Single-Radar Azimuthal Shear

-Training Module-

2019 HWT EWP – Satellite & Radar Experiment







Single-Radar AzShear - Background

- Azimuthal Shear Abbreviation -> <u>AzShear</u>
- Created by applying the local, linear, leastsquares derivative (LLSD) technique over dealiased velocity data (Mahalik et al., 2019)
 - Calculates the strength of gradients in radar data using a neighborhood of gates
- Single-radar AzShear is the first step that is performed in the creation of the popular MRMS Rotation Track product





AzShear - Product Generation Workflow



All Tilts | 0-2 & 3-6 km AGL Layered Product

Multi-Radar AzShear

0-2 & 3-6 km AGL Layered Gridded Product

Rotation Tracks

Low (0-2 km) & Mid-Level (3-6 km) Gridded Product

NOTE: 0-2 km product contains the entire 0.5° AzShear tilt regardless on whether or not it falls within that layer



Single-Radar AzShear – Key Notes

• MAIN STRENGTHS:

- 1. Allows automated quantification of velocity data for use by other algorithms (like the New Mesocyclone Detection Algorithm)
- 2. Can provide clarity in velocity data plagued by noise or large-scale dealiasing failures
- 3. For storms closer to the radar, can help users to identify key storm-scale features that can aid in warning decision making

• MAIN DRAWBACKS:

- Slow dampening of values as you get beyond ~75 km from the radar site (maximized LLSD calculation window width combined with radar beam broadening w/ range)
- Velocity errors passed through to AzShear can cause errors in the output

Single-Radar AzShear – Evaluation (1/2)

- Examine single-radar AzShear (all tilts), comparing it to:
 - 1. Dealiased velocity that it was derived from
 - 2. MRMS AzShear 0-2km & 3-6km AGL
- While evaluating, consider the following:
 - The impact single-radar AzShear would have on your warning operations.
 - The strengths and weaknesses of a single versus multi-radar product.
 - Specific weather scenarios that benefit one type of product over the other.
 - Any changes (visual or technical) that you would recommend to make either product more suitable for operations.

Single-Radar AzShear – Evaluation (2/2)

- Evalution is performed using the WG display viewer, part of the WDSS-II development framework (example of viewer on next slide)
- WG performs differently from AWIPS-II
 - For help, reference the information sheet in your binder you will be provided on Monday
- The evaluation will be in run in a displaced real-time scenario
- <u>NO</u> experimental warnings will be issued by the participant
 - This is purely an examination of single-radar AzShear and how it compares to the merged multi-radar products

Single-Radar AzShear – WDSS-II Visualization

File View Navigate Camera Options Products Map Help



Box A (blue): Window #1 Main Window AzShear Products (singleradar, multi-radar)

Box B (pink): Window #2 Reflectivity (all tilts)

Box C (yellow): Window #3 Dealiased Velocity (all tilts)

Box D (red): Control Pane *Controls to manually change product tilt and time with a mouse click*

More Details Included on Information Sheet in Your Binder