

# Jobsheet

## The Multiple-Radar / Multiple-Sensor (MRMS) Products

### Objective:

- To understand and use MRMS products to help diagnosis severe storms for warning decision making.

### Product Overview:

Multiple-Radar / Multiple-Sensor (MRMS) products are created by combining data from multiple radars into rapidly-updating 3D cubes of reflectivity and azimuthal shear. Next, some of the data is also combined with near-storm environment (NSE) data from numerical model analyses, and other data sources, to produce unique products that overcome many of the limitations of single-radar applications. We hypothesize that the use of MRMS products for warning decision making will:

- Speed up diagnosis and aid in keeping track of most-significant storms
- Improve analysis of storms near cones-of-silence on high tilts versus 4-panel base-data analysis
- Improve polygon alignment and precision (lower False Alarm Area)
- Provide more lead time to onset of severe weather

Besides trying to prove or refute these hypotheses, we have additional objectives:

- Develop optimal MRMS procedures for hail, wind, tornado warning.
- Determine how to integrate MRMS products into the traditional warning decision-making (WDM) workflow.
- Determine optimal “significant” ranges of values for warning decisions.
- Suggest new MRMS products and menus/displays for AWIPS2.

### Job Sheet Overview:

This job sheet contains a sequential set of procedures that you will follow to view and observe MRMS output in the AWIPS environment. In addition, you will carry out 3 exercises and answer a number of questions along the way. Answers to these questions will be provided in the answer key document.

### Instructions:

NOTE: If AWIPS D2D is not currently open, double-click on the Launch AWIPS D2D icon to start up an AWIPS D2D session. Then go through the following three exercises and answer the questions.

## Exercise 1:

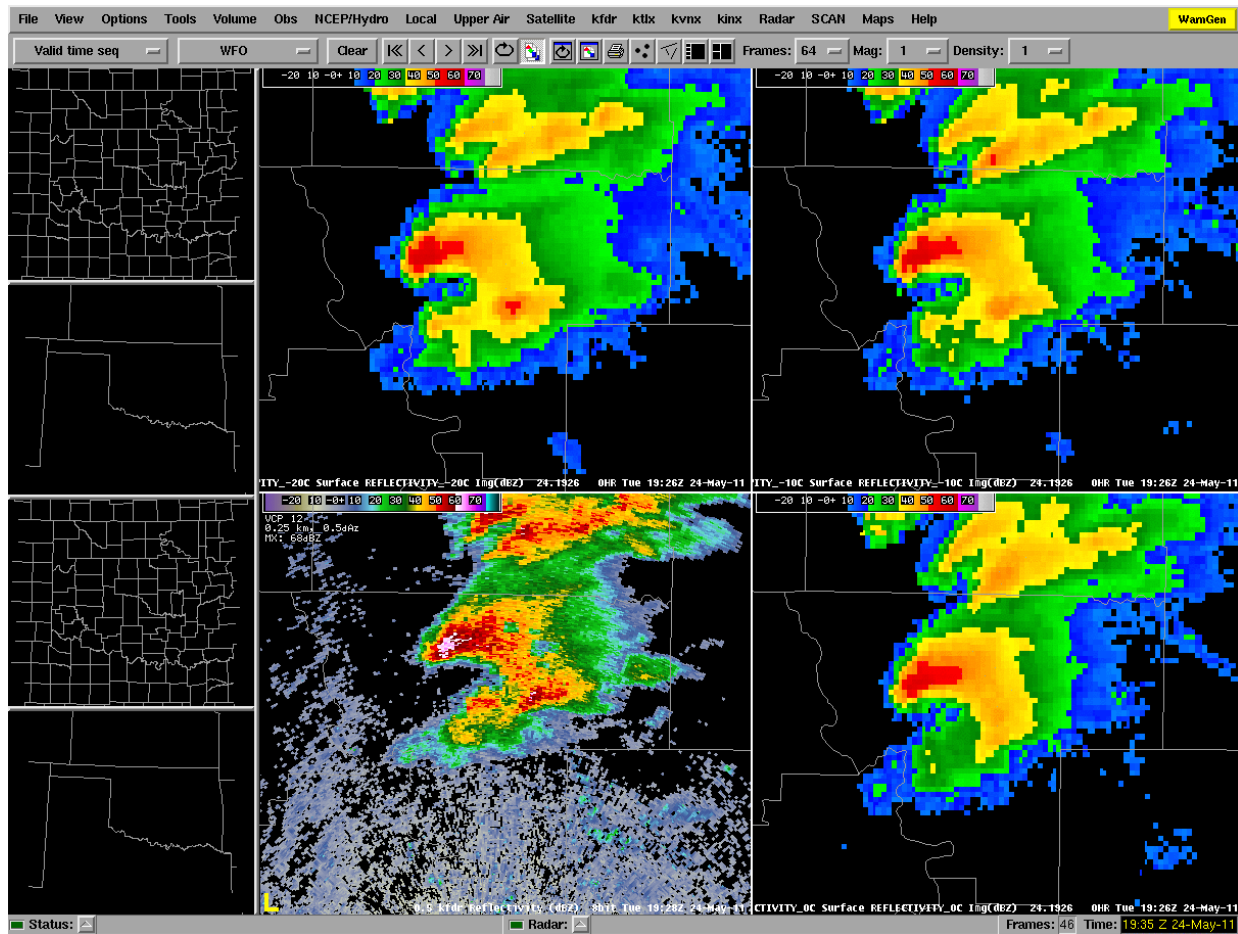


Figure 1: 4-panel display of various MRMS storm severity diagnosis parameters at 1926 UTC 24 May 2011.

Left click on the D2D clock in the lower-right corner of D2D. Inside the “Set Time” window, set the D2D clock to **2011 May 24 19:35:00 UTC** and check the “Freeze Time at This Position” box. Load into a four panel image the following products (the first three from the Volume Browser) and set the frame count to 12:

- lower right: reflectivity\_  
\_0C
- upper right: reflectivity\_  
-10C
- upper left: reflectivity\_  
-20C
- lower left: KTLX 0.5° reflectivity

Go to 1926 UTC and sample the reflectivity for the storm centered at -10°C at latitude = 34.88° and longitude = -98.95°. Place the cursor on the highest reflectivity at -20°C.

**1. Document the corresponding reflectivity on all panels:**

- |                       |       |     |
|-----------------------|-------|-----|
| a) KTLX 0.5° tilt     | _____ | dBZ |
| b) reflectivity _0C   | _____ | dBZ |
| c) reflectivity _-10C | _____ | dBZ |
| d) reflectivity _-20C | _____ | dBZ |

**2. What is the time trend of the reflectivity core intensity at 0°C to -20°C? (upward, neutral, downward)**

**3. Going back in time, from the isothermal reflectivity products above, at what temperature level aloft does the 50 dBZ echo first appear?**  
\_\_\_\_\_ °C

**4. What stage in development is this storm at 1926z? \_\_\_\_\_**

## **Exercise 2:**

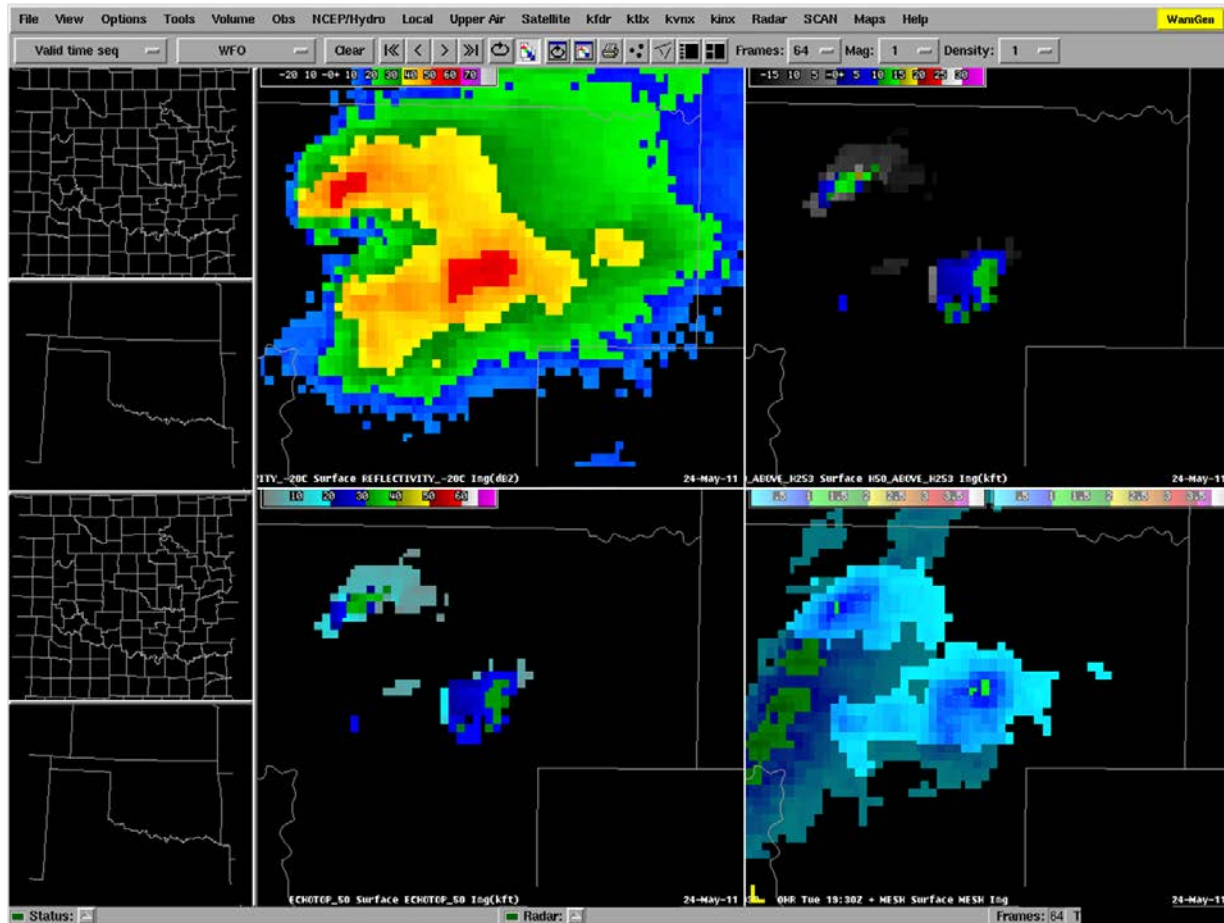


Figure 2: 4-panel display of various hail diagnosis parameters.

Set the D2D clock to **2011 May 24 21:30:00 UTC** and check the “Freeze Time at This Position” box. Load in a four panel display the following products and set the frame count to 64:

- upper left: reflectivity\_-20C
- lower left: echotop\_50
- upper right: H50\_above\_H253 (50 dBZ echo top minus -20°C altitude)
- lower right: Image combine MESH and MESH\_max\_120min

In the lower right, dim the MESH\_max\_120min to create a “meteor trails” effect.

Step back to 1926 UTC and track the storm identified in Exercise 1. Next step forward in time until you believe the storm is producing severe size hail.

Document the following after placing your cursor on top of the maximum MESH value:

- |                      |       |        |
|----------------------|-------|--------|
| 1. Time of 1" hail   | _____ | UTC    |
| 2. MESH maximum      | _____ | inches |
| 3. Echotop_50        | _____ | kft    |
| 4. Reflectivity_-20C | _____ | dBZ    |
| 5. H50_Above_ H253   | _____ | kft    |

Step forward in time until the MESH maximum reaches 2".

Document the following after you place your cursor over the point of maximum MESH.

- |                      |       |        |
|----------------------|-------|--------|
| 6. Time of 2" hail   | _____ | UTC    |
| 7. MESH maximum      | _____ | inches |
| 8. Echotop_50        | _____ | kft    |
| 9. Reflectivity_-20C | _____ | dBZ    |
| 10. H50_Above_ H253  | _____ | kft    |

At this time, zoom all the way out to view all of the storms in Oklahoma. Invoke the right mouse button menu while the cursor is on the four panel display. Select 'load to all panels'. Load county names. Be prepared to time how quickly you come up with the answers.

11. How many total significant storms are there? \_\_\_\_\_

12. Identify the significant storms by the county and directional location in that county (e.g., southern Dutchess)

|       |
|-------|
| _____ |
| _____ |
| _____ |
| _____ |
| _____ |
| _____ |

13. Using the four parameters in the display, how does this storm rank with all of the others?

## ***Exercise 3:***

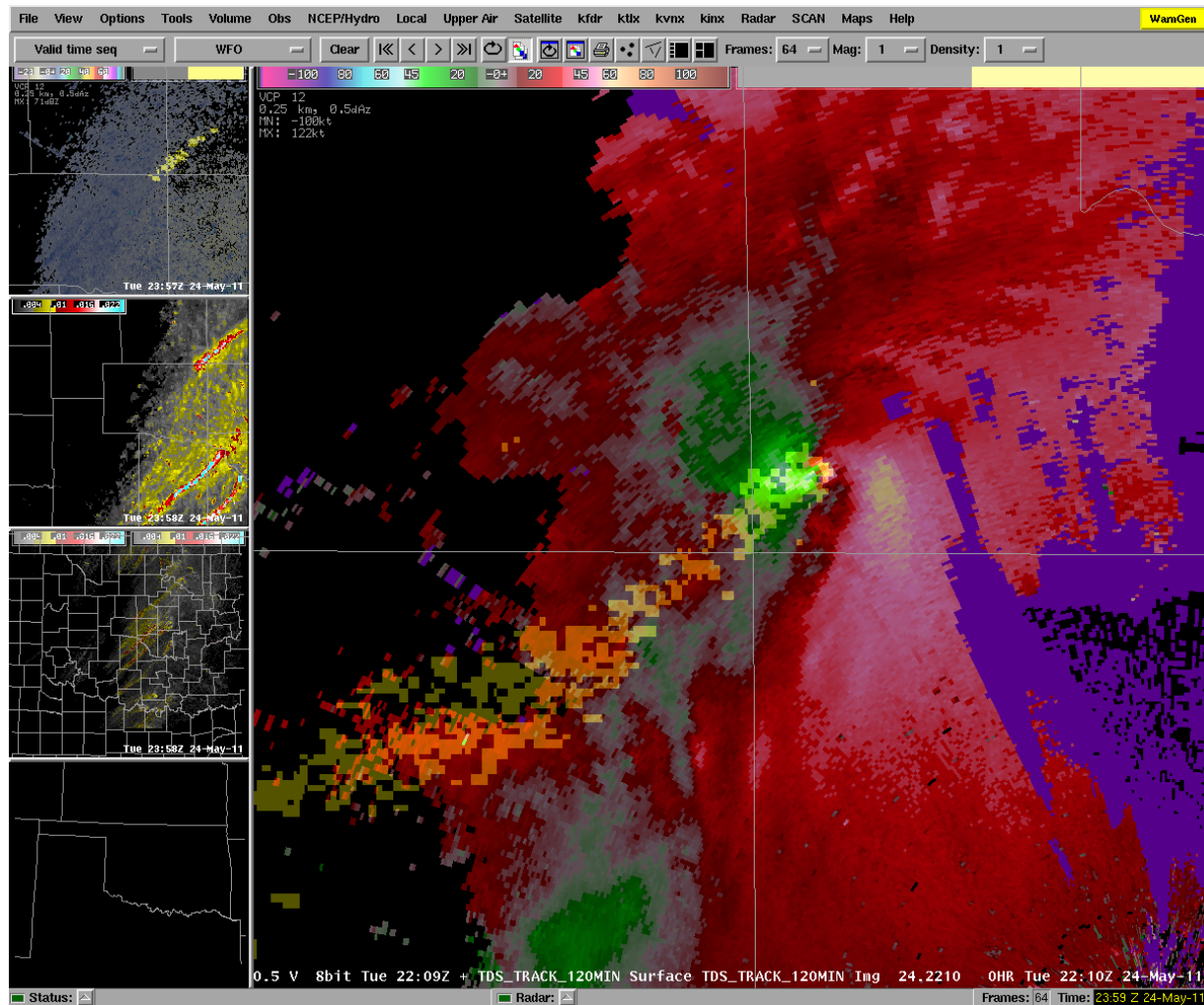


Figure 3: Tornadic Debris Signature (TDS) track for 120-minutes and KTLX 0.5° Velocity.

From the MRMS procedure bundle, load the following four procedures on four different panes and then set the frame count to 64 to each panel:

**LL-azshr-rottrack120min**  
**ML-azshr-rottrack120min**  
**Z-TDStrack**  
**V-TDStrack**

Answer the following questions:

1. At what time do you think was the strongest tornado signature on this storm using your traditional radar analysis methods?  
\_\_\_\_\_ UTC
2. What parameter did you use to determine this and what values did you record? \_\_\_\_\_
3. Using the low-level and mid-level azimuthal shear and other AWIPS tools, from what direction is the storm moving at this time? \_\_\_\_\_°
4. Was this different from 1-2 hours previous, and explain the difference? (yes/no) \_\_\_\_\_
5. What is the maximum LL and ML azimuthal shear at this time?  
LL shear \_\_\_\_\_ s<sup>-1</sup> ML shear \_\_\_\_\_ s<sup>-1</sup>
6. The dual-pol Tornado Debris Signature algorithm is presented as a yellow track. This is a binary product, and parallels the rotation track. No question, but be prepared to discuss its usefulness to WDM when you are working in the HWT.

**What to Expect in the HWT:**

There will be additional products shown during the experiment. Here is the complete list of MRMS products, all of which are available via the D2D Volume Browser. There is more explanation about these products in the MRMS Operations Plan.

EchoTop\_50  
EchoTop\_60  
H50\_Above\_H253  
H50\_Above\_H273  
H60\_Above\_H253  
H60\_Above\_H273  
MergedAzShear\_0-2kmAGL  
MergedAzShear\_3-6kmAGL  
MergedReflectivityQCComposite  
MESH  
MESH\_Max\_30min  
MESH\_Max\_60min  
MESH\_Max\_120min  
POSH  
Reflectivity\_0C  
Reflectivity\_-10C  
Reflectivity\_-20C  
ReflectivityAtLowestAltitude  
RotationTrack30min  
RotationTrack60min  
RotationTrack120min  
RotationTrackML30min  
RotationTrackML60min  
RotationTrackML120min  
TDS  
TDS\_Track\_30min  
TDS\_Track\_60min  
TDS\_Track\_120min  
VII  
VIL  
VIL\_Density

During your participation in the EWP we ask that you think about how the MRMS data can be integrated into your current data interrogation workflow for warning decision making. Do they speed up or hinder the process? If they hinder, would more experience time help? What products are the most useful and which are barely useful? And what new products would you recommend?

Regards,

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