

NEXRAD TAC - February 16, 2017

Meeting called to order at 1pm (central)

TAC members in attendance: John Snow, Rich Ice, Tammy Weckwerth, Lee Crowley, Mike Jain, Jim Evans, Cam Tidwell, Paul Smith, Mike Istok, Dan Miller

2 Informational Presentations; 1 Decision Briefing:

- Review of Dr. Zhang's Book on Weather Polarimetry, Rich Ice, Centuria/ROC
- MIT LL Chaff Detection, Jim Kurdzo, MIT LL
- R(A) Algorithm for Rainfall Estimation, Alexander Ryzhkov and Steve Cocks, NSSL [Decision]

Review of Dr. Zhang's Book on Weather Polarimetry, Rich Ice, Centuria/ROC

- The most important part of the book to the NEXRAD program involves addressing several improvements to dual pol and characterizing errors
- Chapter 5: radar measurements, improvement to data quality, correlation estimators, clutter detection
- Figure 11 of Chapter 5 – most interesting – depicting clutter maps
- Clutter mitigation methods suggested in book may be helpful to NEXRAD methods
- Chapter 7: attenuation correction, statistical methods, combining with models
- Rich Ice has asked for assistance within weather community to determine applicability of methods in Chapter 7 to NEXRAD

MIT LL Chaff Detection, Jim Kurdzo, MIT LL

- Flight controllers don't have access to dual pol base variables that show discernment between precipitation and chaff
- Current HCA identifies chaff as mix of other classifications
- MIT LL noticed a lot of negative ZDR values in chaff
- MIT LL testing new chaff classification in HCA; tracks chaff well
- Sea clutter is also a source of errors for chaff detection; looks similar in dual pol to chaff
- MIT LL testing machine-learning technique to separate sea clutter from chaff
- Presentation shows potential for future HCA categories of chaff and sea clutter

R(A) Algorithm for Rainfall Estimation, Alexander Ryzhkov and Steve Cocks, NSSL [Decision]

- R(A) immune to partial beam blockage – biggest benefit
- $A(r)$ formula is well known; used by NASA for decades; formula is immune to radar calibration, partial beam blockage, wet radome
- 2 methods for PIA (Path Integrated Attenuation); second method using specific differential phase and differential reflectivity to estimate the PIA is more accurate, but less robust – needs ZDR calibration improved across fleet. First method using only total differential phase to estimate the PIA is chosen for R(A)

- Advantages of R(A): low sensitivity to DSD variability, immune to partial beam blockage, high spatial resolution, good performance in light and heavy rainfall, good for compositing
- R(A) only works in rain or rain mixed with hail; does not work in snow or within the melting layer; R(KDP) recommended for hail cores
- Case studies demonstrated R(A) outperformed dual pol QPE with overall lower errors, less bias, better correlation

Executive Session

On Decision Briefing:

- Rich Ice – would like to see the ZDR Slope concept, which is one of the components of R(A), incorporated into the NEXRAD dual pol calibration methods
- Mike Jain – R(A) research going for a long time; see real possibilities; additional work will be needed in improving techniques that can be applied in the melting layer and snow regions
- Paul Smith – How often is enough attenuation observed for R(A) to work? How often is 1-3 degrees PHI DP achieved?
- Jim Evans – does not address issues in the west, where radar beam is higher above terrain and more likely in/above melting layer. Current R(A) proposal is not a complete solution, particularly for western U.S.
- Dan Miller – East of the Rockies, R(A) is far better than not having anything to address partial beam blockage at all; Do not see reason to not move forward
- Tammy Weckwerth – second method of PIA could be confirmed using S-Pol radar since it has a careful and established ZDR calibration. The second method could then be compared with the results of the first method to enhance the confidence level of the first, less accurate PIA method.
- Rich Ice – ROC has vehicle to work with NCAR in using S-Pol

[Unanimous Decision to Recommend R(A)]

Open Discussion on other briefings:

- Kurdzo presentation: would like to see stats on how frequently chaff occurs
- Kurdzo presentation: how much is the sea clutter detection immune to refraction? How does it perform in different atmospheric regimes?
- Ice presentation: Is there enough data processing power/storage available on NEXRAD to support implementation of Dr. Zhang's suggestions? Rich Ice believes answer is yes – would need to study in future years
- Rich Ice will invite Dr. Zhang to future ROC meetings – Data Quality, ECPs