

Combined MPDA/SZ-2 Volume
Coverage Pattern to Mitigate
Range Folding:
Informational Briefing to
Technical Advisory Committee

Radar Operations Center
Applications Branch
David Zittel
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Outline

- Rationale for a combined SZ-2 and Multiple PRF Dealiasing Algorithm (MPDA)
- Description of test VCP 122
- Summary of cases
- Examples
 - Comparison to other VCPs
 - Two vs. three Doppler scans
- Preliminary conclusions
- Build 10 key dates
- Work yet to be done

Rationale for Combining SZ-2 with MPDA

- MPDA
 - Works well out to 175 km which is end of first trip for its slowest PRF
 - Ability to range unfold beyond 175 km is sporadic and susceptible to velocity dealiasing errors
- SZ-2
 - Provides good coverage at long ranges
 - A residual band of range folded signal *may* extend up to 30 km from end of 1st trip
- Combining the two techniques mitigates the weakness of each
- SZ-2 is ORDA based; MPDA is RPG based
 - Runs sequentially

Description of Test VCP 122

- Uses same 9 elevation angles as VCPs 21 and 121
- Uses MPDA scan strategy
 - Combines up to three Doppler scans at the same elevation angle using different PRFs (unambiguous ranges 117, 137, & 175 km) to reduce range folding and improve velocity dealiasing
 - 20 cuts total
- Uses SZ-2 processing for the surveillance and 1st Doppler scan at 0.5 and 1.45 deg
- Takes about 16 more seconds to complete than VCP 121

VCP 122 Split Cuts

VOLUME COVERAGE PATTERN 122(MPDA/SZ-2 with VCP 21 elev. angles)
 SCAN STRATEGY MPDA SHORT PULSE

| Scan | | | | Surveillance | | Doppler PRF No. | | | | |
|-----------------|-------------------|--------------|---------|--------------|-----------|-----------------|--------------|--------------|--------------|--------------|
| Elevation (deg) | AZ Rate (deg/sec) | Period (sec) | WF Type | PRF No. | No Pulses | 4 No. Pulses | 5 No. Pulses | 6 No. Pulses | 7 No. Pulses | 8 No. Pulses |
| 0.5 | 18.675 | 19.38 | CS/SZ2 | 1 | 17 | - | - | - | - | - |
| 0.5 | 19.754 | 18.22 | CD/SZ2 | 8 | - | 43 | 50 | 55 | 59 | <u>64</u> |
| 0.5 | 27.400 | 13.14 | CD | 6 | - | 31 | 37 | <u>40</u> | 43 | 46 |
| 0.5 | 21.402 | 16.82 | CD | 4 | - | <u>40</u> | 47 | 51 | 55 | 59 |
| 1.45 | 19.842 | 18.68 | CS/SZ2 | 1 | 16 | - | - | - | - | - |
| 1.45 | 19.754 | 18.22 | CD/SZ2 | 8 | - | 43 | 50 | 55 | 59 | <u>64</u> |
| 1.45 | 27.400 | 13.14 | CD | 6 | - | 31 | 37 | <u>40</u> | 43 | 46 |
| 1.45 | 21.402 | 16.82 | CD | 4 | - | <u>40</u> | 47 | 51 | 55 | 59 |

VCP 122 Upper Cuts

| Scan | | | | Surveillance | | Doppler PRF No. | | | | |
|-----------------|-------------------|--------------|---------|--------------|-----------|-----------------|--------------|--------------|--------------|--------------|
| Elevation (deg) | AZ Rate (deg/sec) | Period (sec) | WF Type | PRF No. | No Pulses | 4 No. Pulses | 5 No. Pulses | 6 No. Pulses | 7 No. Pulses | 8 No. Pulses |
| 2.4 | 19.205 | 18.75 | B | 1,8 | 6 | 27 | 32 | 34 | 37 | <u>40</u> |
| 2.4 | 27.400 | 13.14 | CD | 6 | - | 31 | 37 | <u>40</u> | 43 | 46 |
| 2.4 | 21.402 | 16.82 | CD | 4 | - | <u>40</u> | 47 | 51 | 55 | 59 |
| 3.35 | 21.600 | 16.67 | B | 2,8 | 6 | 28 | 33 | 35 | 38 | <u>40</u> |
| 3.35 | 27.400 | 13.14 | CD | 6 | - | 31 | 37 | <u>40</u> | 43 | 46 |
| 3.35 | 21.402 | 16.82 | CD | 4 | - | <u>40</u> | 47 | 51 | 55 | 59 |
| 4.3 | 16.304 | 22.08 | B | 2,4 | 6 | <u>40</u> | 48 | 52 | 56 | 61 |
| 4.3 | 29.499 | 12.20 | CD | 7 | - | 29 | 34 | 37 | <u>40</u> | 44 |
| 6.0 | 20.204 | 17.82 | B | 3,5 | 6 | 34 | <u>40</u> | 43 | 47 | 51 |
| 9.9 | 29.499 | 12.20 | CD | 7 | - | 28 | 34 | 37 | <u>40</u> | 43 |
| 14.6 | 29.795 | 12.08 | CD | 8 | - | 28 | 33 | 36 | 39 | <u>43</u> |
| 19.5 | 29.795 | 12.08 | CD | 8 | - | 28 | 33 | 36 | 39 | <u>43</u> |

Summary of Test Cases

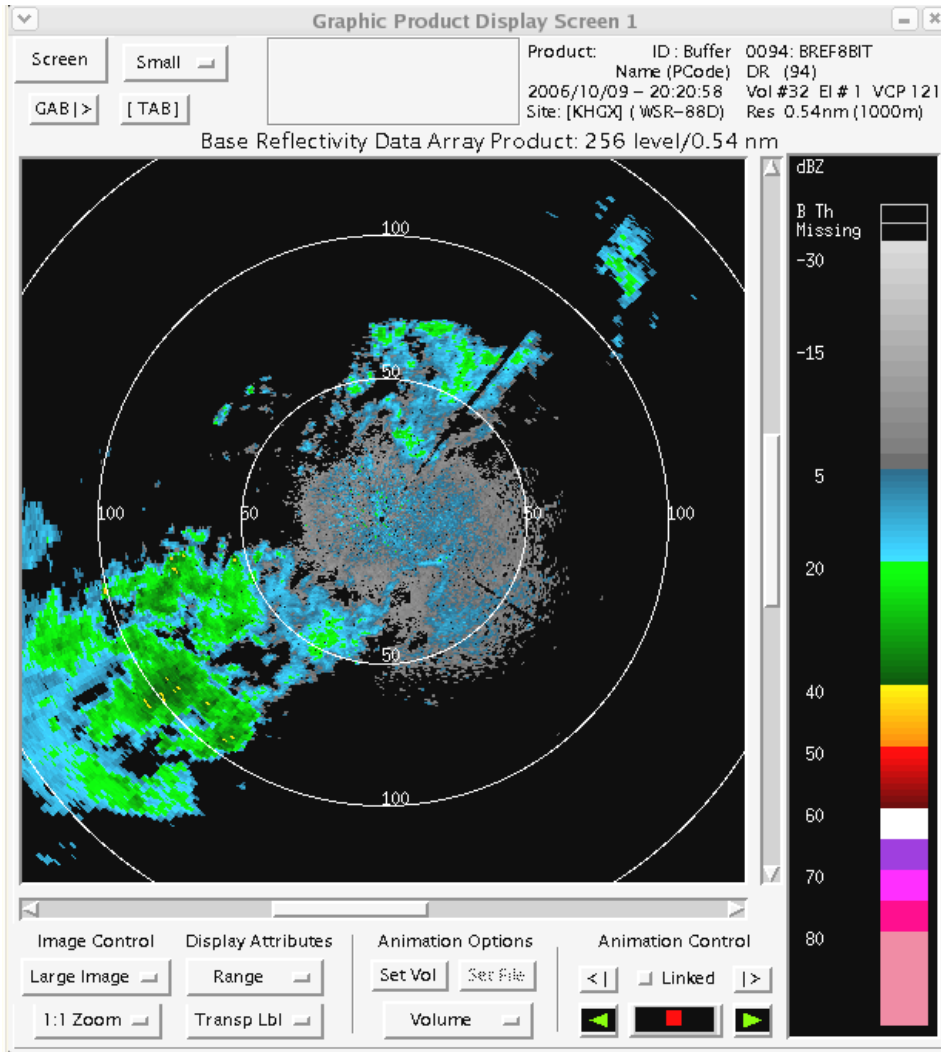
- 9-10 October 2006
 - ~24 hours
 - Widespread rain across central Oklahoma
- 15-16 October 2006
 - ~28 hours
 - Widespread heavy rain south and central Oklahoma

9 October 2006

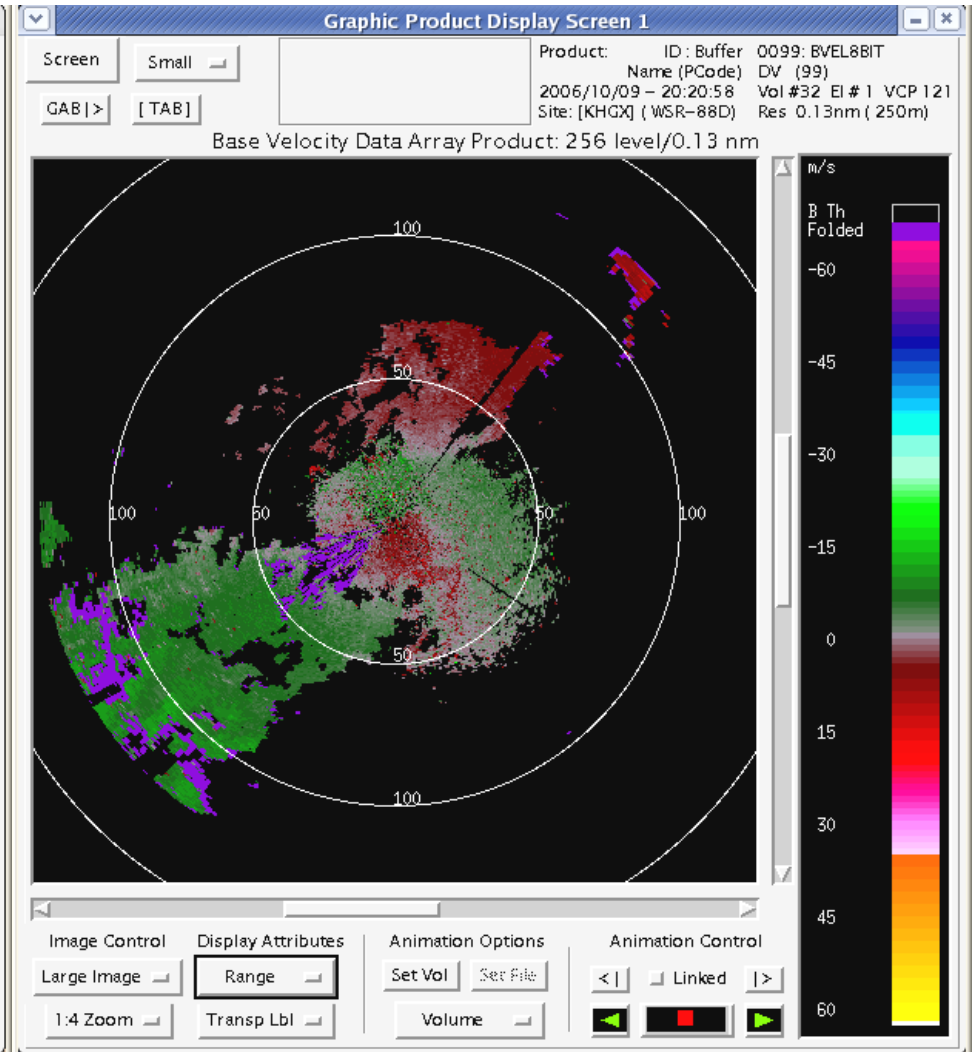
20:20 to 20:57Z

Comparison of Test VCP 122 with MPDA
VCP 121; SZ-2 VCPs 211, 212, 221; and
Legacy VCP 12

20:20Z Reflectivity

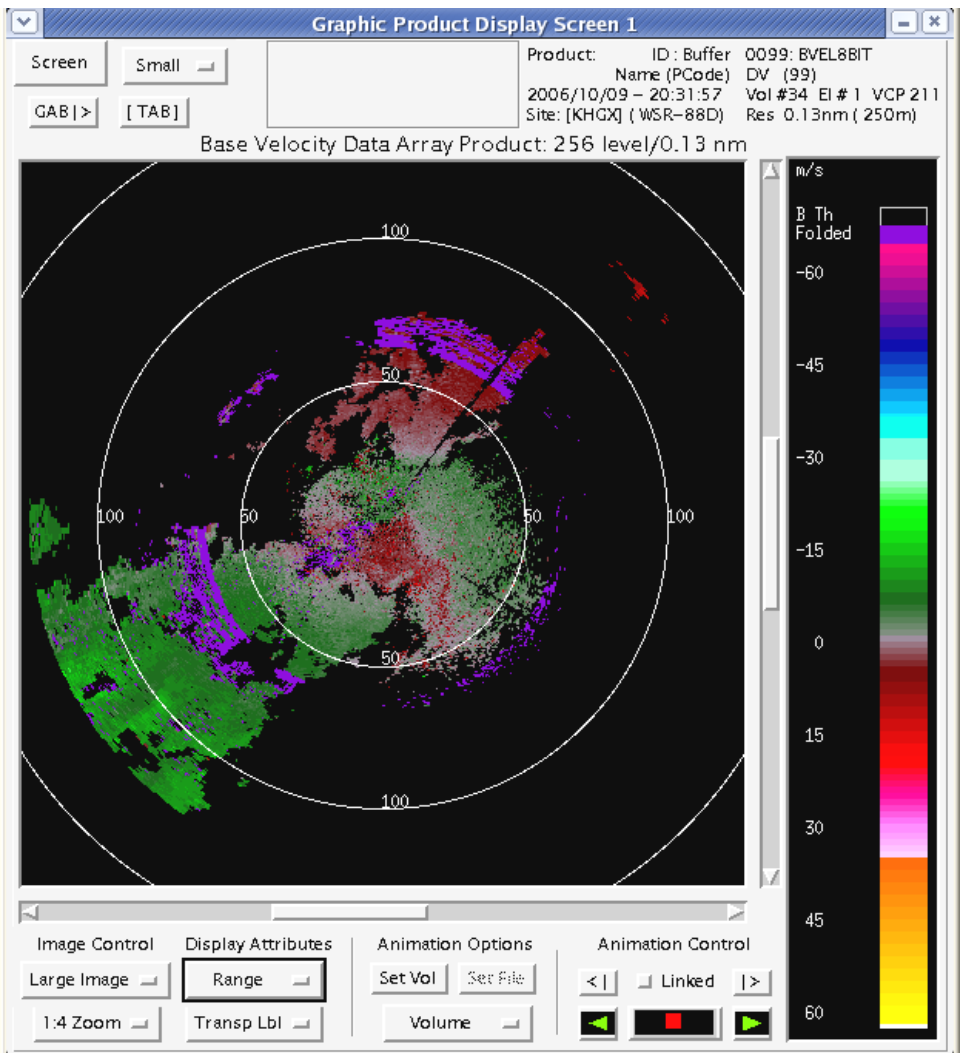
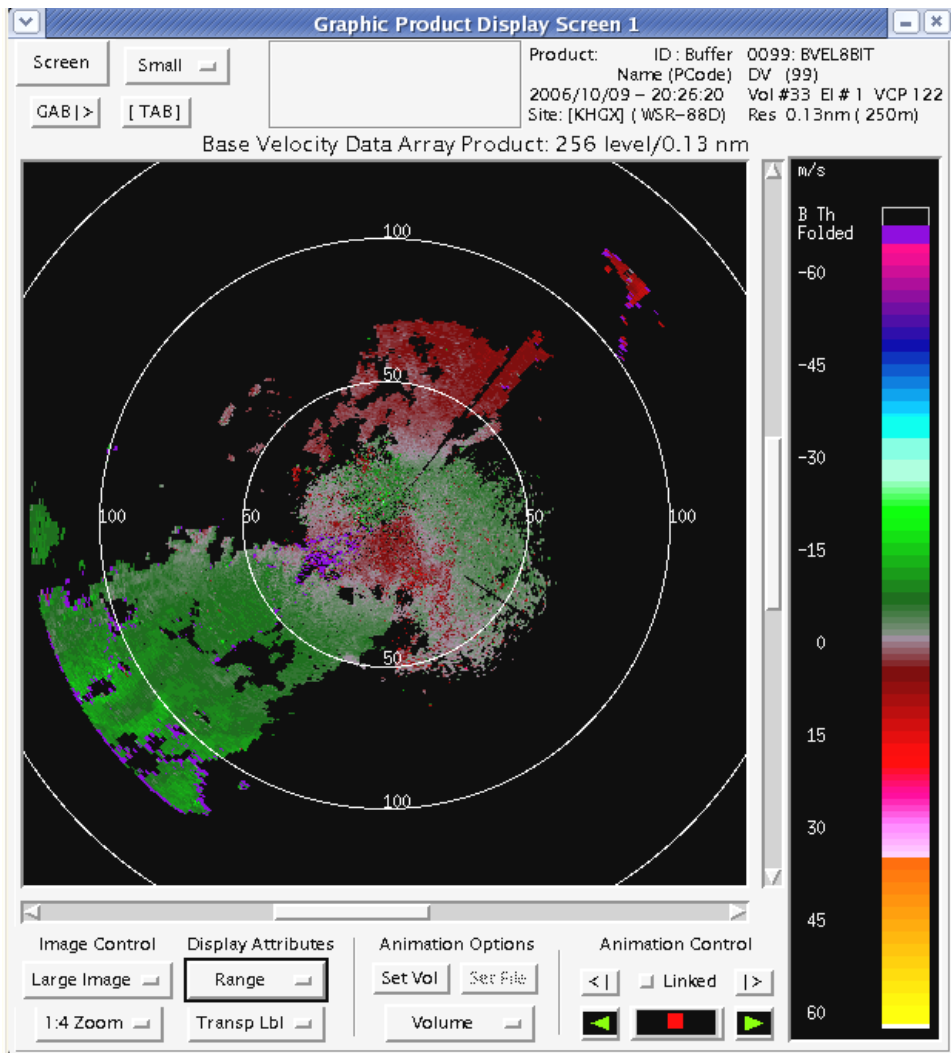


20:20Z MPDA VCP 121



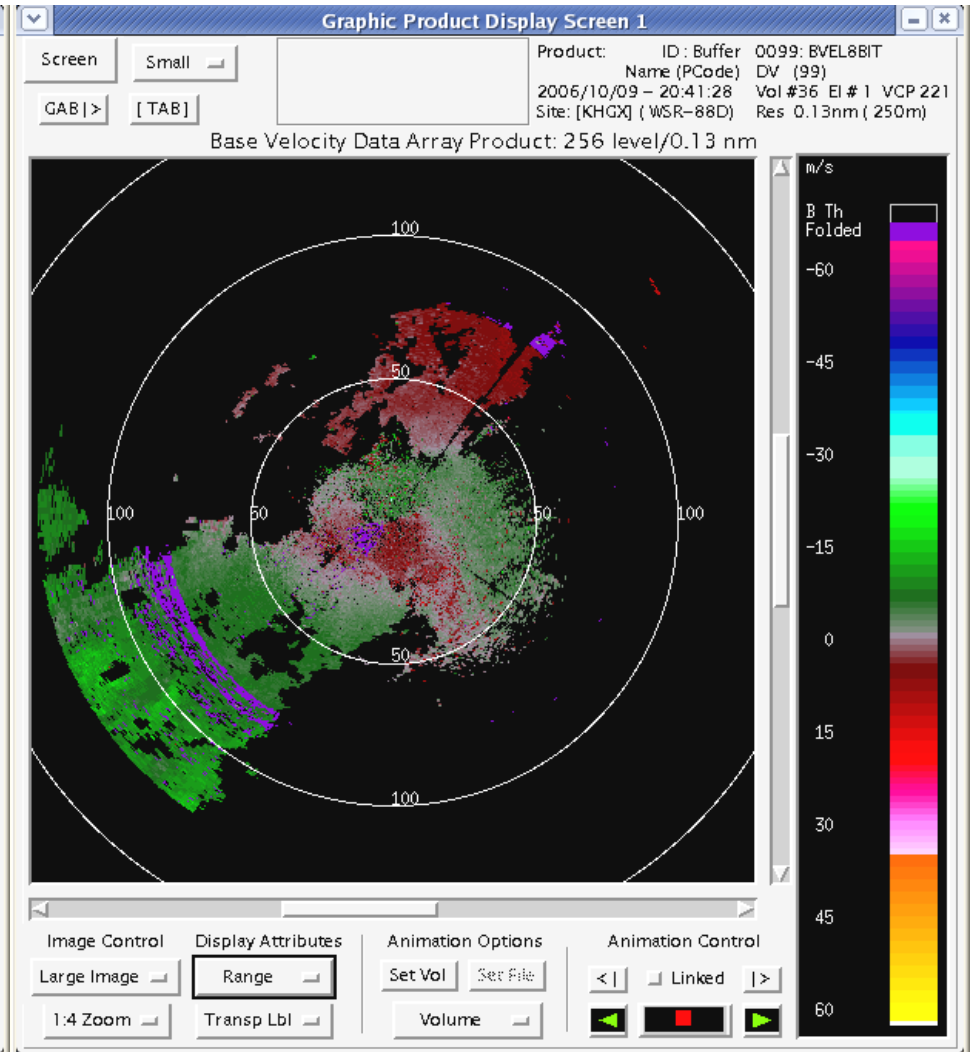
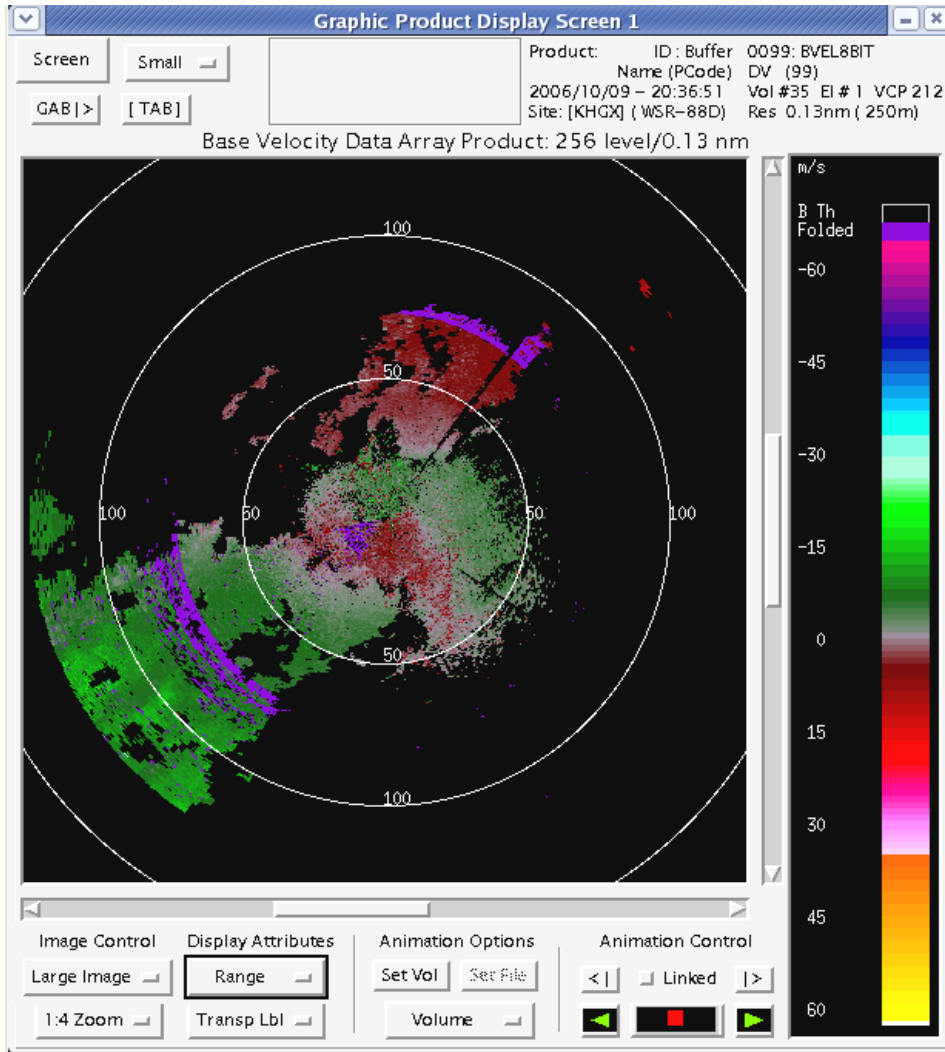
20:26Z Test VCP 122

20:31Z SZ-2 VCP 211



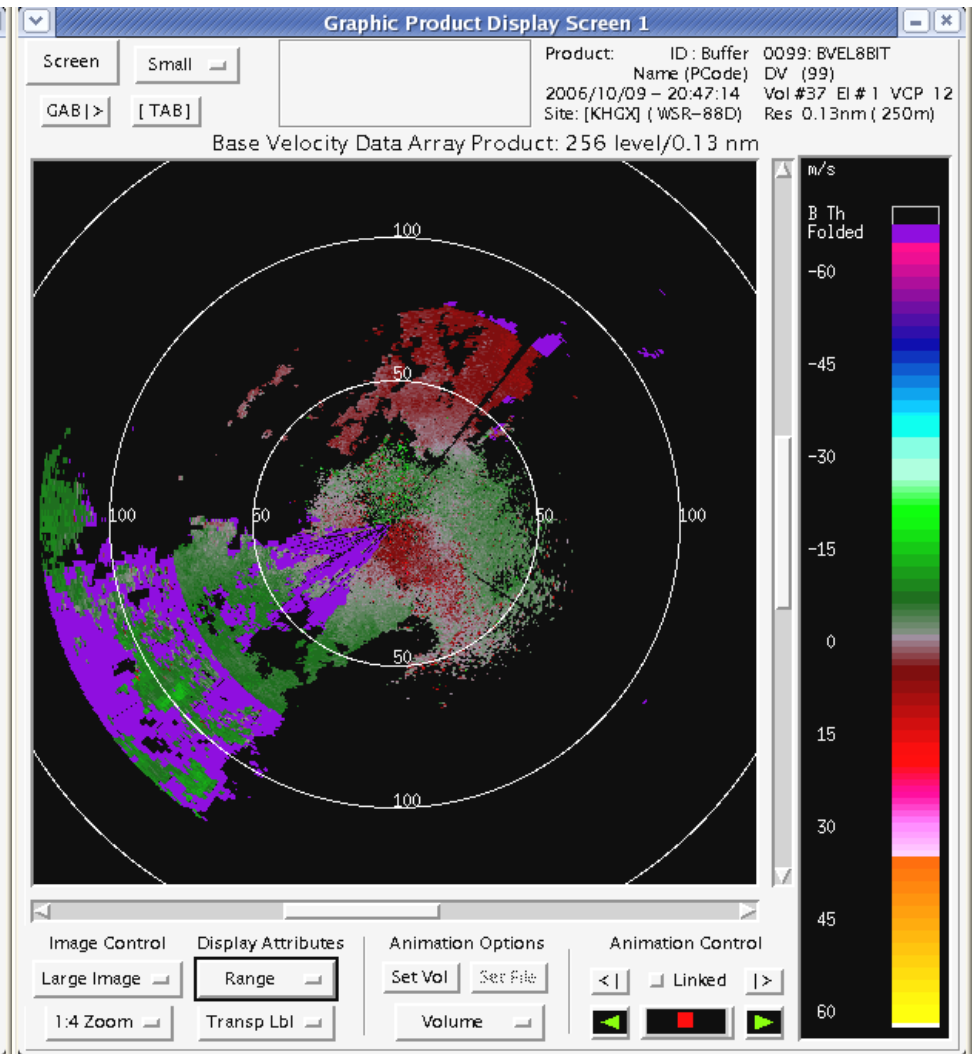
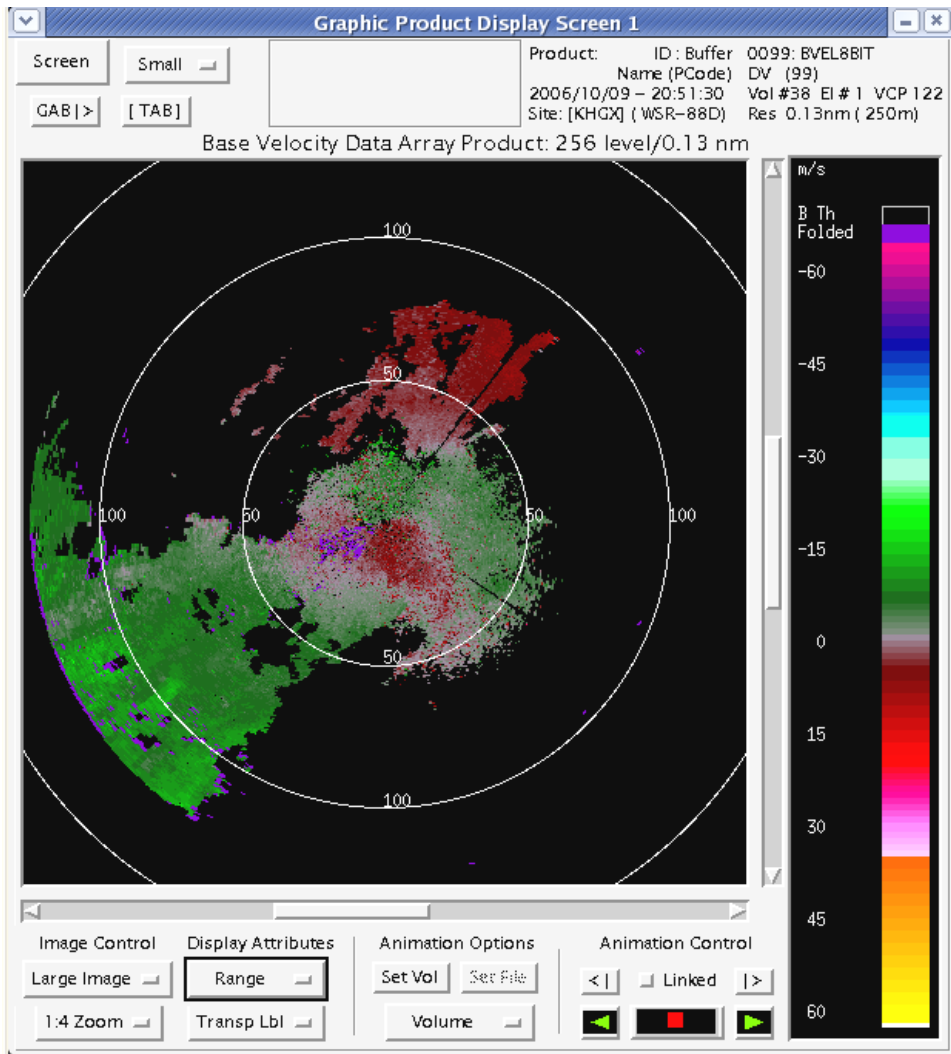
20:36Z SZ-2 VCP 212

20:41Z SZ-2 VCP 221



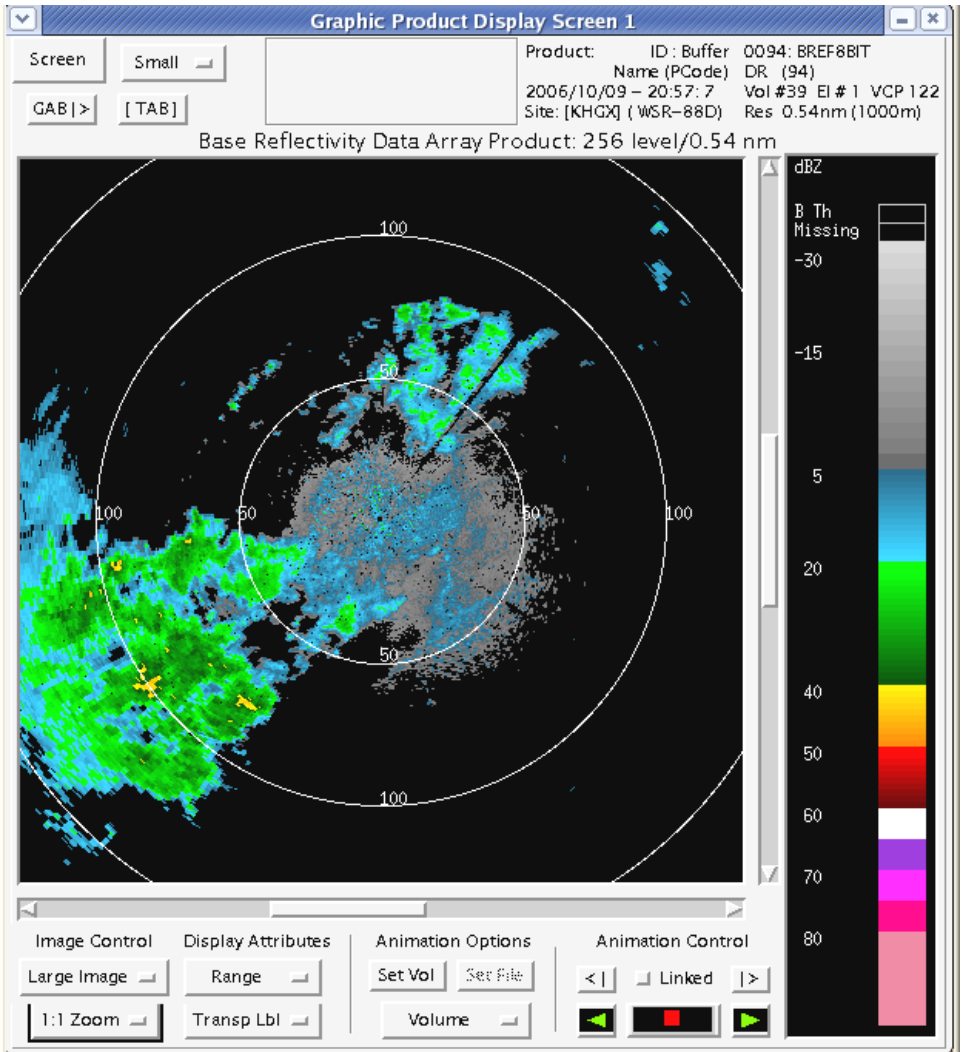
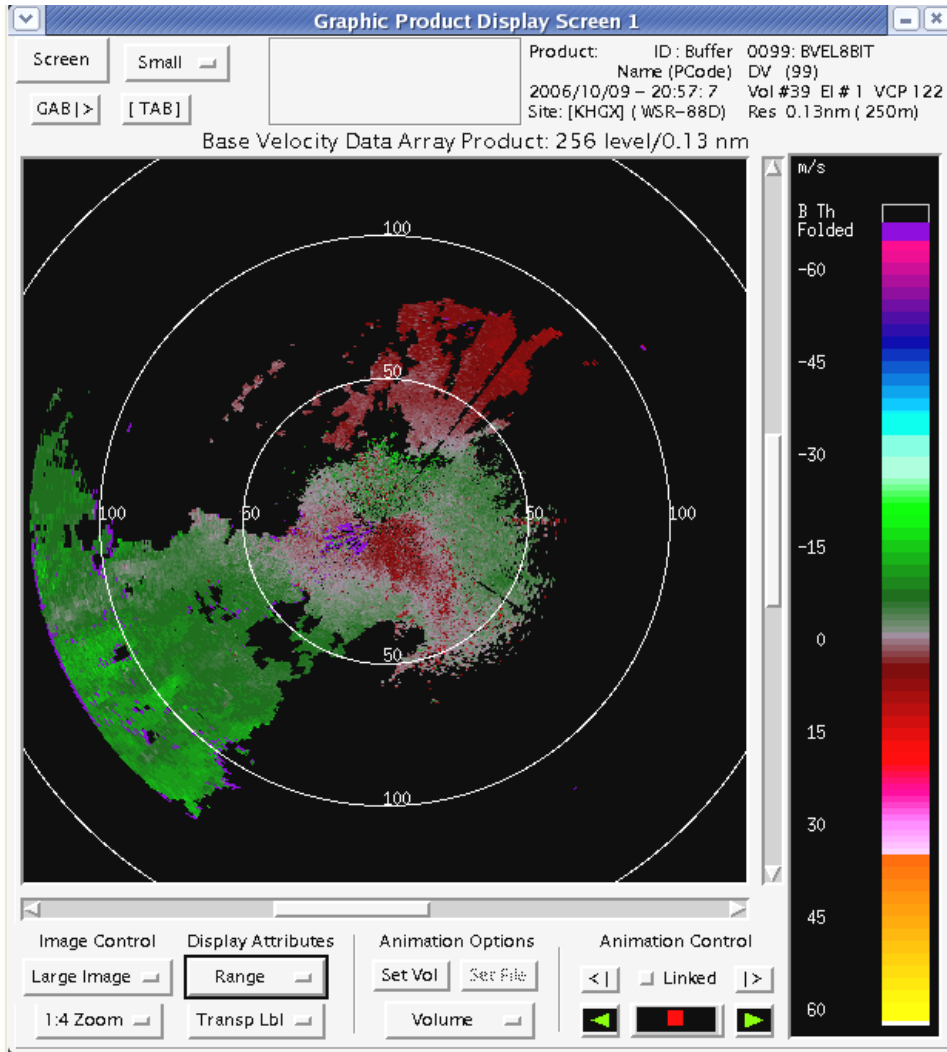
20:51Z Test VCP 122

20:47Z Legacy VCP 12



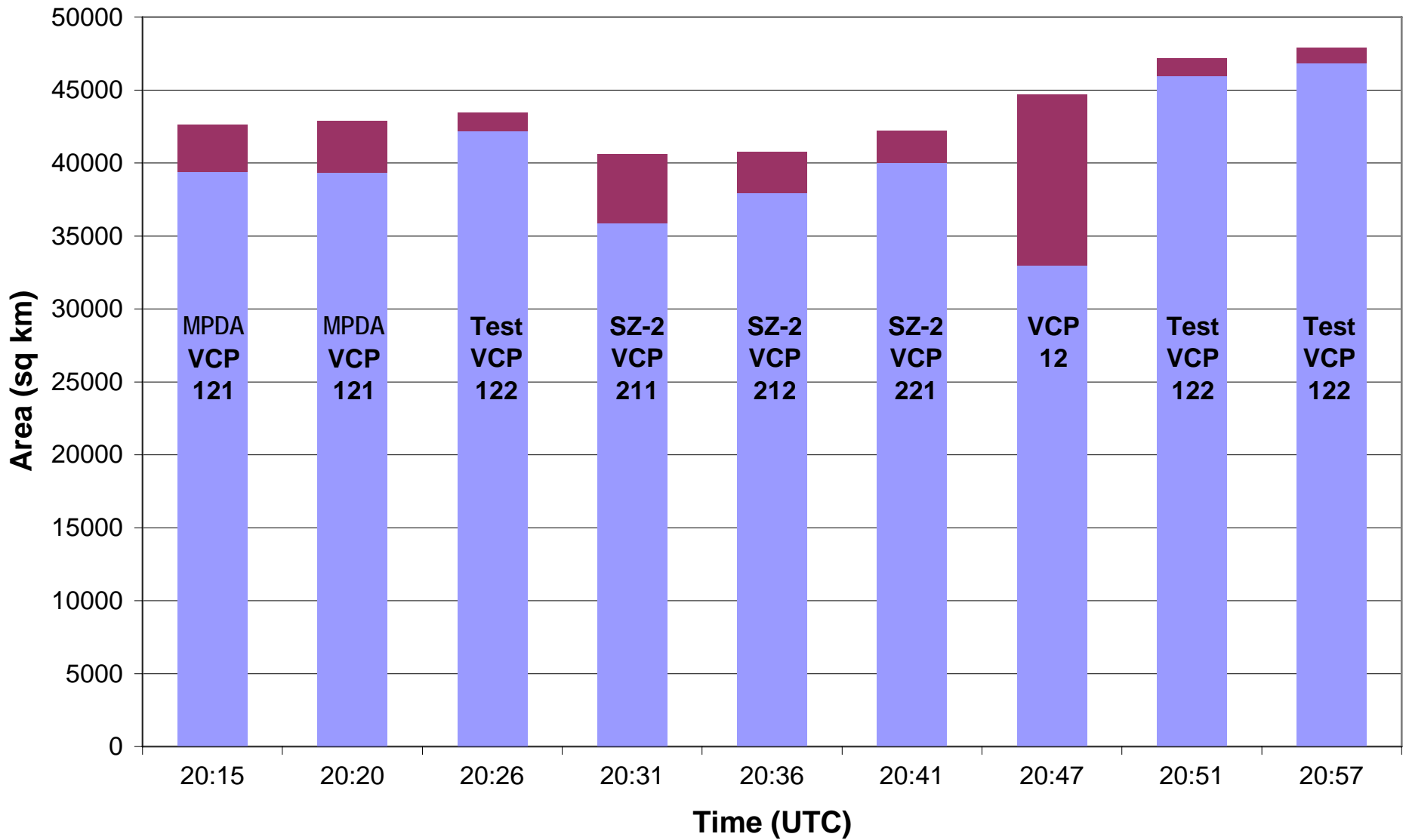
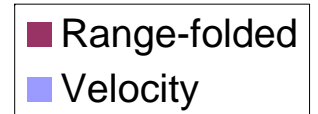
20:57Z Test VCP 122

20:57Z Reflectivity



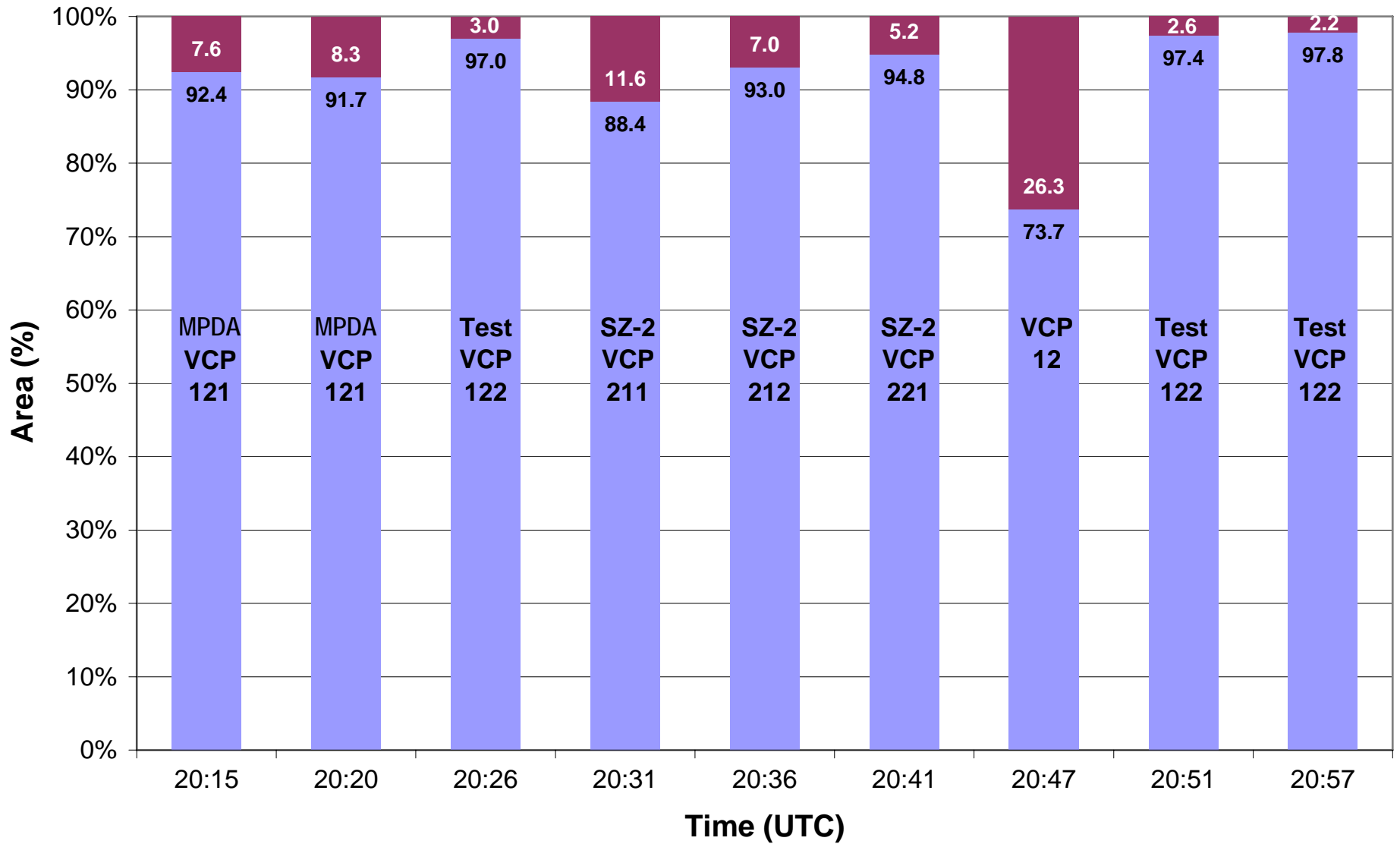
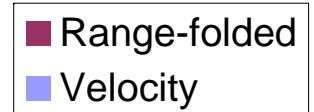
Velocity/Range-folded Area for Various VCPs

9 October 2006, 20:15Z to 20:57Z, Elev. 0.5 Deg.



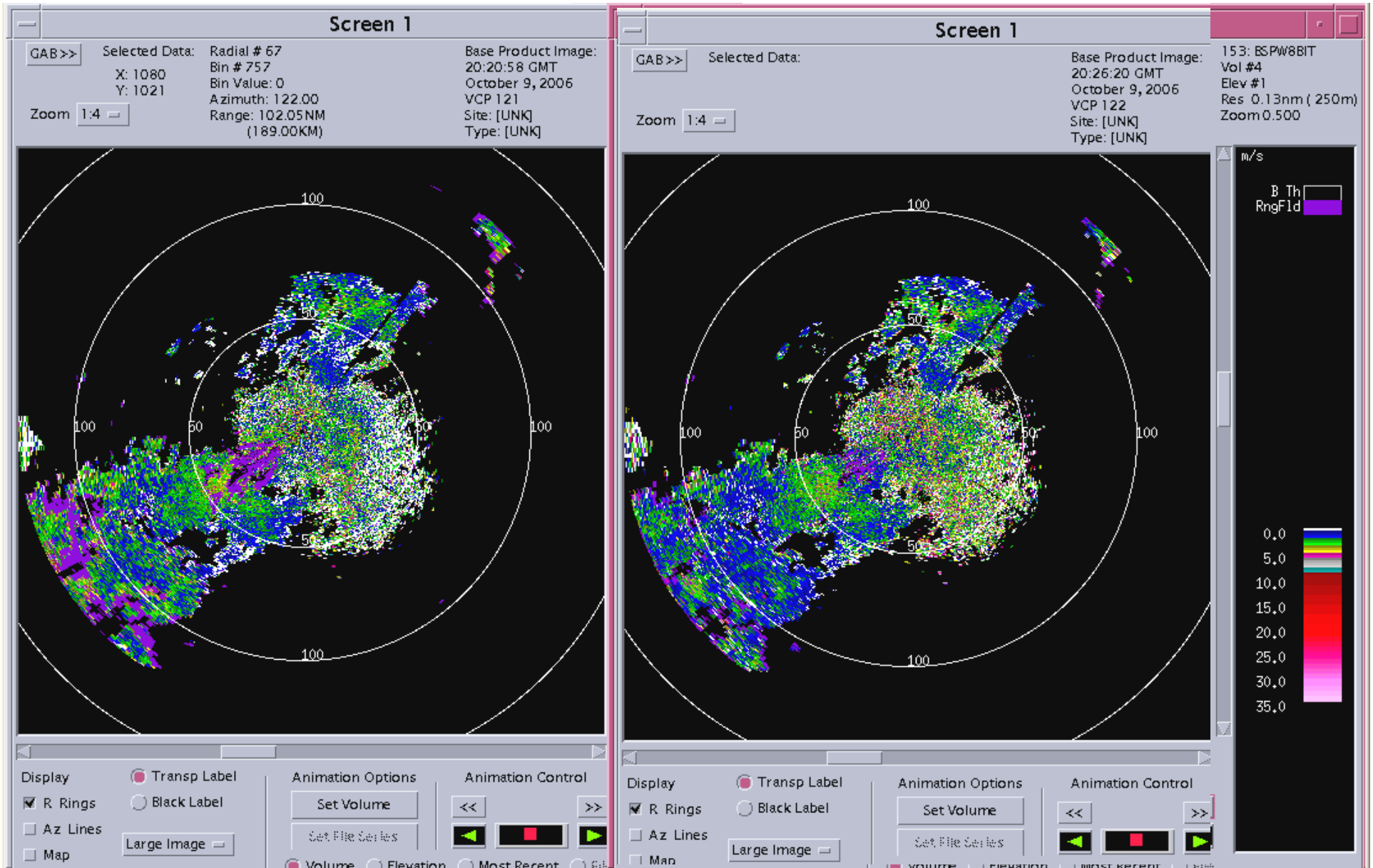
Velocity/Range-folded Area for Various VCPs

9 October 2006, 20:15Z to 20:57Z, Elev. 0.5 Deg.

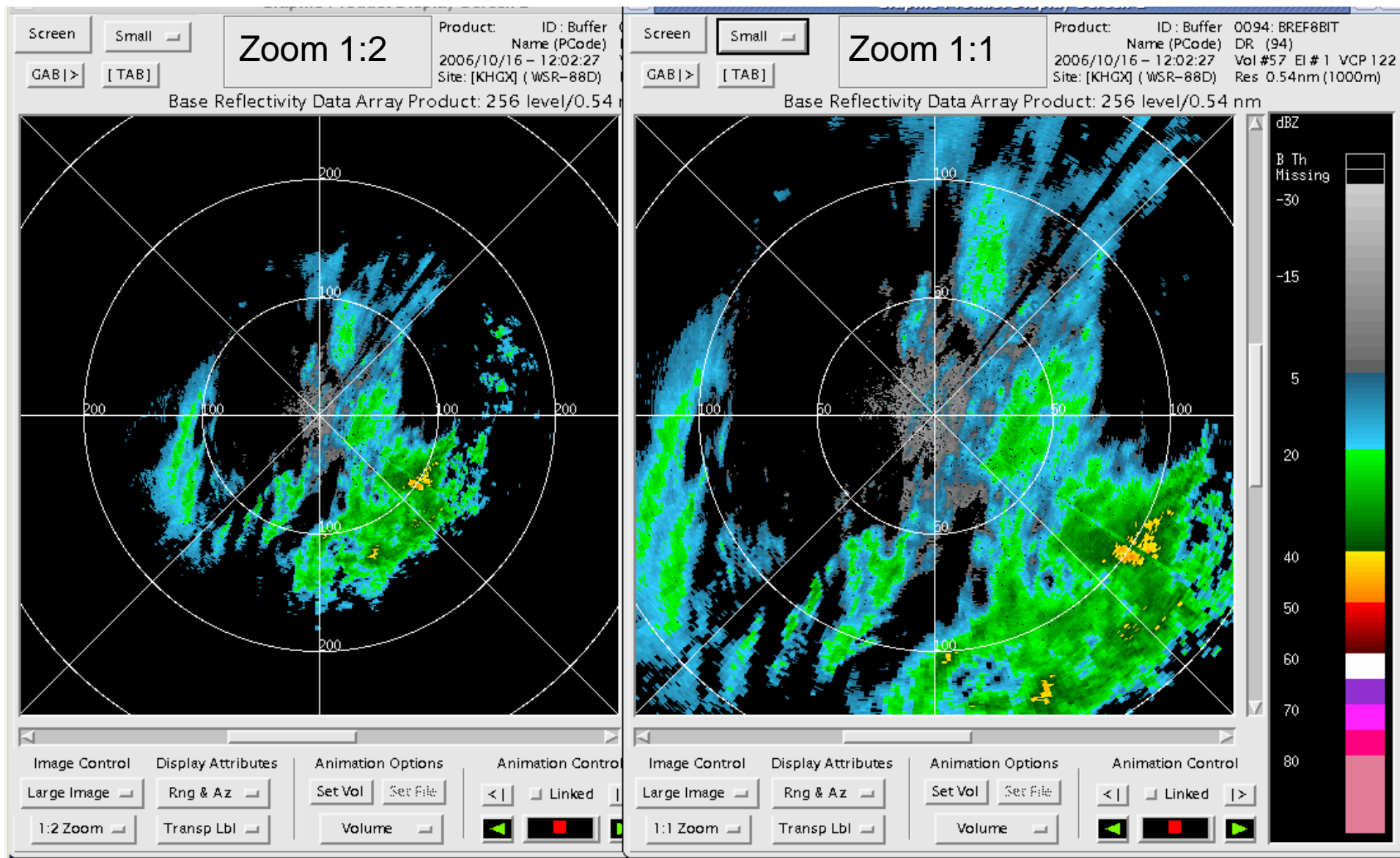


20:20Z MPDA VCP 121

20:26Z Test VCP 122



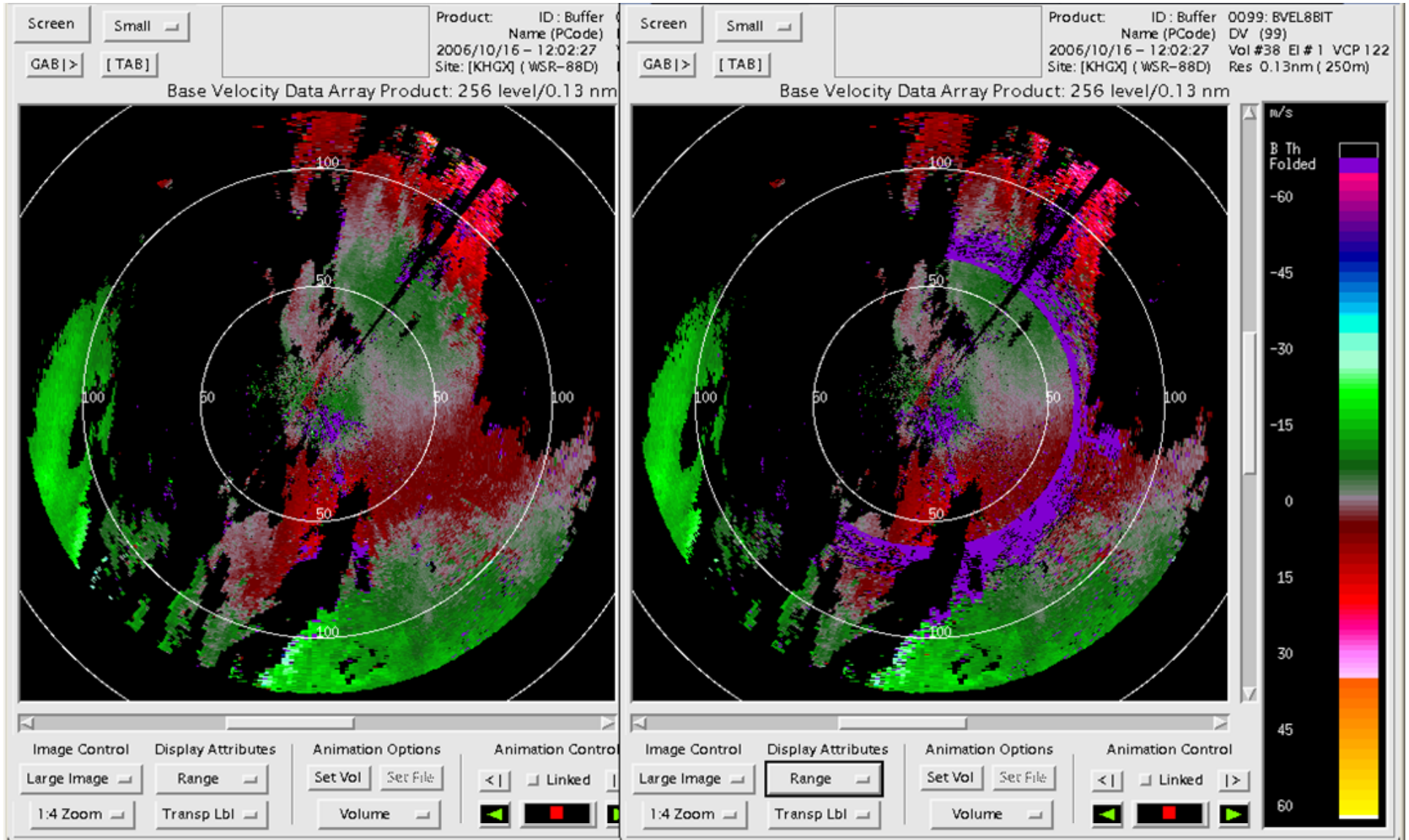
Reflectivity, 16 October 2006, 12:02Z, Elev. 0.5



Test VCP 122

16 Oct 06 12:02Z
Elev 0.5

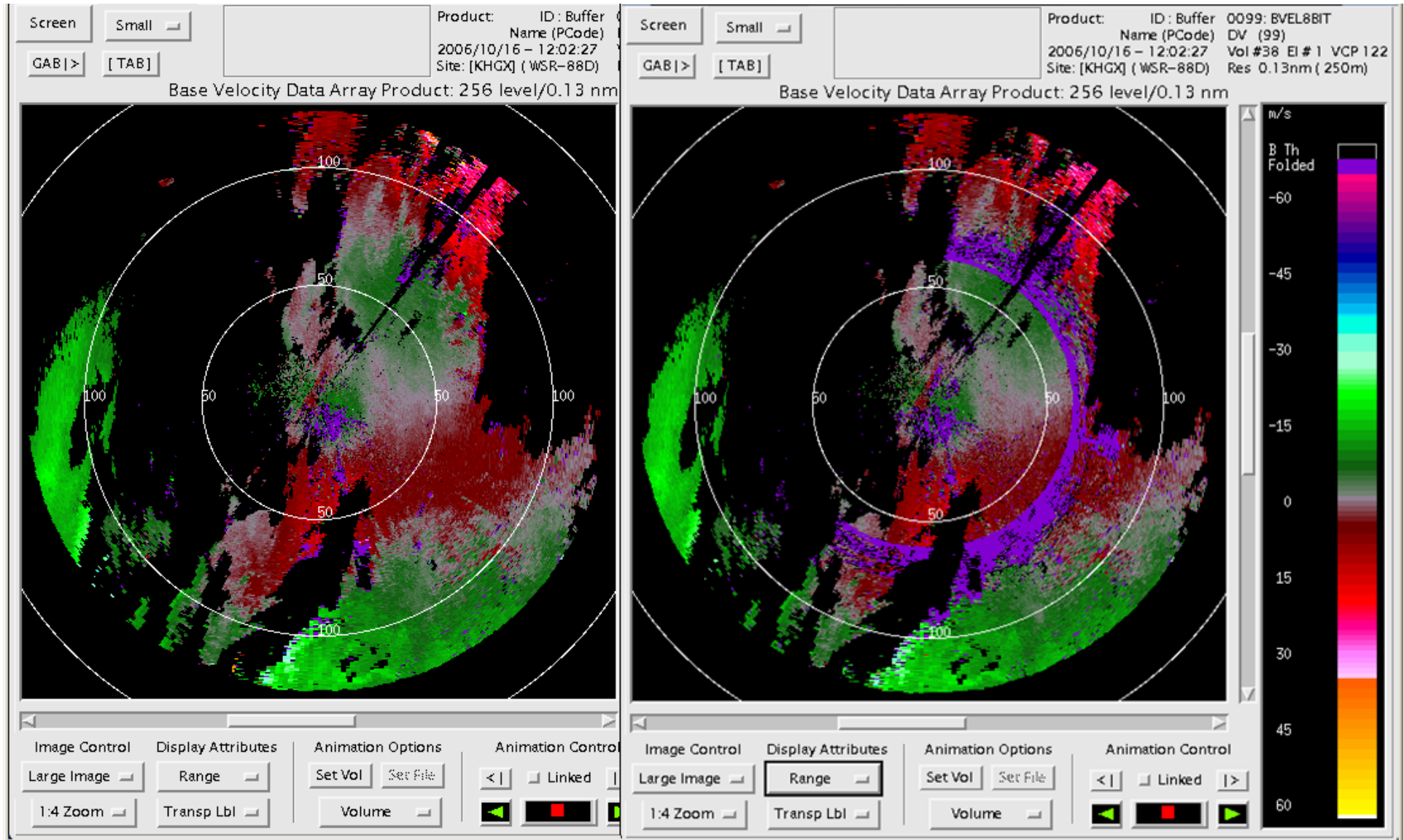
SZ-2 w/PRF8



Test VCP 122
w/PRF6 Omitted

16 Oct 06 12:02Z
Elev 0.5

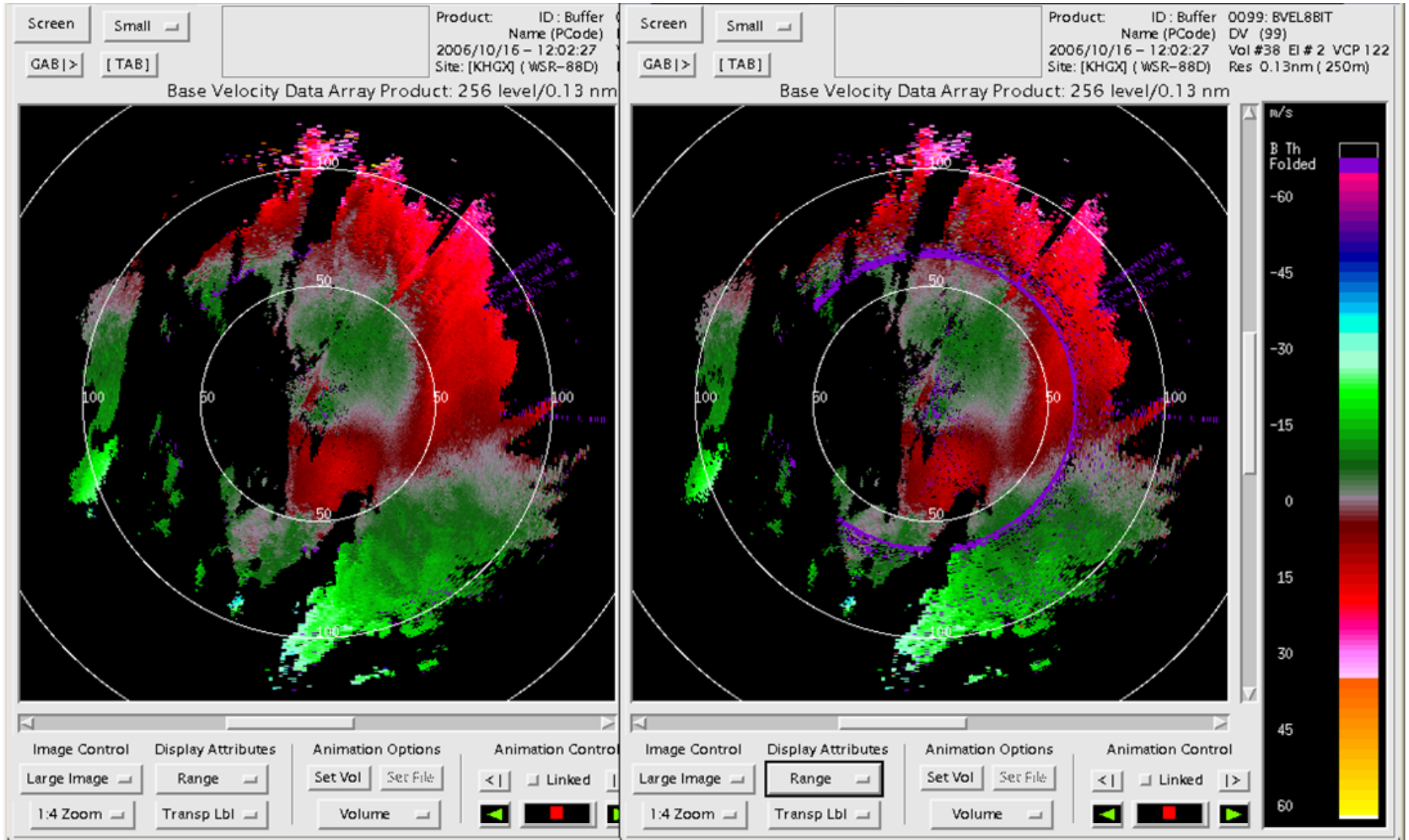
SZ-2 w/PRF8



Test VCP 122

16 Oct 06 12:02Z
Elev 1.45

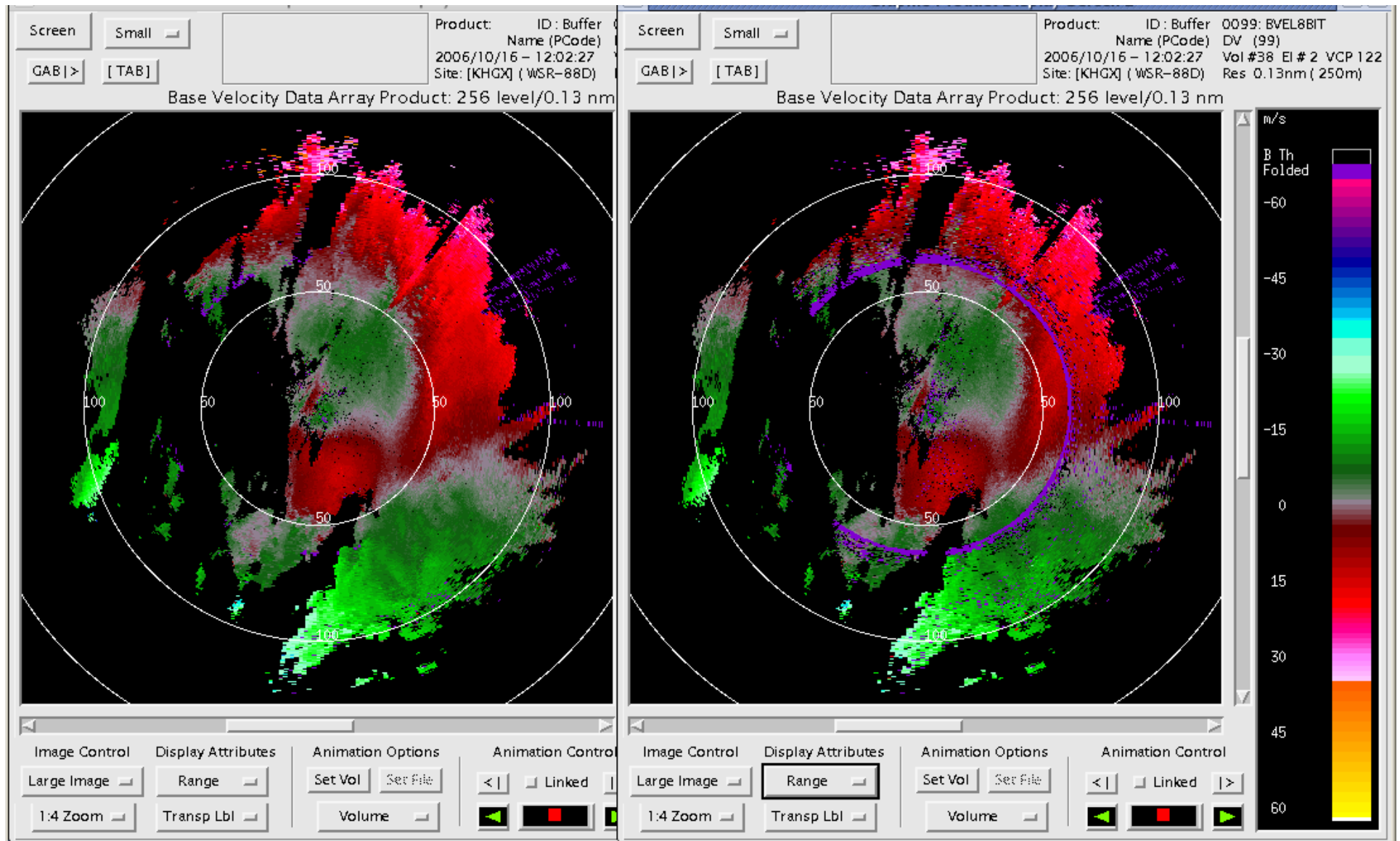
SZ-2 w/PRF8



Test VCP 122
w/PRF6 Omitted

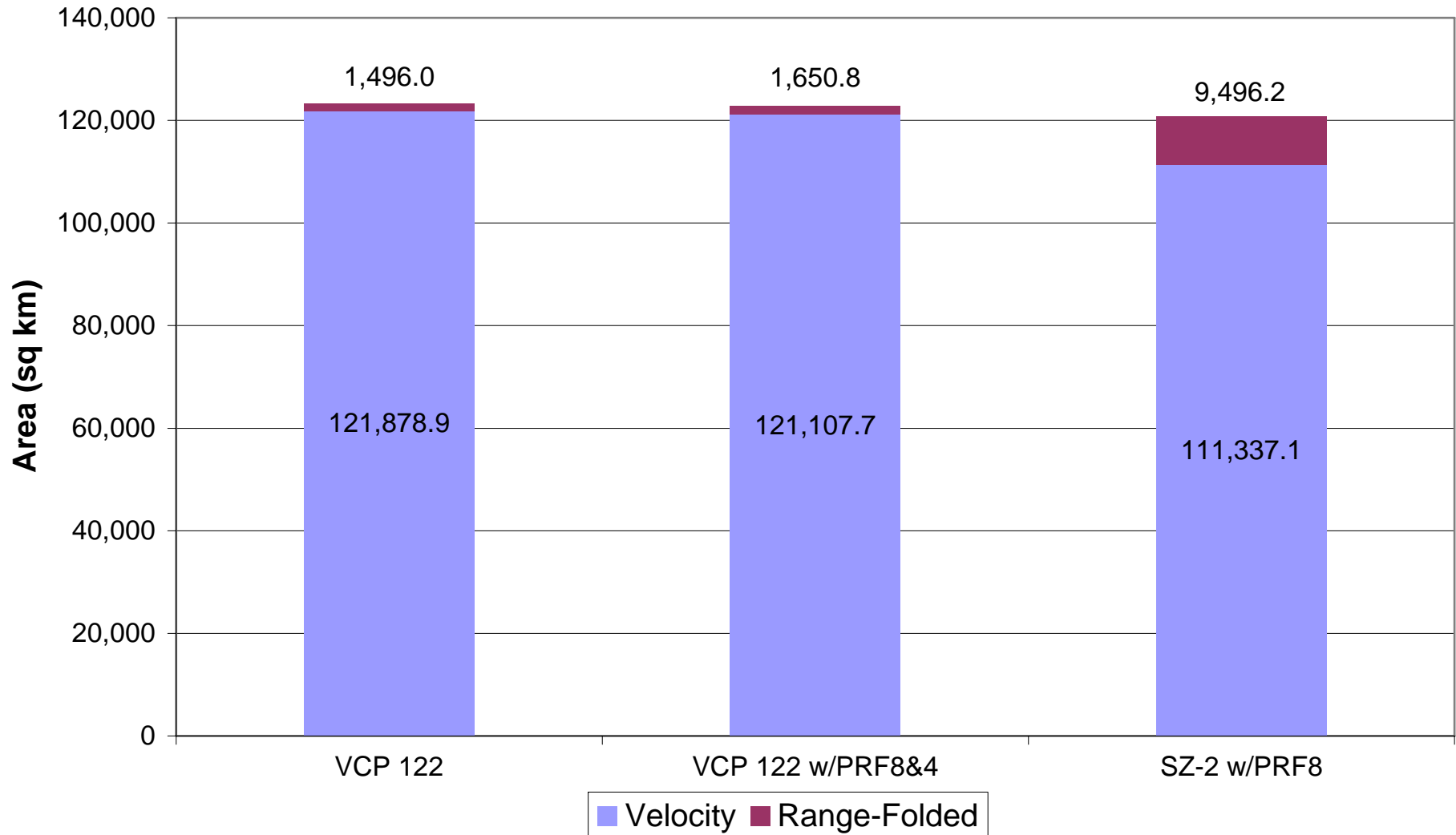
16 Oct 06 12:02Z
Elev 1.45

SZ-2 w/PRF8



Area of Velocity & Range-Folded Signal

15 October 2006, 11:53Z to 12:55Z, 12-Volume Average



Preliminary Conclusions

- VCP 122 outperforms either MPDA VCP 121 or SZ-2 VCPs 211, 212, and 221 in reducing range folding
 - Less than half residual range folding left in by SZ-2 VCPs
- May be able to omit one Doppler scan from MPDA VCP 121 at 0.5 and 1.45 degrees
 - Would cut 26+ seconds from volume scan time
- ORDA data quality team recommends modifying VCP 121 to meet Build 10 Design & Development deadline

Build 10 Key Dates

- 26 Jun 2006 to 30 Mar 2007 Design & Development
- 27 Jan 2007 RPG Integration starts
- 28 Jun 2007 System testing starts
- 23 Oct 2007 Operations testing starts
- 10 Jan 2008 Beta testing starts
- 14 Apr 2008 Deployment

Work to be Accomplished by 30 March 2007

- Submit configuration change request
- Collect more data sets ~10-12 cases, 3-4 hours per case
- Evaluate two vs. three Doppler scans
 - If two is selected, coordinate with other users if needed
- Complete statistical analyses on the cases
- Update TAC if requested to