4 Enhancing the Foundational Data from the WSR-88D: Part I, A History of Success

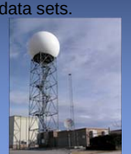
WSR-88D Data Quality Is Greatly Improved!

Since 1993, the Radar Operations Center (ROC) has had a joint agreement with the National Severe Storms Lab (NSSL) and the National Center for Atmospheric Research (NCAR) for the purpose of improving the foundational radar data quality. This agreement, referred to as the Data Quality Memorandum of Understanding (DQ MOU), has focused on the transition of new science research to operations, and has resulted in many significant improvements. This poster illustrates the past and ongoing successes of foundational radar data quality improvements.

The past successes include the development of capturing and utilizing time series data, validating an improved clutter filter that was part of the Open Radar Data Acquisition (ORDA) upgrade, the first range velocity mitigation algorithm using phase encoding, and a clutter detection algorithm that detects anomalous propagation induced clutter in addition to ground clutter. Some of the current efforts addressed in this paper are a second range velocity mitigation effort utilizing staggered pulse repetition frequencies, a method to validate differential reflectivity calibration, improved spectrum width calculations, and continued improvements to the clutter detection algorithm.

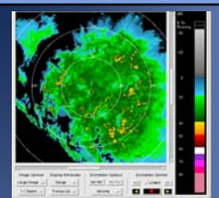
Supporting Investigations
Level I Recording

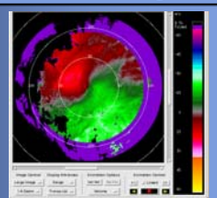
Level I recording began as a ROC application (2003) then transitioned to Sigmet's TSArchive (2005). Soon after, a collaboration with NCAR resulted in the stand alone application, Ts2File, that is used today. Level I recording improves testing capabilities and aids research to operations through shared data sets.

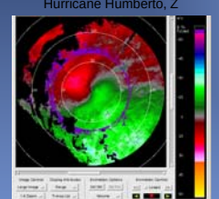


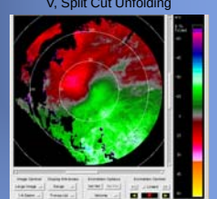
Returned Signals → ORDA → Level I Recorder

Mitigating Range Folding
S/Z (8/64) Phase Encoding


Hurricane Humberto, Z

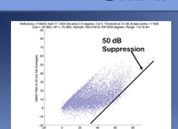

V, Split Cut Unfolding

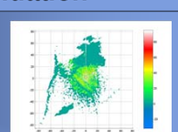

V, SZ-2


V, MPDA

Developed by NSSL with support by NCAR, the range unfolding algorithm, Sachidananda/Zrnic (8/64) Phase Encoding (SZ-2), was the first new science algorithm implemented on the ORDA. This provided the ability to recover 2nd trip echoes and reduced the number of ranged folded bins (purple) to less than 10%. Later, SZ-2 was combined with an RPG based multiPRF scheme, MPDA, to nearly eliminate range folding. SZ-2 was deployed in 2007.

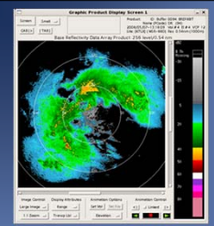
Ensuring Clutter Filter Quality
GMAP Validation



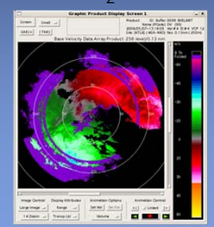


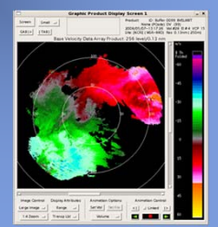
In 2006 through the DQ MOU, NCAR, NSSL, and the ROC verified that the SIGMET GMAP clutter filter met the 50 dB clutter suppression requirement for the WSR-88D.

Mitigating Velocity Aliasing
Staggered PRT

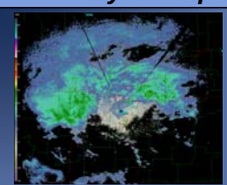

Z

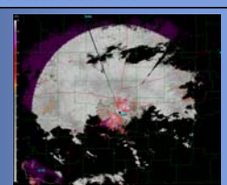
Developed by NSSL, the velocity dealiasing scheme, Staggered PRT, is implemented non-operationally in the ORDA. Clutter filtering is the final step to be completed before deployment. It is expected to be deployed after the dual polarization upgrade.


V, Batch Cut

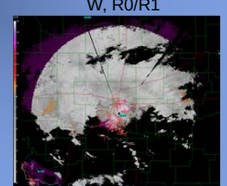

V, Staggered PRT

Improved Spectrum Width
Hybrid Spectrum Width

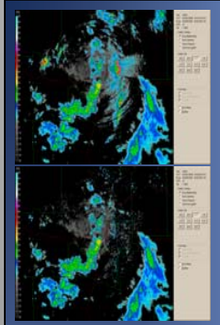

Z

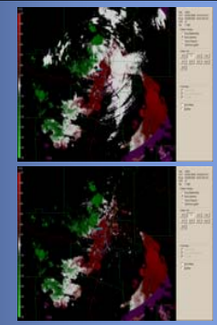

W, R0/R1

Poised to be deployed as part of Build 13 in 2012, the NCAR developed the Hybrid Spectrum Width estimator (HSW) will improve spectrum width estimates. This will directly benefit the NEXRAD Turbulence Detection Algorithm (NTDA).

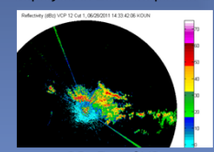

W, HSW

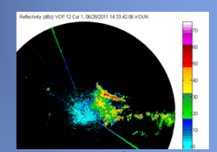
Identifying AP Clutter
Clutter Mitigation Detection

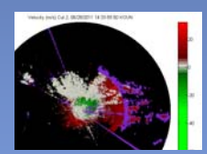

Z top, no CMD,
Z bottom, CMD

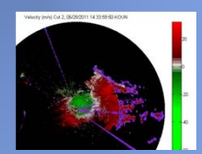

V top, no CMD,
V bottom, CMD

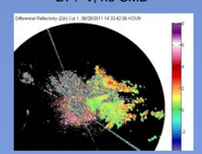
Developed by NCAR with support from NSSL, the clutter detection algorithm (CMD) automatically identifies fast evolving AP clutter as well as ground clutter, freeing forecasters from applying sector maps or all-bins clutter filtering. Images above illustrate version I of CMD that was deployed in 2009 as part of Build 10.

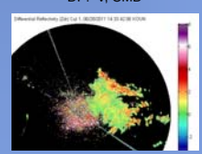

DP: Z, no CMD


DP: Z, CMD


DP: V, no CMD


DP: V, CMD


DP: Zdr, no CMD


DP: Zdr, CMD

Images above illustrate version II of CMD, to be deployed shortly after the dual polarization (DP) upgrade, expected to be part of Build 13. The architecture of CMD was impacted by DP and was redesigned to work with DP variables.

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