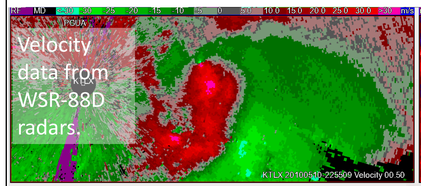
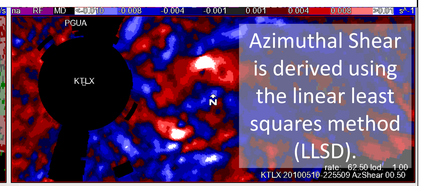
A Radar-Based Storm Rotation Climatology for the CONUS

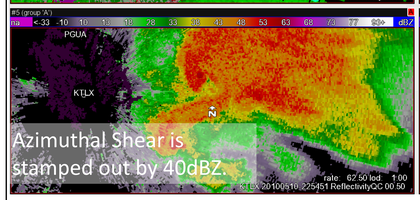
Skylar S. Williams, Kiel L. Ortega, Darrel M. Kingfield, and Travis M. Smith
OU/CIMMS & NOAA/OAR/NSSL

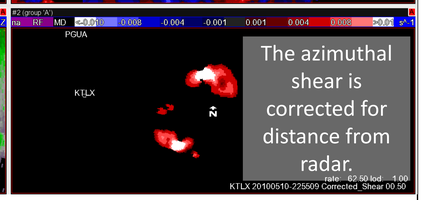
Data and Methodology

- Composite azimuthal shear fields from Multi-Year Reanalysis of Remotely Sensed Storms (MYRORSS) for the years: 2000-2004, 2006, 2008, 2010
- MYRORSS data combines WSR-88D radar data with RUC/RAP model analyses and produces Multi-Radar Multi-Sensor (MRMS) grids





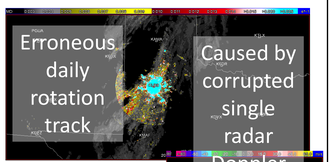




MYRORSS takes the individual radar corrected shear and creates two composite layers: Corrected Shear 0-3km AGL and Corrected Shear 3-6km AGL.

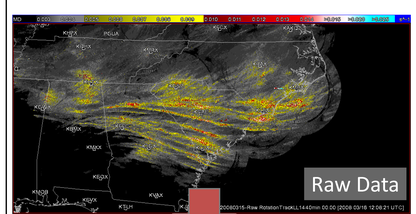
Quality Control Methods

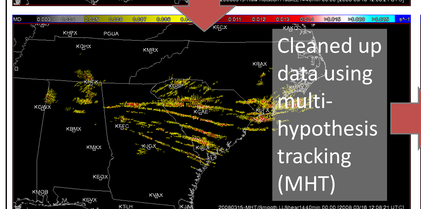
- Daily accumulations of azimuthal shear (rotation tracks) are investigated for poor quality
- For highly erroneous data, single radar Doppler velocity data is removed
- The day is then reprocessed

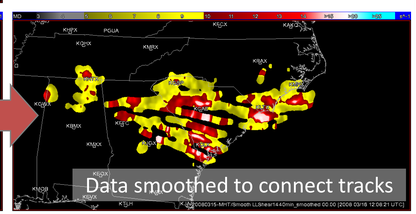


Causes for poor azimuthal shear data

- Corrupted data
- Aliased or improper dealiased velocities
- Radial noise (velocity "spikes")
- Radar clutter

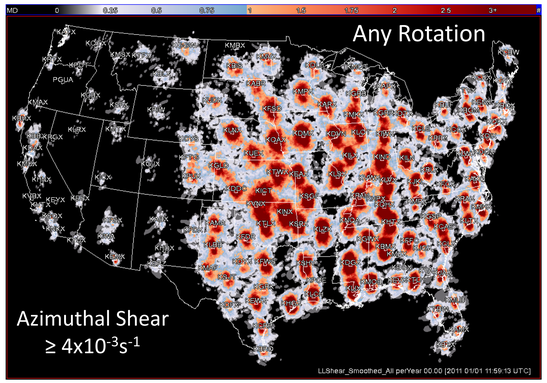


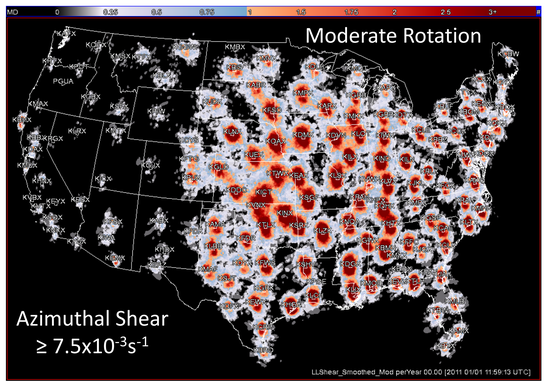


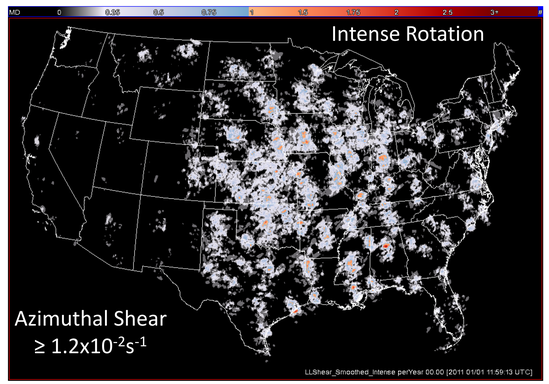


MHT settings: Min. value 0.004 s^{-1}, clusters at least 18 pixels large with a max. value at least 0.005 s^{-1}. Clusters must match within 43 pixels within 1 time step.

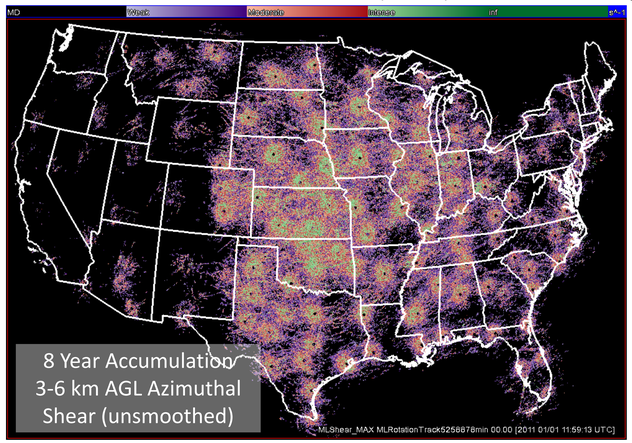
Smoothing settings: 2 iterations of a 90th and 25th percentile filters with increasing neighborhood size. A Gaussian filter of 51x51 km finishes the smoothing.

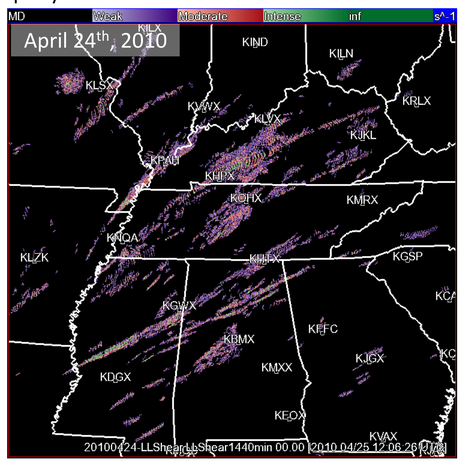


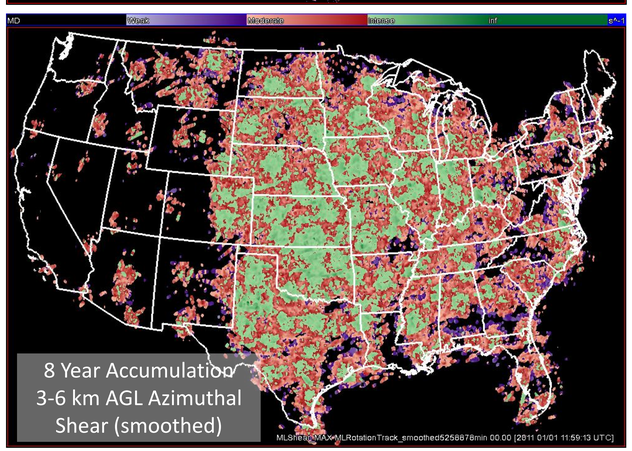




(Above): The number of days per year 0-3 km AGL azimuthal shear exceeds different thresholds





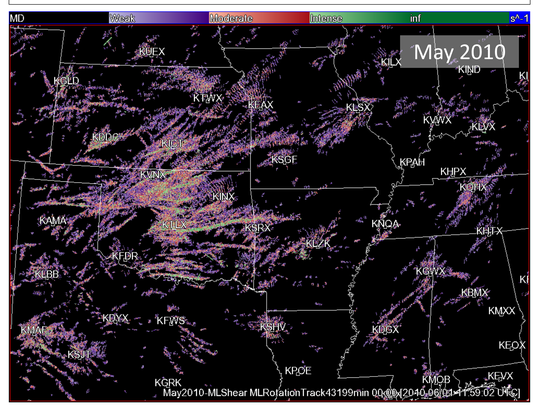


Future Work

- Finish processing and QCing the years: 2005, 2007, 2009, and 2011
- Find best filter method:
  - Modify MHT algorithm to focus on maxima along gust front signatures
  - Filter azimuthal shear by storm clusters to isolate supercell tracks
    - Need to preserve QLCS signatures
- Modify LLSD range correction
- Investigate relationship between azimuthal shear tracks and severe weather
- Compare climatology of rotating storms to overall severe weather climatology

Known Issues

- Gust fronts from storms that pass near radar overwhelm the signal
- Clutter near radars that overwhelm signal
- Unknown of impact of inaccurate range correction within LLSD algorithm
- Currently no guidance on what values of azimuthal shear correlate best to severe weather



Acknowledgments

The authors would like to thank Jennifer Tate, Sam Degelia, Scott Stevens and Wolfgang Hanft for assisting in the creation of MYRORSS. Also thanks to Kevin Biehl, Jordan Christian, Rachel Gaal, Corey Howard, Dave King, Garrett Layne Brittany Newman and Paul Goree for helping with the QC of MYRORSS

This poster was prepared by Skylar S. Williams with funding provided by NOAA/Office of Oceanic and Atmospheric Research under NOAA-University of Oklahoma Cooperative Agreement #NA11OAR4320072, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA or the U.S. Department of Commerce.