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Ocean Science Discussions

Interactive comment on "Characterization of ASCAT measurements based on buoy and QuikSCAT wind" *by* A. Bentamy

A. Bentamy

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I would like to thank the reviewer. I have really appreciated his/her comments that helped me to improve the manuscript. I feel really sorry about typo mistakes in the first version. I did my best to avoid any new problems in the revised manuscript. All reviewer comments were considered and responses are provided hereunder.

Reply to General Comments

Reviewer: The author indicates that local buoy measurements are not representative of area mean scatterometer winds. In literature estimates are given for such representativeness error of 1 m/s in the wind components. The A0, A1 and A2 coefficients that are derived depend non-linearly on these component errors, which is a major concern in GMF estimation. While the GMF is estimated to an accuracy of 5%, the buoy er-

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rors are much larger and their residual effects in the A0, A1 and A2 estimation crucial. The author needs to elaborate on these buoy errors and how these errors propagate in the WVC diagnostics of A0, A1 and A2. Without explanation, it is not clear what the diagnostics should tell the reader about the C-band GMF.

Reply: The reviewer is mentioning very interesting issue related to the calibration and validation of the scatterometer wind retrieval. Even if much work is needed to improve the scatterometer GMF accuracy at global scale as well as at locale scales and for various instrumental and geophysical parameters, previous studies considered the impact of the errors associated to data used as reference for the determination of GMF coefficients. (see for instance:

Bentamy A., Y. Quilfen, P. Queffeulou and A. Cavanie : Calibration of ERS-1 scatterometer C-band model. IFREMER Technical Report, DRO/OS-94-01, IFREMER, BP 70, 29280 Plouzane, 72pp, 1994.

Freilich M. H., H. Qi and R. S. Dunbar : A (Preliminary) refined Ku-band model function for NSCAT, NSCAT calibration/validation workshop report, JPL publication, 20-22 January, Honolulu, Hawaii, 1997.

Stoffelen, A. and D. Anderson, 1997: Scatterometer data interpretation: Estimation and validation of the transfer function CMOD4. J. Geophys. Res., vol. 102, 5767-5780

Mejia, C., S. Thiria, N. Tran, and M. Crépon, 1998: Determination of the Geophysical Model Function of ERS1 Scatterometer by the use of Neural Networks. J. of Geophys. Res., vol. 103, No. C6, 12853-12868

Wentz F. and D. Smith, 1999: A model function for the ocean-normalized radar cross section at 14 GHz derived from NSCAT observations. J. of Geophys. Res., vol. 104, no. C5, 11,499–11,514)

The main topic of the use of A0, A1, and A2 GMF coefficients in the present paper is to assess the consistency between references and ASCAT backscatter coefficient

OSD

5, S33–S39, 2008

measurements. As stated in section 3.1 “Data coherency”: The topic is to investigate the ability of buoy surface wind measurements or QuikSCAT wind observations to retrieve the main characteristics of ASCAT backscatter coefficient measurements. The former are considered through the comparisons between GMF coefficients behaviors derived from measurements or from CMOD5. Figure 1 shows that the observed and simulated coefficients agree well even if some departures are clearly found, especially for A1. To meet the reviewer requirements, the collocated buoy data are taken as true winds and perturbed by adding random noise (centered Gaussian with standard deviation of 1m/s) to their components. The resulting winds are used to estimate A0, A1, and A2. In order to investigate the propagation of buoy wind error through GMF coefficients, comparisons are performed between A0, A1, and A2 estimated from true and noise buoy winds. The following figure shows the behavior of the relative error (mean square difference between the two estimates reported to the mean of true coefficients) as a function of ASCAT incidence angle and for three true buoy wind speed ranges. It indicates that the adding noise has little impact on the GMF coefficients. Indeed, the relative error does not exceed 0.1%.

Rq: Figure may be provided to the reviewer

Reviewer: The ASCAT scatterometer wind product has been stable since its very start. All EUMETSAT backscatter calibrations have been counteracted by corrections at KNMI as reported in their Cal/Val report. The KNMI corrections are based on at EUMETSAT parallel processed ASCAT backscatter data, and were found to be just linear scaling corrections in backscatter to a precision well within 1%. The wind product is monitored by the NWP SAF and KNMI on public web sites www.metoffice.gov.uk/research/interproj/nwpsaf/scatter_report/ascat.html and www.knmi.nl/scatterometer , resp., confirming this stability. In 2007 changes occurred in the ECMWF analyses though, when the ASCAT winds were introduced. With the above information in mind, it appears more likely that the author reports on a changing reference, ECMWF, rather than changes in ASCAT. Anyway, comparing to depen-

OSD

5, S33–S39, 2008

dent ECMWF analysis data is of little scientific interest.

Reply: Thanks for these interesting and valuable information. In the third paragraph of page 3 I am referring to message sent by Anton Verhoef from KNMI.: “ As of today, 17 October, the OSI SAF ASCAT 25-km wind product has the pre-operational status. On 10 October, the L1 ASCAT processing was upgraded, utilizing the results of a sigma0 calibration campaign using one transponder on the ground. The influence of this calibration change on the winds was carefully considered and the sigma0 correction factors used in the wind processing were adapted. The wind processing was upgraded accordingly on 10 October, as well. More information on this can be found in the calibration report, available on http://www.knmi.nl/scatterometer/publications/pdf/ASCAT_calibration.pdf.”

Change: Page 6, 2nd paragraph: ECMWF wind analyses are available four times a day (00h:00; 06h:00; 12h:00; 18h:00 UTC) on regular grid over the global ocean. The spatial resolution is 0.50° in longitude and latitude. ASCAT retrievals are routinely monitored at ECMWF since February 2007. They are used within ECMWF assimilation process since 12th June 2007. Therefore, ASCAT and ECMWF collected after 12th June 2007 are not fully independent

Reviewer: p78l4: "with a spatial resolution" -> "on a spatial grid" ; the spatial resolution is 50 km

Reply: Thanks

Change: Change is done

Reviewer: p79l20,21: "with two spatial resolutions" -> "on two spatial grids" ; the spatial resolutions are 50 and 25 km respectively. Reply: Thanks Change: Page3, 1st paragraph: Two Backscatter coefficient spatial resolutions are available over global ocean: 25km and 12.5km. Only the low resolution is used in this paper. Reviewer: P81l9,10: TAO buoys are averaged over one hour while the NDBC and UK-MF buoys

OSD

5, S33–S39, 2008

are averages over 10 minutes. 10-minute averages can be more extreme than hourly averages and thus represent different measurements; why is the averaging performed? Would uniform measurement characteristics not be better for comparison? If the author is concerned about the time difference between the scatterometer and the buoys he may test with smaller collocation time differences. Reply: Thanks to the reviewer for this valuable comment. The description of time sampling of buoy wind data is somewhat confusing. NDBC and MFUK buoy data are averaged over a period of 8-minutes prior the hour. They are reported hourly. TAO wind data are averaged over a period of 2-minutes and only reported every 10-minutes. I have reprocessed the statistical parameters provided in table 1, using only the closest TAO 10-minute averaged data from the hour. Due to the temporal scale of surface wind in the tropical area, the impact is not significant. For instance there is no change in bias and the rms difference increases from 0.79m/s to 0.80m/s.

Change: Pages 4 – 5: The quite small number of TAO buoys is related to the use of high-resolution wind measurements available only as off-line data. NDBC and MF-UK winds are averaged over a period of 8-minutes and reported hourly, while TAO winds are 2-minute averaged and only reported each 10-minutes. For buoy and ASCAT comparison issues, only the closest valid TAO 10-minute averaged data from the hour are considered.

Reviewer: P81l19: Why is the collocation time window 1 hour when the measurements are hourly; +/- 30 minutes would be sufficient to capture all buoys.

Reply: The temporal collocation criterion is used to enhance the sampling length. Indeed, Previous studies, particularly related to the calibration and validation of remotely sensed winds, showed that hourly successive winds are highly correlated

Reviewer: P82l7: "resolution" -> "grid"; the DIRTH filters out small scales and thus increases resolution length scale beyond the swath grid.

Reply: Correction is added.

OSD

5, S33–S39, 2008

Change: Page 5, Line 25.

Reviewer: To collocate two 25-km grids, a 18-km collocation distance is sufficient; why is 50 km used ?

Reply: The main reason is to capture all significant matchups with respect to ASCAT and QuikSCAT wind retrievals procedures. Increasing the spatial criterion to 50km, improves the sampling length of collocated data in tropical and mid latitudes areas. As indicated in the in the paper, only the closest data are used for comparison purposes

Reviewer: Why use ECMWF analyses that use the very ASCAT and QuikScat observations that you try to validate? Comparison to short-range ECMWF forecasts would prevent this.

Reply: One the main reason is we are dealing with the use of satellite and ECMWF analyses (including winds) to improve the forcing ocean circulation function (see for instance Ayina et al, 2006). Such topic request to assess the comparisons between the two sources at various scales. Furthermore, previous studies (Chelton et al, 2005; Bentamy et al, 2007) have indicated that even if ECMWF analyses use QuikSCAT observations, significant departures are found.

Reviewer: P84l16: "predicated" -> "predicted"

Reply: Thanks

Change: Correction is done

Reviewer: Table 1: second column: what speed boundaries are used? ASCAT, reference speed, or the average of both?

Reply: Wind speed boundaries are determined from buoys (See page 9, 2nd paragraph).

Reviewer: Table 2: ASCAT and QuikScat are used in ECMWF analyses; the reference data are thus dependent?

OSD

5, S33–S39, 2008

Reply: The reviewer is right for ASCAT and ECMWF data occurred after 12th June 207.

Change: Page 11, last paragraph: The statistical parameters characterizing the wind speed and direction comparisons performed over the global ocean as well as over some specific oceanic regions are summarized in Table 2. They are calculated from spatial and temporal collocated data during the second period. On average, ASCAT and ECMWF wind differences exhibit quite low bias at global and regional scales. Such result may be related to the use of ASCAT in ECMWF analysis process.

Interactive comment on Ocean Sci. Discuss., 5, 77, 2008.