Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2018-232-RC1, 2019


Atmospheric Measurement Techniques Discussions

# *Interactive comment on* "A Generalized Simulation Capability for Rotating Beam Scatterometers" *by* Zhen Li et al.

**Anonymous Referee #2**

Received and published: 14 February 2019

This is an interesting paper which 1) describes a simulation and FoM methodology, and 2) uses this methodology to evaluate the relative performance of three recent specific scatterometer designs. This paper would be even more valuable to the community if it described the system parameters of SCAT and WindRad in a little more detail (as suggested below). I also have some specific questions, comments, and suggestions in the text.

Page 3, Line 3: Question: Have either SCAT or WindRad been launched? Are there any references to their design and on-orbit performance?

Page 5, Tables 1,2,and 3: {

Correction: What is currently listed as "antenna bandwidth" in the table is perhaps more



appropriately termed "center frequency."

Recommendation: In Tables 1-3 include the actual TRANSMIT BANDWIDTH in the table. This would be extremely valuable for the readers to understand how many independent range looks are available for each slice measurement. (For instance, from the literature SeaWinds has a transmit bandwidth of 375 kHz.).

Recommendation: Specifically state the number of independent looks (not views) for each slice.

Recommendation: In Tables 1-3 add what the Noise Equivalent sigma-0 is for each system. Perhaps it is actually a range of values depending on the specific slice position within the antenna footprint on the ground. }

Recommendation: Add a new diagram/figure showing how each antenna footprint is "sliced" using range processing. What are the dimensions of the individual slices on the ground? What is the overall spatial resolution of each system?

Page 7, Lines 1-5: Comment: The authors are correct in indicating that the coefficients A, B, and C are a function of the precise detection scheme. The approximations for A, B, and C given in the paper are identical to those derived for SeaWinds, which uses a deramp detection of the chirped bandwidth and then frequency filtering to obtain each slice. It is unclear whether they are applicable to the SCAT or WindRad cases because the dection scheme is not specified.

Question: I don't understand what the statement "The distribution of Bs on each slice in one pulse is assigned according to the antenna gain pattern of the pulse" means.

Page 7, Figure 3: Question: Is there any error term in the simulation for the radiometric calibration accuracy? Radiometric calibration accuracy is another factor important in scatterometry. What is the assumed or achieved radiometric calibration accuracy for SCAT, WindRad and SeaWinds?

Page 9, Figure 6: Question: What are you defining as being a "view." Specifically for

SeaWinds, my understanding is that for the outer WVC's, there are measurements that occur from multiple azimuth angles for multiple antenna rotation, although it is a very small range of azimuth angle variation). For instance, in the paper "Point-Wise Wind Retrieval and Ambiguity Removal Improvements for the QuikSCAT Climatological Data Set," A.G. Fore et. al., IEEE Trans. on Geosci. and Remote Sensing, VOL 52, No. 1, January 2014, it shows a distinct "saddle shaped" distribution of "composites" as a function of WVC, not a flat distribution as shown in the author's Figure 6. What is the difference between "composites" in the above paper and "views" in this paper?

Page 10, Lines 4,5: Comment: The line that reads "... the Kpc on the WVC level is derived by averaging the Kpc for all the views in the corresponding WVC." Wouldn't the Kpc instead be actually reduced when all the views of included together? As multiple s0's from different views are averaged, wouldn't the aggregate Kpc go down?

Pages 14 and 15: Question: Figures 10 and 11 appear to be a model simulation output whereas Figure 12 is an actual SeaWinds measured wind field (?).

Page 20, Line 20: Comment: The statement "Overall the wind retrieval performance of the rotating fan-beam instruments is better than the pencil-beam instrument." Clearly more "views" are better than fewer views, but the number of looks is also important. This conclusion may be the case for this specific pencil-beam scatterometer (SeaWinds) with its relatively small bandwidth and low number of looks per slice, but a pencil beam scatterometer with a higher gain and/or higher transmit bandwidth could potentially compensate for the lack of views. There may be a trade-off here.

Page 25, Conclusions: Comment: One aspect that I find seriously missing in this paper is the acknowledgement that SeaWinds (as well as SCAT and WindRad maybe?) have already been operating in orbit. In the case of SeaWinds, there is an approximately 10 year data record that has been extensively evaluated. Yet the actual performance of the scatterometers on actual wind fields is not compared to the model simulation results. It seems that this would be a good means of establishing the validity of the



model, particularly with regards to evaluating the "geophysical noise." The chances are good, I would guess, that the model performance is actually better than that observed in the real world in all cases. Thus the model/simulation evaluation might best be said to be an evaluation of "relative performance potential" amongst various scatterometer designs as opposed to actual real world performance.

---

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-232, 2018.