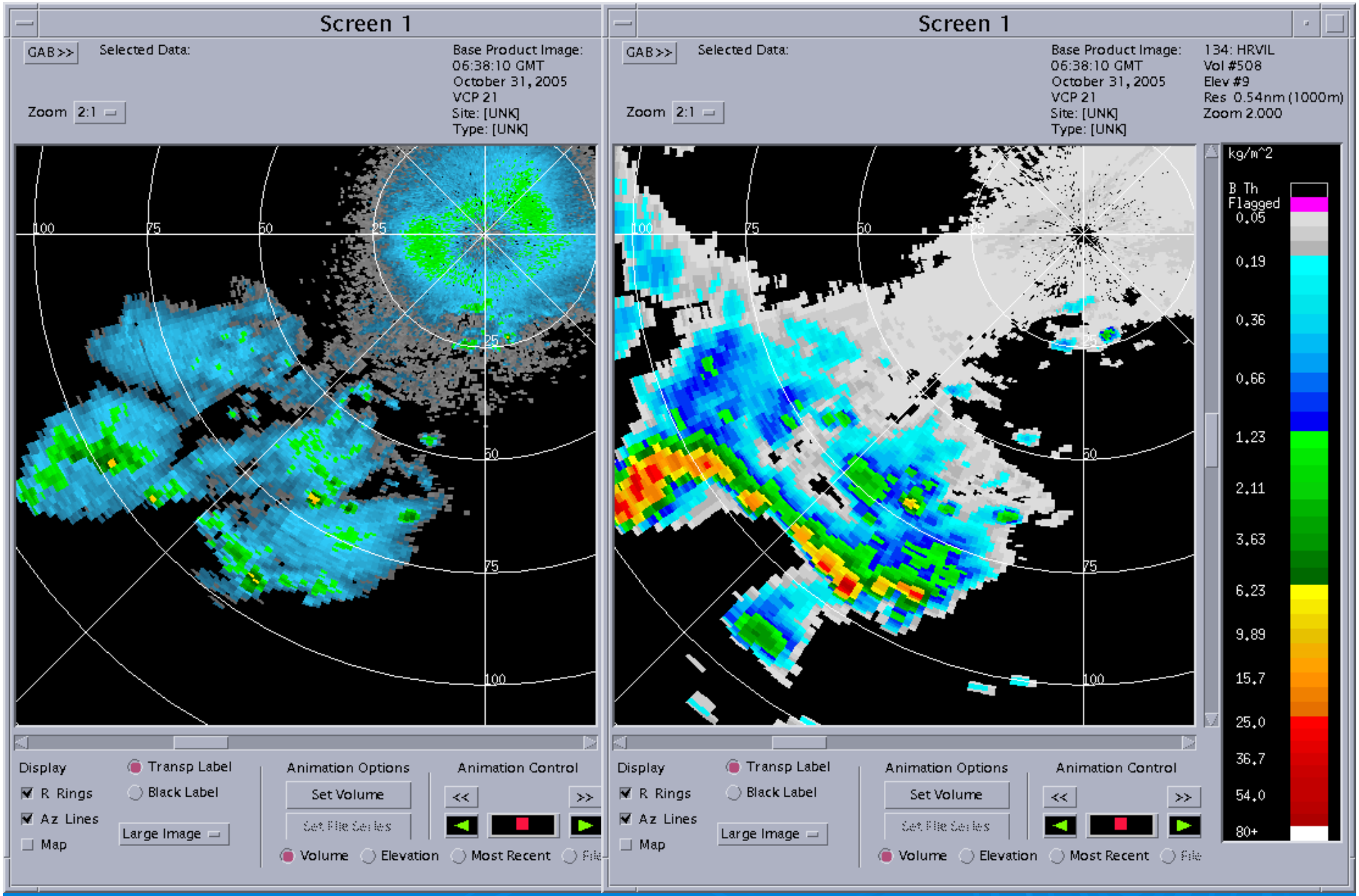
- Level II data and products collected from 51 of 57 ORDA sites between 1 September 2005 and 13 March 2006.
- Reflectivity and spectrum width data spot checked.
- More than 185,000 velocity products evaluated for velocity dealiasing errors.
- More than 44,000 algorithm products evaluated.
  - MDA, TVS, ET, EET, CLR, CLD,OHP,THP, STP, VWP, STI, HSR, VIL, DVL, OSW, OSD, SSW, SSD

ORDA Fielding Progress



Reflectivity Discussion

- KPUX reflectivity spikes not ORDA - external interference being studied by ROC Eng
- Load instructions for Build 8 recommend sites don't filter all bins everywhere to address zero-isodop issue. All bins filtering is recommended during clear air conditions when AP is present.
- Ring in batch mode reflectivity data when filtering all bins everywhere



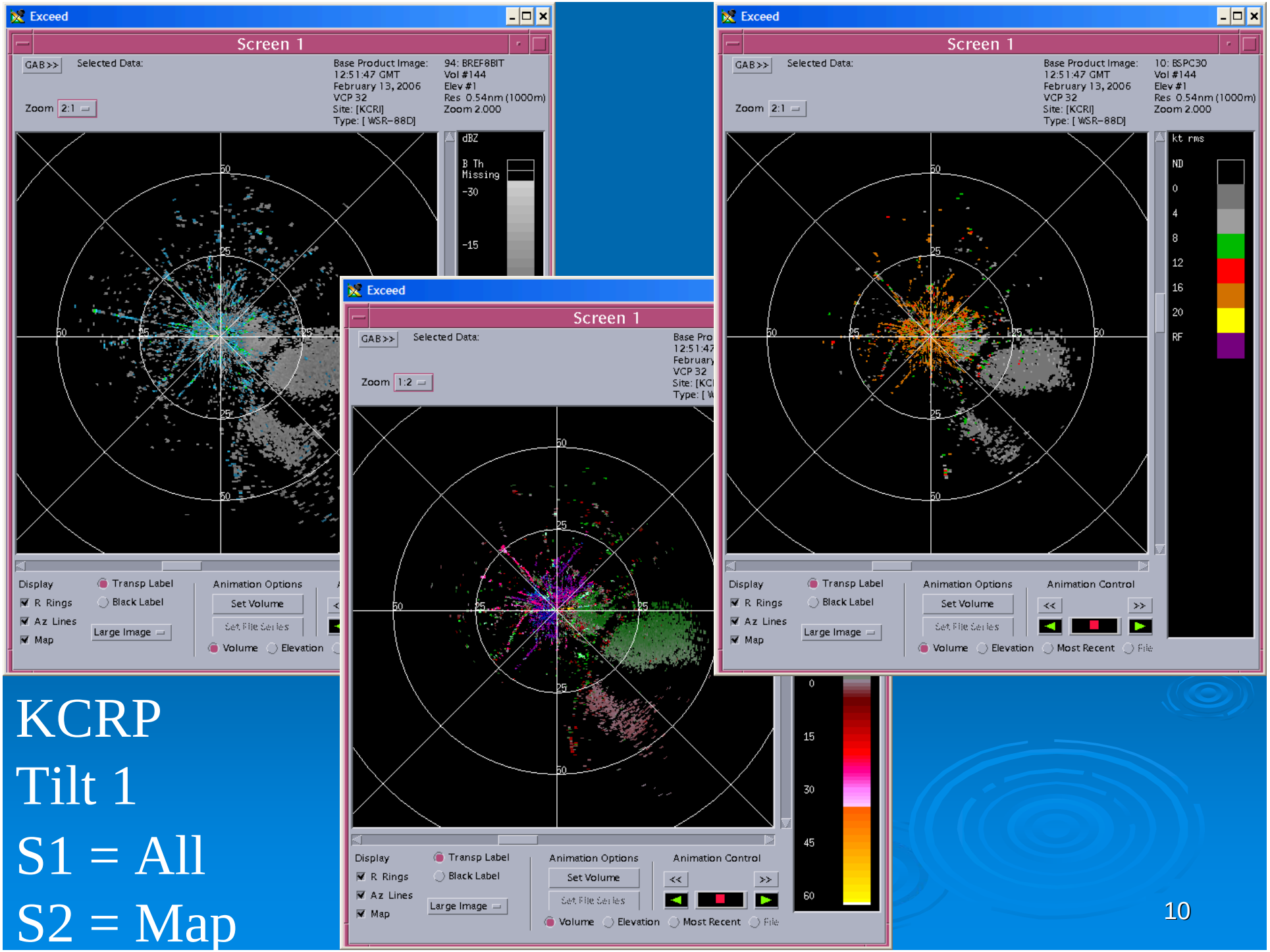
Reflectivity Ring No VIL Effect

Velocity Comments

- Velocity dealiasing errors reported by forecasters at KICT during ORDA B7 beta test.
  - A combination of VCP 12 and PRF 4 contributed to the velocity dealiasing error problem.
- Velocity Dealiasing Error Study
  - Dealiasing errors strongly correlated to am/pm rush hour traffic and meteorological conditions conducive to AP and ducting during the clearest, coldest, winter weather conditions.
  - Observed in Legacy and ORDA alike.
  - ORDA error rate at KTLX (.006) smaller than Legacy (.02).

Velocity Comments II

- Data Quality Committee members noted that Corpus Christi data exhibited systemic velocity dealiasing errors and high spectrum width values near the radar. These data characteristics were not observed from Houston or Brownsville
- Engineers and Hotline personnel identified transmitter problems at KCRP.
- High spectrum width values observed from other ORDA sites correlated with similar transmitter and other hardware problems after ORDA was installed
- Hardware problems present in Legacy systems were manifested in different ways after ORDA was installed
  - Clutter Filtering and Censoring
  - Spectrum Width truncation and computation
  - Post Charge Regulator Control



KCRP

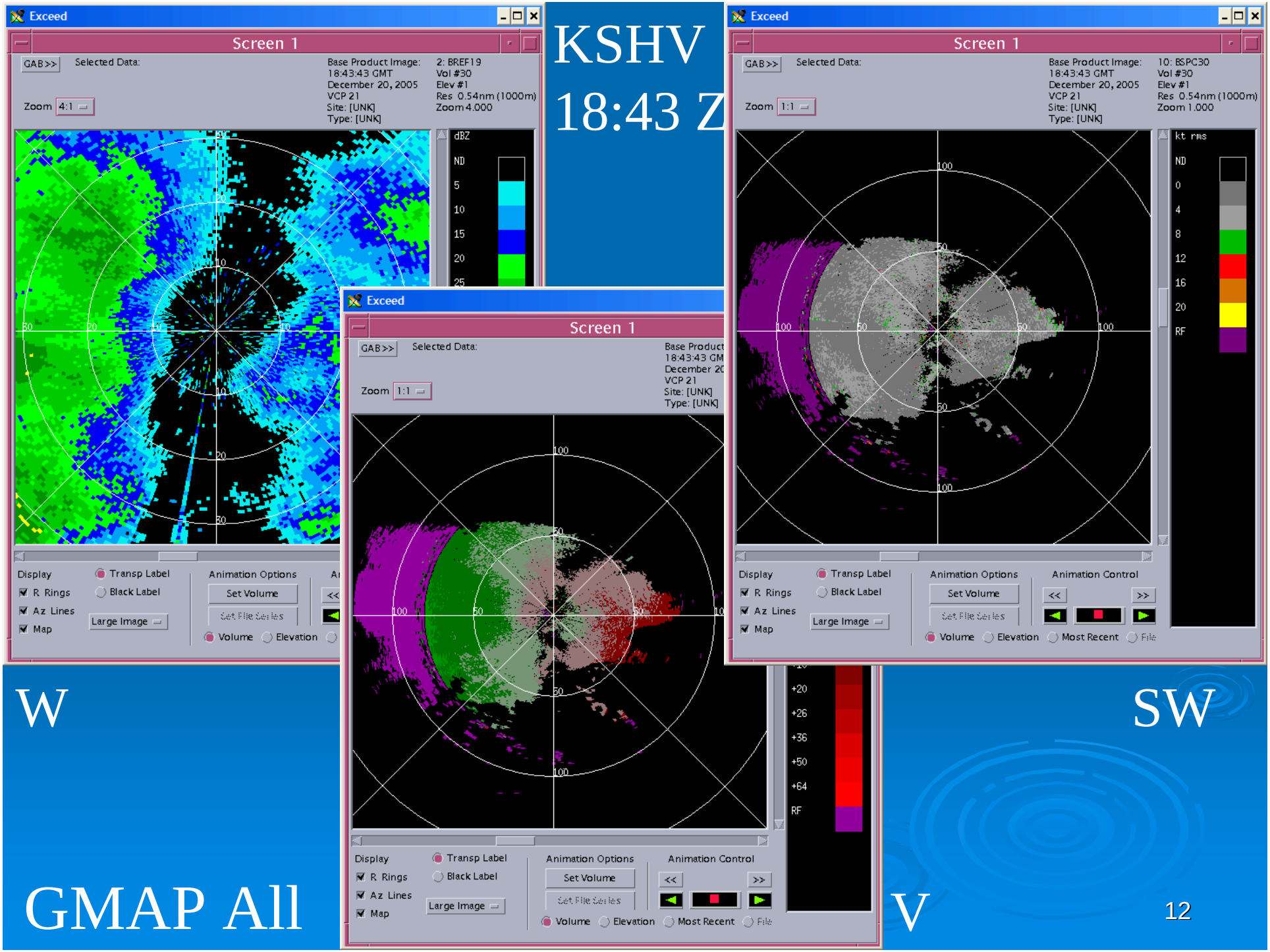
Tilt 1

S1 = All

S2 = Map

Clutter Map Comments I

- A 1 km bin clutter map generation error was identified – fixed in Build 8
- ROC personnel are working with some sites that are still using clutter maps that were generated with less than ideal weather conditions during ORDA installation
- Zero-Isodop Issue
  - GMAP aggressively removes base data from the zero-isodop region during stratiform precipitation that is accompanied by small spectrum width values. Light winds compound the effect. Example from KSHV follows.


KSHV
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Screen 1
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December 20, 2005
VCP 21
Site: [UNK]
Type: [UNK]
2: BREF19
Vol #30
Elev #1
Res 0.54nm (1000m)
Zoom 4.000
Zoom 4:1
dBZ
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R Rings
Az Lines
Map
Transp Label
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Large Image
Animation Options
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Exceed
Screen 1
GAB>>
Selected Data:
Zoom 1:1
Site: [UNK]
Type: [UNK]
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R Rings
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Map
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Animation Options
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Exceed
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GAB>>
Selected Data:
Base Product Image:
10: BSPC30
Vol #30
Elev #1
Res 0.54nm (1000m)
Zoom 1.000
Zoom 1:1
Site: [UNK]
Type: [UNK]
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Transp Label
Black Label
Large Image
Animation Options
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Animation Control
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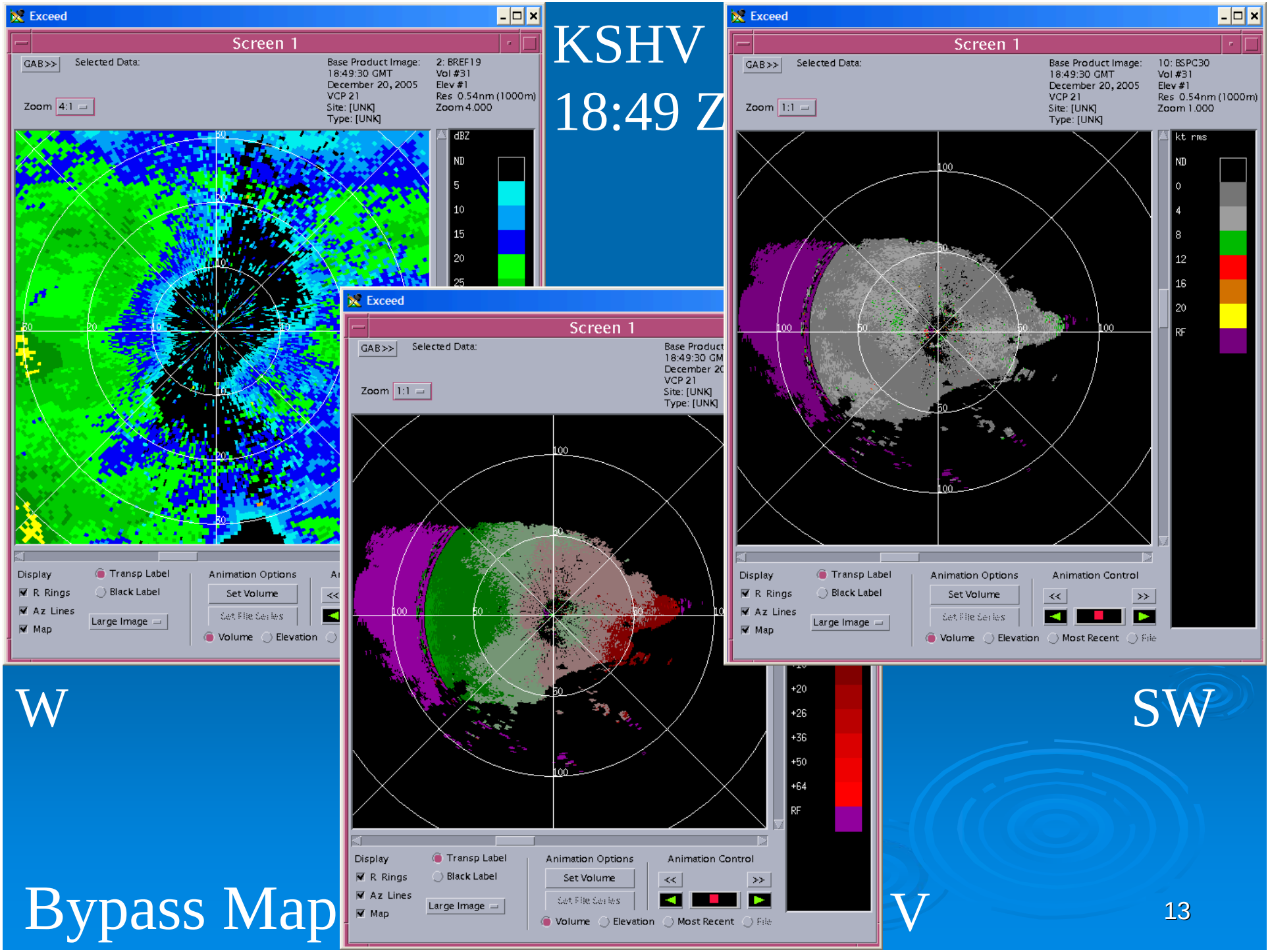
+26
+36
+50
+64
RF
W
SW
GMAP All
V


KSHV
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VCP 21
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Type: [UNK]
2: BREF19
Vol #31
Elev #1
Res 0.54nm (1000m)
Zoom 4.000
dBZ
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Transp Label
R Rings
Black Label
Az Lines
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Large Image
Animation Options
Set Volume
Volume
Elevation
Exceed
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GAB>>
Selected Data:
Zoom 1:1
Site: [UNK]
Type: [UNK]
Display
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Animation Options
Set Volume
Animation Control
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Elevation
Most Recent
Exceed
Screen 1
GAB>>
Selected Data:
Zoom 1:1
Base Product Image:
18:49:30 GMT
December 20, 2005
VCP 21
Site: [UNK]
Type: [UNK]
10: BSPC30
Vol #31
Elev #1
Res 0.54nm (1000m)
Zoom 1.000
kt rms
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Black Label
Large Image
Animation Options
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+64
RF
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SW
Bypass Map
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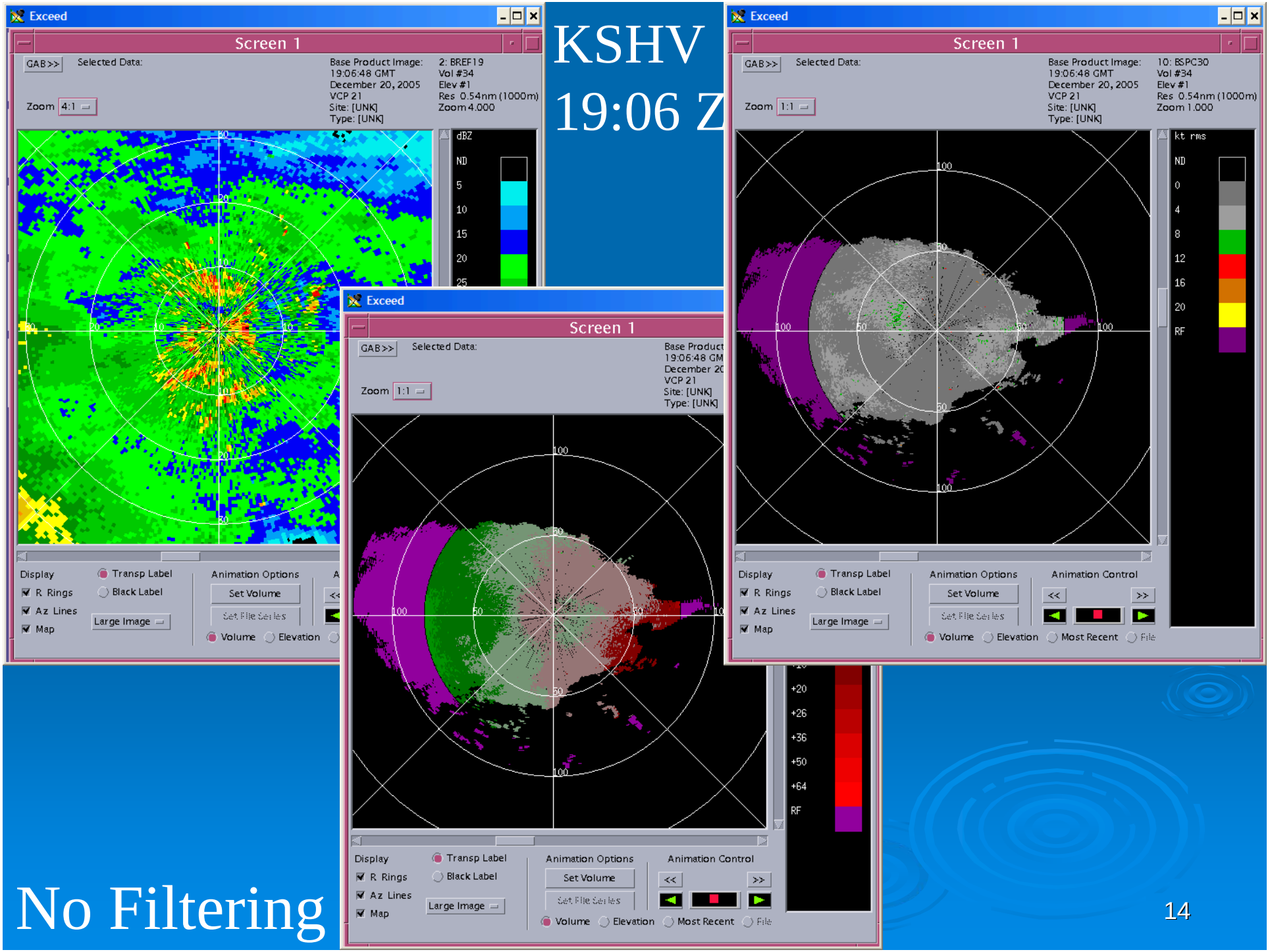
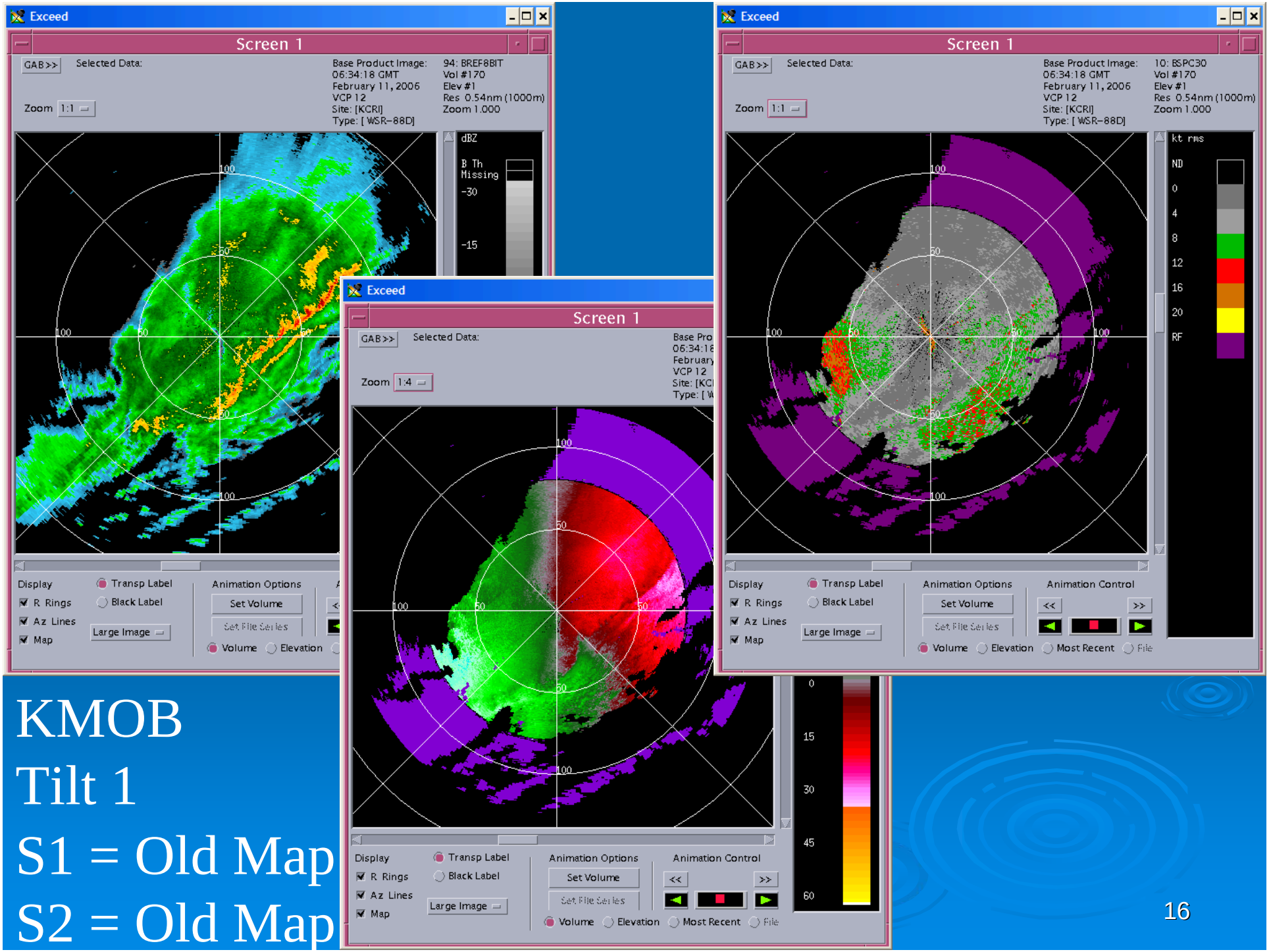


No Filtering

Clutter Map Comments II

- Zero-Isodop Issue
  - Soundings and hodographs from KSHV confirmed light winds and small precipitation amounts.
  - Less data was removed when the bypass map was used compared to the all bins settings.
  - GMAP worked as designed and removed what was considered clutter in areas of very low spectrum width values. Light winds compound the problem. Example from KMOB follows.

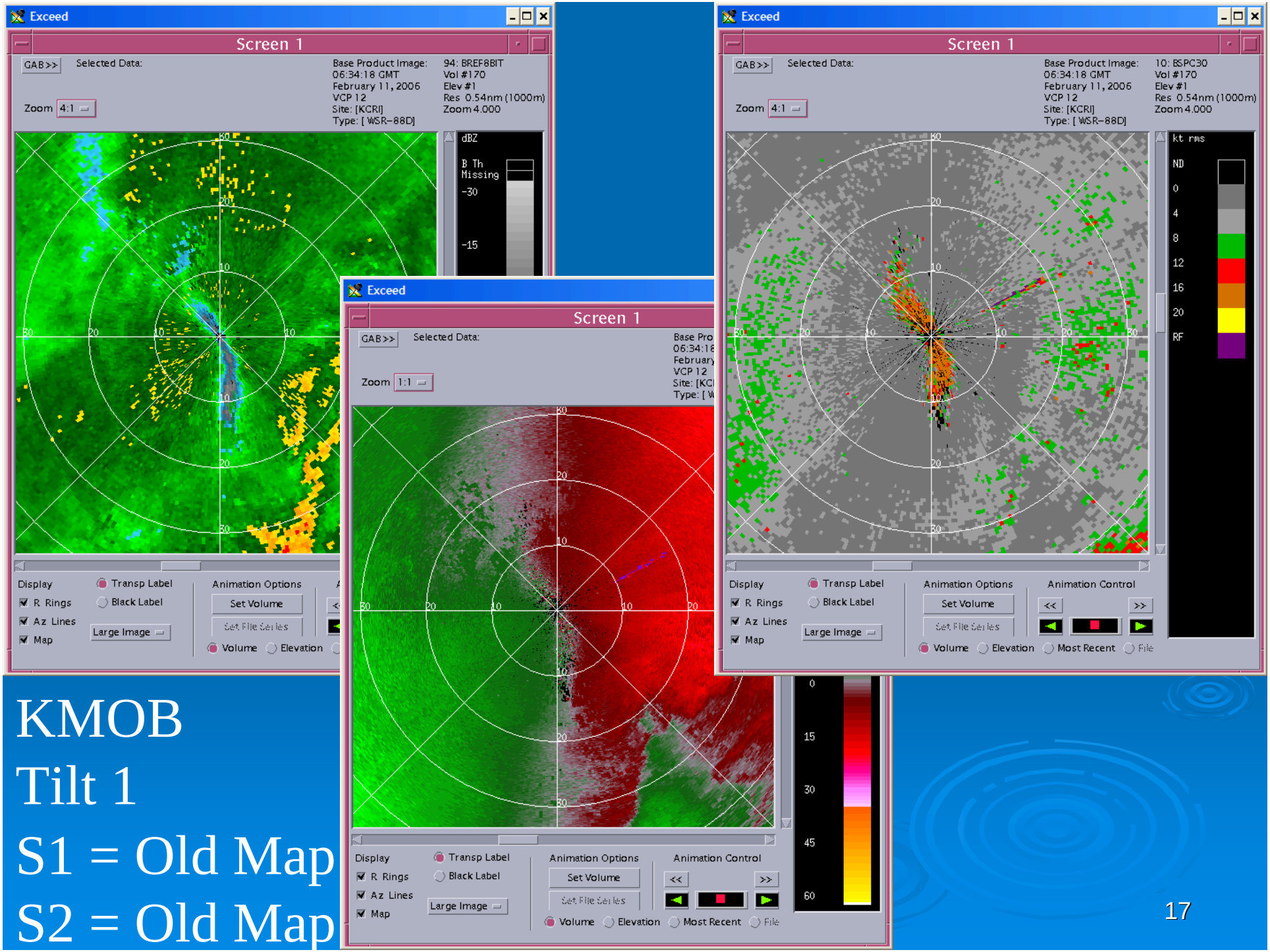


KMOB

Tilt 1

S1 = Old Map

S2 = Old Map



KMOB

Tilt 1

S1 = Old Map

S2 = Old Map

Clutter Map Comments III

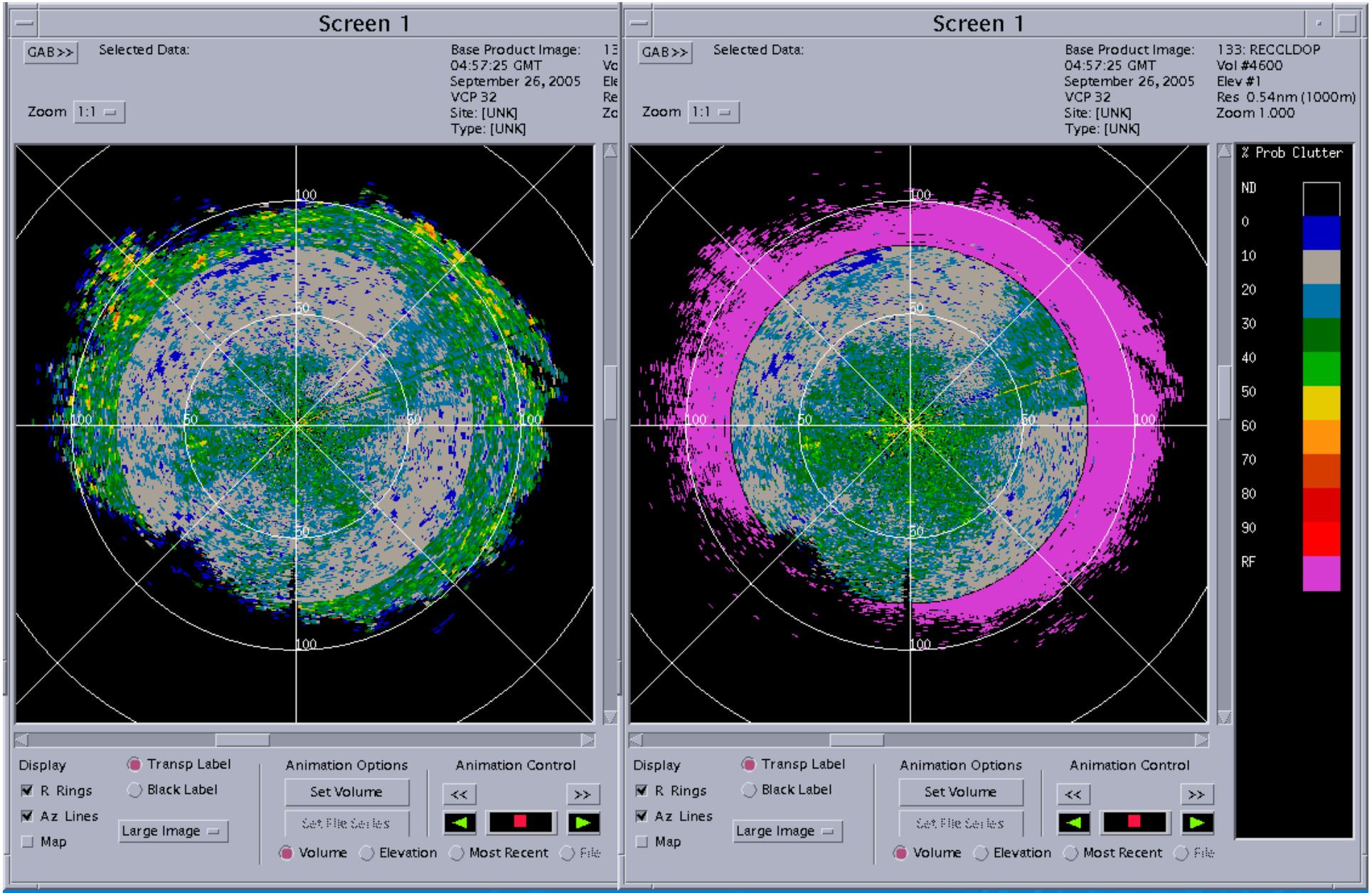
- Zero-Isodop Issue
  - Data collected by legacy systems using high suppression showed similar effects of data being removed from the zero-isodop region.
  - This issue will continue to be studied and evaluated from other fielded sites.
    - A lower spectrum width seed value for GMAP will reduce the bias.
    - The effect can also be reduced by using the clutter bypass map rather than filtering all bins everywhere.
    - Engineers will modify ORDA Build 9 software to provide additional flexibility to test various engineering parameters.

Radar Reflectivity Comparison Tool

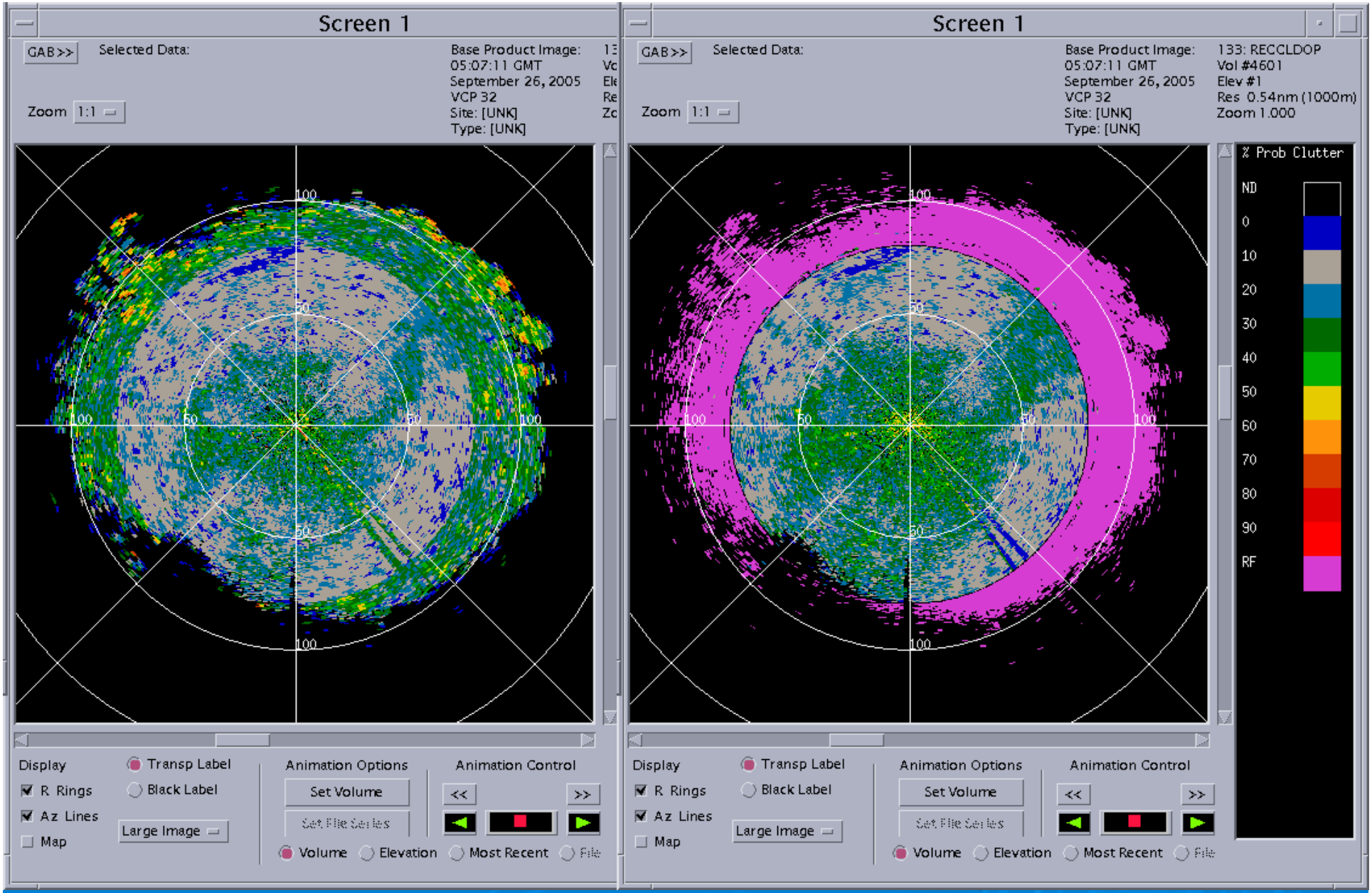
- Preliminary results from the RRCT show good comparison between ORDA and surrounding Legacy and other ORDA sites.
- The RRCT needs many precipitation events collected from adjacent sites to provide an accurate comparison. More data is needed.

Algorithm Comments

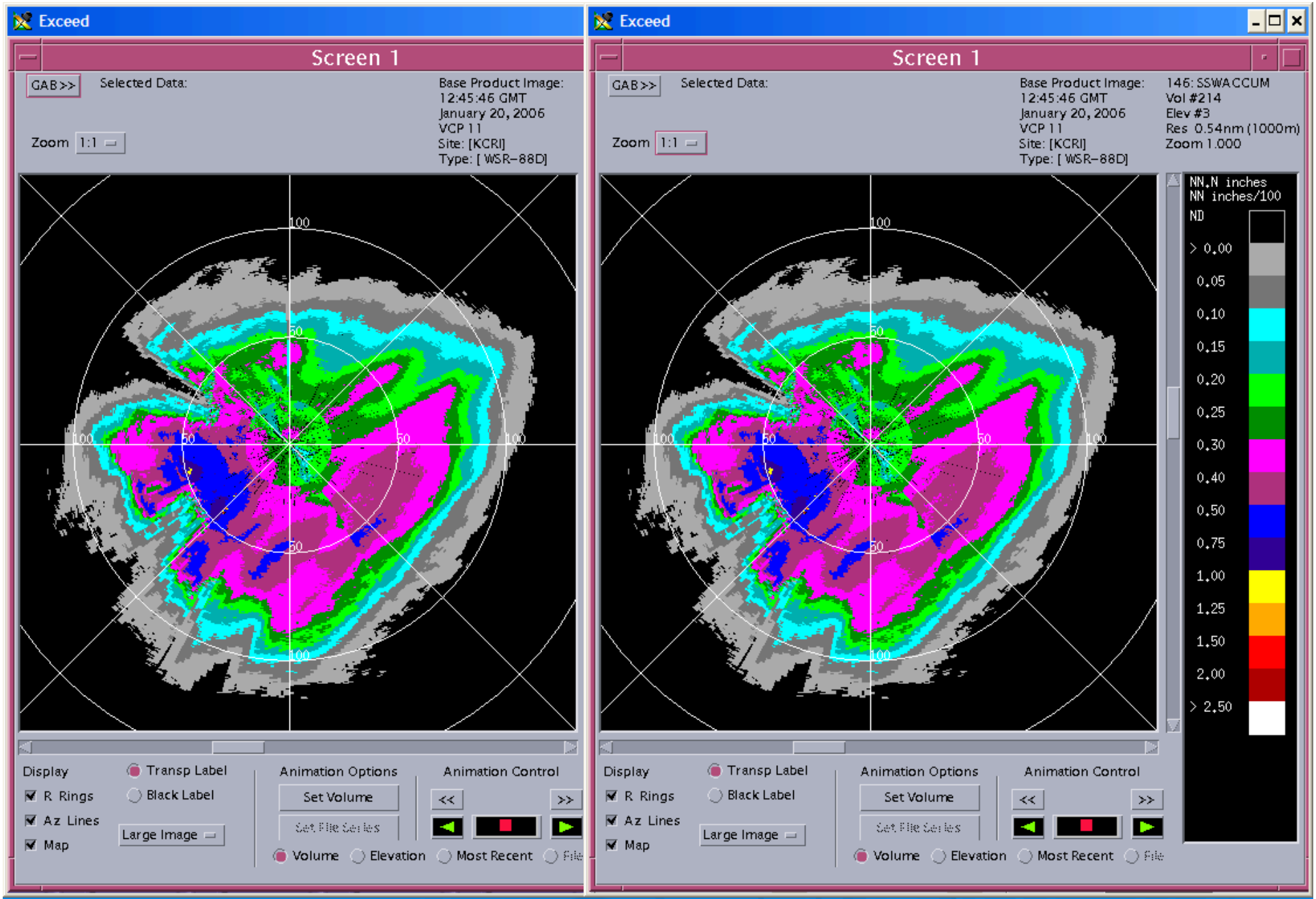
- REC
  - Radial processing
- EPRE
  - 360º radial



REC Radial Processing Errors



REC Radial Processing Errors



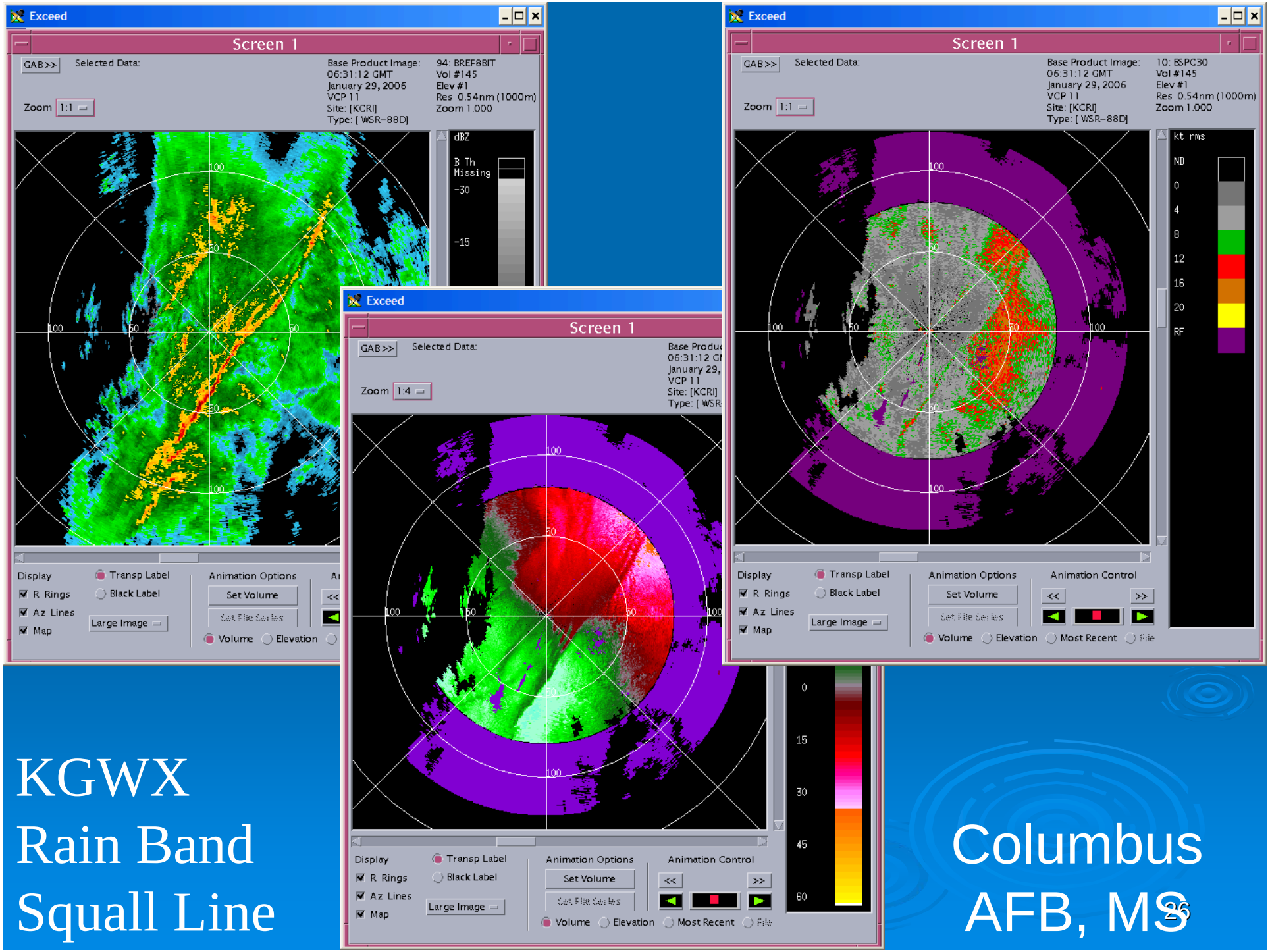
KPUX EPRE Not Patched

KPUX EPRE Patched

RFC Feedback

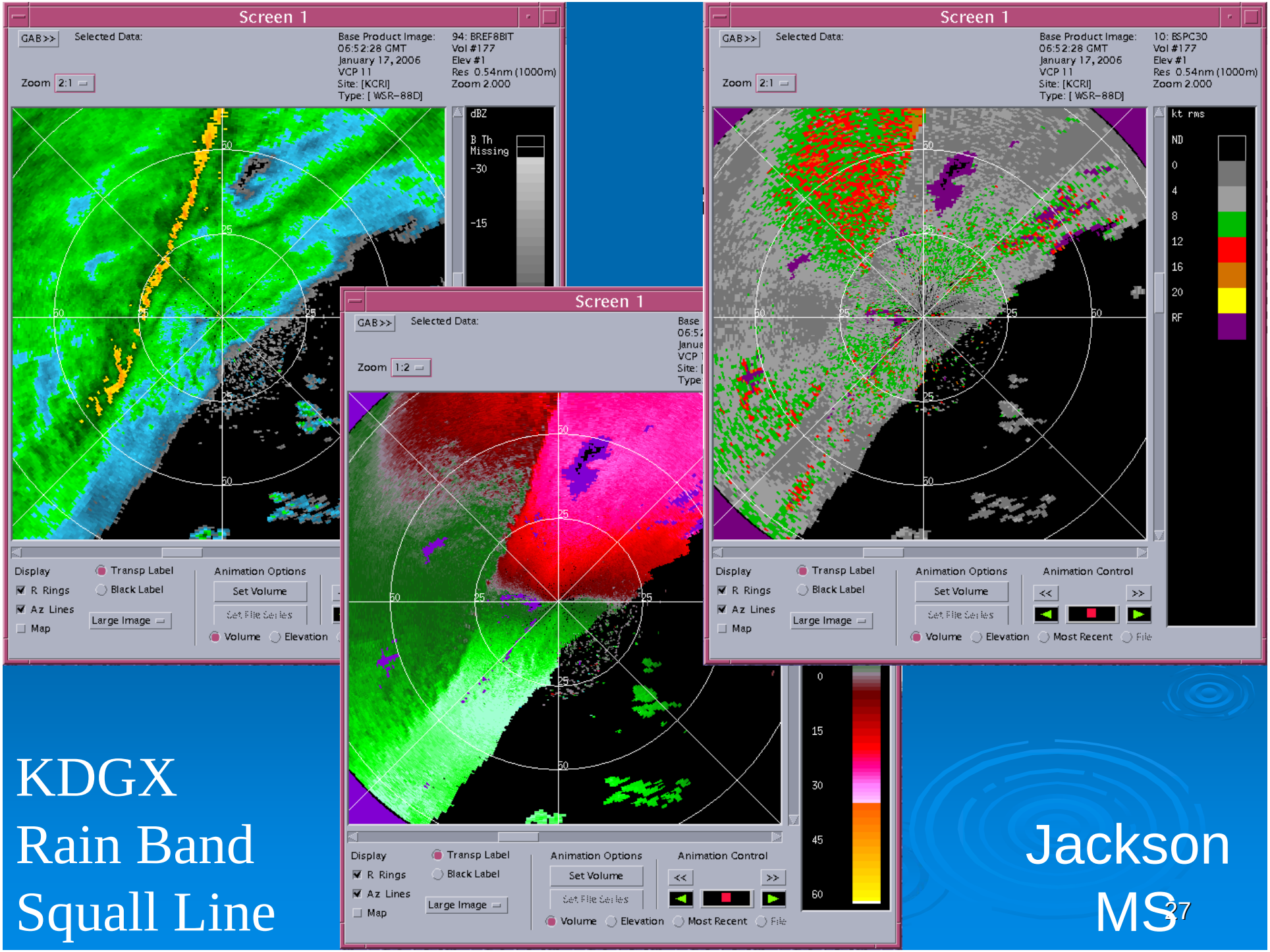
- More AP/Ground Clutter has been observed from individual radars but I'm not sure it can be attributed to the ORDA. The Jackson, MS radar sometimes has less precip along the zero-isodop. - Jeff Graschel, Senior HAS, LMRFC
- Although the ABRFC has been relatively dry, we have not noticed any continual patterns in the differences between the legacy RDA and ORDA systems. - James Paul, Senior HAS, ABRFC

Data Examples



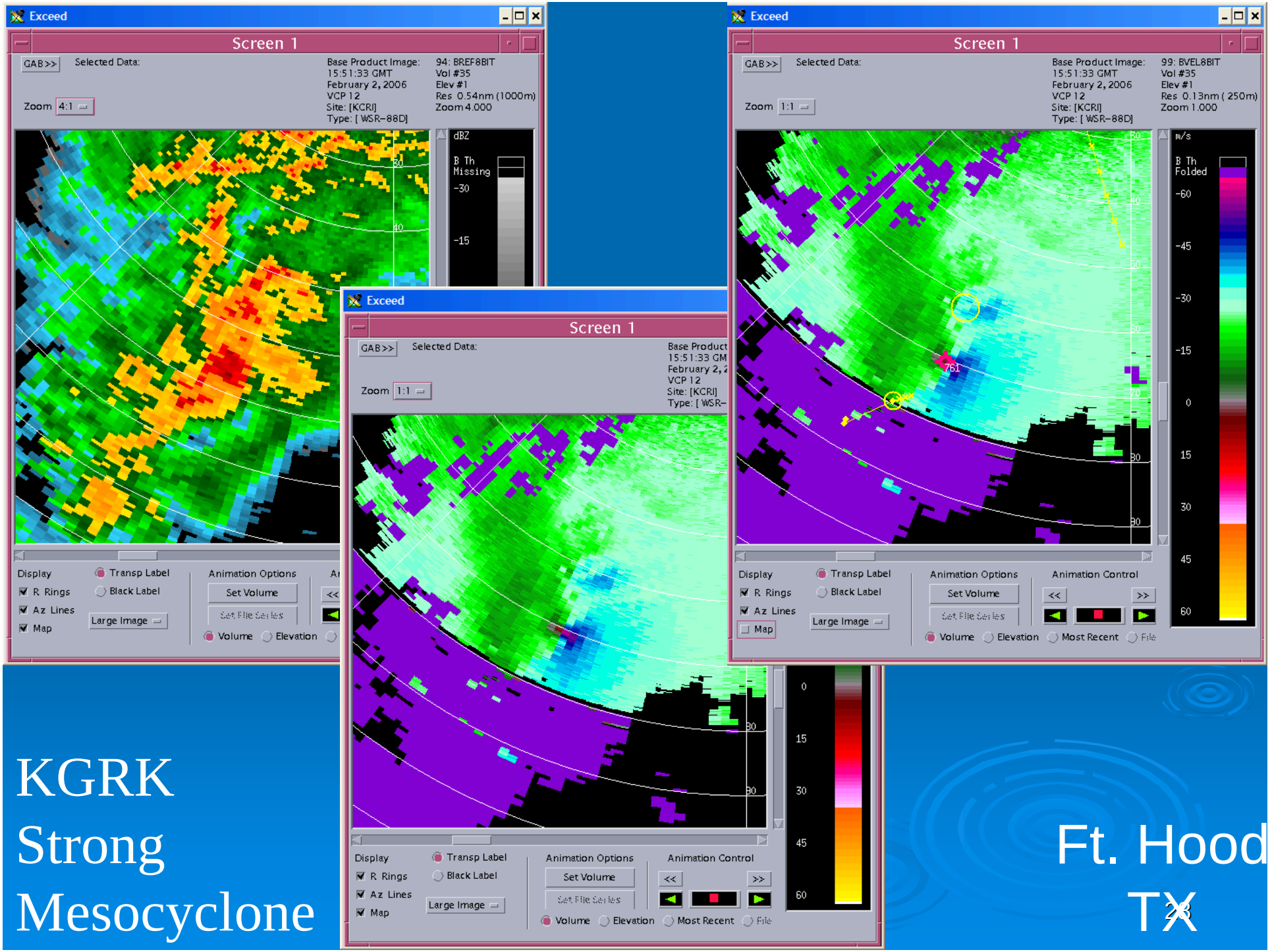
KGWX
Rain Band
Squall Line

Columbus
AFB, MS



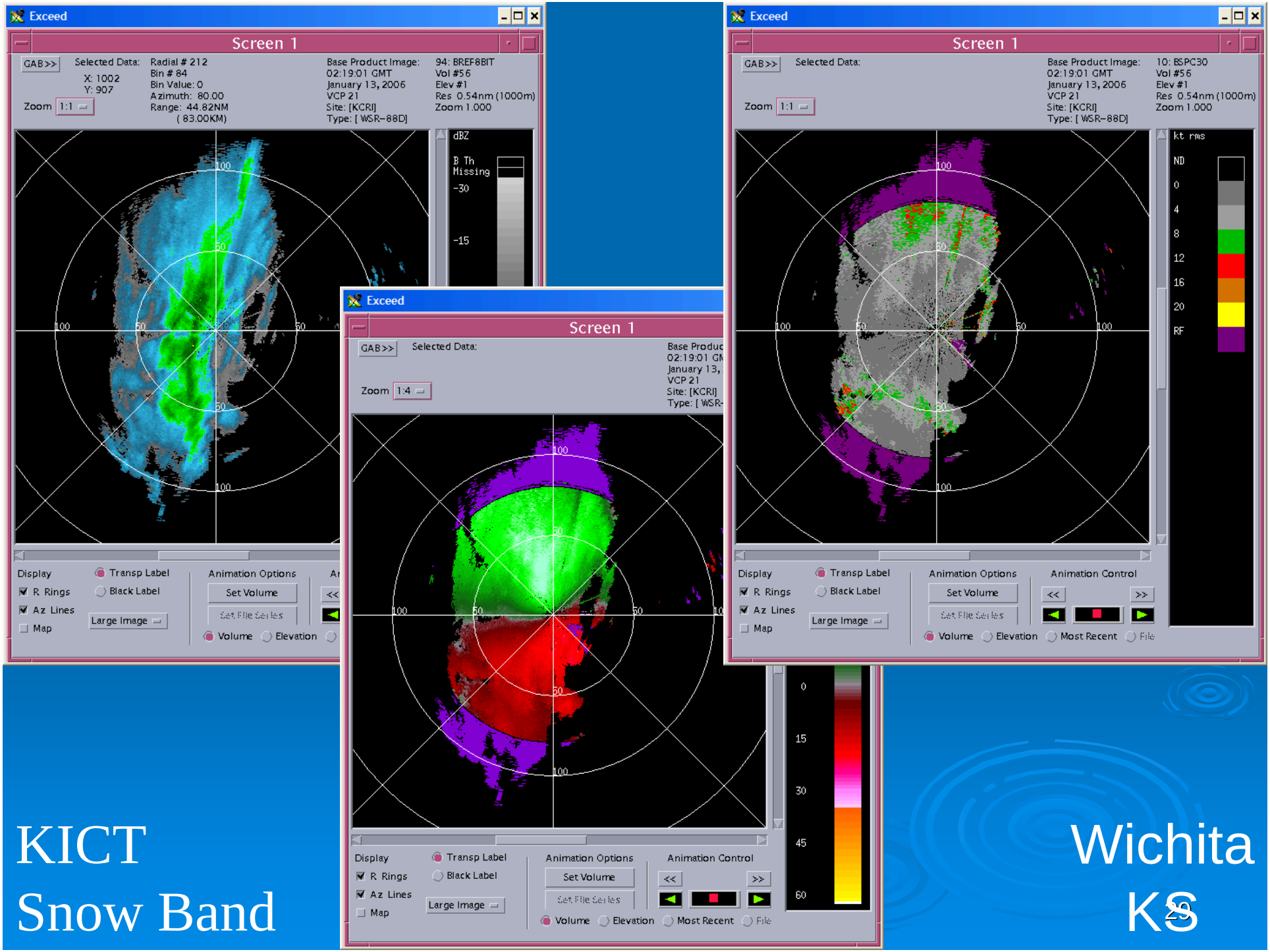
KDGX
Rain Band
Squall Line

Jackson
MS



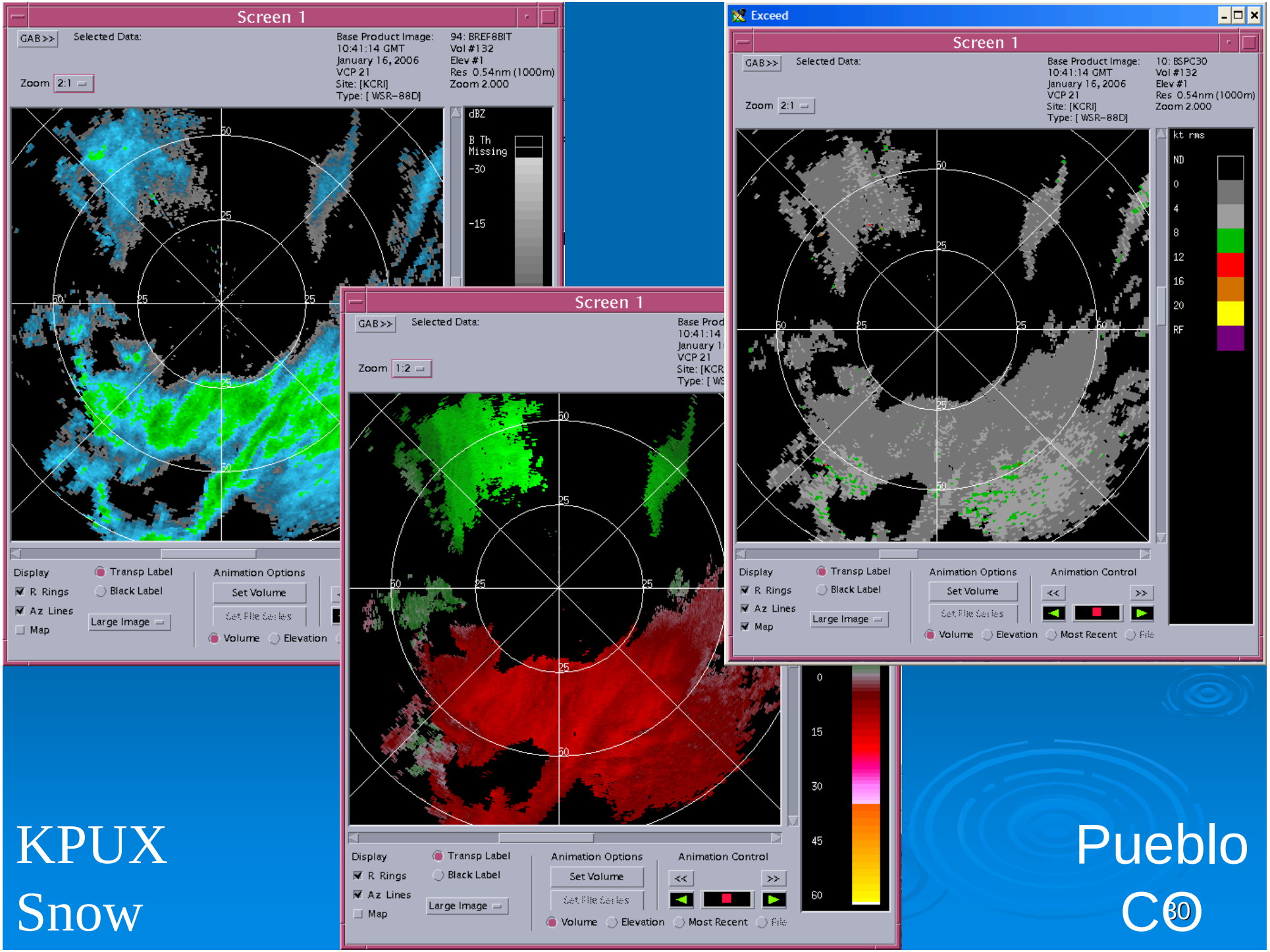
KGRK
Strong
Mesocyclone

Ft. Hood
TX



KICT
Snow Band

Wichita
KS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January 16, 2006
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Vol #132
Elev #1
Res 0.54nm (1000m)
Zoom 2.000
Zoom 2:1
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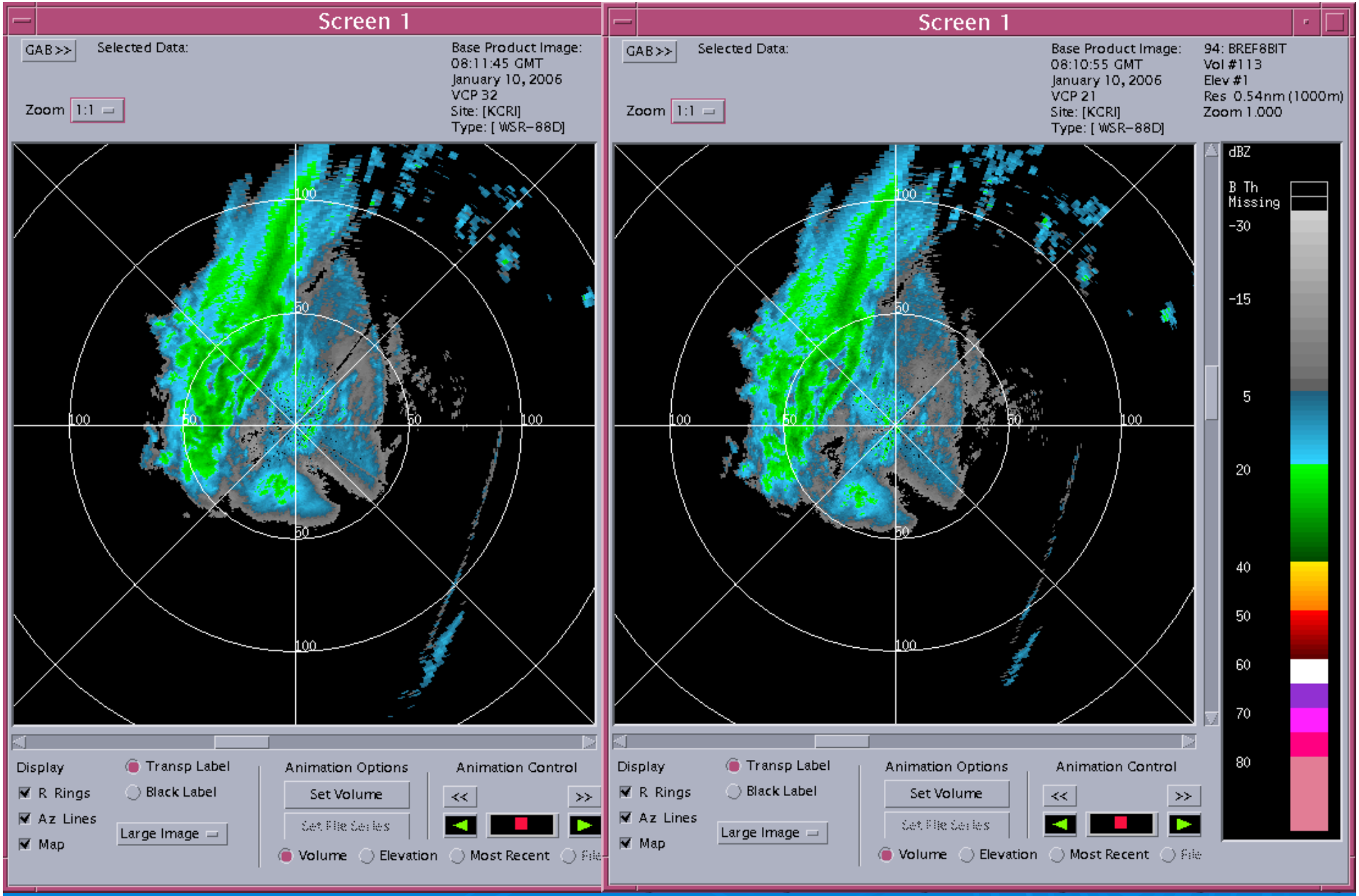
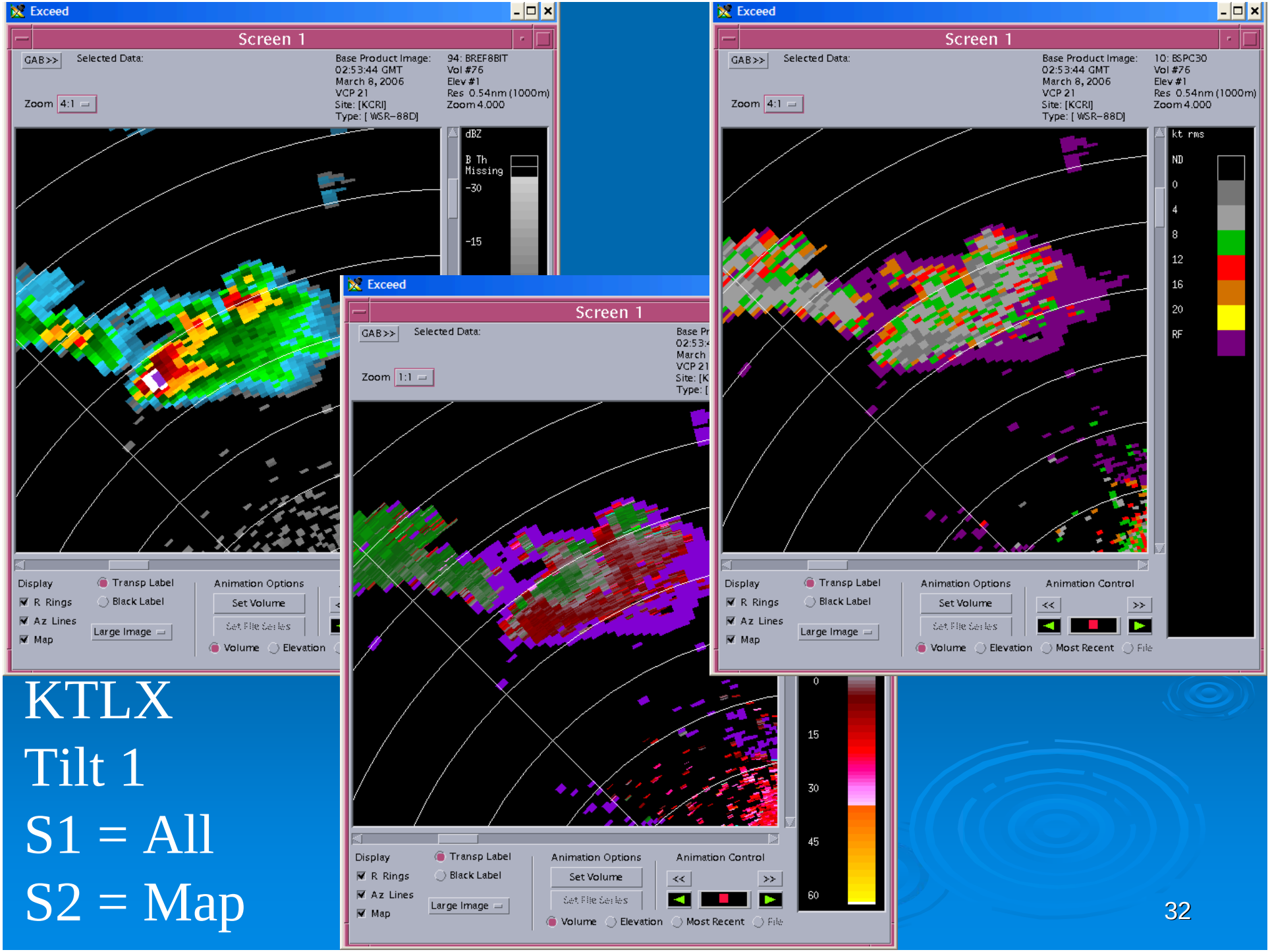
KPUX
Snow
Pueblo
CO



KCRI KTLX ORDA

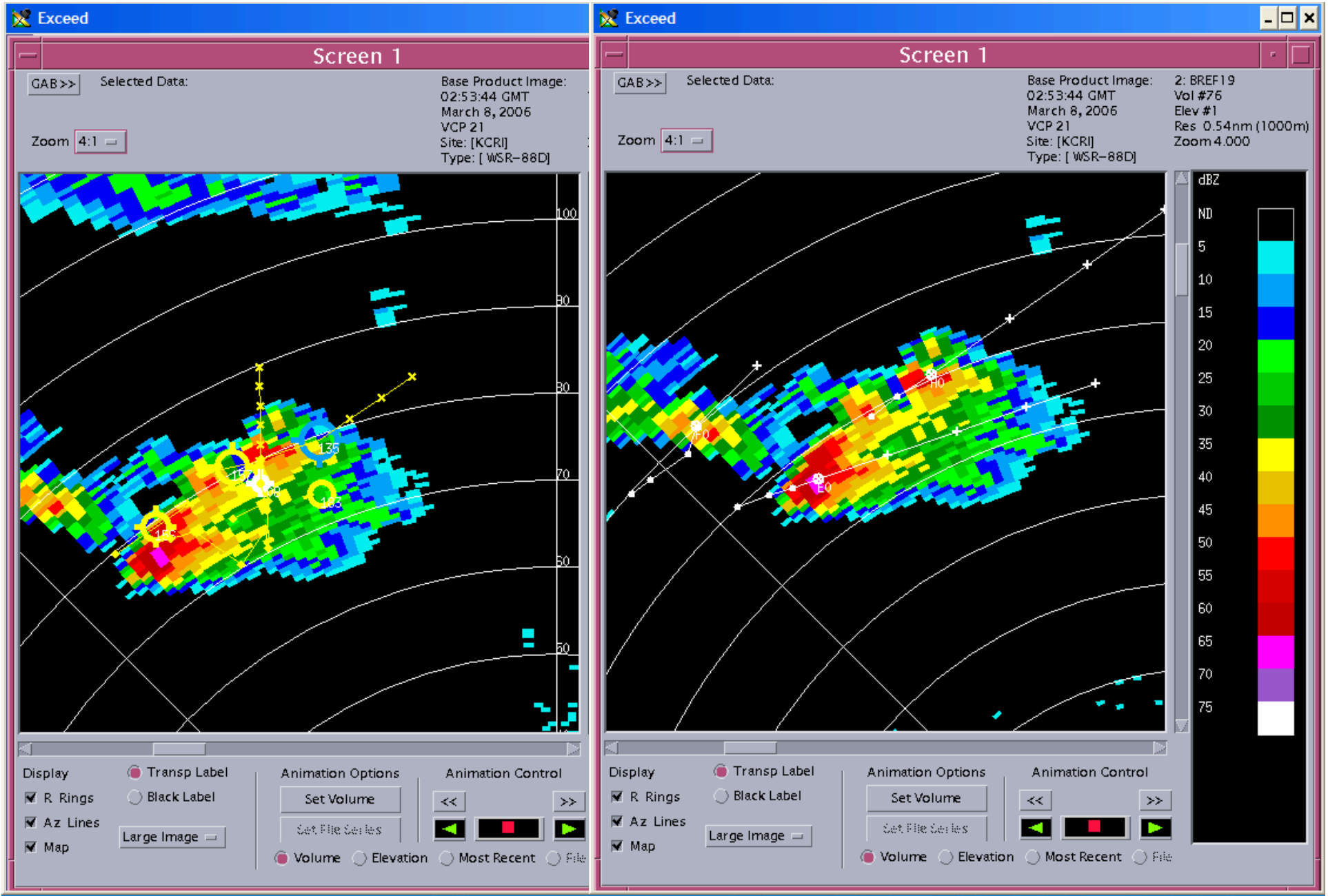


KTLX

Tilt 1

S1 = All

S2 = Map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March 8, 2006
VCP 21
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Screen 1
GAB>>
Selected Data:
Base Product Image:
02:53:44 GMT
March 8, 2006
VCP 21
Site: [KCRI]
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Elev #1
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Zoom 4.000
Zoom 4:1
dBZ
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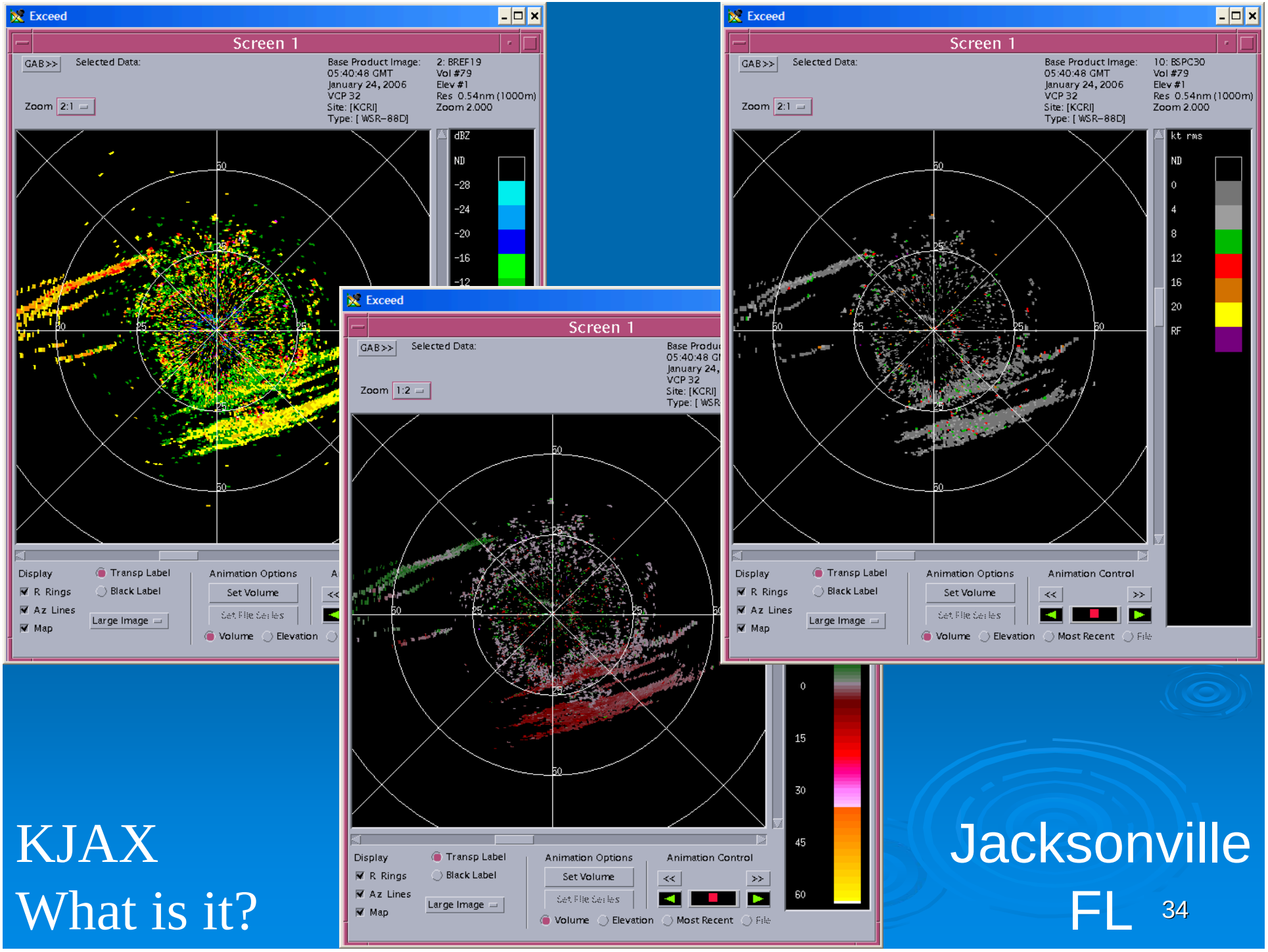
Elevation
Most Recent
File



KJAX

What is it?

Jacksonville

FL

Conclusion

- Data quality, GMAP, and ORDA are still good.
- Two minor issues identified
  - Reflectivity ring
    - Fixed in Build 9
  - GMAP removes too much data from zero-isodop region when spectrum width values are small. The effect is larger when wind speeds are smaller.
    - Use a clutter map rather than all bins
    - Adjust SW seed value in Build 9
- GMAP is performing better than the Legacy clutter filter, however, it is not performing as good as possible

Recommendations

- To mitigate zero-iosodop effects and low reflectivity bias, do not filter all bins except in clear air AP conditions, consistent with Legacy recommendation
- Change default SW seed value in Build 9 to reduce zero-isodop data removal
- Investigate interference at KPUX
- Fix EPRE 360º issue
- Fix REC radial processing issue
- ORDA engineers should perform a GMAP optimization study
- Hotline should continue to document base data and clutter filter maps before and after ORDA installation