QUALITY INFORMATION DOCUMENT

For the Global Ocean Wind Products

WIND_GLO_WIND_L4_REP_OBSERVATIONS_012_003

Issue: 2.1

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CHANGE RECORD

Issue	Date	§	Description of Change	Author	Validated By
2.1	2017-01-22	All	Creation of the document, Wind QUID split up from the SIW QUID.	Abderrahim Bentamy	Abderrahim Bentamy

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EXECUTIVE SUMMARY

Products covered by this document

This document describes the quality of the updated wind field climatology, estimated as L4 product (WIND_GLO_WIND_L4_REP_OBSERVATIONS_012_003) using daily averaged scatterometer wind analyses. The wind variables include monthly averaged wind speed, zonal and meridional wind components and wind stress amplitude. Daily wind fields are provided by IFREMER and calculated based on the use of ASCAT-A/B scatterometer retrievals and objective method. Scatterometer data are made available by the operational Ocean and Sea Ice Satellite Application Facility (OSI SAF) of EUMETSAT. This document reports the quality of monthly wind estimates calculated for the extended period 2012 through 2016.

Product	*Product description*	*Production unit, PU*	*Dissemination unit DU*
WIND_GLO_WIND_L4_REP_OBSERVATIONS_012_003	Global ocean wind climatology L4	OSI-IFREMER-BREST-FR	CNR-ISAC-GOS (Roma)

Table 1 : OSI TAC Wind products and partner roles.

Summary of the results

The investigations of the quality of the objective method, used to estimate the gridded wind fields, the resulting monthly wind estimates, and of the operational procedure are checked as follows:

- Determination of monthly wind product accuracy through comprehensive comparisons with monthly winds from available moored buoy data. The latter are derived from various buoy networks: NDBC/NOAA (Atlantic, Pacific oceans), UK Met Office and Météo-France (Atlantic and Mediterranean Sea), TAO (Tropical Pacific), PIRATA

(Tropical Atlantic), and RAMA (Indian Ocean). Comparisons are performed for November 2015. The biases for wind speed as well as for wind direction are quite low. The associated standard deviations do not exceed 0.65m/s and 15°, respectively. The scatter and vector correlation coefficients for wind speed and direction are higher than 0.95 and 1.85, respectively.

- Assessment of climatology wind product quality based on comparisons with spatially and temporally collocated ASCAT retrievals. The former are performed over global ocean to characterize L4 and ASCAT wind speed and direction agreements. The comparisons indicate that monthly wind speed and wind components are in good agreement with the remotely sensed ones. Collocated data are used for comparisons purposes. The overall statistics characterizing ASCAT and monthly collocated data comparisons indicate that the biases are close to zero and the standard deviation (std) values are less than 1 m/s. The correlation coefficients exceed 0.95. It is noticeable that zonal and meridional components have similar behaviours. Furthermore, ASCAT and climalogy exhibit better agreements than those drawn from ASCAT and ECMWF forecast comparisons.
- Quality control of each netcdf file geophysical content is performed based on the calculation of the statistical parameters characterizing the difference between L4 wind speed and direction data and the related ECMWF analysis. Only files such as differences between L4 and ECMWF data indicate significant discrepancies are checked. The statistical parameter time variabilities are quite steady. For instance, wind speed bias, standard deviation, and correlation are of 0.20m/s, 0.60m/s, and 0.96, respectively, along the study period.

VALIDATION FRAMEWORK

Validation is a continuous on going activity to characterize accuracy and quality of the delivered sea ice and wind products. It is mainly be based on operational data, but can be supported by campaign data

Each PU is responsible for validation of their products. The OSI TAC Validation activities are for the most based on what is already implemented at the partners' institutes and has shown to be useful.

Description of validation data and procedures and link to validation results for each product are given in the next sections.

Procedure

The subsystem performance and associated product quality are scientifically assessed in the following way:

- Determination of L4 monthly wind products accuracy through comprehensive comparisons with monthlly winds from available and valid moored buoy data. The latter are derived from various buoy networks: NDBC/NOAA (Atlantic, Pacific oceans), UK Met Office and Météo-France (Atlantic and Mediterranean Sea), TAO (Tropical Pacific), PIRATA (Tropical Atlantic), and RAMA (Indian Ocean). More than 190 buoy raw data are routinely collected, investigated, and collocated in space and time with monthly satellite estimates. The main statistical parameters, including the first four conventional moments and the linear regression parameters, will be estimated and provided. The differences between buoy and L4 wind products are investigated according to geographical locations (e.g. off-shore, coastal, high-latitudes, mid-latitudes and tropical areas). For further assessment of L4 product accuracy, statistics related to monthly buoy and satellite are provided too.

- Scatterplots and the related statistical parameters (bias, rms, correlation, linear regression coefficients) illustrating the comparison between L4 global ocean wind and available and validated buoy wind speeds and directions.
- At global scale the quality of each L4 monthly wind product is assessed based on comparisons with spatially and temporally collocated scatterometer (e.g. ASCAT-A/B) retrievals.
- Determination of global maps of differences between monthly satellite wind product and the associated ECMWF analysis. Maps illustrate the bias, rms difference and correlation coefficient spatial patterns for wind speed, zonal, and meridional components.
- Time series of differences between monthly satellite wind product and the associated ECMWF analysis. They deal with bias, rms difference and correlation coefficient for wind speed, zonal, and meridional components.
- Summary of the results characterising L4 wind product (wind speed, zonal and meridional components) and ECMWF analysis.
- Quality control of each netcdf file geophysical content is performed based on the calculation of the statistical parameters characterizing the difference between L4 wind speed and direction data and the related ECMWF analysis. Only files such as the difference frequency exceeding three times of standard deviations is higher than 10% will be checked. According to the finding, the monthly wind field could be reprocessed.

Result summary

Comparisons of monthly NDBC buoy and scatterometer data

The quality of the resulting wind fields is investigated trough comprehensive comparisons with monthly averaged wind estimated derived from buoy measurements. Comparisons are performed for coastal buoy (located less than 50km from coastline) and for

offshore buoys. Figure 1 illustrates the results obtained from collocated, in space and time, offshore buoy and L4 V5 wind data occurring during the extended period : January 2012 through March 2016.

Table1 and Figure 1 indicate that for offshore comparisons, no systematic departures are depicted and for most wind variable bins, the collocated data are close to the perfect line. The associated errors are lower than 1m/s and 20° for wind speed and direction, respectively. The significant bias is found for buoy wind speeds less than 4m/s. Indeed, L4 wind speeds tend to be slightly overestimated compared to in-situ data due to differences in spatial representation and binning. Table 1 summarizes the related statistical parameters: mean (Bias) and standard deviation (Std) of buoy minus scatteromter data, scalar and vector correlation coefficients (Cor) for wind speed and direction, respectively. One should notice that for wind direction vector correlation is provided in Table 1. The overall statistics indicate that monthly satellite wind fields compare very well to averaged buoy data. The rms differences do not exceed 0.50m/s and 15°, for wind speed and direction, respectively. For in-situ and scatterometer winds higher than 3 m/s no significant bias trend is found. The wind direction bias is relatively small. The results obtained from comparisons performed based on the use of collocated coastal buoys are lower than those found for offshore buoys..

Table1: Statistical parameters characterizing differences between monthly averaged NDBC buoy and scatterometer wind speed and direction estimates for the period January 2012 – March 2016. Std and Cor stand for standard deviation and correlation, respectively. Statistics are only provided for offshore areas.

		Wind Speed			**Wind Direction**		
	Length	Bias (m/s)	Std (m/s)	Cor (scalar)	Bias (deg)	Std (deg)	Cor (Vector)
OffShore(>=50km)	1070	0.01	0.42	0.97	-2	14	1.87

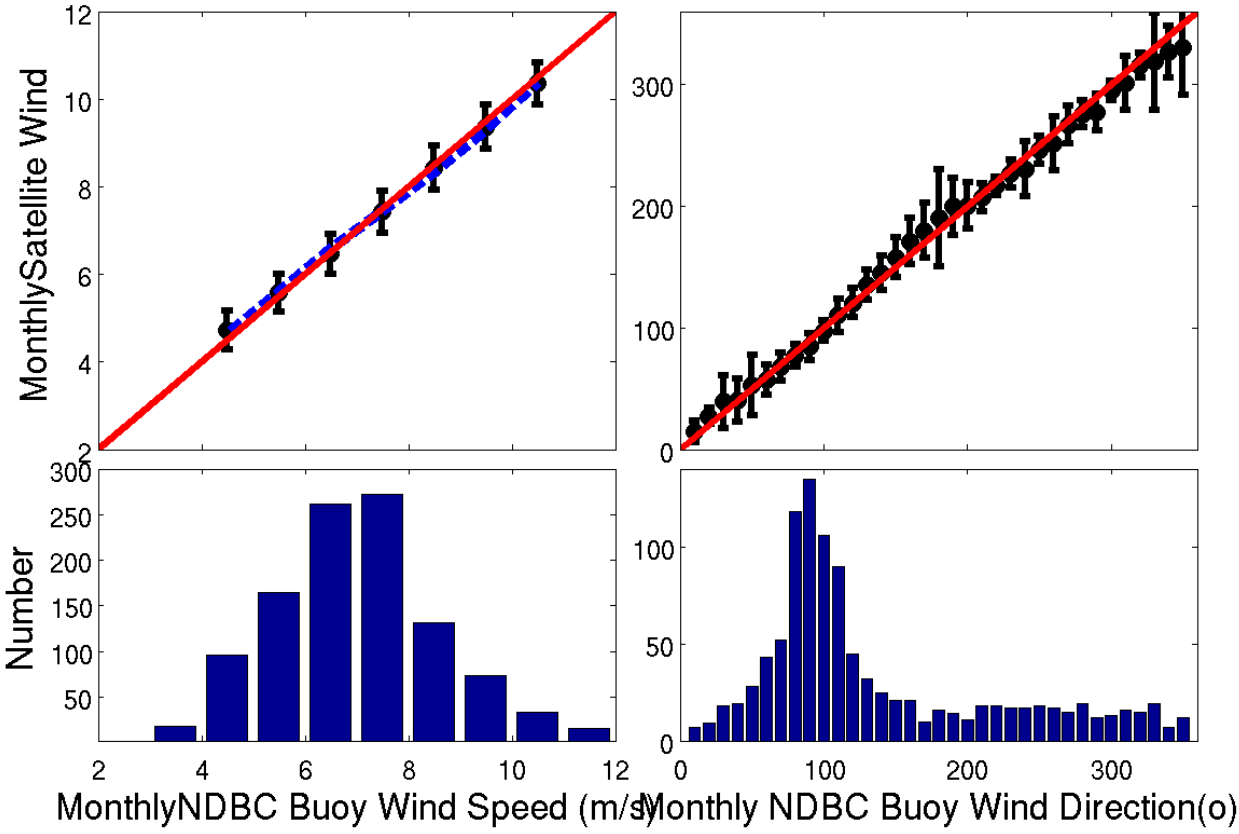

Figure 1 : Comparison of monthly wind speeds (left column) and wind direction (right column) from L4 winds versus offshore NDBC buoy winds. panels on top show comparison results for the buoy wind speed binned in 1m/s and 20° bins. The dashed blue line indicates the results obtained for the 1m/s binned monthly wind speeds. One standard deviation values estimated for each bin are also shown.

Monthly Scatterometer and ECMWF wind Comparisons (Long term quality control)

The quality control of geophysical content of climatology wind files is performed based on the calculation of the statistical parameters characterizing the difference between monthly wind speed, zonal, and meridional wind component estimated from scatterometer data and from ECMWF analysis. Figure 2 shows time series of difference (sccatterometer – ECMWF) biases (top) and the related standard deviations (middle), and of correlation coefficients

(bottom). Times series are shown for wind speeds (red colour), zonal component (blue colour), and for meridional component (black colour) determined for the period January 2007 – March 2016. The statistical parameter time variabilities are quite steady. For instance, wind speed bias is about 0.20m/s, resulting from the difference between equivalent neutral wind (scatterometer) and real wind (ECMWF). The standard deviation variation tends to be seasonal related and is mostly lower than 0.60m//S. The wind speed correlation varies between 0.95 and 0.98 according to season.

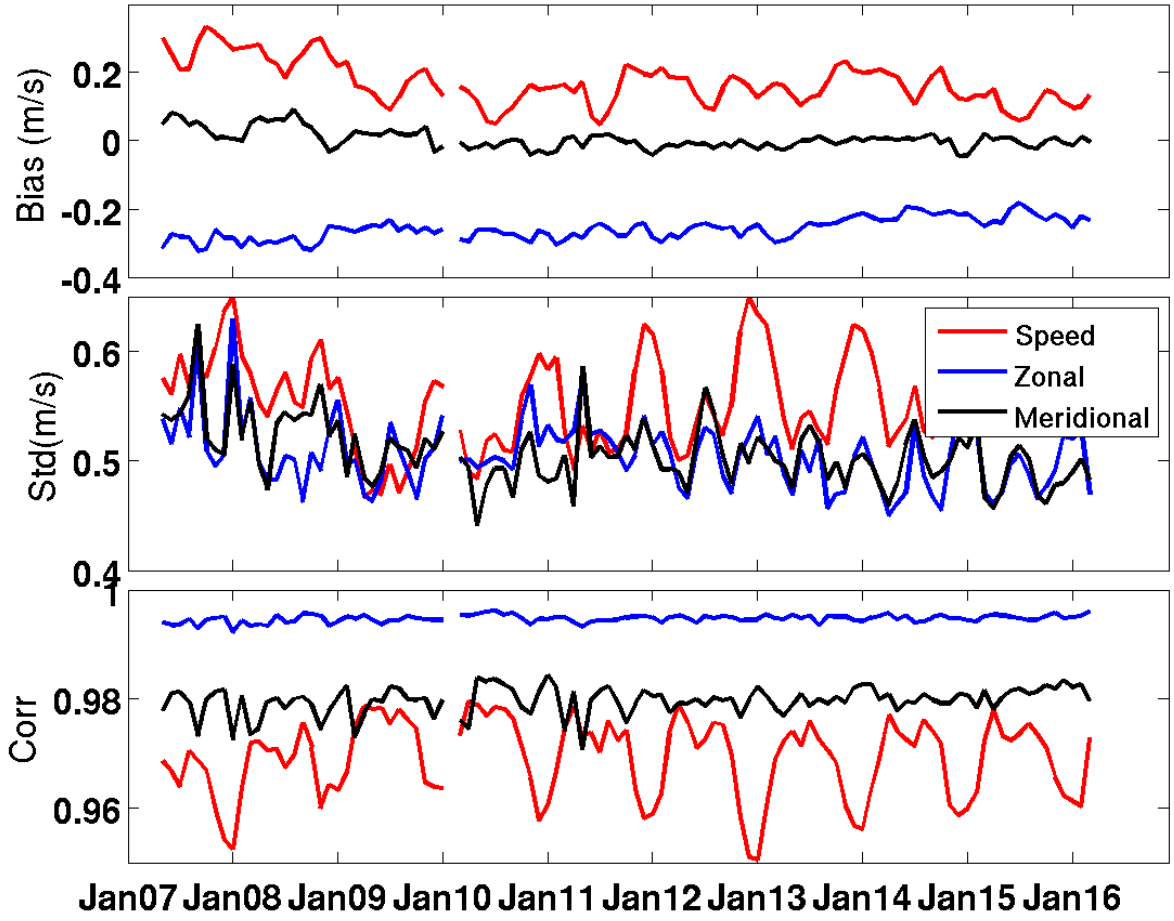

Figure 2 : Time series (January 2017 – March 2016) of statistical parameters characterizing monthly scatterometer and ECMWF wind comparisons over global ocean. Top through bottom panels show time series of biases (Scatterometer –ECMWF in m/s), standard deviations (m/s), and correlation coefficients, respectively.