

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

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Received and published: 1 February 2013

### **General comments**

The paper characterises the high-rank directional wind ambiguities from ASCAT using the distance of the measurement triplet from the GMF surface (MLE). It is shown that in certain cases the high-rank solutions are rather meaningless and should be rejected to prevent their possible selection in VAR. A new MLE threshold is proposed to reject high-rank ambiguities for triplets lying close to the cone surface whilst still retaining the genuine high-rank ambiguities for triplets close to the cone centre.

The manuscript is a very useful contribution towards continued improvements in scatterometer wind quality control and is within the scope of AMT. The methods employed in the paper are clearly described and results are well presented with appropriate use

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of figures and tables. The new QC method shows good potential for removing the geometry-related aliases that could otherwise be erroneously selected by ambiguity removal.

Overall there are only a few minor issues (mostly technical), but once addressed I would recommend for publication.

### **Specific comments**

In the introduction it is probably worth mentioning that we also have ASCAT on Metop-B as well now.

The numbering of WVC is slightly confusing. For 12.5-km ASCAT I would normally expect the WVC to be numbered from 1-82, from left-outer swath to right-outer swath. In this paper the WVC are numbered from 1-41, from outer-swath to inner-swath, for both left and right swaths. This is fine but just needs to be made clearer in the text as at first glance figure 5 looks like data from just one swath. Probably also worth explicitly stating how many WVC there are.

In Section 4, could do with a little more explanation about how the probability of occurrence is calculated as 0.3

In potential rain contamination cases where the chosen high-rank solutions are of poor quality, but in marginally better agreement than the first 2 solutions, then rejecting the high rank solutions will still be beneficial as it will allow VarQC to reject the entire report if it cannot resolve the remaining rank1 and rank2 solutions. However, I agree that ideally all solutions should be rejected by QC in such cases.

The plots in Figure 5 need to be larger and the lines are quite difficult to identify on the left hand plot – suggest either group the WVCs as per the plot on the right or alter the line styles to something easier to differentiate. Also the y-axis title on the left hand plot should be wrt to ECMWF and not buoys.

Need to be careful with how the “sets” of winds are referred to in Section 3 on page

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8847. For example, the phrase “the wind retrievals with high-rank solutions rejected” is slightly ambiguous. Standalone, it could be taken to mean the set of wind retrievals remaining, after excluding the rejected high-rank solutions. Or as intended, it could refer to those winds with high-rank solutions, that have had those high-rank solutions rejected. Perhaps “the retrievals with rejected high-rank solutions” is a bit clearer?

It's worth thinking (not necessarily in this paper) about how such a QC method might be implemented in practice in the L2b BURF product. The WVC quality control flags are usually used to reject/flag an entire report, rather than individual aliases. I therefore assume that the spurious high-rank solutions would be excluded (pre-filtered) from the BUFR product all together? The other option would be to flag the affected WVCs so that users could implement their own check to remove the artificial high-rank aliases should they wish to do so (requires effort on users' part).

#### **Technical corrections**

The authors should check they are consistent with hyphenation e.g. up-/down-wind or up/downwind.

Page 8840 line 6: plural so “residuals”, “estimates”

Page 8840 line 8: perhaps break this sentence up e.g. “. This indicates a low probability for the high rank-solutions..”

Page 8840 line 15/16: rewrite as “one of the instruments on-board Metop-A, a polar-orbiting meteorological satellite..”

Page 8840 line 18: replace “pointing into a swath at each” with “tracing a swath each”

Page 8840 line 21: can drop “the” before ASCAT

Page 8840 line 21: should define “ $\sigma_0$ ”

Page 8840 line 21: can drop “the” before 3-dimensional

Page 8840 line 24: “ocean surface” sounds better than “sea-surface”

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Page 8841 line 7: replace “which is called inversion residual” with “known as the inversion residual”

Page 8841 line 20: replace “such distance” with “the distance”

Page 8841 line 28: replace “there is” with “there are”

Page 8842 line 13: replace “and which validation is presented” with “validation of this method is presented”

Page 8842 line 17: although the z-space transformation is described on the next page, there needs to be some kind of reference to what it is here

Page 8842 line 19: “ocean surface” sounds better than “sea-surface”

Page 8842 line 22: reword to “The particular values of B0, B1 and B2 are presented in Verhoef et al.”

Page 8842 line 25: “MLE” has already been defined in Section 1 so no need to repeat

Page 8843 line 14: change to “Numerical Weather Prediction Satellite Application Facility (NWP SAF)”

Page 8843 line 24/25: change to “..for one such case, where two well-defined minima have similarly low MLE values” and delete “are found”

Page 8844 line 9: change “presents” to “represents”

Page 8844 line 9: change “close to cone” to “close to the cone”

Page 8844 line 10: change “at up-/down-wind” to “at an up-/down-wind”

Page 8844 line 14: “close to crosswind” to “close the crosswind”

Page 8844 line 16: “to up/downwind solutions”

Page 8844 line 18: “probability as compared” to “probability compared”

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Page 8845 line 6: change to “Ocean and Sea Ice Satellite Application Facility (OSI SAF)”

Page 8845 line 19: remove “,in contrast,”

Page 8846 line 1: suggest reword as “The MLE value can be used for such a purpose.”

Page 8846 line 4: change “distance (MLE) difference” to “difference in distance (MLE)”

Page 8846 line 12: I would break to a new line for “In summary, ..”

Page 8846 line 13: change “for the wind retrievals” to “for wind retrievals”

Page 8846 line 15: For equation 3, I think it should be “ $MLE_1 < 0$  or  $MLE_2 < 0$  or ..” i.e. the second “ $<0$ ” is missing.

Page 8846 line 21: reword as “to that of cases with rejected high-rank solutions..”

Page 8847 line 8: change “does a good job on rejecting” to “does a good job of rejecting”

Page 8847 line 13: reword as “much broader for inner-swath WVCs than for outer-swath WVCs”. Also, it might be useful to demonstrate this by including an additional plot as per Figure 3 but for an inner-swath WVC.

Page 8852 Table 1: change “which rejected” to “with rejected” and “solutions are” to “solutions that are”

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