

Dual Polarization: Coming Soon to a Radar Near You!

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**NOAA/NWS Warning Decision
Training Branch**

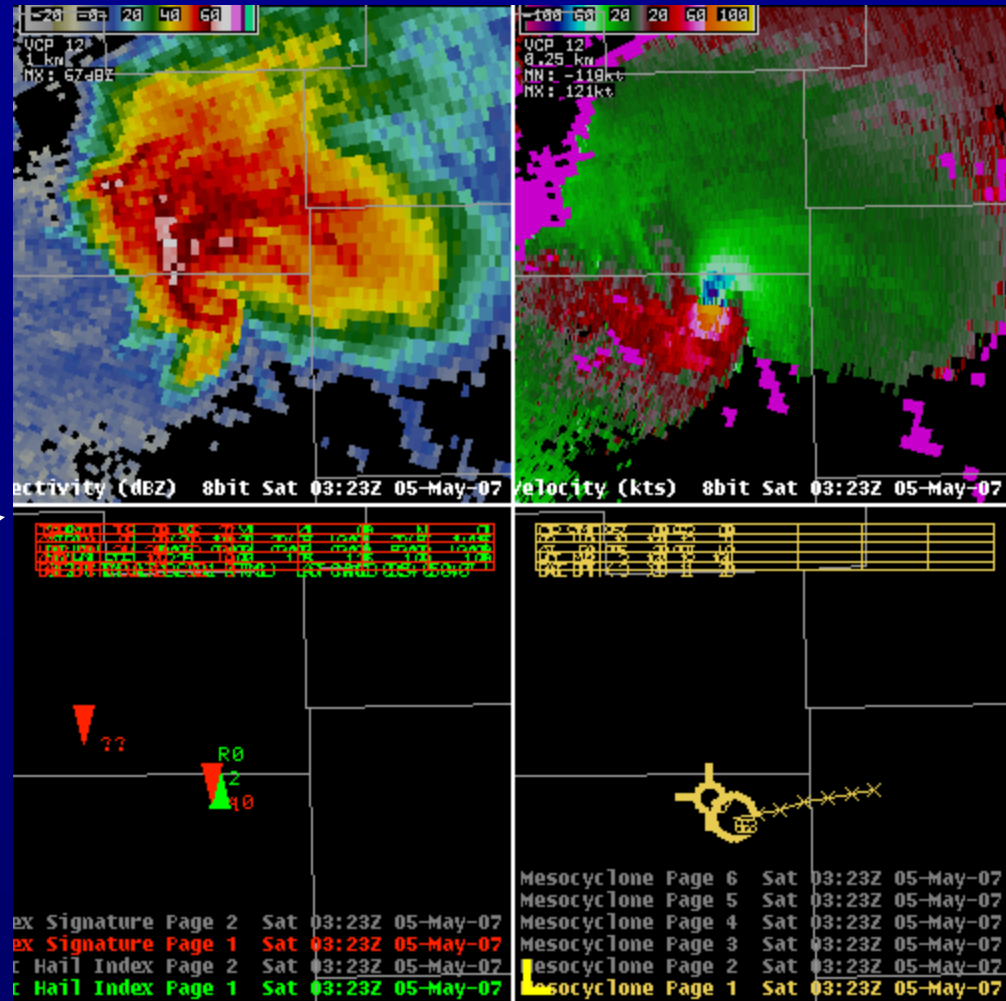


NSWW 2009
March 6, 2009

kcri 0.5 Melting Layer Tue 05:43Z + kcri 0.5 KDP 8bit Tue 05:43Z

Compare to Current 88D

- Retrofit on existing dish, tower, etc.
- Same VCPs
- 10 cm wavelength
- ~1.2 deg effective beamwidth
- Velocity, SW, Reflectivity, Algorithms: Unchanged



Policy of "Do no harm"

List of New Products via Dual-Pol

- Differential Reflectivity (ZDR)
- Correlation Coefficient (CC)
- Specific Differential Phase (KDP)

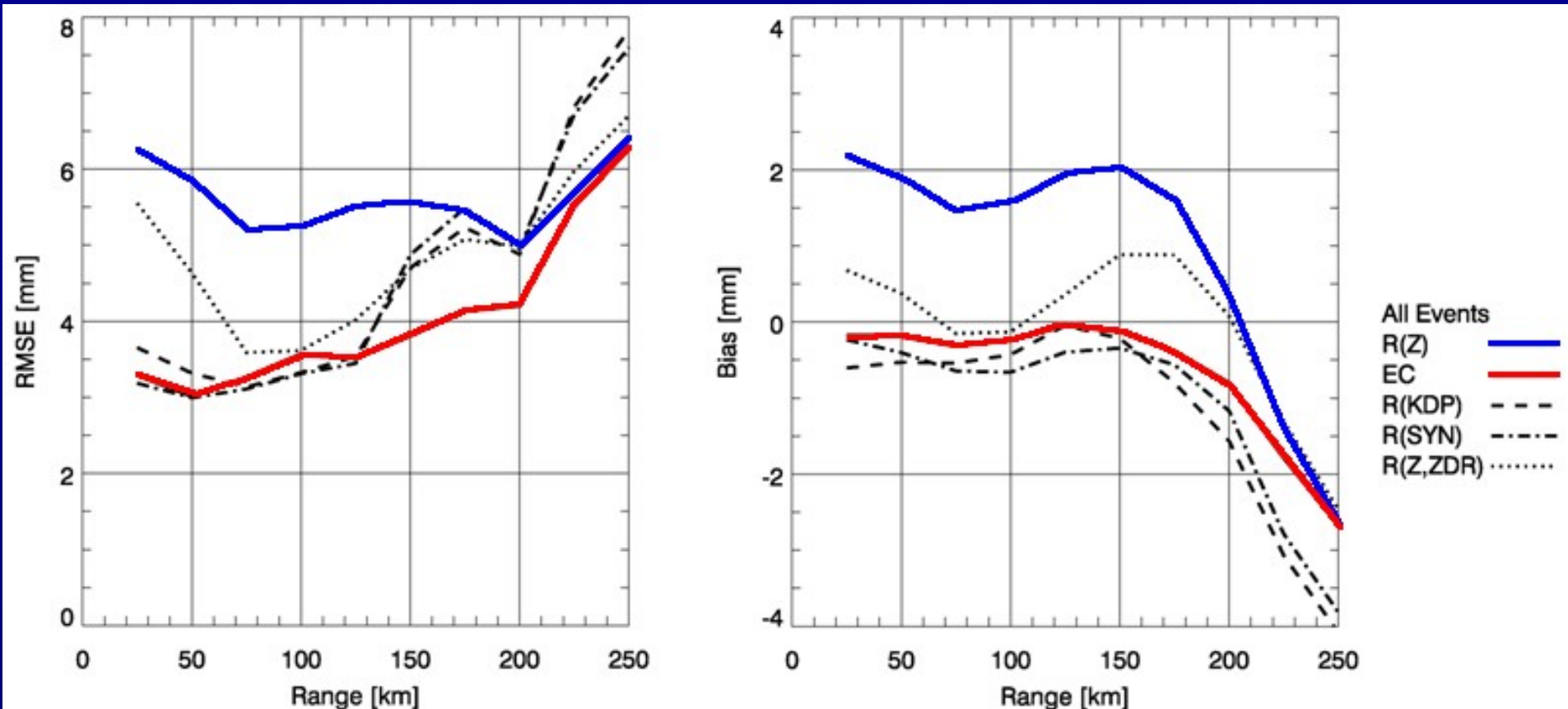
- Algorithms
 - Melting Layer
 - Hydrometeor Classification

- 9 NEW Precipitation Estimation Products

Highlights of How Dual-pol Data Will Aid Decision Makers

1. Better precipitation estimation
2. Improved detection and mitigation of non-weather echoes
3. Melting layer identification
4. Hydrometeor classification
5. New severe storm signatures

1. Better Rainfall Estimation

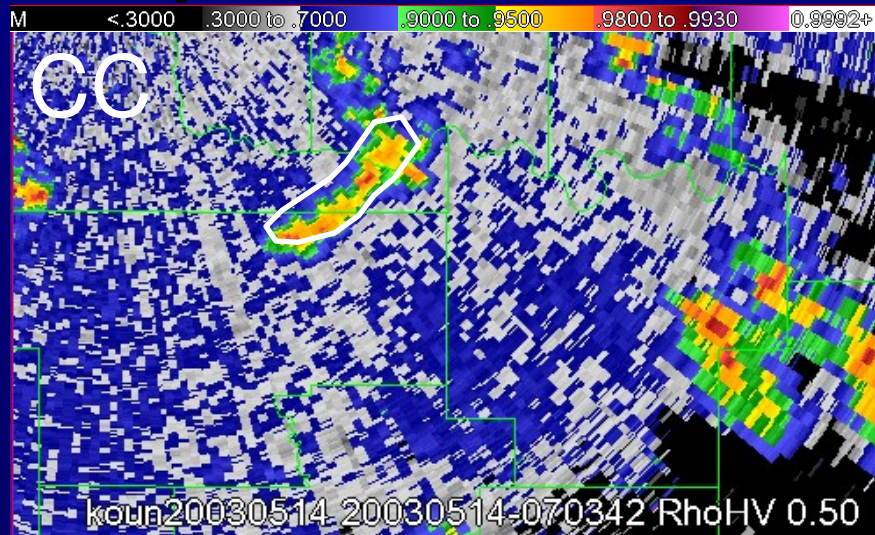
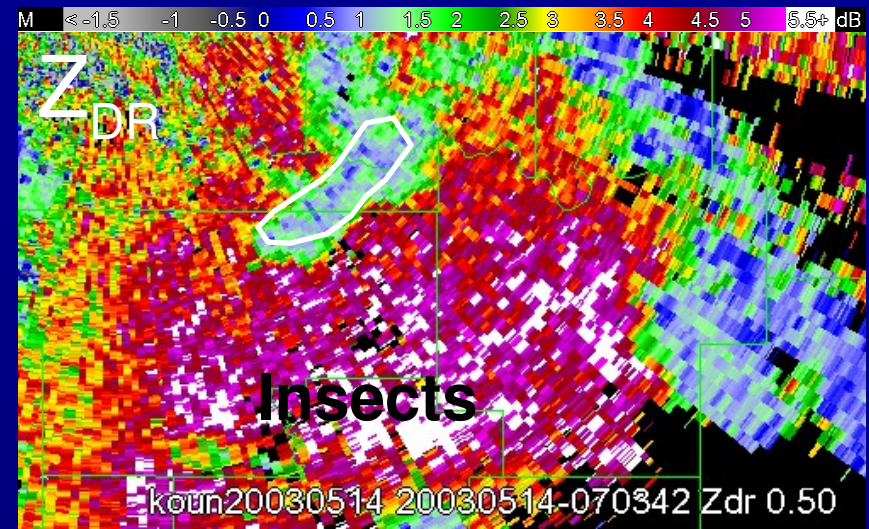
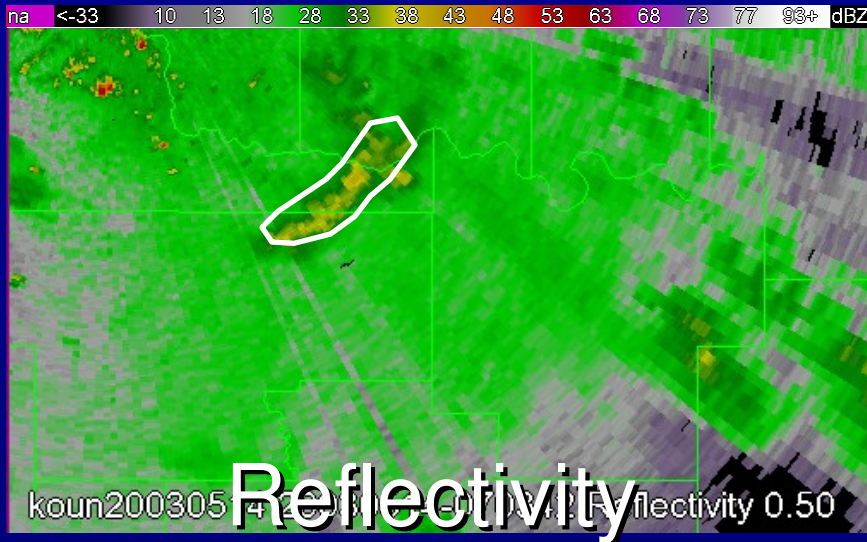


→ Based on 43 events (179 hrs) of radar rainfall data comparisons to a dense network of rain gauges in C. OK

2. Improved Detection and Mitigation of Non-Weather Echoes

- Chaff
- Ground Clutter
- Anomalous Propagation
- Birds/Bats/Insects
- Wind Farms?

Differentiate Between Rain and Ground Clutter/Insects



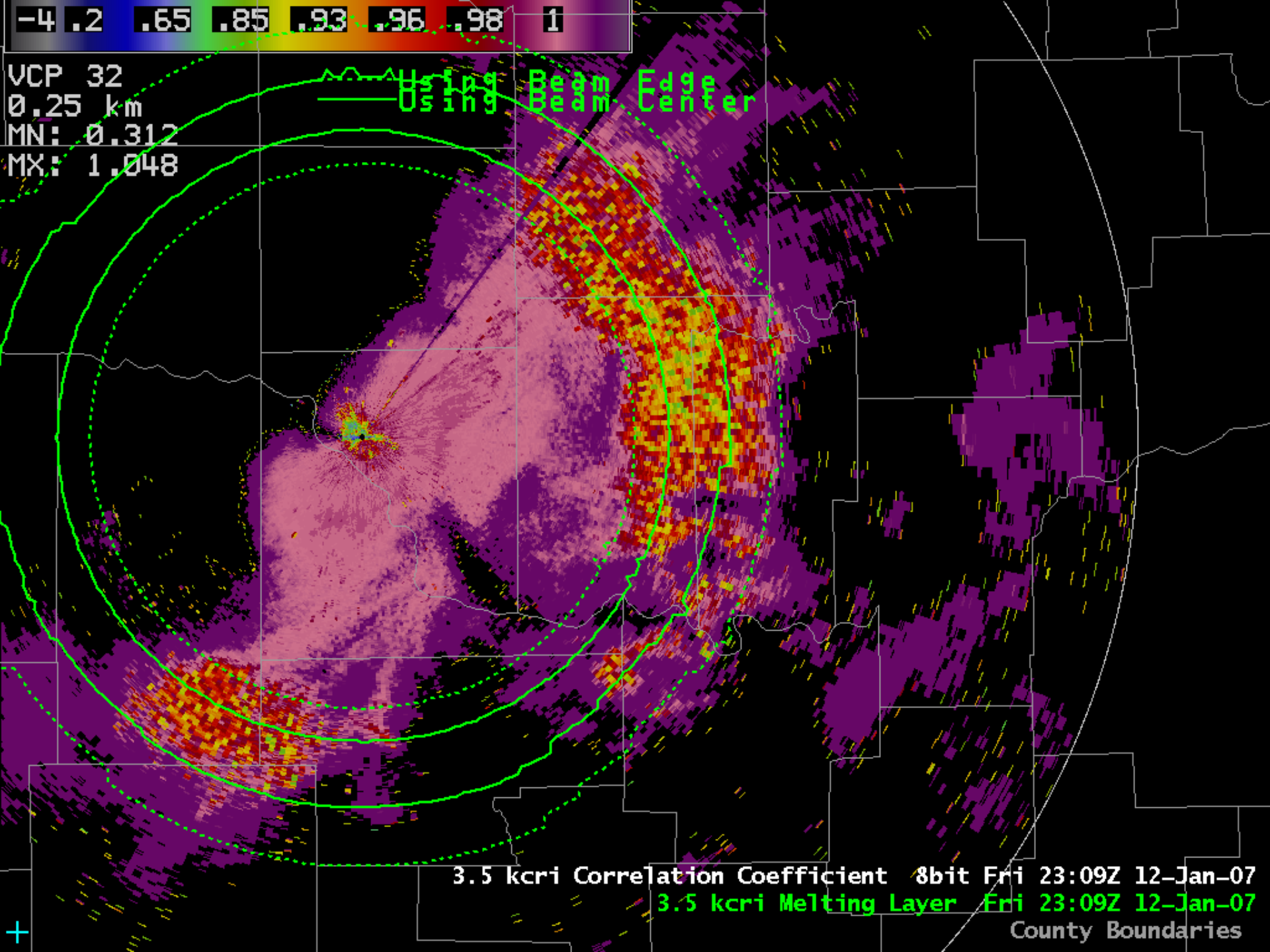
3. Melting Layer Detection

- Melting hydrometeors: Easy detection for dual-pol!
- Applications
 - Winter weather nowcasting: Rain/snow/freezing rain/sleet
 - Rainfall estimation



VCP 32
0.25 km
MN: 0.312
MX: 1.048

Using Beam Edge
Using Beam Center



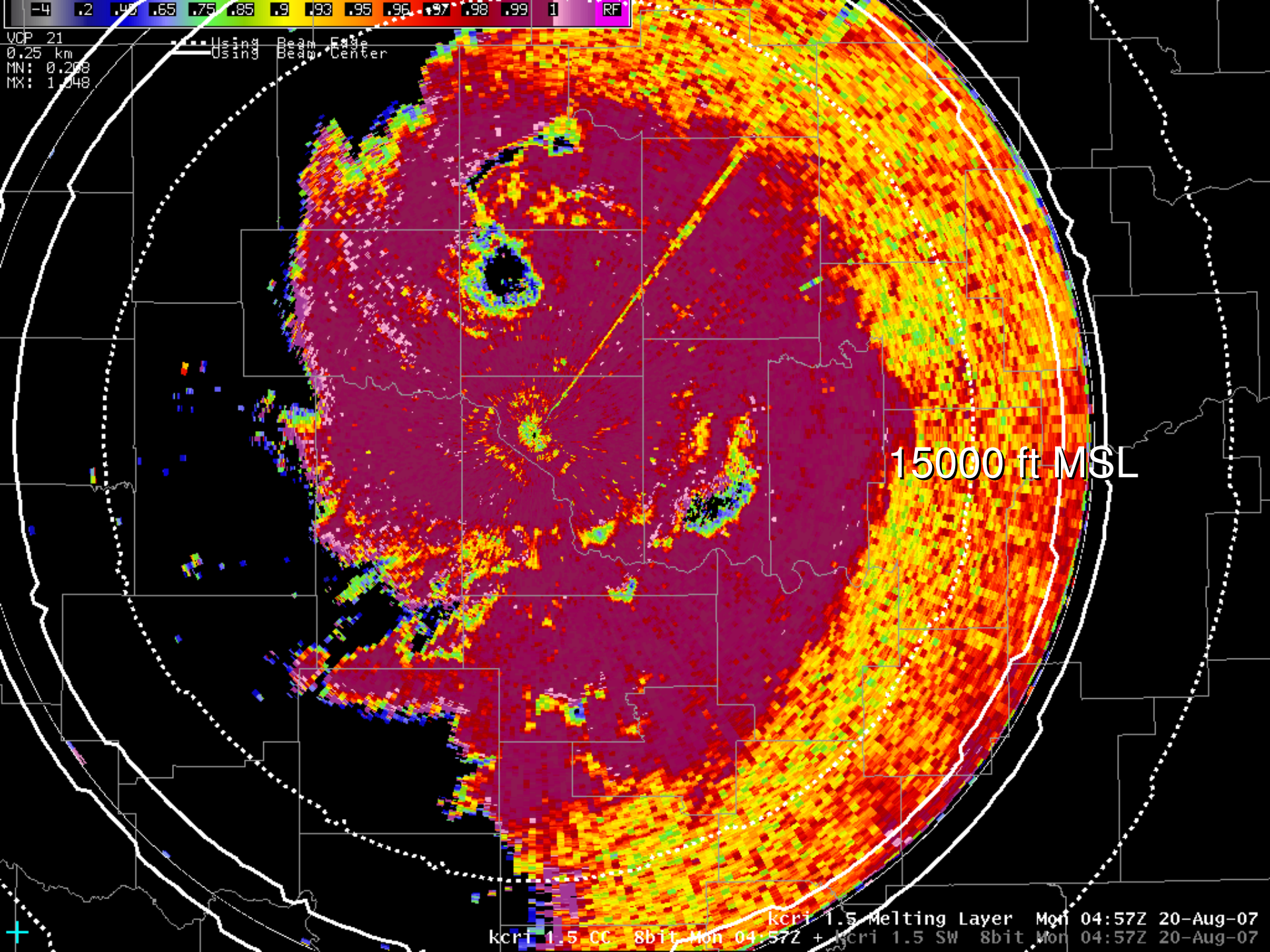
3.5 kcri Correlation Coefficient 8bit Fri 23:09Z 12-Jan-07
3.5 kcri Melting Layer Fri 23:09Z 12-Jan-07
County Boundaries

+

-4 .2 .4 .6 .8 .9 .93 .95 .96 .97 .98 .99 1 RF

VCP 21
0.25 km
MN: 0.208
MX: 1.048

Using Beam, Edge
Using Beam, Center

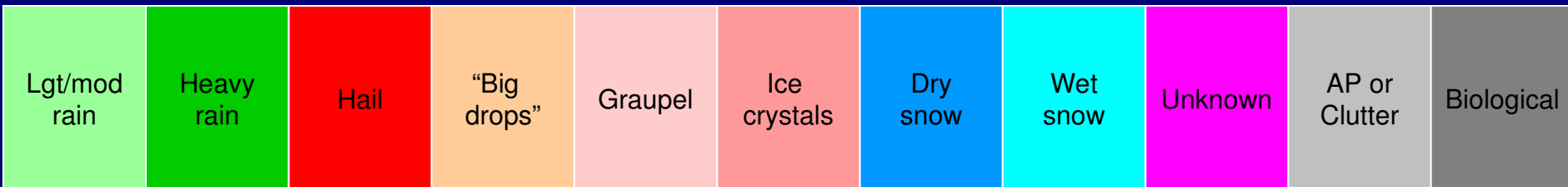


15000 ft MSL

kcri 1.5 Melting Layer Mon 04:57Z 20-Aug-07
kcri 1.5 CC 8bit Mon 04:57Z + kcri 1.5 SW 8bit Mon 04:57Z 20-Aug-07

4. Hydrometeor Classification

- Algorithm makes best guess of dominant radar echo type
 - Every radar elevation angle



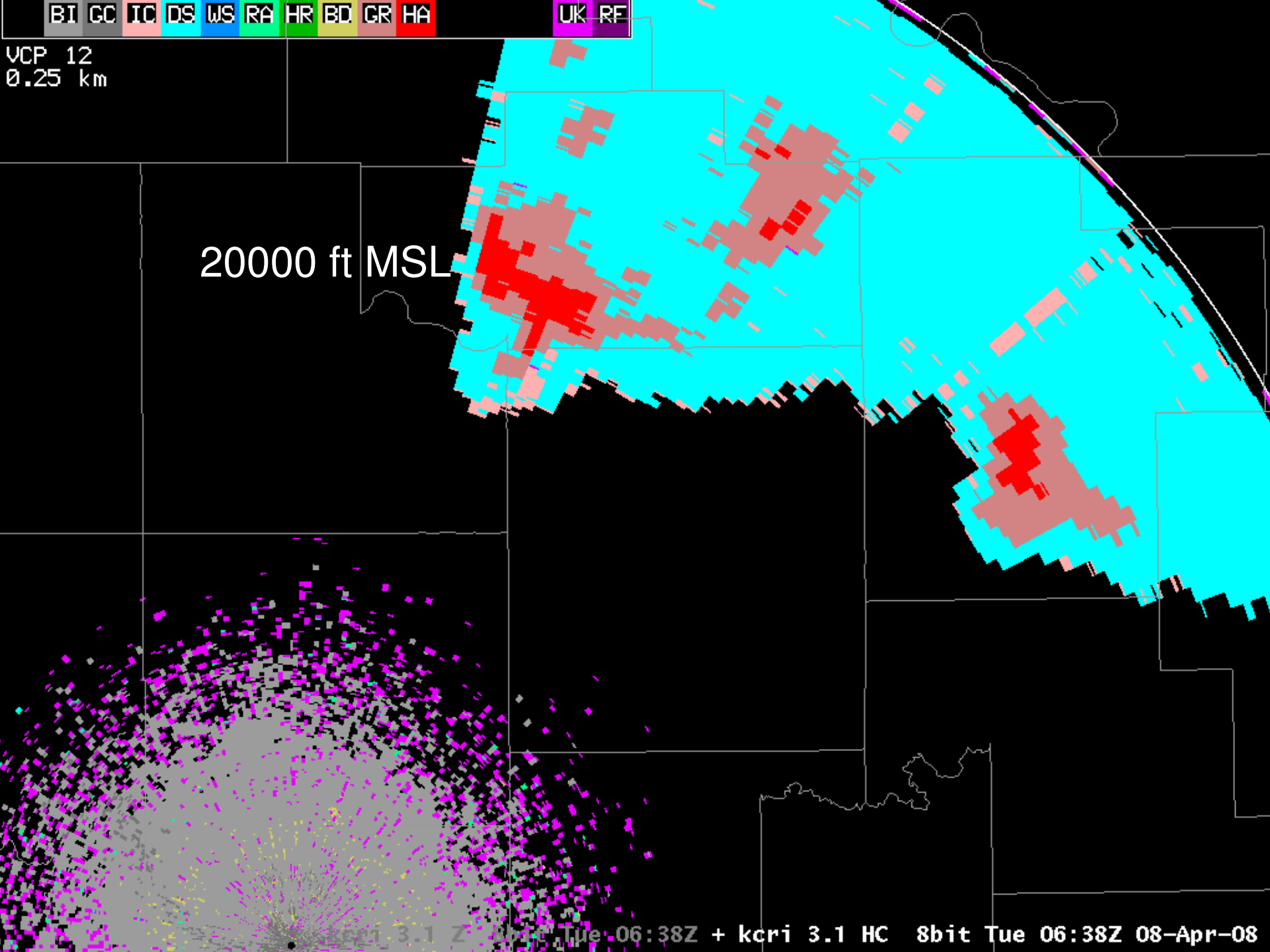
Current Classification Options

BI GC IC DS WS RA HR BD GR HA

UK RF

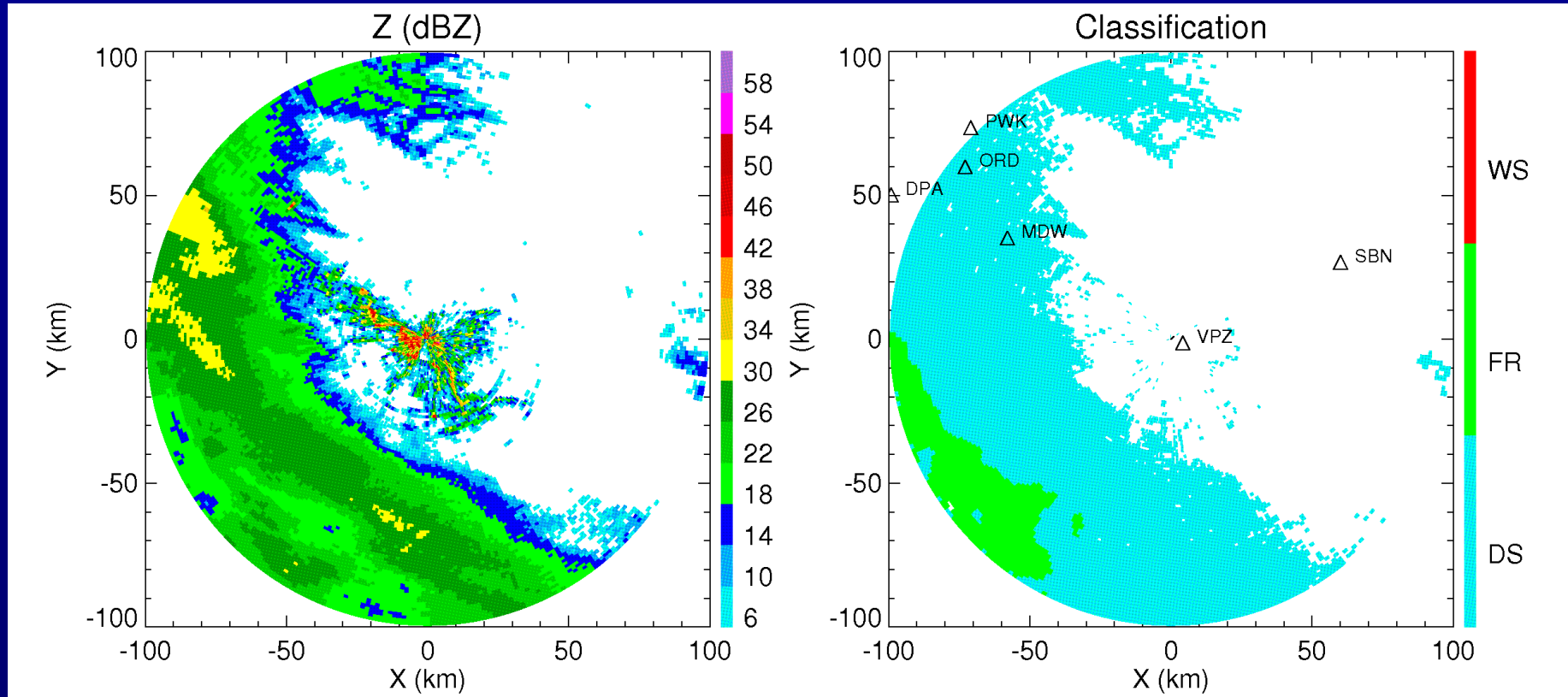
VCP 12
0.25 km

20000 ft MSL



Future Algorithm Improvements for Winter Weather

12/01/2007 1802 UTC

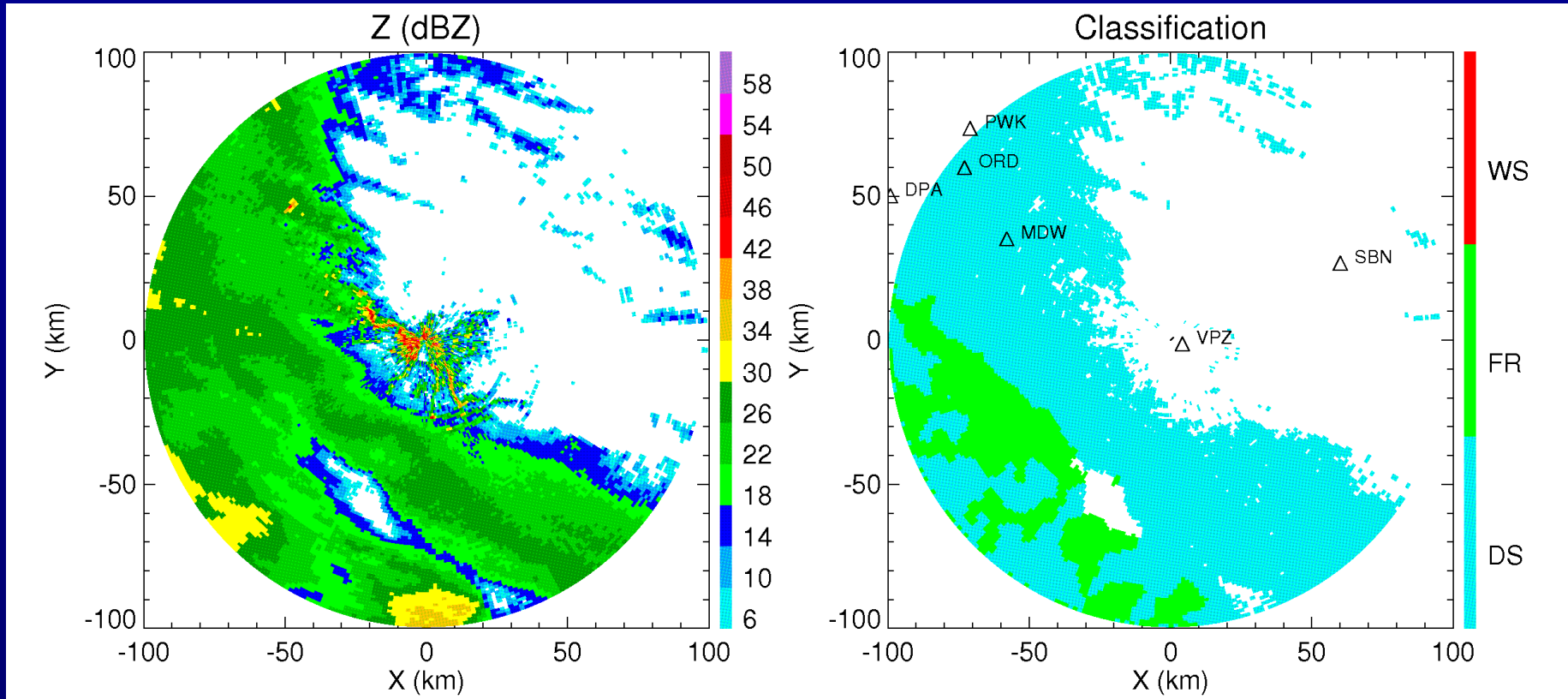


Precipitation classification at 0.5°

This and related images courtesy Ryzhkov, NSSL

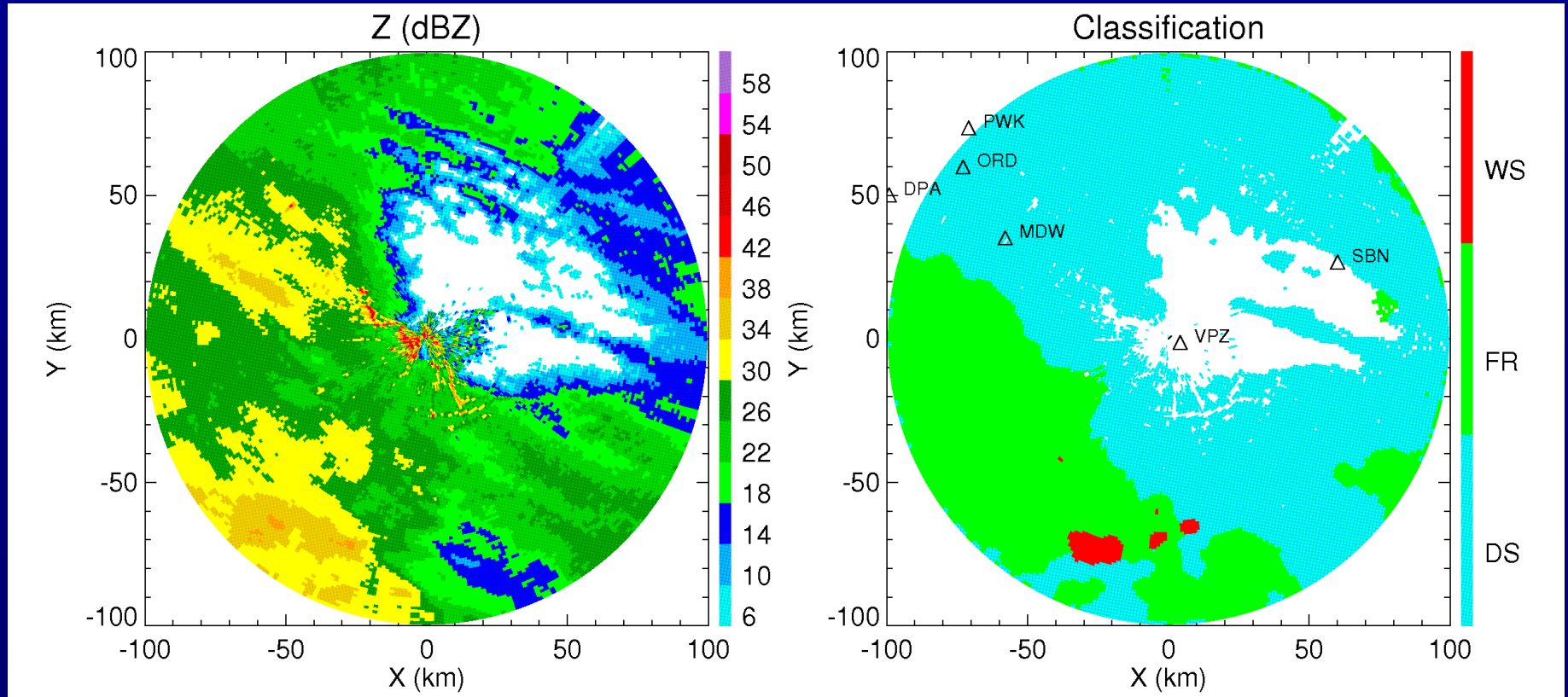
Future Algorithm Improvements for Winter Weather

12/01/2007 1834 UTC



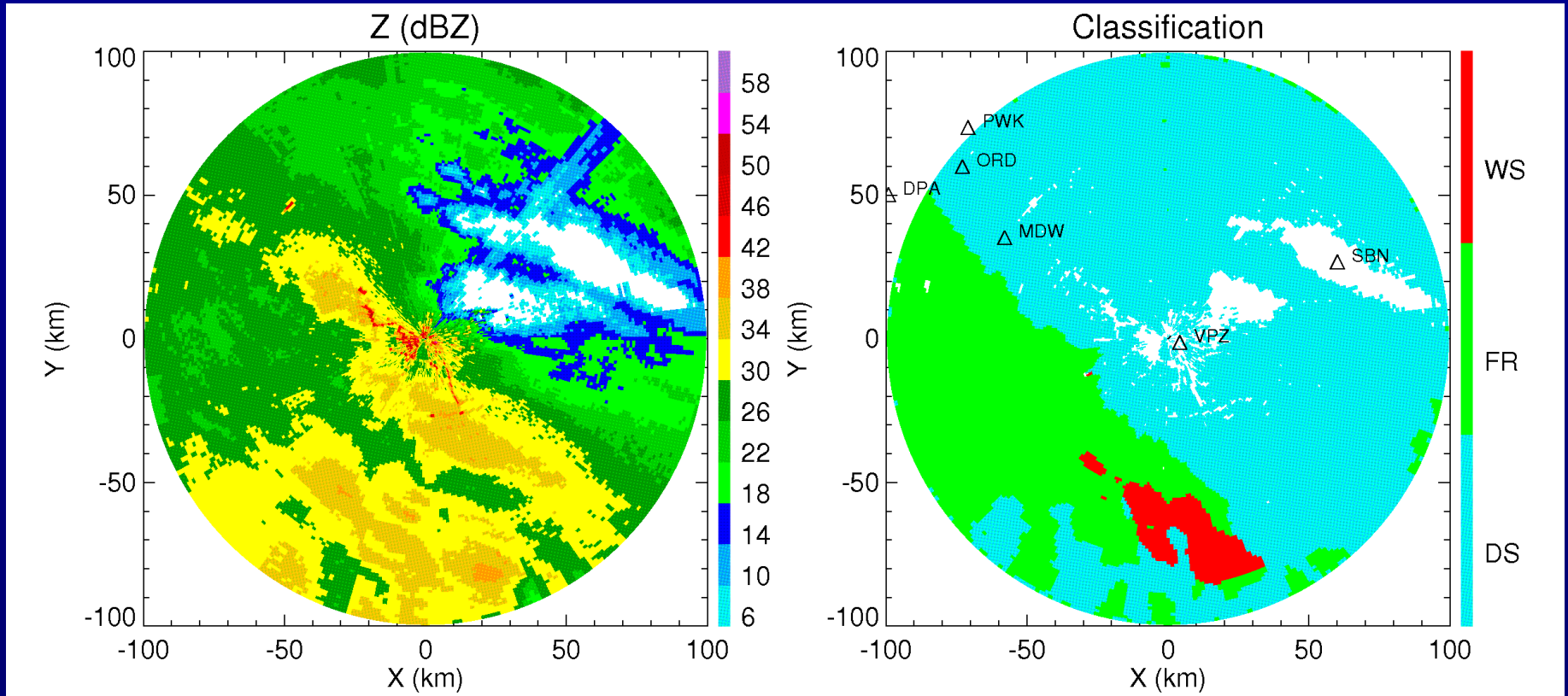
Future Algorithm Improvements for Winter Weather

12/01/2007 1905 UTC



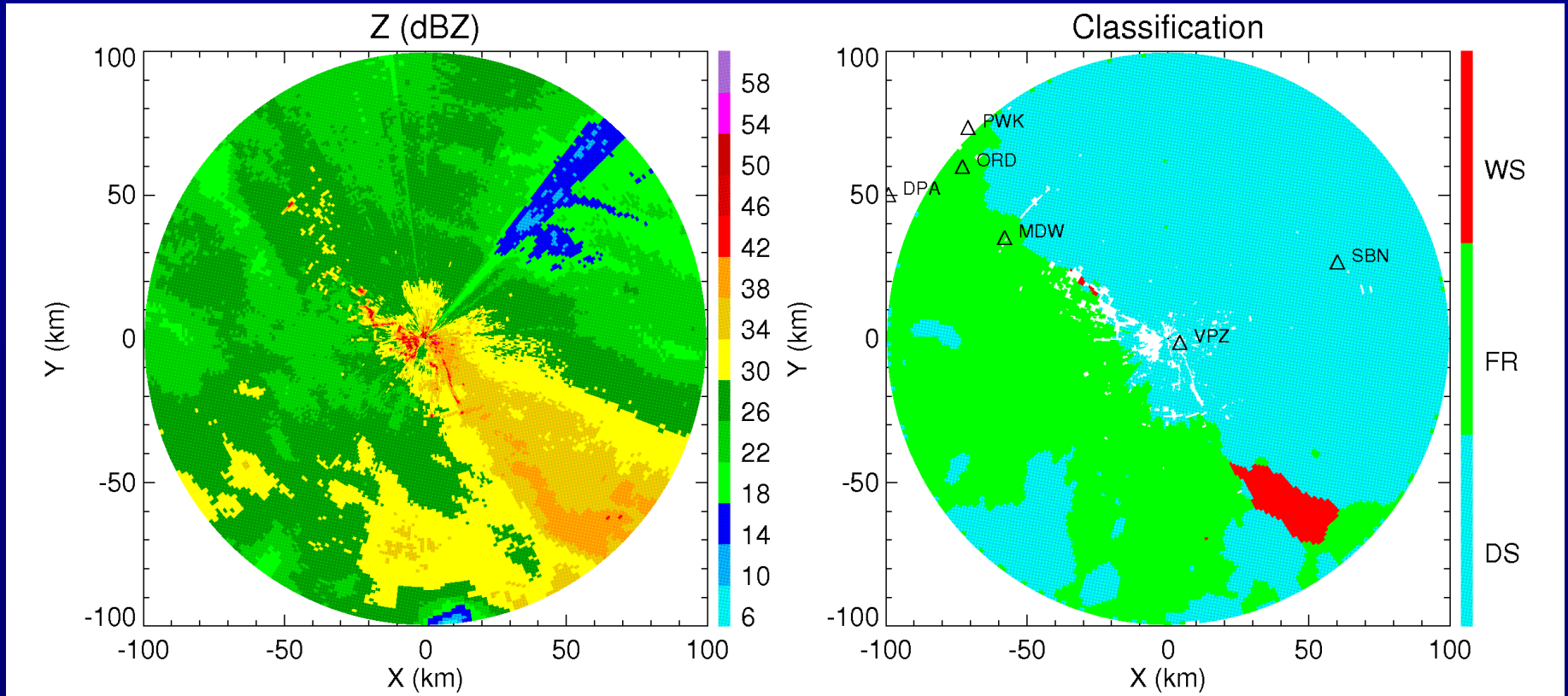
Future Algorithm Improvements for Winter Weather

12/01/2007 1930 UTC



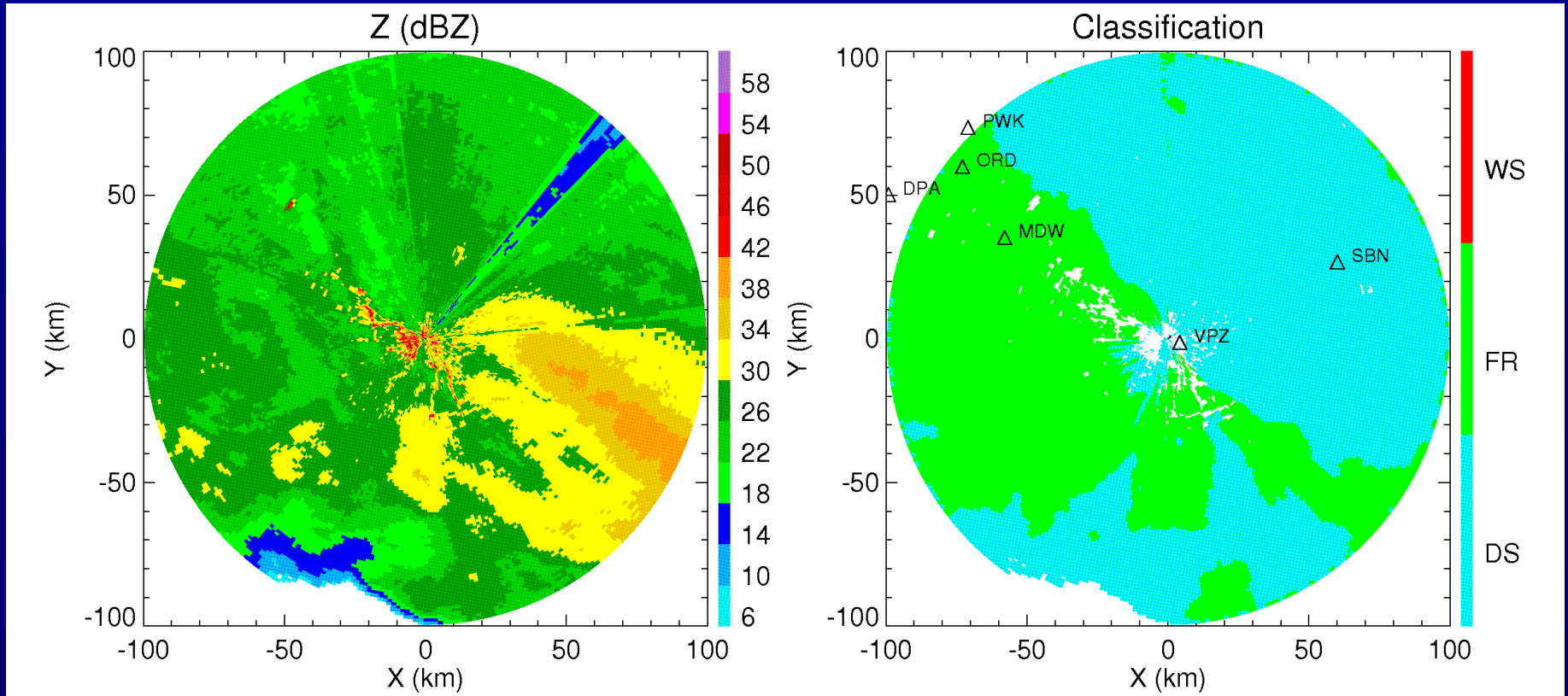
Future Algorithm Improvements for Winter Weather

12/01/2007 2002 UTC



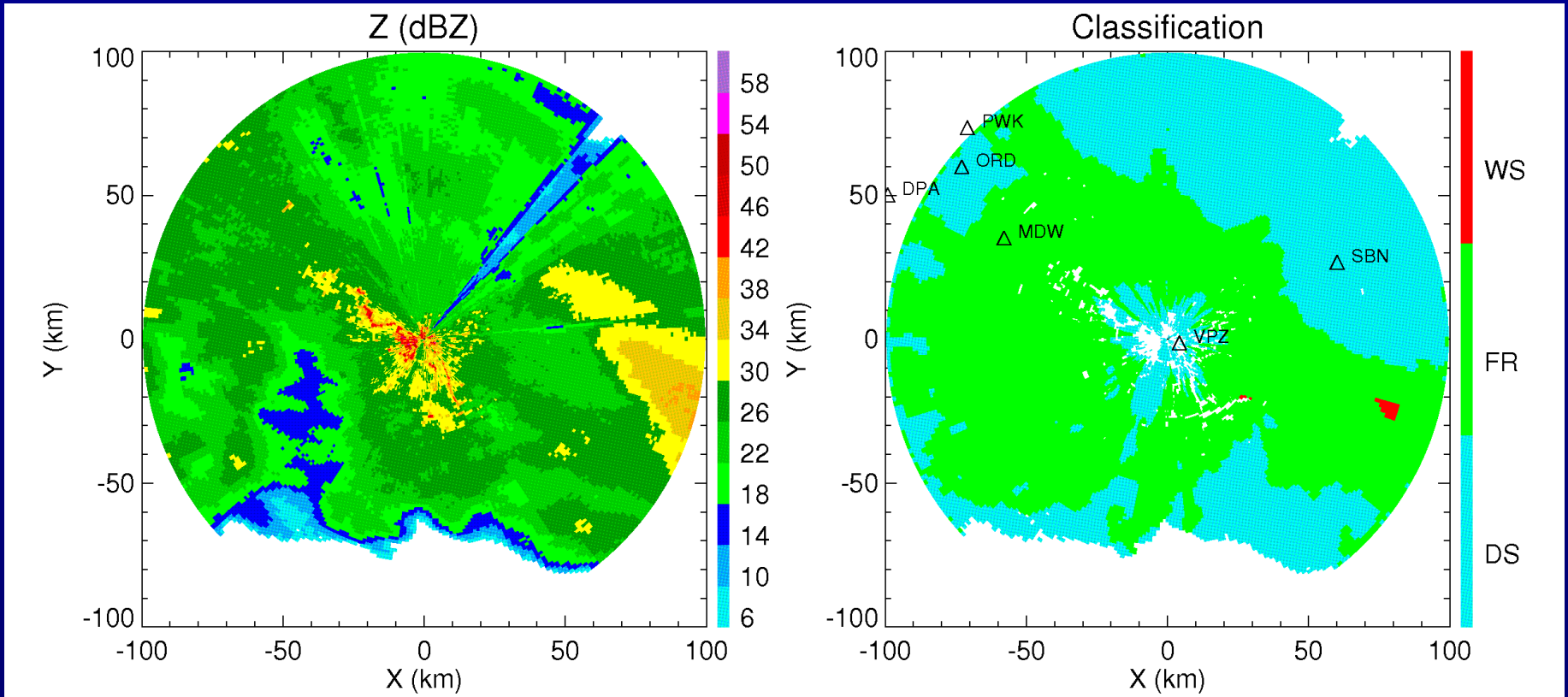
Future Algorithm Improvements for Winter Weather

12/01/2007 2027 UTC



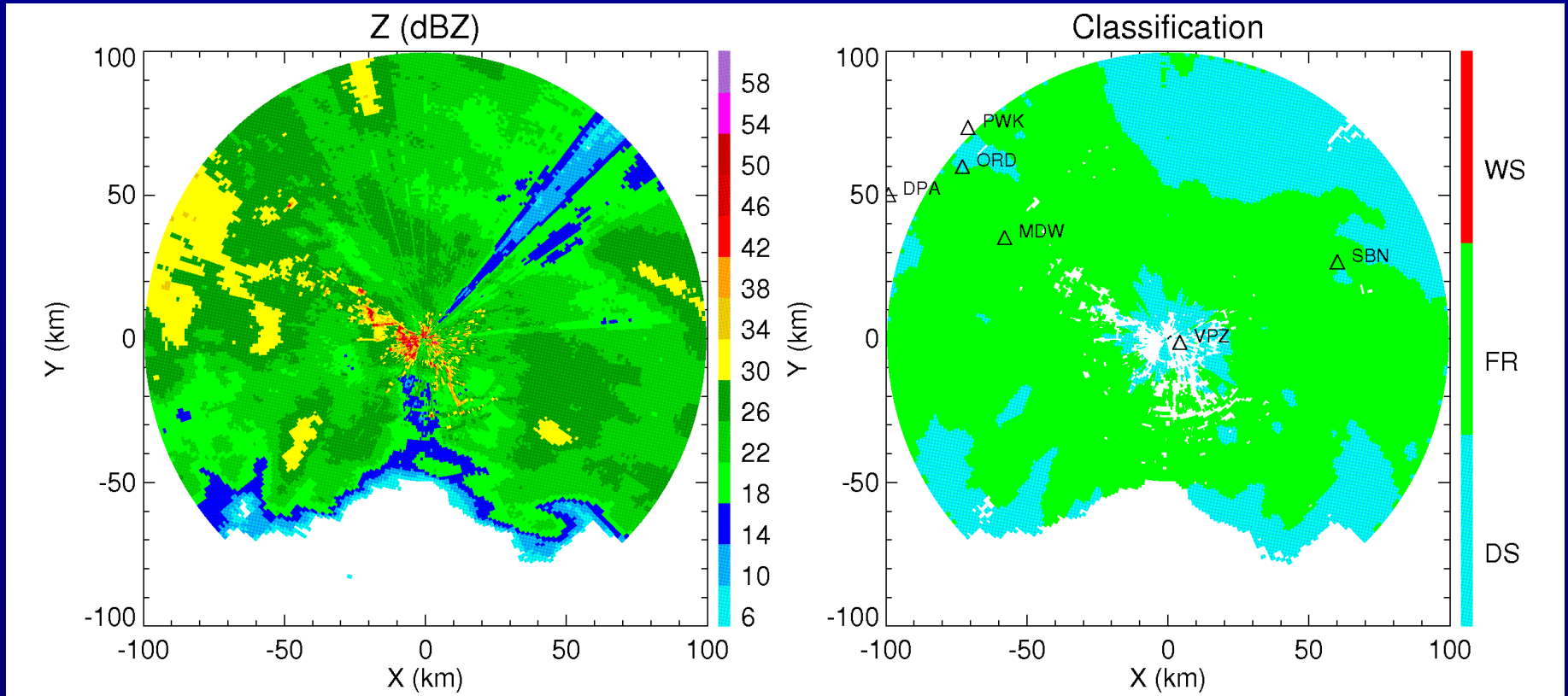
Future Algorithm Improvements for Winter Weather

12/01/2007 2105 UTC



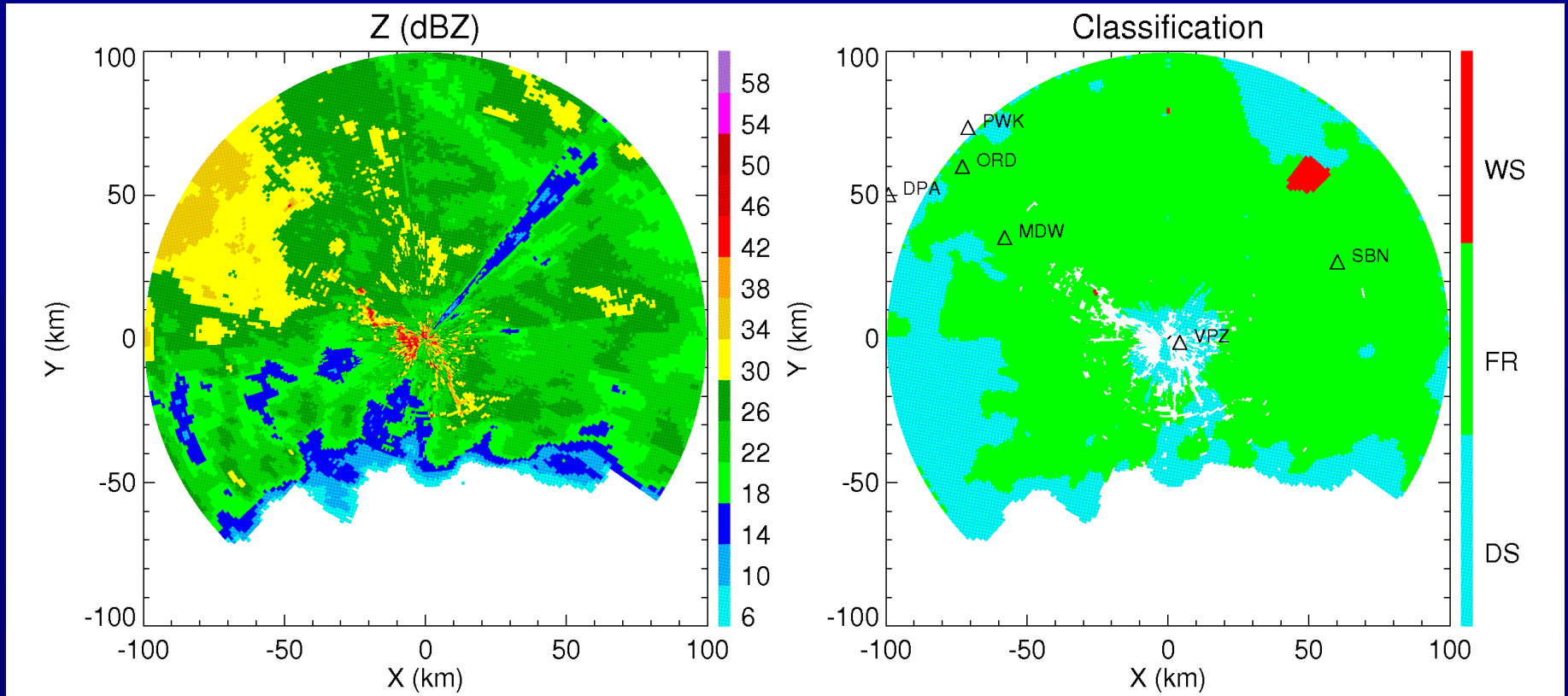
Future Algorithm Improvements for Winter Weather

12/01/2007 2131 UTC



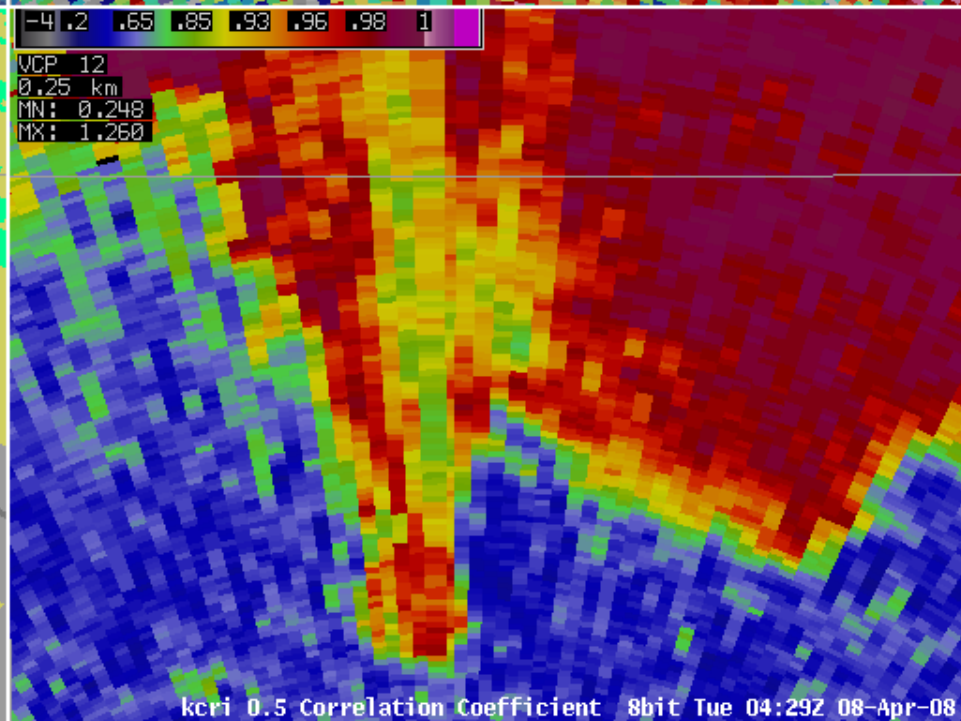
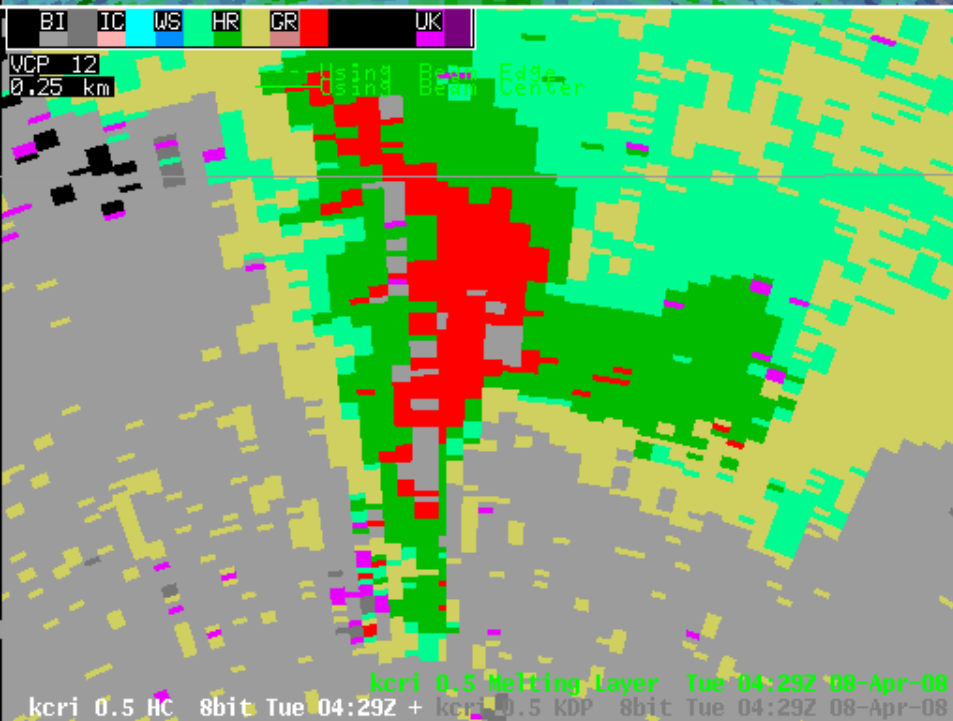
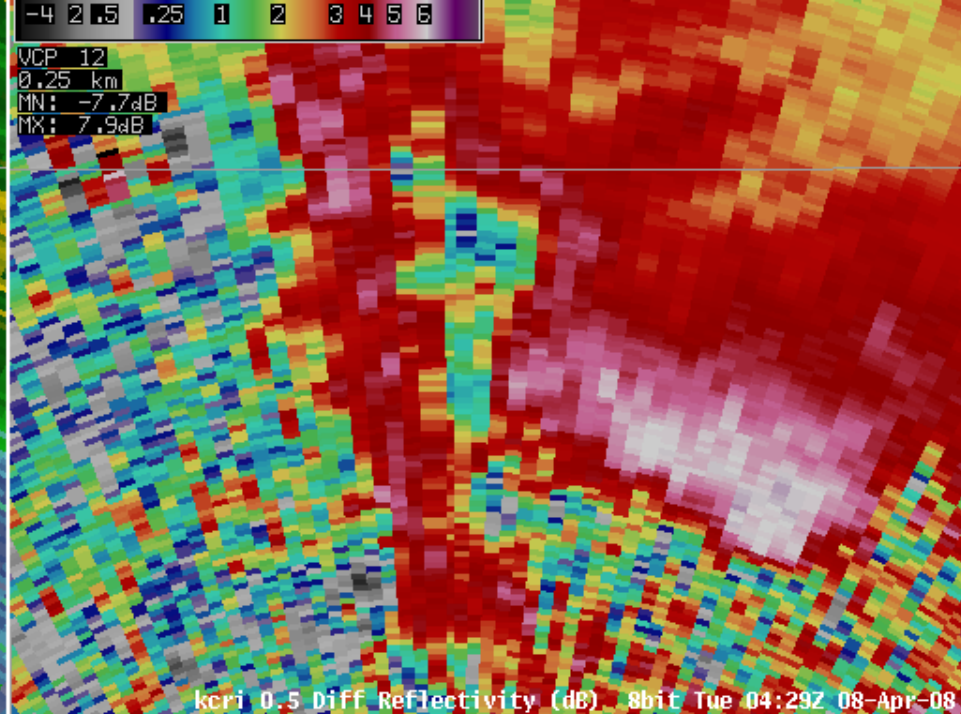
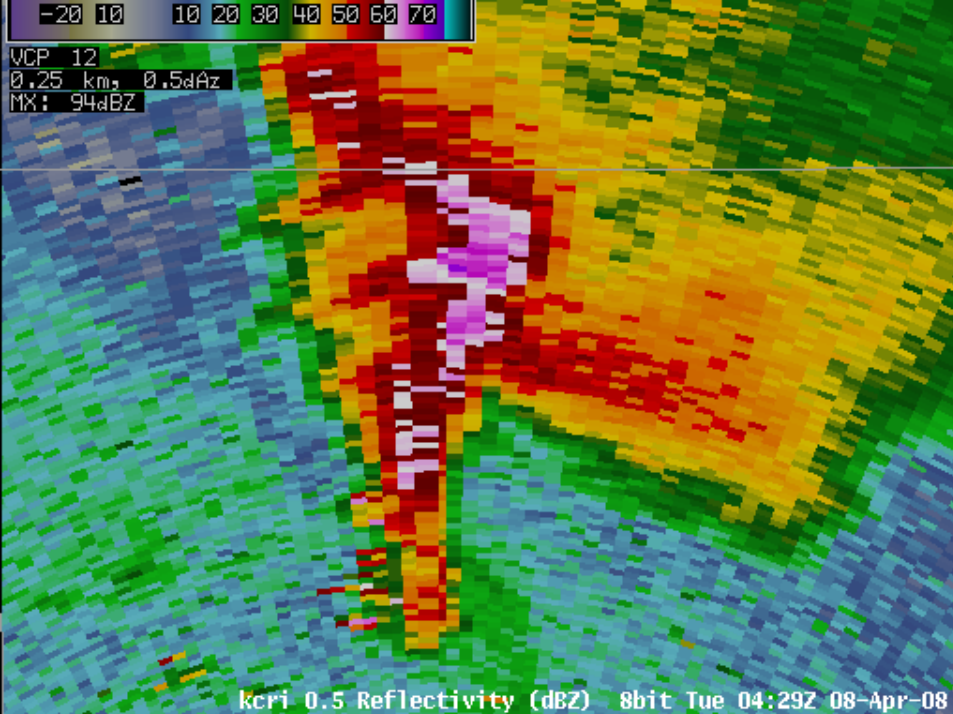
Future Algorithm Improvements for Winter Weather

12/01/2007 2202 UTC



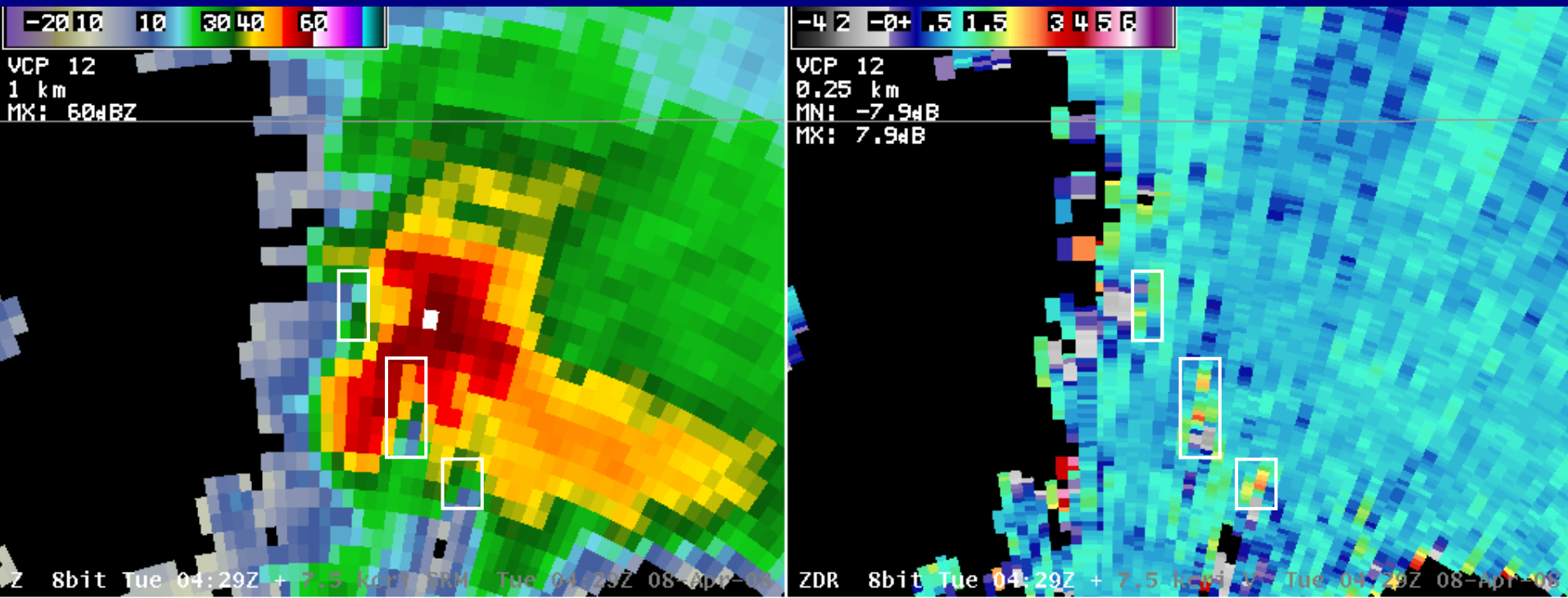
5. Severe Storm Signatures

- Hail Detection
- Updraft Detection
- Tornadic Debris Detection
- Research finding others

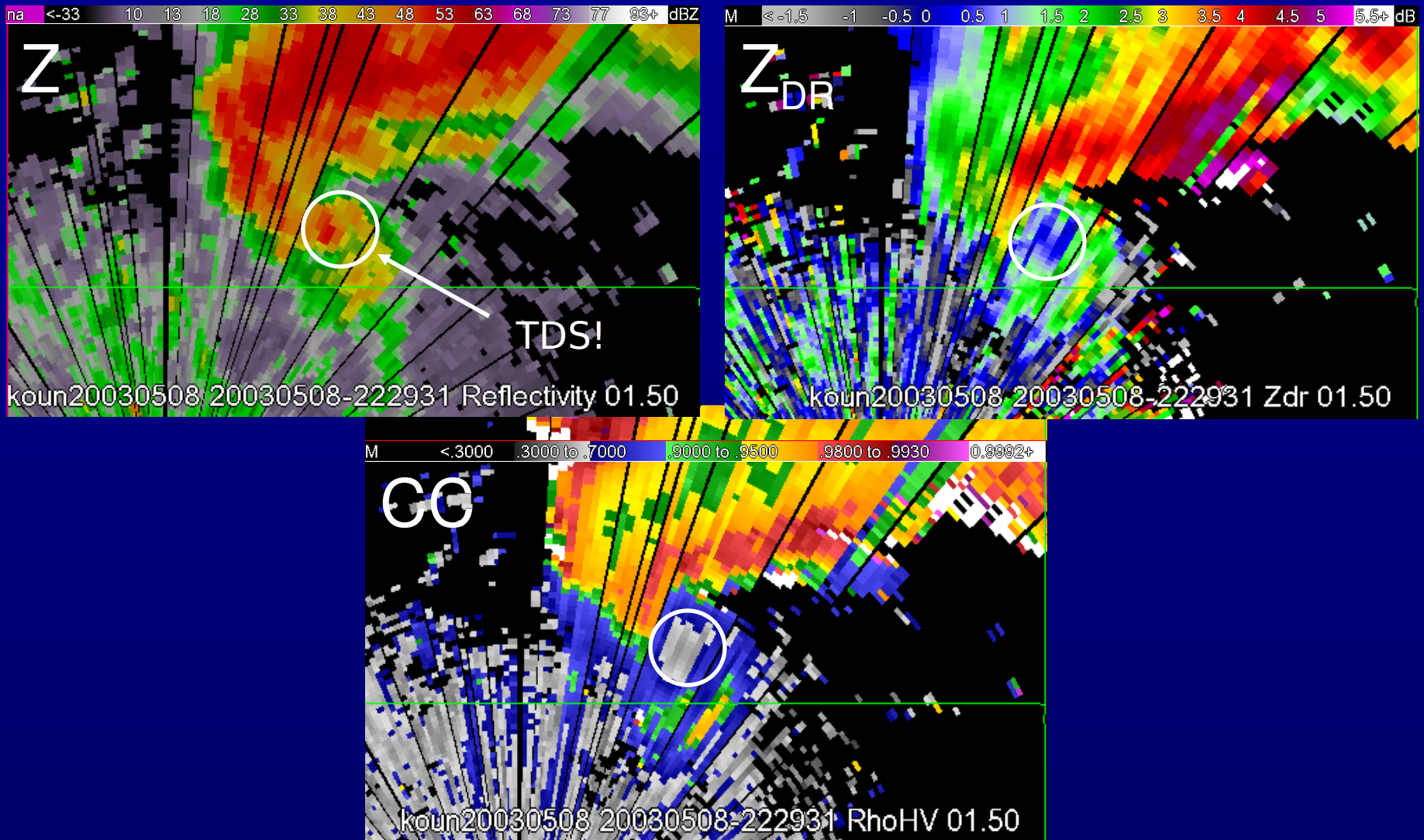


Updraft Detection

- “ZDR columns”: regions of liquid water found above the environmental 0°C height

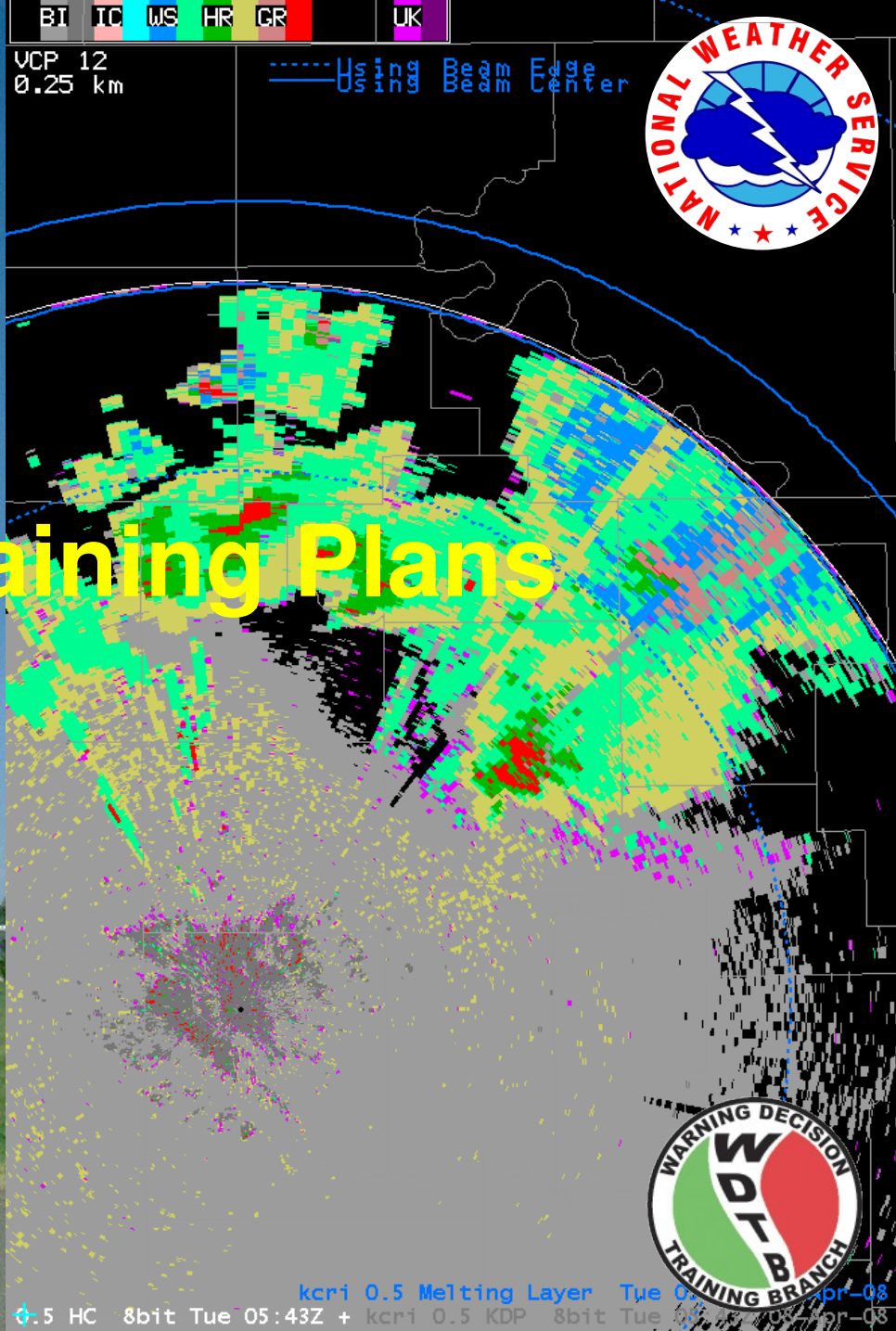


Tornadic Debris Signature (TDS)



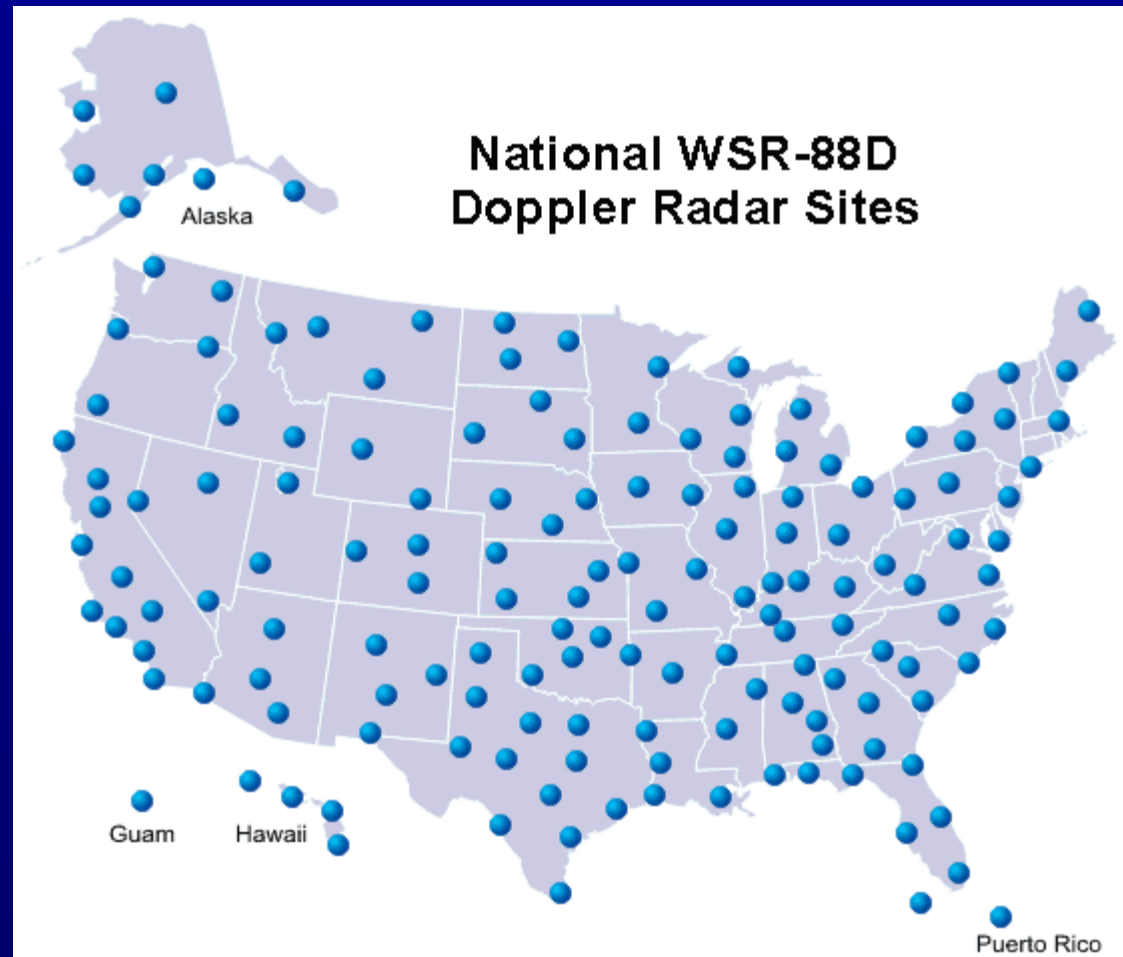


Dual-Pol Training Plans



When/What is the Impact?

- All WSR-88Ds upgraded 2010-2012
- 10-14 days radar downtime during upgrade



Target Two Critical Stakeholders

Course	WSR-88D Dual Pol Operations Course	Dual-Pol Education and Outreach
Audience	All NWS Forecasters <ul style="list-style-type: none">- Meteorologists- Hydrologists- CWSUs	<ul style="list-style-type: none">- First Responders- Broadcast Mets,- Emergency Managers- Other Public Stakeholders
Scope	<ul style="list-style-type: none">- 2000 Students- Two ~8 hour courses- Web-based & Simulations	<ul style="list-style-type: none">- 10,000 students- Two online modules- Web-based training

Dual-Pol Operations Training Delivery: Two Courses over Two Years

- Complexity of data, new visualization tools
- Importance of development of expertise
- Dedicated time for training

FY10	FY11
4-6 months prior to dedicated or back-up upgrade	9-12 months after 1 st upgrade
Background, Theory, and Benefits to Warning Decision Making	Advanced Applications
~8 hrs	~6-8 hrs

FY10: Background and Applications to Warning Decision Making

- Training on background, theory, AWIPS, RPG: Learning paths in the LMS
 - Beneficial applications to warning decisions
 - Improved data quality
- Distance Learning

WES Exercises

The screenshot shows a web-based learning interface. On the left is a navigation menu with an 'Outline' tab selected, listing 17 topics. The main content area has a title 'Why Would You Examine Z_{DR} ?' and two bullet points: 'Indicates the presence of larger liquid drops' and 'Hail shafts without a lot of liquid water'. Below the text is a horizontal row of six circles representing different drop sizes: 8.0 mm, 7.4 mm, 5.8 mm, 5.3 mm, 3.5 mm, and 2.7 mm. A diagram shows a radar beam hitting a hail shaft, with a callout box titled 'Hail' containing the text: '-Typically Spherical', '-Tumbles as it falls', and '-Major axis aligned vertical'. The bottom of the slide includes the date '11 September 2007', the title 'The Dual-pol WSR-88D Field Test', and the location 'NWS WFO Wichita, KS'. The interface also features a search bar, a 'Notes' button, and a video player control bar at the bottom.



End Goal: Build Expertise!

FY11: Advanced Applications

- ~ 1/3 sites upgraded between 1st and 2nd release
 - New cases and techniques developed
 - Products familiarity
- Some web modules, majority will be WES exercises and full simulations

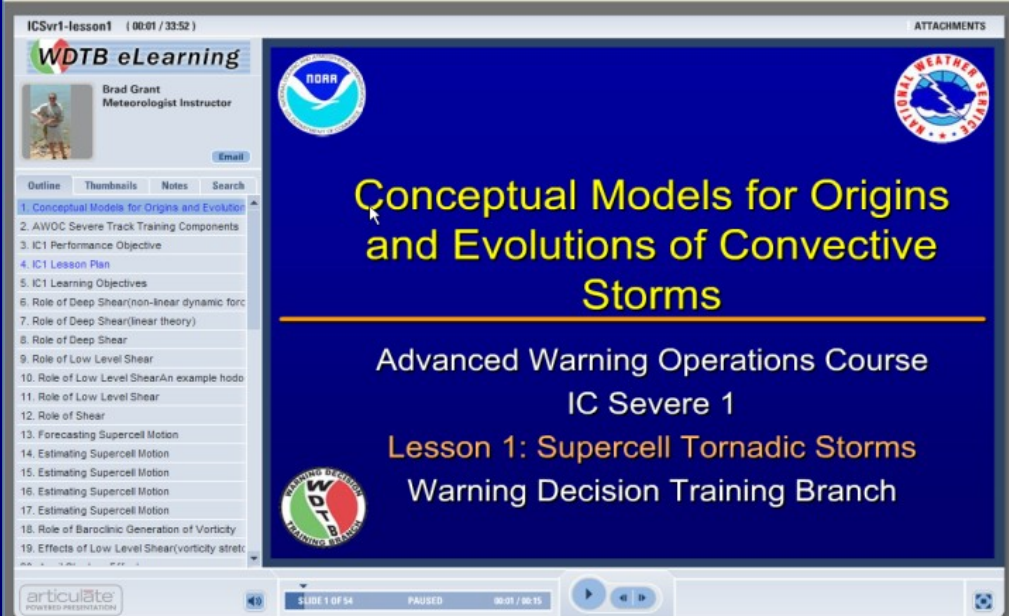
WES Exercises and Simulations



End Goal:
Fully Integrated into Operations

Dual-Pol Outreach Course: FY10 and Beyond

- Capabilities and limitations of the new radar products everyone has access to
- You tell us!



The screenshot shows a presentation slide from the WDTB eLearning system. The slide title is "Conceptual Models for Origins and Evolutions of Convective Storms". The slide content includes "Advanced Warning Operations Course", "IC Severe 1", "Lesson 1: Supercell Tornadoic Storms", and "Warning Decision Training Branch". The slide features logos for NOAA and the National Weather Service. The presentation interface includes a table of contents on the left, a navigation bar at the bottom, and a status bar at the very bottom.

ICSvr1-lesson1 (00:01 / 33:52) ATTACHMENTS

WDTB eLearning

Brad Grant
Meteorologist Instructor

Outline Thumbnails Notes Search

1. Conceptual Models for Origins and Evolutions
2. AWOC Severe Track Training Components
3. IC1 Performance Objective
4. IC1 Lesson Plan
5. IC1 Learning Objectives
6. Role of Deep Shear(non-linear dynamic forc
7. Role of Deep Shear(linear theory)
8. Role of Deep Shear
9. Role of Low Level Shear
10. Role of Low Level ShearAn example hodo
11. Role of Low Level Shear
12. Role of Shear
13. Forecasting Supercell Motion
14. Estimating Supercell Motion
15. Estimating Supercell Motion
16. Estimating Supercell Motion
17. Estimating Supercell Motion
18. Role of Baroclinic Generation of Vorticity
19. Effects of Low Level Shear(vorticity stret

Conceptual Models for Origins and Evolutions of Convective Storms

Advanced Warning Operations Course
IC Severe 1
Lesson 1: Supercell Tornadoic Storms
Warning Decision Training Branch

articulate
POWERED PRESENTATION

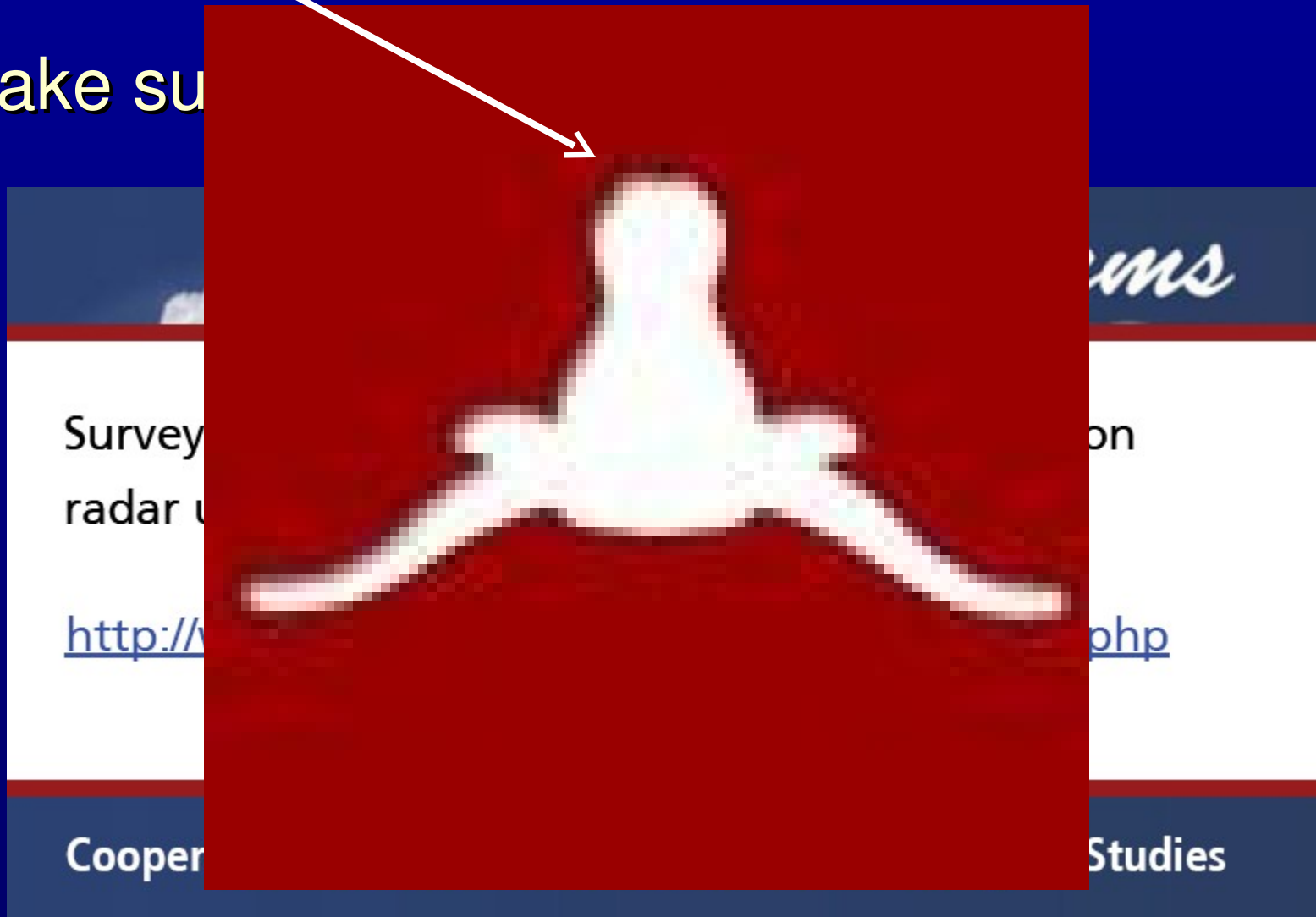
SLIDE 1 OF 34 PAUSED 00:01 / 00:35

Current Dual-Pol Schedule

2009 OND	2010 JFM	2010 AMJ	2010 JAS	2010 OND	2011 1 JFM	2011 AMJ	2011 JAS	2011 OND	2012 JFM	2012 AMJ	2012 JAS	2012 OND	2013 JFM	2013 AMJ	2013 JAS
		Beta Test 1 st WSR-88Ds upgraded													
				Deployment 10-14 days downtime each radar											
	WDTB's Dual-Pol Outreach Course Targeted audience: EMs, first responders, media, general public														
	WDTB's Dual-Pol Operations Course Part 1 Topics: Background and Theory End Goal: Develop Expertise														
					WDTB's Dual-Pol Operations Course Part 2 Topics: Advanced Applications and Simulations End Goal: Fully Integrated into Operations										

Steer our Dual-pol Training!

- Take su





Questions?
www.wdtb.noaa.gov

Email me at Paul.T.Schlatter@noaa.gov