MDL Newsletter
Winter 2011

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- **MDL Users Survey enters its seventh year**
- **Sign up for the RITT Forum e-mail list.**
- **Multiple Radar/Multiple Sensor Severe Weather Algorithms**

MDL Users Survey enters its 7th year.

The Annual MDL Users Survey 2011 will be open soon for feedback from MDL's core customers, the NWS field forecasters. This year marks the 7th year that the survey has been offered. The survey provides MDL scientists, developers, and management with extremely useful feedback on both new and long-standing operational statistical guidance and software applications. In particular, tracking satisfaction ratings for a given statistical package such as the GFS LAMP (Localized Aviation MOS Program) provides a metric of success as improvements are made to the guidance. These metrics used in combination with the written comments allow MDL to examine its entire portfolio and optimize development resources to better serve field operations.

Sign up for the RITT Forum e-mail list.

Keep abreast of upcoming research and innovation that may be impacting NWS operations. Sign up to receive announcements of the Research and Innovation Transition Team's (RITT's) monthly webinar series, the RITT Forum. Email John.Schattel@noaa.gov to join and check out the RITT website (http://www.nws.noaa.gov/mdl/RITT/) for more information.

NSSL Multiple-Radar / Multiple-Sensor (MRMS) Severe Weather Algorithms

Greg Stumpf (MDL, Norman, OK)

The National Severe Storms Laboratory (NSSL) multiple-radar / multiple-sensor (MRMS) severe weather algorithm system, the result of over 10 years of research and development, was recently approved as an official NOAA Line-Office Transition Project. The MRMS system benefits severe weather forecasts and warnings, hydrology, aviation, and numerical weather prediction by offering a seamless three-dimensional cube of multiple radar data which exploits the overlapping coverage of the entire CONUS WSR-88D network. The integrated cubes of radar data mitigate single-radar data limitations due to distance, terrain blockage, and cones-of-silence, and provide a more accurate and complete depiction of storms, their evolution, and precipitation characteristics. The MRMS system will help users from multiple forecast agencies

to quickly and automatically manage the ever-expanding “fire hose” of all available basic meteorological information from multiple radars and multiple sensors (surface, upper air, satellite, lightning, NWP). Numerous two-dimensional multiple-sensor products offer assistance for hail, wind, tornado, quantitative precipitation estimation/forecasts, convection, icing, and turbulence diagnosis.

MDL is contributing to the MRMS project by supporting testing and evaluation on the NOAA Hazardous Weather Testbed (HWT). MDL is also providing expertise with technology transfer to NWS operational platforms.

The system is expected to be deployed operationally in the coming years. In the interim, experimental MRMS data are available to certain users now. Hydrometeorological products are currently offered to all RFCs as well as all Western Region WFOs. Severe weather products are available to the SPC and some WFOs in the Southern Plains. Radar reflectivity cubes are being used in the data assimilation scheme of the RUC model. Once the operational system is deployed, users can expect 24/7 reliability, more products, an on-demand data retrieval system, and eventually higher time and space resolution.

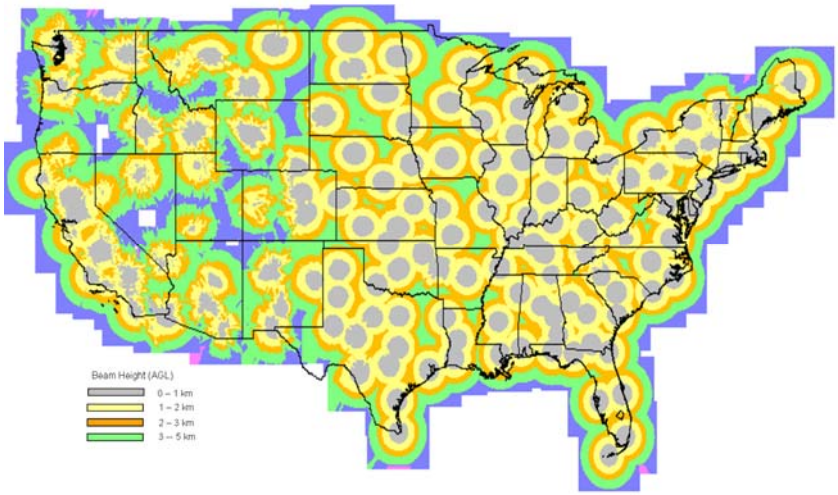

Figure 1. Multiple WSR-88D coverage across the U. S.

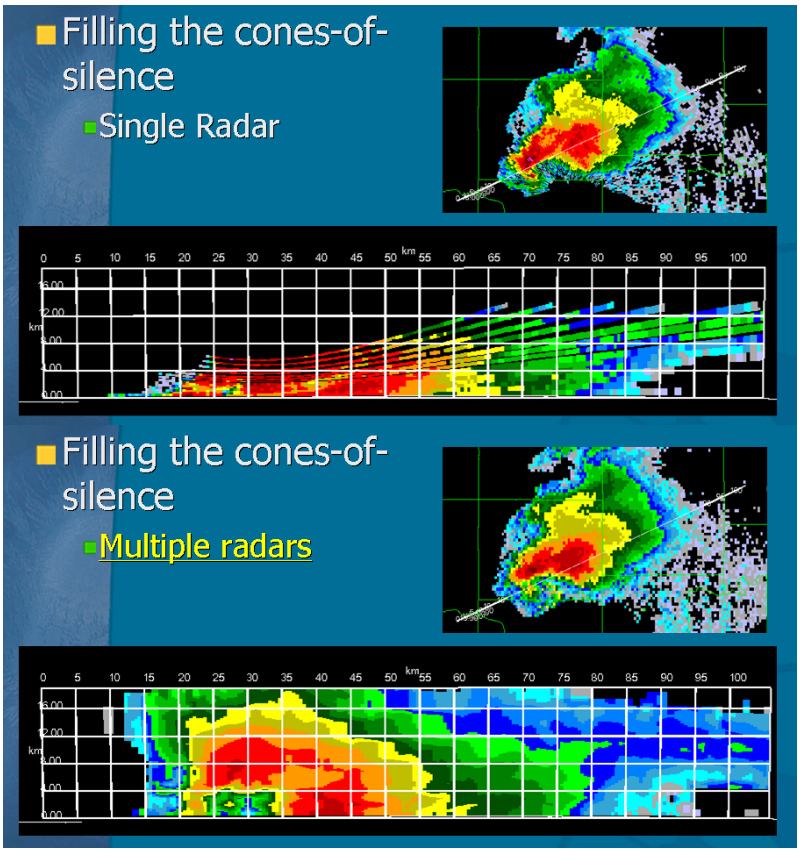

Figure 2. Horizontal and Vertical cross-section of a supercell storm on 8 May 2003 in Central Oklahoma that passes into the cone-of-silence of the KTLX WSR-88D. Cross-sections are generated using the AWIPS Four-dimensional Stormcell Investigator (FSI). (a) Single radar data from KTLX; (b) Multiple-radar data, from KTLX, KINX, KVNX, KFDR, and the OKC TDWR.

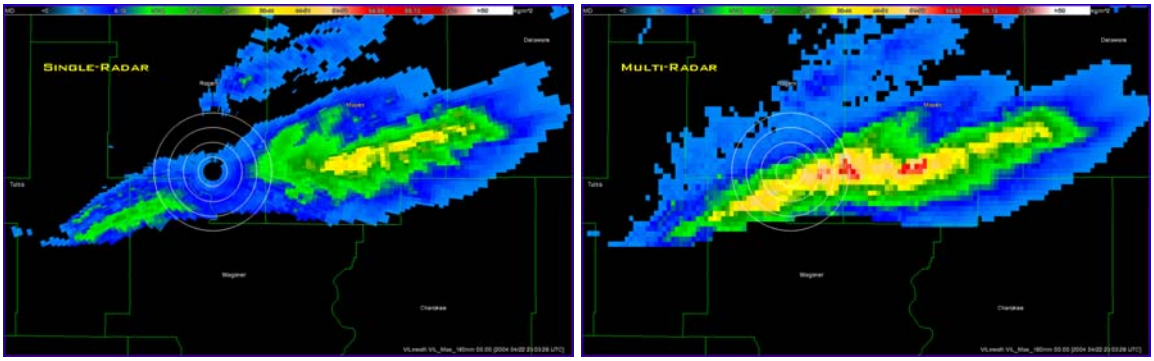

Figure 3. "Swath" of maximum Vertically Integrated Liquid (VIL) over a 180-minute period for a severe storm passing over the KINX (Tulsa, OK) radar site on 22 April 2004; (a) single-radar data only (KINX, location shown by concentric circles), (b) multiple-radar data.

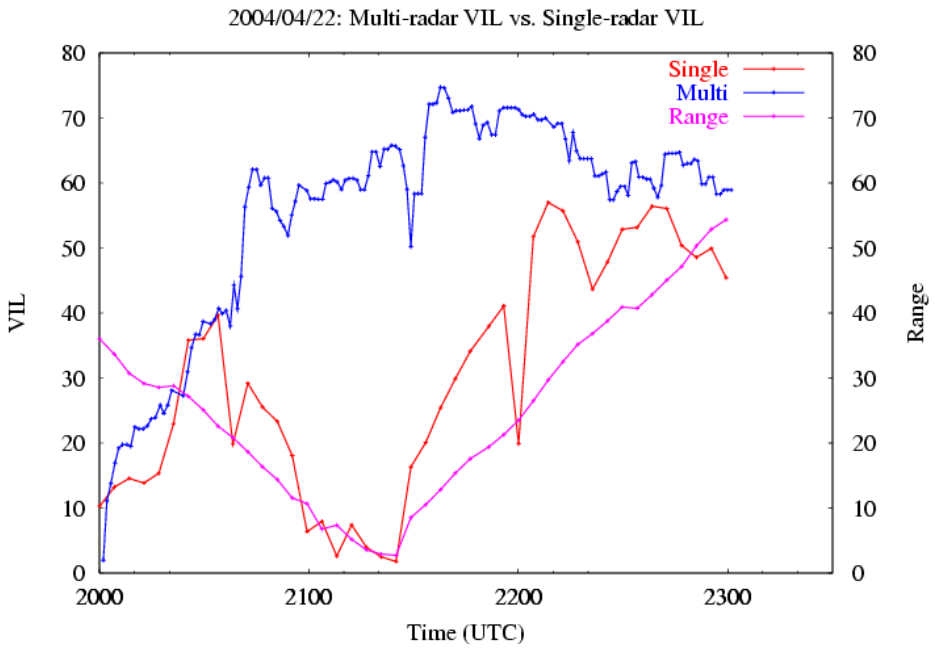

Figure 4. Trend information for the storm event in Fig. 3. The magenta curve denotes the range from the single radar (KINX) as the storm passes over the cone-of-silence. The red curve traces the VIL values as computed from just the single radar data. The blue curve is the VIL values from multiple-radar data. Note that the multiple-radar trend has more data points, as they are more-frequently updated with the infusion of data from multiple sources.

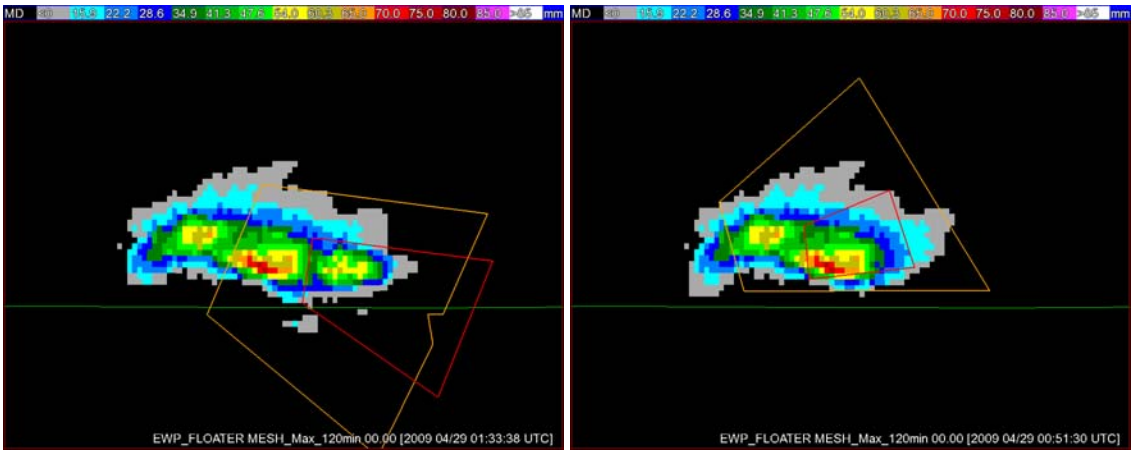

Figure 5. MRMS "Hail Swath" product for a supercell event in southeast New Mexico on 28 April 2009. The left figure shows the experimental warnings (orange = severe; red = tornado) issued by forecasters during exercises in the 2009 spring Hazardous Weather Testbed (HWT) experiment. The right figure shows the official NWS warnings for the same event. Note that the experimental warning polygons (left) are more closely aligned with the motion of the storm tracks, leading to better representation of the weather hazard.

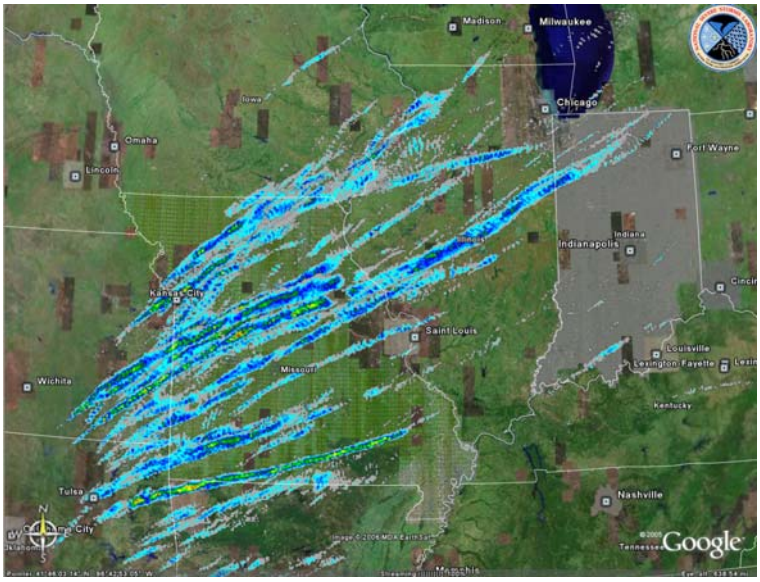

Figure 6: MRMS "Hail Swath" product for the severe weather outbreak of 12 March 2006. The tracks represent maximum estimated hail size over a 12 hour period centered on the storm outbreak.

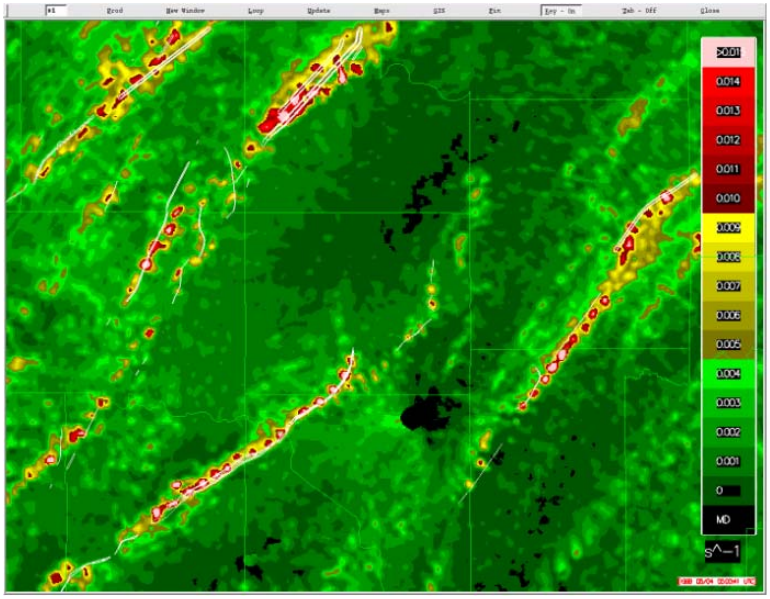

Figure 7. MRMS "Rotation Tracks" product for the 3 May 1999 Central Oklahoma tornado outbreak. The tracks represent maximum azumithal shear, derived from Doppler radial velocity, in the 0-3 km AGL layer. The white lines indicate the actual tornado paths as determined by post-event surveys.

MRMS References

Lakshmanan, V., T. Smith, K. Hondl, G. J. Stumpf, and A. Witt, 2006: A real-time, three dimensional, rapidly updating, heterogeneous radar merger technique for reflectivity, velocity and derived products. Wea. Forecasting, 21, 802-823.

Lakshmanan, V., T. M. Smith, G. J. Stumpf, K. D. Hondl, 2007: The Warning Decision Support System—Integrated Information. Wea. Forecasting, 22, 596-612.