

## ***Interactive comment on “On the characteristics of ASCAT wind direction ambiguities” by W. Lin et al.***

### **Anonymous Referee #3**

Received and published: 22 February 2013

#### - General comments

This paper discusses a specific issue encountered during the ASCAT wind vector retrieval, namely the handling of spurious solutions (i.e., with no geophysical information content), prior to the ambiguity removal step. It is generally well motivated, systematically developed and presents adequate and coherent conclusions. This in my opinion well justifies its publication, after addressing some minor aspects as proposed below.

I have taken the opportunity of reviewing the latest update of the papers by the authors, uploaded on 21/02/13. Thank you to the other reviewers for addressing already several editorials and small technical issues.

It is worth mentioning that the issue addressed in the paper is something that has surfaced or become more obvious in the last few years due to the advancement in

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AR techniques, particularly with the establishment of AR algorithms using the Multiple-Solution-Space (MSS). The development of those techniques became very necessary in the context of the SeaWinds mission, due to its geometry and the sensitivity to rain at Ku-band, and addressed issues that had never been a priority for fan-beam C-band scatterometer missions before. All that experience with SeaWinds can now be applied to ASCAT, not only increasing potentially the quality of the ASCAT winds, but most importantly taking the understanding of the measurements and their information content a significant step forward. If the authors agree with this statement, it may be appropriate to reflect this briefly in the introduction and/or conclusions and to refer explicitly to key published literature on the MSS-based AR algorithms.

- Specific comments are listed below sequentially by page number and line number, regardless of their importance/severity.

P2, Line 13-14: Instead of just ‘which represents the measured triplets’, it would be appropriate to mention here that the GMF ‘is empirically derived (ref to Hersbach) as the best fit to the measured triplets, representing thus an average state of the sea surface roughness in the global ocean, calibrated to 10 m high wind vectors.’ P2, Line 15: Perhaps add here what the retrieval process really consist on, so after ‘...WVC.’ and before ‘The radar geometry...’, insert ‘Thus for a given measurement backscatter triplet and a WVC, the retrieval process consists on finding the wind speed and directions corresponding to the GMF backscatter positions closest to the measurement.’ Then in line 17, ‘...which in general leads to several solutions with similar values of the wind seep but ambiguous wind directions.’. Then the sentence ‘The most likely..... inversion algorithm ‘ becomes unnecessary. P2, Line 22: This would be a good point to make a reference to the MSS method (see under general comments above). P2, Line 23: There is a reference to Figure 1, but the z-space has not been defined. I think the caption in Figure 1 should make some reference to what this z-space is in relation to NRCS, without going into the complicated formula, which is later introduced in section 2. P2, Line 24: Replace ‘inner-most’ with ‘near-swath’ P2, Line 33: As a reader, the

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question that would come up is 'Why'? It would be good to add a reference to support this statement, it is not obvious if you don't know about how most AR algorithms work (the use background NWP wind field, etc...)

P3, Line 10-11: For better reading, move 'on the cone surface' to a position in between 'corresponds' and 'to' in line 11. P3, Line 5: '... is the backscatter simulated with the GMF for a range of possible wind speed and direction combinations, through Eq. (1).'

P3, Line 7: '.. as the search, among those  $\theta$  and  $\nu$  combinations, for the minimum distance...' P3, Line 8: 'The  $\theta$  and  $\nu$  solutions associated with such minima are then sorted...' P3, Line 29: 'large MLE values' – I struggled for a while with this statement because in figure 2 they don't look too large, and got confused for a while with the units and which curved you were talking about. I think it would be better to remove 'and large' or replace with 'larger' maybe?

P5, Line 24-27: Here I struggled a bit by looking at Figure 2 to put this statement into context. You have just written above in the paragraph that there are two clearly defined cases represented by the dashed and dotted lines. If they are as clearly defined as Figure 2 indicates, surely an MLE threshold of say, 80, would do the job. But what is not explicitly said and might help to state here is that most cases, as can be seen in figure 1, lie in between of the two regimes, and that is what makes it so difficult to discern between the two (and indeed that is why the reader needs to go on reading this paper beyond this point ~~IAŁ~~)

P6, Line 7: 'Tropical Atmosphere Ocean' P6, Line 28-29: Replace 'against...Figure 1' with 'for the triplets in Fig. 1, using the same vertical axis'.

P7, Line 2 and Figure 3: I am not sure that it helps to include the plot for WVD 41, without doing the same for Figure 1 – particularly, the loss of symmetry in the vertical axis is difficult to visualise in the mind, without seeing the actual cone cross-section... I suggest that either the figure is commented, or the equivalent in figure 1 is added, or it is removed altogether... P7, Line 5: I think (3) is not correct: what you need is two

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separate conditions separated by and 'AND', i.e., (1)  $MLE1 < 0$  or  $MLE2 < 0$  \*AND\* (2)  $|MLE3/MLE1| > T$ . P7, Line 6: Figure 2 does not really show this. It shows one case only. Perhaps better to say: 'Figure 2 illustrates with an example how cases with only ...'. However, I struggled to understand the sentence that follows ('High rank solutions ... reside near the cone surface', because in Figure 2 one cannot see this, only if you understand Figures 1 and 2 together. P7, Line 12: better understood if you add 'rank-1' before 'PDF'. P7, Line 12-16 and figure 4 in the top left corner: I cannot understand why there is a minimum in this function, could you offer an explanation? I looked it also with Figure 1 in mind, but I cannot figure it out.

P9, Line 30: GMF sensitivity to what? Do you mean 'non-linearity'? Please clarify.

P10, Line 2: Insert '... quality control and prior to the ambiguity removal step'.

P11, Line 27: This is not a peer reviewed paper available in the open literature. The report is good, I have personally read it before, but if possible it would be good to replace this reference with a paper published in a journal. If not possible, then the web page where this technical note is available should be provided for transparency.

P14, Figure 1 caption: as already mentioned above, there is no explanation of the relation between the z-space and the NRCS-space – I feel that at least a sentence is necessary.

P16, Figure 3: as already mentioned, the (b) part does not add anything if the WVC is not introduced previously in figure 1. P16, Figure 3 caption: Perhaps better to replace 'triplet position' by 'axis'.

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Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8839, 2012.

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