WIND ENERGY SCIENCE DISCUSSIONS

WESD

Interactive comment

Interactive comment on "Applications of satellite winds for the offshore wind farm site Anholt" *by* Tobias Ahsbahs et al.

Anonymous Referee #2

Received and published: 7 March 2018

General Comments:

This paper addresses relevant and interesting science questions. The comparison of SAR and SCADA is novel . It is generally well written and structured so as to be easy to follow. The methodology is clearly presented, but missing some important details. Wind speeds retrieved from SAR correlate well with the SCADA derived wind speeds (P21,L11) and this is a useful result. The results also show the SAR derived wind speeds reproducing the measured wind speed variability along turbine row A well. However, errors and uncertainties arising from the method are not fully explored and considered. I don't feel that the results presented fully support the conclusions drawn and so this paper should be revised before final publication.

Specific Comments:

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Discussion paper

Comments regarding the methodology:

P4, from L16: Why select this GMF, these reanalysis data sets for derivation of SAR wind speed? Is this essentially describing how the DTU archive of wind speed maps is derived? If so, it would be clearer to turn this around to say that the archive of processed wind maps is used, and this archive is derived using SAROPS, CMOD5.N etc.

P5, L23 : It is not clear what "averaging (WRF) wind direction at the same locations as for SCADA derived wind direction" means. Is this averaging across some time window or spatially, and to what end?

P6,Table 1: I am quite unclear on what 'Wind Direction' refers to. Isn't SAR wind speed using reanalysis data input all the time? Is this the wind direction used to select scenes, eg to determine that the wind direction is long or short fetch?

P6, L9 : Why the hexagonal shape? How does it relate to SAR wind speed resolution cells? P10, L4 : Why is variation expected to be large? (This is kind of explained P11 L 14-15, but why not hypothesised here? It would be clearer.)

Comments regarding treatment of Errors and Uncertainties:

P2,L10 : It is mentioned that the absolute accuracy of SAR derived wind speeds are low compared to mast measurements. This needs further elaboration and consideration in order to draw conclusions from the results.

P8, L9 and P19, L3: Wind direction input is picked out as a source of error in deriving SAR wind speeds, but is not explored. There is a passing reference to having also looked at SAR winds derived with SCADA wind direction as input. This would seem to offer an opportunity to explore and possibly quantify to some degree the uncertainties arising from wind direction input.

P5,L30: For SAR based wake studies it is assumed that turbines are operational. With SCADA data available in parallel with SAR, the uncertainties arising from this assump-

tion could be quantified allowing you to draw firmer conclusions from the results found.

P5, L17; P7,L12; and P19, L9 and 17 : The simplification of adjusting between heights using a logarithmic wind profile is highlighted as a likely source of error. Please expand on this. What might be a better option, if you had information about the stability conditions? Uncertainties arising from this could be tested by trying other assumed atmospheric conditions and height adjustments and seeing to what degree they affect the delta U results. The discussion on p19 seems to contradict itself, suggesting that the height correction method should not be affected between upstream and downstream measurements as stability conditions will be similar for both (L9) but that downstream the logarithmic profile is no longer expected to be valid (L17).

P10,L25 : An anomalous result at position A05 is dismissed as a problem and not real, but can this be justified. Can the SCADA data reveal evidence for this assertion?

Comments regarding the conclusions drawn from the results:

P9,L11 : I am not satisfied by the suggestion that the lower RMSE seen downstream might be due to sample size. Lower RMSE would seem to imply that the SAR 'model ' data better fits the SCADA observations downstream.

P21, L14: The wakes study with SAR does appear to show a wind farm wake effect in the long fetch scenario, but I am not satisfied that this allows the conclusion that 'strong indications of wind farm wake effects. . .' . This is because the short fetch scenario shows no, or weak effects, and in the long fetch scenario there appears to be some unexplained wind speed up after the wind farm is constructed in the region north of the island (P14,figure 7). I think it can only be concluded that it's a promising technique and should be revisited in the future with more post wind farm SAR data.

P17,L15 : The explanation for the deviations between before and after upstream wind speeds in transect b is not at all satisfactory. There is no explanation of why transect b might be more sensitive to wind direction than say d. This theory should be further

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explored by considering any bias in the wind direction distribution between the before and after wind farm images and comparing this to the transect locations relative to the coast.

Technical Corrections:

P1, L20 : Give the date that these wind capacity numbers are valid for.

P2, L14,18 : Insert brackets around these references (name and year) for consistency with others in the paper.

P2 , L6 : "wind is causing" should be "wind causes".

P3, L2 : Missing reference

P4, L6 : Suggest inserting ", and was " between 400MW and constructed to make the sentence clearer. P4, L16: Insert "," after wind speed retrieval.

P5, L5: Explain "curtailed" for the benefit of readers from the remote sensing rather than energy community.

P5,L8 : "on at edge" should be "on the edge" or "at the edge".

P11,L6 : Number the equation and then reference it in Table 3.

P13, L18 : "with on standard error" should be "with one standard error".

P16, Figure 10 : The turbines marked in black are not clear to me.

P18, L11 : "a as" should be "as a".

P19, L24: "is experiencing" should be "experiences".

P20: L7: "approx." should be "approximately".

Interactive comment on Wind Energ. Sci. Discuss., https://doi.org/10.5194/wes-2018-2, 2018.