Blended Sea Surface Winds Product

1. Intent of this Document and POC

1a. Intent
This document is intended for users who wish to compare satellite derived observations with climate model output in the context of the CMIP/IPCC historical experiments. Users are not expected to be experts in satellite derived Earth system observational data. This document summarizes essential information needed for comparing this dataset to climate model output. References are provided at the end of this document to additional information.

Dataset File Name (as it appears on the ESGF):
TBD

1b. Technical Point of Contact for this dataset
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2. Data Field Description

CF variable name, units	**TBD**
Spatial resolution	1/4° (~25 km) rectangular grid
Temporal resolution	Six (6) Hourly, Daily, Monthly, July. 1987 - present (ongoing)
Coverage	Global Ocean Domain

3. Data Origin

Details can be found from the dataset website (https://www.ncdc.noaa.gov/data-access/marineocean-data/blended-global/blended-sea-winds) and references cited there. The Blended Sea Winds dataset contains globally gridded, high-resolution ocean surface vector winds and wind stresses on a global 0.25° grid, and multiple time resolutions of six-hourly, daily, monthly, and 11-year (1995–2005) climatological monthlies. The period of record is July 9, 1987, to present. Blending observations from multiple satellites (up to six satellites since June 2002) allows for the creation of gridded wind speeds. The wind directions come from two sources depending on the products: for the research delayed mode product, the source is the National Centers for Environmental Prediction (NCEP) Reanalysis 2 (NRA-2) and for the near-real-time products, the source is the numerical weather prediction of the European Centre for Medium-Range Weather Forecasts.

Blending multiple-satellite observations fills in the data gaps (in both time and space) of the individual satellite samplings and reduces the subsampling aliases and random errors. These products were developed in response to the demand for increasingly higher resolution global datasets. For example, scientists want to improve the accuracy of their forecasts of ocean and weather conditions. Links to articles on the high-resolution feasibility study and the blending methodology are available in the Bibliography section below.

Please note that these are research products, and thus, are experimental in nature. Users are encouraged to register (link is external) to receive update notices and to provide comments.

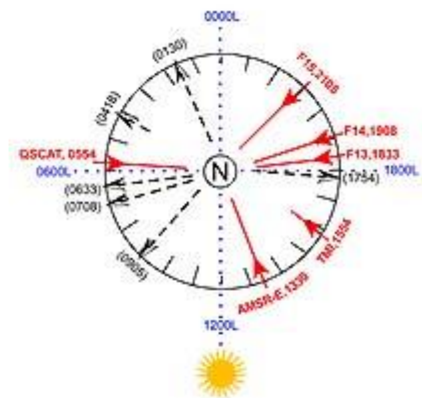

Figure 1. Blending observations from multiple satellites (up to six satellites since June 2002) allows for the creation of gridded wind speeds.

4. Validation and Uncertainty Estimate

A validation study can be found in a peer-reviewed publication:

Peng, G., H.-M. Zhang, H.P. Frank, J.-R. Bidlot, M. Higaki, S. Stevens, and W.R. Hankins, 2013: Evaluation of various surface wind products with OceanSITES buoy measurements. *Weather and Forecasting*, **28**, 1281–1303, doi:10.1175/WAF-D-12-00086.1(link is external).

5. Considerations for Model-Observation Comparisons

In the early days of the dataset (July 9, 1987–December 7, 1990), only the SSMI F13 satellite was available to provide data and at times retrieving data from it failed. In particular, no observational data is available from December 3, 1987 to January 12, 1988, and thus all values for that period are “bad” = -9999 globally.

The global 0.25-degree gridded products were generated using a Gaussian-like interpolation with a spatial radius of 62.5 km. The interpolations were done over the global 0.25-degree grid. No cleaning has been done over land along the coast (+/- 0.25 degree) because some users want this information for coastal applications. A topographic dataset on the blended wind grid is provided.

We are aware of the noisy stress, and a new version of the wind stress data is in progress. The data currently provided are calculated by scaling the NCEP Reanalysis 2 (NRA2) stress by the ratio of blended satellite wind speed of the NRA2 wind speed squared (for stress). Thus, in areas where NRA2 winds are near zero while the Blended Seawinds are not near zero, you will see "geophysically unrealistic wind stress." The NRA2 also contains noisy stresses. In the future, the wind stress will be computed using the COARE3.0 bulk formula. This will avoid nearly all of the issues with unrealistic air-sea fluxes associated with NWP and climate models. Turbulent air-sea heat fluxes will also be available.

6. Instrument Overview

The Blended Seawinds are currently generated by blending observations from multiple satellites. The timeline of the long-term US sea surface wind speed observing satellites is shown in Figure 2. Note that in this long-term assessment study, we have not used the short-lived wind satellites (e.g., the US National Aeronautics and Space Agency Scatterometer (NSCAT), the joint US/Japan SeaWinds on the Advanced Earth Observing Satellites (ADEOS) I & II), non-US satellites (e.g., the European Remote Sensing Satellites (ERS) −1 and 2, which have narrow observing swaths and interrupted observations), and satellites from which sea surface wind speed can also be retrieved (presently with less accuracy) along with the primary product of sea level (e.g., the joint US/French altimetry satellites of Ocean Topography Experiment (TOPEX)/Poseidon and the follow-on Jason).

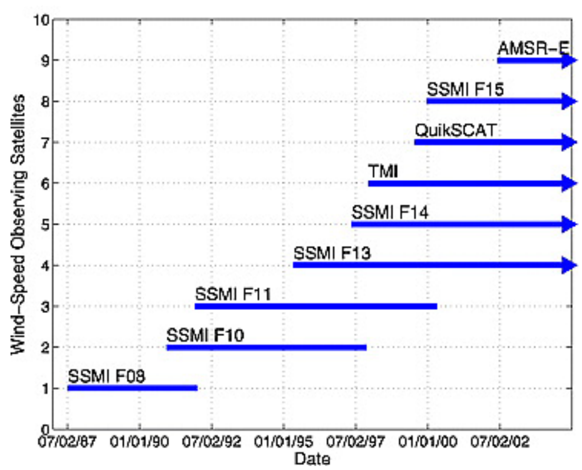

Figure 2. Timeline of the long-term US sea surface wind speed satellites used in this study.

Among the satellites in Figure 1, the passive DMSP observations are from the microwave radiometers on the Special Sensor Microwave Imager (SSMI [*Hollinger et al.*, 1987; *Wentz*, 1997]). Later additions to these passive microwave observations are the Tropical Rainfall Measuring Mission (TRMM) Microwave Imager (TMI [*Kummerow et al.*, 1998]) and the

Advanced Microwave Scanning Radiometer of NASA's Earth Observing System (AMSR-E [e.g., *Wentz and Meissner*, 1999]). The scatterometer (e.g., the Quick Scatterometer (QuikSCAT)), which is active by nature, uses microwave radar and retrieves both wind speed and wind direction [e.g., *Dunbar et al.*, 1991a, 1991b; *Liu et al.*, 1998].

The individual satellite data were obtained from the Remote Sensing Systems (RSS), Inc. [e.g., *Wentz*, 1997]. The RSS data were chosen for their uniformity of the retrieval algorithms for the multiple satellites over the whole time period, and for their wide use in producing various air-sea turbulent fluxes [e.g., *Chou et al.*, 2003, and references therein].

7. References

<u>Primary References</u>

Zhang, H.-M., J. J. Bates, and R. W. Reynolds, 2006: Assessment of composite global sampling: Sea surface wind speed, Geophysical Research Letters, 33, L17714, http://dx.doi.org/10.1029/2006GL027086(link is external).

Zhang, H.-M., R.W. Reynolds, and J.G. Bates, 2006: Blended and gridded high resolution global sea surface wind speed and climatology from multiple satellites: 1987–present. 14th Conference on Satellite Meteorology and Oceanography, Atlanta, GA, American Meteorological Society, Paper 100004. [Available online at https://ams.confex.com/ams/Annual2006/webprogram/Paper100004.html(link is external).]

Peng, G., H.-M. Zhang, H.P. Frank, J.-R. Bidlot, M. Higaki, S. Stevens, and W.R. Hankins, 2013: Evaluation of various surface wind products with OceanSITES buoy measurements. Weather and Forecasting, 28, 1281–1303, doi:10.1175/WAF-D-12-00086.1(link is external).

<u>Other relevant references</u>

Chou, S. H., E. Nelkin, J. Ardizzone, R. M. Atlas, and C. L. Shie (2003), Surface turbulent heat and momentum fluxes over global oceans based on the Goddard satellite retrievals, version 2 (GSSTF2), J. Clim., 16, 3256–3273.

Dunbar, R. S., S. V. Hsiao, and B. H. Lambrigtsen (1991a), Science algorithm specifications for the NASA Scatterometer Project: Sensor Algorithms, JPL D-5610-1, Jet Propul. Lab., Pasadena, Calif.

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Hollinger, J., R. Lo, G. Poe, R. Savage, and J. Pierce (1987), Special Sensor Microwave/Imager's user's guide, technical report, 120 pp., Nav. Res. Lab., Washington, D. C.

Kummerow, C., W. Barnes, T. Kozu, J. Shiue, and J. Simpson (1998), The Tropical Rainfall Measuring Mission (TRMM) sensor package, J. Atmos. Oceanic Technol., 15, 809–817.

Liu, W. T., W. Tang, and P. S. Polito (1998), NASA scatterometer provides global ocean-surface wind fields with more structures than numerical weather prediction, Geophys. Res. Lett., 25(6), 761–764.

Wentz, F. J. (1997), A well-calibrated ocean algorithm for SSM/I, J. Geophys. Res., 102(C4), 8703–8718.

Wentz, F. J., and T. Meissner (1999), AMSR Ocean Algorithm, version 2, Tech. Rep. 121599a, Remote Sens. Syst., Santa Rosa, Calif.

8. Dataset and Document Revision History

Rev 0 - August 2017
This is a new document for NCEI Obs4MIPs project.