

March 2015 TAC, Thursday, March 12, 2015

**In attendance:**

Kelly Thomason  
Michelle Collier  
Jessica Schultz - NWS Focal Point  
Kiel Ortega - CIMMS/NSSL  
John Krause - CIMMS/NSSL  
Michael Istok - NWS HQ  
Lt. Col. Neil Edens - Applications Branch, BC  
Dennis Roofe - FAA Liason  
Rich Ice - DoD Representative, Engineering Branch  
Terry Clark - ROC, Acting Director  
Maj. David McDonald - Applications Branch  
Michael Jain - NSSL  
Don Burgess - CIMMS/NSSL  
Cheryl Stephenson - Program Branch, BC  
Russ Cook - ROC, Engr Branch - TL  
Dave Zittel - Applications Branch  
Lindsey Richardson - Engineering Branch  
Bob Lee - Applications Branch  
Christina Horvat - Engineering Branch, BC  
Dan Berkowitz - Applications Branch  
John Hubbert - NCAR  
Igor Ivic - NSSL  
Amy Daniel - Operations Branch  
Rich Murnan - Applications Branch

**Via Telephone:**

Ricky Keil - Offut AFB  
Kevin Kelleher - GSD (Global Systems Division)  
David Smalley - NSSL (several other ppl on the line as well)  
Dr. Zapotocny - AF  
Jami Boettcher - WDTB  
Jim Rosen - NCAR  
Dave Ward - NSSL  
Andy Wood - WDTB  
Dan Miller - NWS, Duluth, MN

## Briefing #1: Hail Size Discrimination Algorithm

By: John Krause (software), Kiel Ortega (validation), and Alexander Ryzhkov (science)

Presenters: John Krause and Kiel Ortega

### Comments and Questions:

During John Krause's presentation he stated "Our code has been delivered to Brian Klien @ OS&T and they have implemented this code already. Currently the code is waiting for the comparison data. As soon as Brian Klien saw this slide he started doing comparisons against the same data.

IRR is to be scheduled & HAD is targeted for delivery to the ROC for Build 17.

**Q.** Kevin Kelleher - Earlier in the slides, you had a profile broke into six categories. Were those profiles derived from observation, or how exactly did you get those profiles?

**A.** The profiles were hard. You have to match the hail found at the surface with the data found in the column. Kyle will cover that process and how one can do that.

**Q.** Dan Berkowitz - How sensitive is this to strong vertical wind shear?

**A.** The algorithm is not sensitive to vertical wind shear, in fact, wind shear is not used in the algorithm. What the wind shear will cause is the hail won't fall out exactly where the large giant hail pixel has been identified on the data. Just because we identify large and giant hail does not mean it will fall straight down. It can certainly fall at some distance from that detection.

**Q.** Rich Ice - Looking at membership functions, the ZDR calibration errors that we struggle with from the Engineering side can have a detrimental effect, obviously we want to give you the best calibrated ZDR we can give you. Have you done any analysis of having a bias error of a couple of 10<sup>th</sup>s or 3/10's of a dB?

**A.** Yes, Bias error does create either over production or under production of hail. When we started the algorithm, we make the assumption that the data is calibrated.

**Q.** (Statement). The goal is to get the best calibrated data but we also can produce an estimate of the error. So that might be something you can think about for the future.

**A.** (Response) - True, if we know the radar is low, we can do something about it. That has not been programmed in, but it can be added.

**Q.** Dan Miller - As far as the ZDR biases go, if the ZDR bias is negative that is going to give you more hail detection and vice versa. On the other end, is that correct?

**A.** Yes, that is expected.

John Snow asked John Krause what would you like us to know from this stage?

John Krause - let you know what we are doing and that it works.

**Q.** Andy Wood - Curious with the addition of the 2<sup>nd</sup> categories to the HCA if there was any impact to the Dual Pol QPE?

**A.** No, QPE will run as though it has run in the past. Dual Pol QPE still sees hail as hail. Does not care if it's large or giant, just small.

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## Briefing #2: An Update on the Improved Correlation Coefficient Estimator

By: Igor Ivic

**Q.** Rich Ice - When you say sample size enhancement, do you mean scanning, so more samples are available? (as in slowing the antenna or obtaining samples from beyond the normal azimuth limits)

**A.** At a certain range, you are going to have invalid estimates so you will then borrow samples from the previous radial. For example: take 1 sample and increase the sample size where you have the invalid estimate - borrow one sample from the previous radial - re-compute. If you don't get the valid estimate then add 2 samples for the previous radio.

**Q.** Rich Ice - You're not talking about slowing down the scanning or anything?

**A.** No.

**Q.** Rich Ice - Range averaging, are you talking about how you weight the samples down range to get the current value?

**A.** The middle would be weighted the most, you wouldn't have much impact on ranges.

**Q.** Lindsey Richardson - Have you done any testing? So if we are still proposing doing oversampling in the future, how much effect do you have on the window? Is there a need to focus on the type of window you used compared to having more samples for the estimator?

**A.** Yes, with the over sampling the variance will improve. However, the estimator itself is dependent on the window. It is more difficult to get a good bias as opposed to when you have the last tapered one that's another incentive for using the less tapered window at least for CC but possibly for all variables.

**Q.** Lindsey Richardson - Any concerns about proposed new high resolution correlation in terms of increasing the beam width? There has been discussion of shipping out a more high res CC product instead of the current smooth product that goes to level 3. Have you heard anything about this?

**A.** No, to my knowledge, the algorithm itself does not use it.

**Q.** Lindsey Richardson - Right, but this is more of a proposal to having a level 3 having a high res product down the line?

**A.** Yes, Definitely research should be done to see how that opening of the window would impact. (someone else added in - You could look at that product all the time, it would just be level 2).

**Q.** Rich Murnan - Question regarding NEXRAD Technical Requirements. Whenever we end up doing big modifications that consist of those requirements, this has to be addressed by the contractor that is actually doing the work. I wonder if the effective beam width was one of the effective NEXRAD Technical Requirements that had to be met, do you know?

**A.** I am not aware of that.

Comment - Rich Ice - Those requirements were adjusted when we did the Super res.

**Q.** Rich Murnan - Do those fall into that?

**A.** Yes, the 1.4 7's (?) is out, but the other ones are within. There is not an effective beam width requirement that can be looked at. It was talked about in the RDFR meeting for NOAA.

**Q.** John Hubbert - What is the effect of ground clutter mitigation?

**A.** To my knowledge there shouldn't be, to be honest I did not look into that.

Rich Ice - In the clutter itself, a very aggressive window is applied in order to achieve the suppression levels and that would be true even if we moved to CLEAN AP which chooses a different window. There can be an aggressive window if there is strong clutter.

Igor - In case of ground clutter you would not open window. Ground clutter bins would be touched.

Rich Ice - Request - If you could give us an idea of where the characteristics of your new estimator, a conference publication, web site or report that has the process you have talked about before. People may wonder what the features are of this new estimator, and what's different from the old one.

Igor - I am writing a paper on it. There will be a publication on it. Regarding the window: There is a possibility to adjust the less tapered window to get the desired effective beam width.

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### **Briefing #3: Quasi - Vertical Profiles - a New Way to Look at Polarimetric Radar Data**

**By: Alexander Ryzhkov - CIMMS/NSSL**

**Q.** Rich Ice - Comments for the evaluation angles 10 & 20 degrees. In NEXRAD we have an operational mode if the coverage is below a certain number we don't do the higher scans. Is that where the 18dbz comment came from?

**A.** We see a lot of value in the first echo in super cells usually happen above 18dbz. It is better not to jump from one dbz to another dbz in order to provide this uniformity.

**Q.** Rich Ice -I was involved in the decision to blank out the first 2 kilometers. The initial NEXRAD had a blind zone of a kilometer and when the open RDA deployed that was essentially set to zero. It was an oversight. We had an initial problem because of strong clutter near the radar. We looked at needing to reestablish that blind zone for this antenna at our wavelength. The far field range of the antenna which is the range at which you can model the antenna as a colimated beam. That is a kilometer and a half. The assumption that might go into calibration parameters to retrieve the data would no longer be valid in terms of the beam width of the antenna. Those are things that would have to be examined in a decision to reduce that.

**A.** We discussed this issue. The German X band radar blind zone range is 3x's smaller. They don't sense anything

**Q.** Interesting question on snow getting into wet growth. Have you done some Shuman Ludlum calculations with the available liquid water contents and the very modest motion of the snow through the liquid water to verify you really think you can get to 0 degrees C.

A. That is what we are planning to do within the next month. Its clear wet growth here means that we have enough super cool liquid water. The mass of this is so much smaller than that of a hail storm.

Q. Jim Wilson - Have you ever had a chance to do it on a clear air signal with (Bragg scattering)? We could detect blaze that way.

A. We tried to do that but 4.5 degrees is too low.

Q. We may have oversold the -15 dBZ it may not be pure dispositional growth there is a problem a lot of arrogation that is also going on. The work also confirms the work crystal growth is actually confided of very cold temperatures.

A. We have seen this wet snow in Alaska which is really amazing.

Q. Rich Murnan - Is there a reason you didn't take all 4 panels that we have all of the different parameters and apply the HAD techniques to it?

A. It would be updated very slowly for any given radar.

Q. Rich Murnan - The forecasters need a product that will give them ideals to what's going to be happening in the future. If you had the HCA displayed, it was starting to show rain was over the top of snow. It would really help them.

A. Of course, we will do HCA for this it is easy.

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#### **Briefing #4: Quasi -Rainfall Measurements Based on Specific Attenuation**

**By: Alexander Ryzhkov - CIMMS/NSSL**

Q. Scott Ellis - Sometimes in hail do you see values of KDP estimated from ?? that are not valid? They might be negative for some reason or another. What would you do in that case?

A. Yes, but at this moment we don't know what to do.

Q. Dan Berkowitz - Currently 88D uses QPE rainfall estimate based on the existing KDP. Do we need to change that? We are using that in the presence of rain mixed with hail.

A. At the moment don't take out any algorithms or KDP. Wait for the improved KDP.

Q. Rich Murnan - Regarding the summary page on the third bullet point from the bottom

- The original version of R(A) is running on 11 dedicated WSR-88D radars by the MRMS team by the analysis has not been done yet

This is one of the items on the MOU in Application's Branch that we wanted to do an analysis on our spec. We did do an analysis and did find that R(A) really works well in partial beam blockage which there are 11 88D's dedicated that were chosen based off of blockages and it worked pretty well.

A. Alexander replied that he had typed up the briefing prior to finding out about Rich Murnan doing the analysis. Glad that it works good.

**Q.** Rich Ice – The ZDR slope is a good way to look at the situation, what we are doing now when we analyze the rain, the ZDR relation in rain to try to assess the state of calibration of particular radar. Is there a possibility the ZDR slope could be used as a way to adjust the recommended expected values of the rain? A ZDR that would help us fine tune our monitoring of the state of calibration? You provided a series of the recommended values of ZDR as a function of Z, could ZDR slope be used to tweak these numbers a little bit to get us a more accurate assessment for the particular event you know tropical or convective? Seems like that could be used.

**A.** Yes, absolutely. Some of these have apparent mis-calibrations. But you could use this.

Comment – Rich Ice – I think we should look into that.

Dr. Snow – Thank you Alexander for two simulating talks.

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#### **Briefing #5: Dual-Pol CMD Analysis and Zdr Calibration Results**

**By: John Hubbert, Greg Meymaris, Mike Dixon, Scott Ellis – National Center for Atmospheric Research – Boulder, CO**

After John Hubbert's presentation, Rich Ice made some further comments.

**Comment** - Rich Ice – I would like to add some clarifying comments. Since we've been involved with some of this work, just to highlight some of John's points.

Happy to see they have verified the antenna is a problem we are going to have to deal with at some point. We have seen this and were wondering if we did something wrong with the way we had done our analysis. That's the one the ROC obtained doing data here in Norman. There was a time period here in Norman, Dec 2012 where Adam Heck who was working on cross polarization power calibration method, was running KOUN. He (John) showed the chart Adam made from KOUN doing sun scans anytime the sun was visible for a period over a week. That's where you saw the S curves. That receive path bias was with the active receiver portion removed through the use of the test pulse injection so we didn't know at the time if there was something wrong with our test pulse injection process, was it the radome somehow? This was the winter and there were a lot of temperature variations during the day. I presented that curve at the radar conference in Breckenridge a year and a half ago. It was met with skepticism and only a few theories from people as to what we were seeing. People like Paul Smith were speculating non level pedestals and things like that. I'm glad to see now this is a real phenomenon. I'm even more convinced it's real seeing this is S pol data because your active portion is all in a temperature controlled environment. The only parts that should be affected by temperature would be the structures leading up to the antenna and the antenna itself. That has alerted us to the fact we probably ought to research this and we may in fact have to consider making temperature corrections to our ZDR bias and it may depend on the particular site. It does partially explain why we are having such a hard time nailing down calibrations across the network. Not only is it a difficult thing to do to precise measurement but we may be chasing a moving target.

**Q.** Dan Berkowitz – How much more impact by having the radar in a radome?

**A.** It depends how much the temperature changes inside that radome, a big heat trap it's a heated radome it'll change even more.

**Comment - Rich Ice** - Our radomes are not heated unless we have people doing maintenance. Some sites may run the heater such as Alaska. The fact that we are in a radome may explain why our curves looked kind of strange, sort of a S shape and that may be the thermal lag occurring because its an insulated dome, but it will eventually go down to the outside temperature. Theirs is not in a radome so it may have a different relationship with the outside temperature.

**Comment - Dave Zittel** - Just an observation that we had been looking at bragg scatter across the whole fleet 24/7 for one month in April last year. Now, I'm interested to go back and look at the temperature to see what's going on.

**Q. Dan Berkowitz** - Dave, was some of the study based on a particular Z time?

**A. Dave Zittel** - No, this was the whole time, continuous.

**Mike Istok** - The NEXRAD level II data and the performance and maintenance data has temperature sensors up in the radome, external temperature. When we originally were here a couple of years ago ISDP would see what temperature changes we tracked that temperature with the ISDP and you see a variation. The radome heaters don't help the radome. When you see the temperature, the heater is going on and off too.

**Alexander** - Temperature could be such in results. We joke that that dual pol could be used as a thermometer.

**Dr. Snow** - This brings us to the end of the presentations. Thank you to the presenters, you did a very nice job. Recognized Neil as his departure is at the end of May. Closed for a break, then the Executive session will be held.

## March 2015 TAC, Thursday, March 12, 2015 - Executive Session

### In attendance:

Dr. Snow  
Neil Edens  
Mike Istok  
Dennis Roofe  
Rich Ice  
Terry Clark  
Jessica Schultz  
Dave McDonald

### On the phone

Jim Wilson  
Dan Miller

### Comments/Concerns

**Dr. Snow** - Presentations we heard this afternoon were not decision presentations they are all considered progress reports. Quite interesting. People want feedback, which a lot came out during the question time. Please send in any notes that were taken.

**Jim Wilson** - Curious what our role is in this sort of thing. Seems like they just go forward anyways.

**Dr. Snow** - Not necessarily, at least not right away we have sent some of them over the last few years for more work. Before they came to us on a decision brief. It also prepares them for what we are likely to raise or have raised so they can answer it during the decision brief.

**Mike Istok** - Had a prior meeting regarding the TAC process. Not consistent with what requires a decision brief. What's an information brief? There's interpretation in definition which are never clear-cut. HSDA is viewed in some regards as an extension of the HCA product. HCA algorithm. Does that require it to be approved by the TAC or not? Clearly its not a black or white answer. We need to try to clarify that make sure the briefing that we got was prepared as a decision briefing but since the ROC didn't as for a decision briefing it was not. The slide that says decision was not included. Jim's comment is appropriate what is our role?

**Neil Edens** - Jim's not the only one that had that question. John Krause asked the same question. R20 process is something we've had recent discussions about.

**Terry Clark** - Read over charter it says the TAC will evaluate over the technical merit. In this case, it looks like a technical merit. It also says the TAC will conduct an independent review on critical issues. What's considered critical? PMC will consider the algorithm for implementation for the 88D baseline. If any comments are made over technical merit then the PMC or the ROC. Will take that into consideration to put it into the baseline. Do we need to revise this to get more guidance?

**Mike Istok** - anything we can do that changes anything could be interpreted as something that requires technical merit. In that case it would be to much to be reviewing to much detail, what's science - technique? To little and you risk deploying things that aren't quite right. People don't think there is something questionable about this.



**Dr. Snow** - The fact there is a body to do a review whatever the nuances are. It's kind of a thing holding over people's heads. I got to do this right to make sure I can convince a group of people that I'm moving in the right direction. To have to stand up and give a presentation, put their name on it before a group of peers. There has been times in the past where we have decided it wasn't right or presented correctly.

**Terry Clark** - Consider the TAC as a peer review.

**Rich Ice** - In the past, what has made the distinction what is a decision brief? The TAC has been asked to make a recommendation.

**Dr. Snow** - Yes, whether that's been a formal ask, sometimes people have briefed us 2 or 3 times over a period of 3-4 years and we've watched a piece of work mature. We know we are ultimately making this thing work. But whether its reached the stage where its ready to go into a build or be considered is the question that has come up.

**Terry Clark** - The charter says on request the TAC will provide critical review. The PMC, for example, when they did ORDA, and Dual Pol they looked at the TAC for critical review.

**Mike Istok** - in past SREC meetings a question will come up, does this need TAC approval and in the TRC meetings that question gets asked there as well. Perhaps more discussion is required on that very subject. Run through questions very quickly with no time to debate.

**Dr. Snow** - To answer the questions, it's not a simple role. We provide several functions here. In some cases actually providing a decision other cases help with a technical exchange.

**Jim Wilson** - I've seen the changes over the years seems like we get asked less and less. This briefing on hail is pretty important.

**Terry Clark** - On the other side, less and less decision briefing because we have to update the technical needs. We've addressed so many of them so updating them would give us more direction.

**Mike Istok** - The reality of it the budget. The funding for research to operations is way low. Dual Pol as a project & program took a long time in resource and attention. So now we are trying to do stuff again.

**Terry Clark** - The baseline was frozen for almost 2 ½ years we couldn't implement anything we have a back log on things to implement. We didn't have the money or the resources to do anything.

**Mike Istok** - We have a lower but steady amount of funding for the next few years.

**Terry Clark** - We have Dual Pol out there now and we are about to find out what it's going to do. The new RVP opens up options for data quality.

**Rich Ice** - It's going to get harder in the future as there is so many options and all of these decisions about how many samples do you take? Do you do a window for each variable? Do you do a clutter suppression, performance curve for each variable, too much complexity for the options. Could help management decide what has priority.

**Dr. Snow** - Reason why we did it that way, to get through the installation.

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## Comments/Concerns - Briefing #1 - Hail Size Discrimination Algorithm

Terry - I think we have it scheduled for B17

R. Ice - It's another user application that relies on good calibrated ZDR data but we can also find other uses for assessments to see what the bias is. Talked to John, take the output of our RPG bias estimates and do something with those. There's connections there.

M. Istok - We are slowly moving in that direction.

Dr Snow - Still the need for good ground truth data and the complexity sometimes of getting good comparative data. We tend to focus on the radar but in order to do the radar like we want too, we still have to have in this case people at mom and pop stores across the US looking out their window and a bunch of under graduate students calling to ask what is going on outside your window. On that basis of that, we develop a very sophisticated algorithm to go into a very expensive radar. It actually seems to work pretty well. It ultimately starts with observations in the field. I think Ortega has been at it since 2006. I think he started this as an undergraduate, doing this stuff.

R. Ice - This has been behind the M-Ping for people to report what they are seeing.

Dr. Snow - Yes, exactly. Do it faster, get far more observation than you can, simply by calling people in a reverse phone book.

Terry - People are making business models out of using that hail data. Now if they have hail size with the hail sloth data, that's another branch of commercial activity for insurance companies.

Dr. Snow - There's at least four people in town doing that.

Dr. Snow - So any more comments?

Dan (Duluth) - In addition to the comments, I had sent Neil an email wanting to discuss the overall calibration issues under the hood, so I'm glad to see there was some of that addressed in the presentation and hopefully we can keep that discussion going forward.

The other thing I wanted to bring up, there is some research that Scott Blair has been leading out of the weather center office in Kansas City. I'm not sure if it's been formally published yet, but I know he's presented some of the preliminary notes at a couple of conference that I've been at and Matt Camgen (splg) has been doing a lot of hail and Dual Pol research out of Penn State presented down in Atlanta last year. The one thing from a science stand point, I don't want to say it troubles me I think as far as looking at reflectivity and Dual Pol variables structure within a storm, there is only so much you can do but it also has its limitations in the end. At the end of the day, here we are still looking at reflectivity cores and we're tied to essentially where the reflectivity core in the storm is opposed to somewhat independently store type - where I'm going with this is research seems to suggest that the best discriminator of giant hail vs non giant hail is super cell storm structure. That would be one of my comments going back to the researchers is that I think all of these examples that they showed today where a supercell storms form what I could see, there wasn't a lot of velocity data shown. I guess, I wonder in that small set of more multi cell type of storm might get given the methodology that their using get a unproportioned high number of false alarms in that. I don't know what the answer is but I think it's something based on some of the other research I have seen presented warrants looking into.

**Dr. Snow** - So, potential false alarm issues with other types of hail producing storms.

Yeah, or is storm type or mesocyclone depth and strength considered in the HSDA. Is that considered as part of the process, because I do think that would add value above and beyond simply looking at the reflectivity.

**Mike Istok** - Several times he said no, he described the algorithm and those other aspects are not included. That is more of a concept. What do you do with all this algorithm output? Do you combine it in some way that collectively tells them to do something? That could probably be done, but that is a whole different animal. I don't know if the existing hail algorithm that already in the 88-D characterizes storm type in a better way all that does is say the storm has the capability of producing hail and intensity, but it doesn't tell you where. Whereas this kind of tells you where with data. Maybe using that in conjunction with each other.

**Dan** - That is ultimately where I'd like to see that go is more of a whole approach evaluating the storm based on all the data we get from the radar, rather than just reflectively or whatever equals whatever. - hoping I'm making sense.

**Neil** - Dan, back to your calibrations. That topic already has a spot on the next TAC agenda. To provide an update.

**Dr. Snow** - Asking for specific points to be sent to Neil.

**Dr. Snow** - The census - Hail size ready to go forward. Plan to implement over time next 18-24 months. Anyone have an objection proceeding on that track?

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### **Comments/Concerns - Briefing #2 - An update on the Improved Correlation Coefficient Estimator**

**Dr. Snow** - Update on the improved Correlation Coefficient Estimator? Comments?

**Neil Edens** - Definitely, showed an improvement.

**Rich Ice** - It's really part of a multipart thing. For the basic estimator itself he's derived a new mathematical estimator which does a better job accounting for the noise and the number of samples some other suggestions made like borrowing samples from adjacent radials. Those are implementation things we have to think about at the ROC and the range averaging things that could be done as we have the option to put all these complexities into the system we have to evaluate how they relate to other things going on. It's good work, good science. I don't see any issues with it other than we want to learn more about the details. He did say he was about to publish a paper that will be available for review.

**Mike Istok** - Shows the consequence of what correlation coefficient the impact on it. From what we chose to do with super resolution the baham window essentially reduces the samples used to process it that variable is very sensitive to samples so there is the algorithm then there's the window then those other things there is like 4 or 5 parts to this at briefing.

**Dr. Snow** - Any recommendations for him? Focus on the estimator and get that in good order?

**Rich Ice** - I think Mike, is probably doing it on his MOU, what is the next phase to just continue documentation what he's done to be available for possible transfer.

**Mike Istok** - Yes, they would be prepared to discuss a description of the algorithm in the time frame.

**Dr. Snow** - That is for the estimator?

**Mike Istok** - Yes

**Dr. Snow** - Because he has other things that come along with it that he was recommending.

**Mike Istok** - Windowing, we are already starting to look at seems to me like it's a good idea. There is still discussion going on regarding pros and cons.

**Dr. Snow** - What about borrowing samples?

**Mike Istok** - Yes, that makes me more uneasy. How do you know you're on the region?

**Rich Ice** - No issue with estimator itself, it's a more sophisticated way to extract the estimate. I can't think of a downside to that.

**Mike Istok** - Most of the J-Pol work was done with 64 pulses per radio. If we had done that in NEXRAD we would have a lot of range folding on the lowest elevation, which would have been detrimental but we chose to use a surveillance cut which at times is only 13-15 samples. We are trying to get over that difference.

**Rich Ice** - The borrowing samples is for a future discussion. The estimator itself could probably be implemented.

**Dr. Snow** - Yes, Informal recommendation move forward with the estimator, further discussion of the window as part of an ongoing discussion and the borrowing of samples is somewhat questionable.

**Rich Ice** - Which is somewhat mitigated by other projects. Possibilities going to use the Doppler data for Dual Pol.

**Mike Istok** - The oversampling hopefully will improve that.

**Dr. Snow** - So the first two carry on, the second one lets wait and see what other projects turn up.

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### **Comments/Concerns - Briefing #3 - Quasi-Vertical Profiles - a New Way to Look at Polarimetric Radar Data**

**Dr. Snow** - One of the things Alexander had mentioned a couple of times, how would we implement this given the current way the radar is used?

**Mike Istok** - Challenging. There are two things. VCP working group - plan to change vcp's and define new vcps and making sure we always scan at some angle to be considered. We've had this mentality to speed things up as fast as possible and assets turn on defaults everywhere now, unless users manually turn it off. It's often radars will only scan about 6 1/2 degrees if there's no data above 18 dbz, we are not picking up a lot of this stuff.

**Dr. Snow** - Extremely interesting what is going on in the atmosphere.

**Mike Istok** – Winter type situation I wouldn't think there would be much issue. Always having some scan at a high angle in order to do that kind of work. Now that we have sails and mesosails how important is that? Not as important probably?

**Jim Wilson** – Jim Evans would have been interested in FAA info, particularly in the winter.

**Dr. Snow** – Recommendation to brief FAA people – same briefing.

**Terry Clark** – Air Force would be interested in that. Because of icing on the planes, seems like a customer requirement question. Should you restrict it to certain bcp? Maybe could give a recommendation.

**Mike Istok** – Just talked about that the other day, lower the threshold but I don't know how much you'd be able to save time on a vcp? Re-look at the vcp, Joe came up with for the future consider always having something at a relatively high angle.

**Dan** – One other thing to consider, I know our office and a lot of the offices with colder climates tend to operate with vcp 31 especially within cold season. Not sure if this adds limitations to what Alexander is proposing. How can we most effectively transition it to something we could use in an operational environment?

**Mike Istok** – With that Dan, with these new vcp's are being considered long pulse, dual pol signal processes have helped.

**Jessica Schultz** – Like a VCP 31 that would have more angles and we could consider getting an angle between 1- and 2- which is what Alexander is proposing. But what we are looking at for winger weather you would use a different VCP, not 31, number of pulses would be 31, but it would have different angles.

**???** – Yes, and it would be faster. Key is the long pulse not so much whether the elevation slices are distributed at, I don't think. We lost a little bit of sensitivity. When we went to the Dual Pol Signal processors that does help us get a little bit of that back. It really is useful in light dry snow or freezing drizzle situations.

**Jessica Schultz** – That would be a way to cut the difference between what the operations are wanting vs what Alexander is proposing, I think.

**Dr. Snow** – What are the actions? We need to involve the FAA, get Dennis Roofe involved and get their feedback. FAA could be a major potential customer for that type of product.

**Terry Clark** – Dennis may want to get his technical guy and get their feedback.

**Mike Istok** – From a cloud physics stand point, I wonder if finding some of that crystal growth regions helps you identify where heavy snow is.

**Terry Clark** – He identified the freezing level and the lowering of the freezing level. It was pretty interesting. If you can get it in real time though, so you can make a forecast out of that.

**Mike Istok** – It's like the VWP concept. Some are of average of some volume. So it's a representation of that, it's not instantaneous.

**Recommendation** - Put HCA on it. Course we will have some of the same issues like we already have accurately classifying things.

**Dr. Snow** - Wait to hear back from FAA and see what they got out of it.

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**Comments/Concerns - Briefing #4 - Rainfall Measurements Based on Specific Attenuation**

**Dr. Snow** - Any comments?

**Neil Edens** - Great for partial beam blockage. He's still working on it.

**Mike Istok** - Applications Branch did a study of the two radars and in the areas of light rain and moderate rain, how is it compared to ZZR for a well calibrated radar?

**Neil Edens** - I just remember the outcome is beam blockage, and does an outstanding job. Outside of that not so much.

**Mike Istok** - When you say not so much, are you saying its worse then RDA?

**Neil Edens** - Yes

**Jessica Schultz** - It would over estimate.

**Neil Edens** - Is that when he started developing his alpha factor might have been an earlier version.

**Jessica Schultz** - Does not go everywhere, only goes on radicals with partial beam blockage.

**Mike Istok** - How does that compare with what we are already doing with zdr with calibrated radar. Without that adjustable factor it sounded like it performed worse than the zdr.

**Jessica Schultz** - We need him to get his updated version where we can work on it and test it.

**Dr. Snow** - So move it over to the MMRS?

**Jessica Schultz** - It already is, it's a matter of him getting his latest and finishing it out. Get the alpha value nailed down the way he sees it. He is pushing updates, which is what we want.

**Jim Wilson** - Impressed with what Alexander is doing - Tell him and to keep working!

**Terry Clark** - Is it in the Apps Branch MOU?

**Neil Edens** - It has the evaluation of it but the development part is on Applications Branch MOU, bits and pieces are on MI.

**Dr. Snow** - Glad to see the Koreans radar is up and running.

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## Comments/Concerns - Briefing #5 - Dual-pol CMD Analysis and Zdr Calibration Results

**Dr. Snow** - Got interesting with the mechanical issues heating/cooling of the support struts for the feed horn, then it was the dish itself. But I could be wrong.

**Rich Ice** - From the ZDR bias, it's a function of the frequency which is a proxy for changing the size of the antenna when you think about it. By changing the frequency you have the same effect if you deformed the antenna. That is the point he was making with the frequency analysis. He did a calculation that the actual physical changes are pretty small relative to our wavelength and we see those results with the megahertz change. That was an important aspect of the briefing. But from the other point he did, that he is doing for the ROC, he is investigating detection performances in the low clutter to signal ratio (CSR) which have become critical for the polarimetric 88D. Whereas whit reflectivity and velocity you started with before. If you could reliably detect clutter from around 0 to not even -10, you're okay most of the time but what we've discovered the last few years with research going on around the world is that the polymeric variables are much more sensitive to low CSR's and so we need better detectability to low CSR's that would be the focus of the work. There were two aspects on what John briefed us on. This really started off by as we deployed the Dual Pol Mod we started getting observations in the field of clutter residue causing some biases of data. In fact, Duluth was one of the places that really started this off. Interesting Dan, you guys kicked off all of the work from your system. So that is why we are focusing on the detection capability of CMD to address the negative issue with the polymeric detection as opposed to wanting to go back to old all bins filtering process we want to avoid getting into a need to do that.

**Mike Istok** - At the same time, CLEAN AP is coming along, may work better then CMD.

**Rich Ice** - Will be able to compare between CLEAN AP and CMD.

**Mike Istok** - Neuro net CMD, is that a new version of CMD that he is proposing?

**Rich Ice** - I think they are just looking at it. I don't know very much about that aspect of it.

**Mike Istok** - What is the Neuro net he is proposing it can be difficult to work with. Will it be trained at sites?

**Rich Ice** - I don't know.

**Dr. Snow** - He has brought that up before. We have had discussions of neuro net, using the S Pol data.

**Rich Ice** - What I carried away from him, this concept if the receiver operating curve and where you pick your point of the combination probability of detection and probability of false alarm. In our case it maybe that we move a letter towards the probability of false alarm in these cases of misdetection we sort of picked a point, for example in the CMD algorithm to go thru all this fuzzy logic and to come up with a probability of clutter number of 0-1 probability of clutter. Will we flag a bin as clutter and apply the clutter filter if that number is one half or more, maybe we should make that number 0.4 we would get more detections but we would also get more false alarms. But there maybe some tweaks we can do in operating the system. So that's useful information.

**Neil Edens** - So false alarms would mean a bigger isodopp problem?

**Rich Ice** - Yes, but then he also mentioned there are other things you could do to eliminate zero isodopp? In other ways, which we do now as part of the evaluation performance of CMD. One of the things routinely done is to not count bins on the zero isodopp. It could be another factor you throw into the decision.

**Dr. Snow** - He mentions that in the next to last slide.

**Rich Ice** - They have been helping the ROC come up with independent assessment from the actual radar data of what is our detection curve for CMD is as it's implemented in the field looking at level 2 data. We can take level 1 data and process sets where filters are applied everywhere, and filters not applied anywhere and filters applied via CMD and I take those 3 data sets and compare it in a tool to basically derive those probability in a curve that is one of those things NCAR is going to help us with. So we will know fairly soon what the actual performance is of the implemented version.

**Mike Istok** - Could it help with CLEAN AP?

**Rich Ice** - It could, just trickier. There will be a tool to do the comparison.

**Dr. Snow** - When will that be available?

**Rich Ice** - The tool is there now. Results are in the validation phase to make sure it's done correctly. Need to collect a lot more data to convince us we are really seeing true performance indications that cmd is following short of what we thought it would do so. We need to ensure we haven't made a mistake somewhere.

**Dr. Snow** - Any more comments? We've gone thru the 5 presentations, any recommendations about the next TAC?

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### **Comments/Concerns - Next TAC**

**Dr. Snow** - Any general questions, thoughts for our next session?

**Neil Edens** - Introduced his successor, Major Dave McDonald

**Terry Clark** - Charter needs to be updated. We have a PMC meeting at the end of May 2015. We have collected comments, passed the charter around 2 years ago but do not remember the outcome. The ROC will help get the charter sent around and updated.

**Neil Edens** - It wasn't the charter we started on. An executive group agreed that we needed to update all 3 of the TAC related documents and we had 1 or 2 executive meetings only. The first document we worked on strategic documents and put it on the google drive. People without NOAA accounts, we got them access, however a draft was never sent out.

**Terry Clark** - I'd like to get these documents rolling, as we are having a PMC meeting coming up. There is a re-organization at HQ's, an AF re-organization, we have new members coming in on different committees it is time to refresh all of these documents.

**Dr. Snow** - Is the charter clear, obviously it's not.



**Neil Edens** - As a group we never discussed it we were planning on it at the last meeting we had discussion and notes but too much travel.

**Terry Clark** - At the PMC, I do not need to tell them it's done, just that it is being worked on.

**Mike Istok** - Technical need and strategic direction will really help us as of what product we should focus on. Why are we here? What are we trying to accomplish?

**Dr. Snow** - Technical needs document is that is out of date as soon as we moved into the Dual Pol.

**Mike Istok** - There are still technical needs.

**Dr. Snow** - There no doubt there are technical needs. Some of the ones that are listed have been taken over. It is like we need to start from scratch. Where are we today? Where are we trying to go?

**Terry Clark** - I think you're right. Trying to keep radar running for the next 15 years until MPAR or some other replacement for the radar comes along. Couldn't do everything we wanted to when the radar was installed. How do we keep it running? What is there out there in the industry to help make it until MPAR comes out.

**Mike Istok** - At some point, we will be asked to stop trying to improve things. Either phase array will be around the corner or we will be doing something else. It would be good to have some instruction.

**Terry Clark** - MPAR is out of the scope of TAC. It can't do less then what NEXRAD does. MPAR would be a TAC function.

**Rich Ice** - Signal processing (developed for the WSR-88D) could go into MPAR. Processing algorithms are the key.

**Dr. Snow** - Send charter around again, put a cover letter on it. Neil Edens volunteered to get it started.