



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure
and Water Management*

Scatterometer-model wind bias statistics for different instruments and other factors

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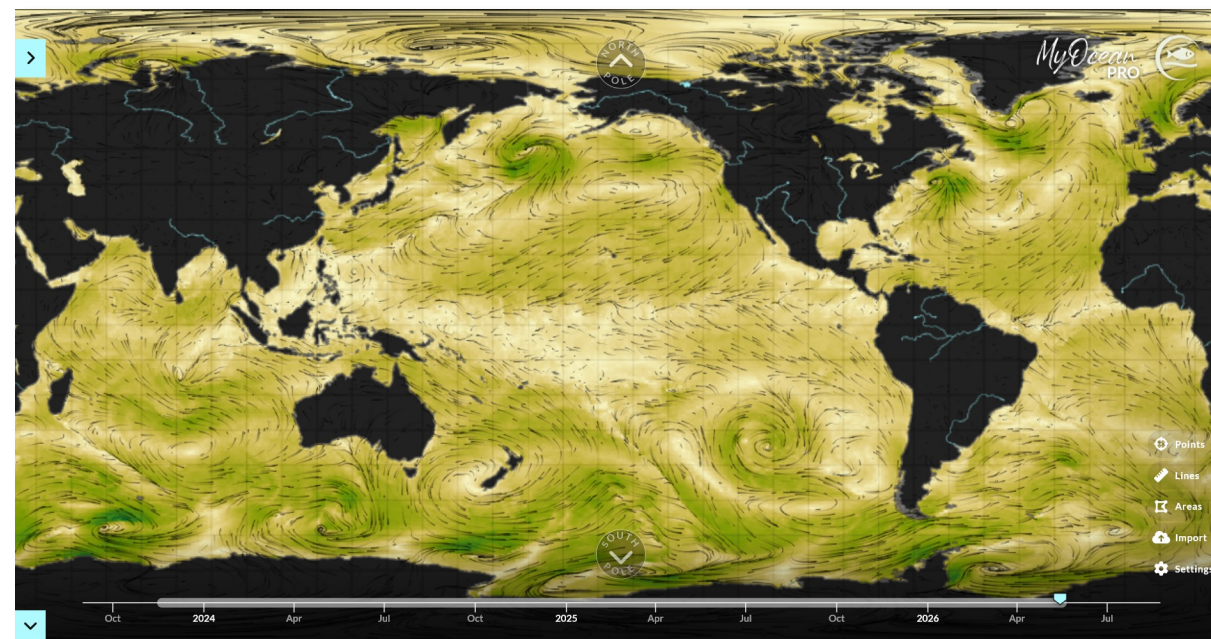


Motivation

- ▶ KNMI produces L3 and L4 global wind products for the Copernicus Marine Service
- ▶ The L4 products provide bias-corrected ECMWF model fields based on scatterometer observations
- ▶ Bias corrections in the near real-time product are currently based on Metop-B and Metop-C ASCAT

- ▶ **Can we use additional scatterometers to further optimize the L4 NRT product?**

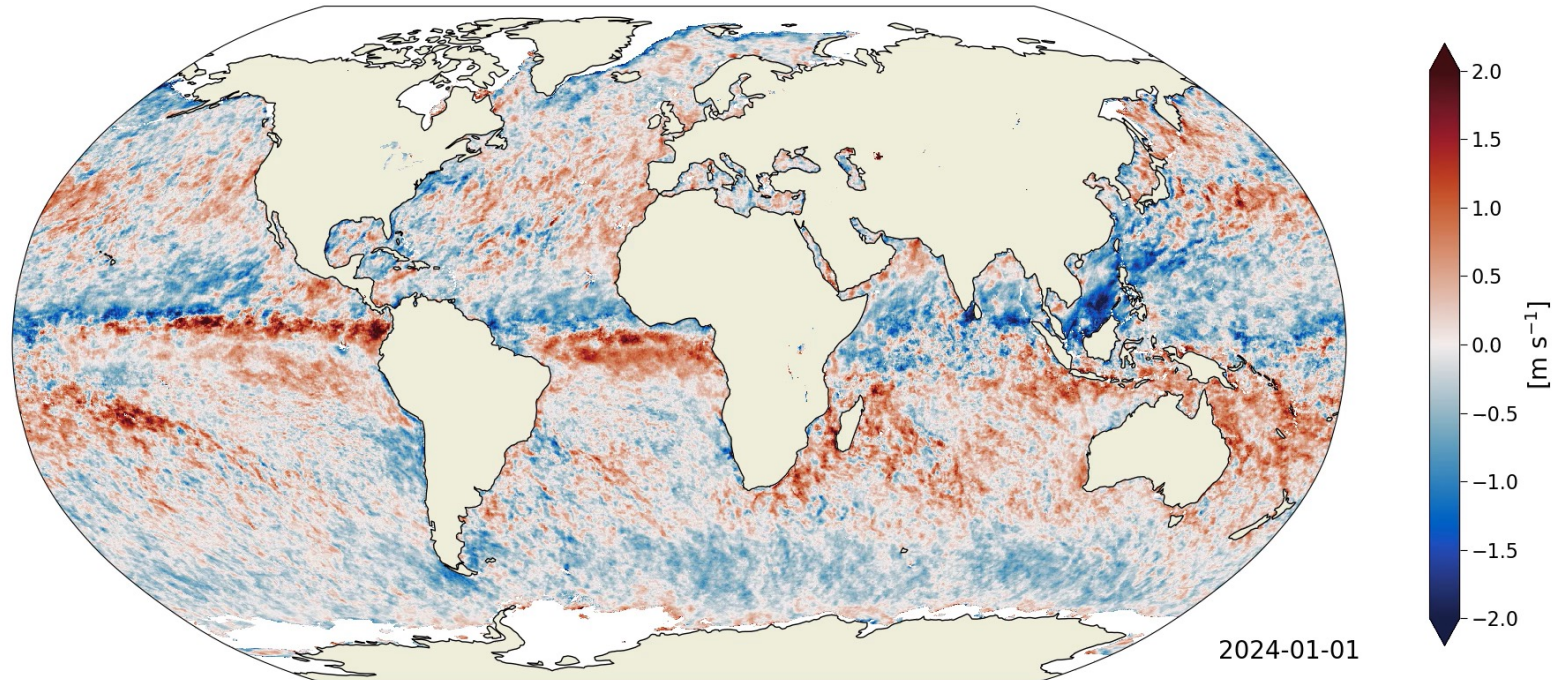
The screenshot shows the Copernicus Marine Data Store interface. The header includes the title "Copernicus Marine Data Store" and navigation links for "Home" and "Marine Data Store". Below the header, there are search filters for "FREE-TEXT SEARCH", "TIME RANGE", "DEPTH RANGE", "UNIVERSE", "MAIN VARIABLES", "ALL VARIABLES", "AREA", "FEATURE TYPE", and "TEMPORAL RESOLUTION". The main content area displays "Products 5 in Copernicus Marine Service" with a grid of product thumbnails. Each thumbnail includes a title, a small map preview, and technical details such as the product ID, model, satellite, and temporal resolution.





L4 NRT scatterometer correction

- ▷ 20-day averaged difference between scatterometer observations and collocated ECMWF model winds
- ▷ Combination of Metop-B and Metop-C ASCAT ascending and descending passes
- ▷ Collocated ECMWF winds are interpolated in space and time within model forecast lead range [+3, +15]

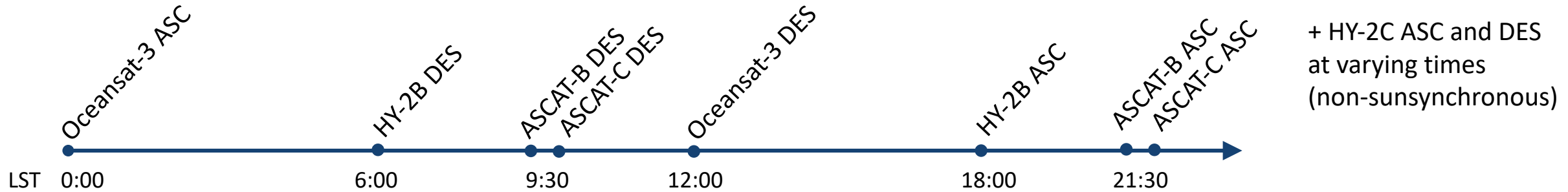


20-day average
meridional wind bias
(ASCAT-B+C - ERA5)
[Jan-Dec 2024]

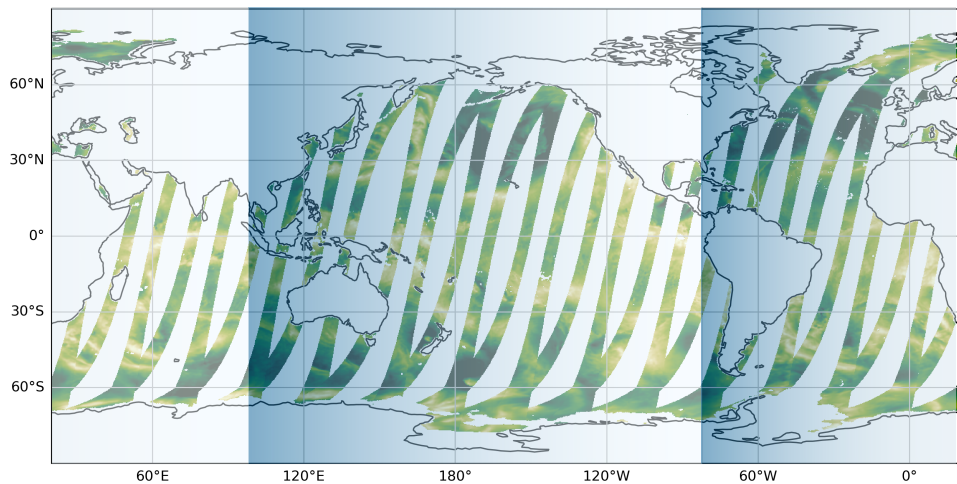


Scatterometer virtual constellation

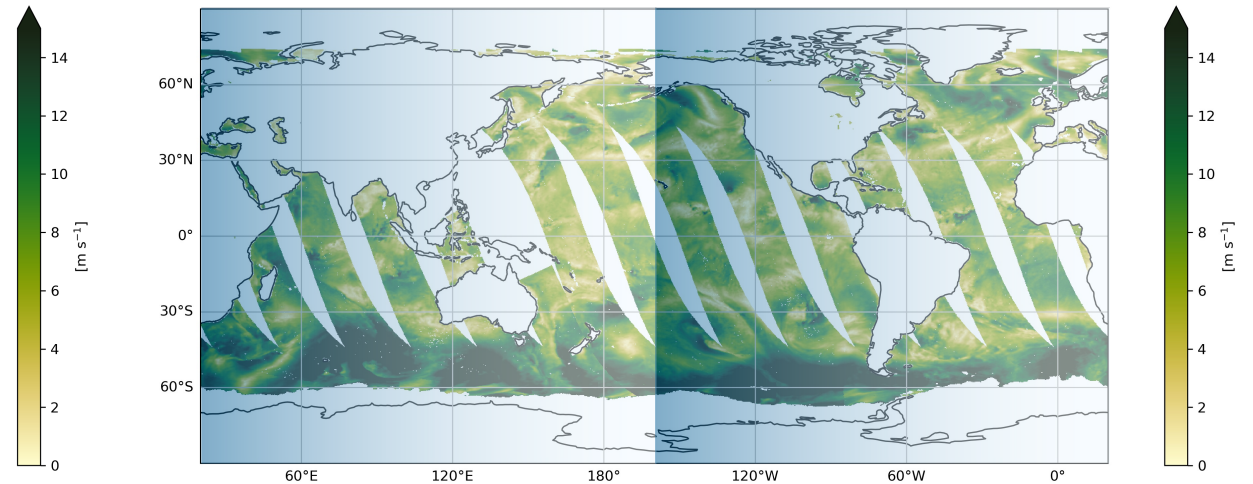
- ▷ Different instruments (e.g. frequency, equator crossing time, orbit type)
- ▷ Overpass time determines the local ECMWF model forecast lead time used for bias calculations



Metop-C ASCAT DES



HY-2C HSCAT DES



+15 Forecast lead time +3

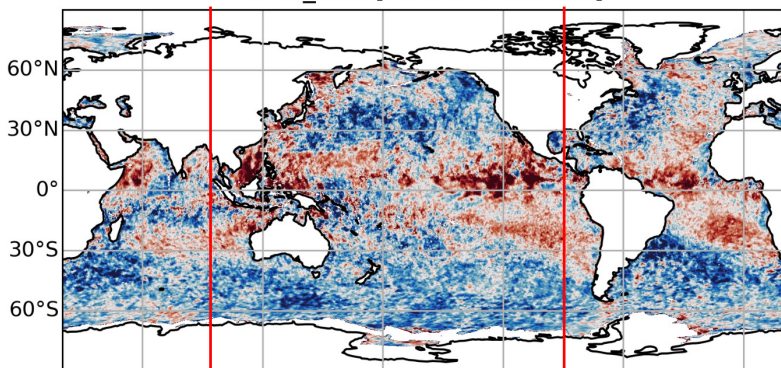


Spatial bias differences

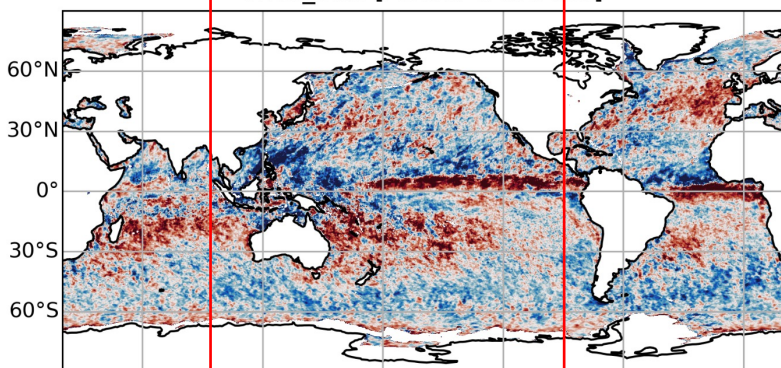
20-day average wind bias
(scat – ECMWF OPS)
[1-20 Jan 2026]

► Bias differences between scatterometers are considerably smaller than the biases themselves

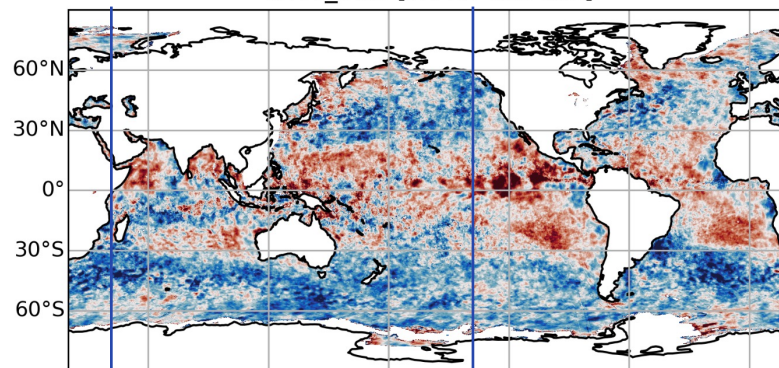
u10s_bias [ASCAT-C asc-des]



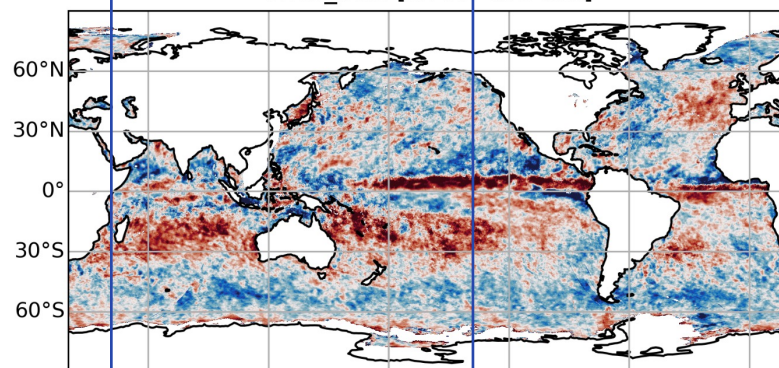
v10s_bias [ASCAT-C asc-des]



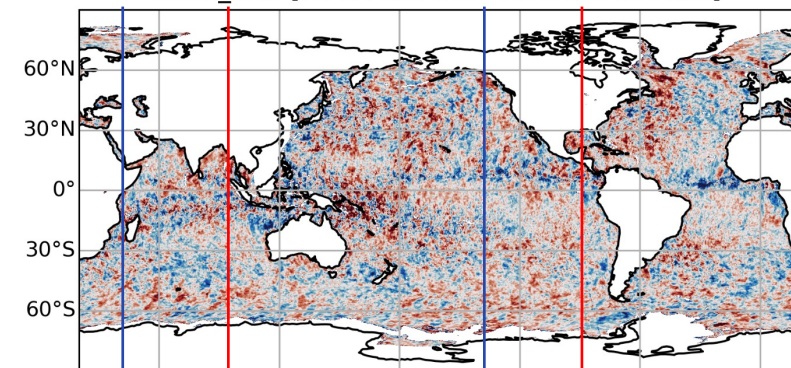
u10s_bias [HY-2B asc-des]



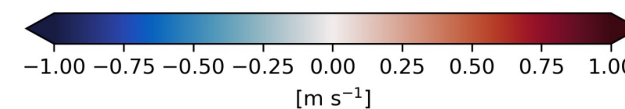
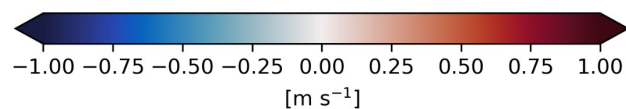
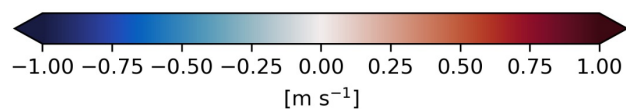
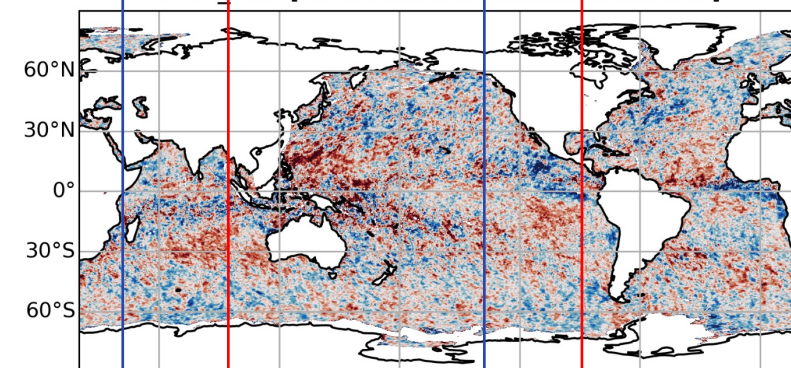
v10s_bias [HY-2B asc-des]



u10s_bias [HY-2B asc-des - ASCAT-C asc-des]



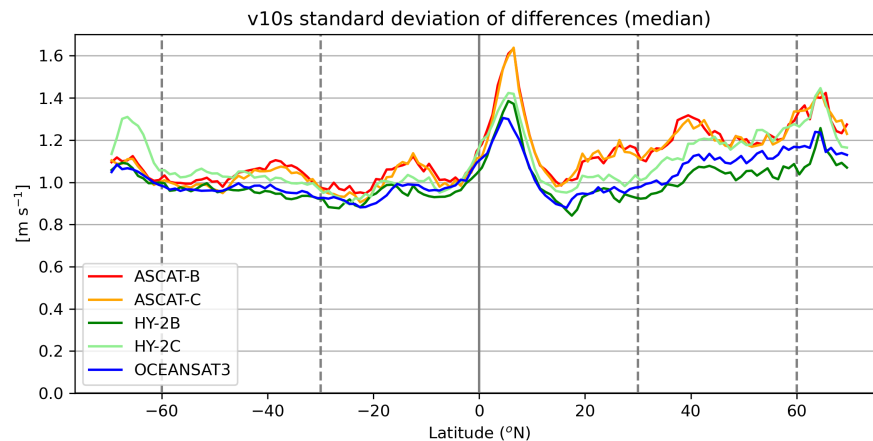
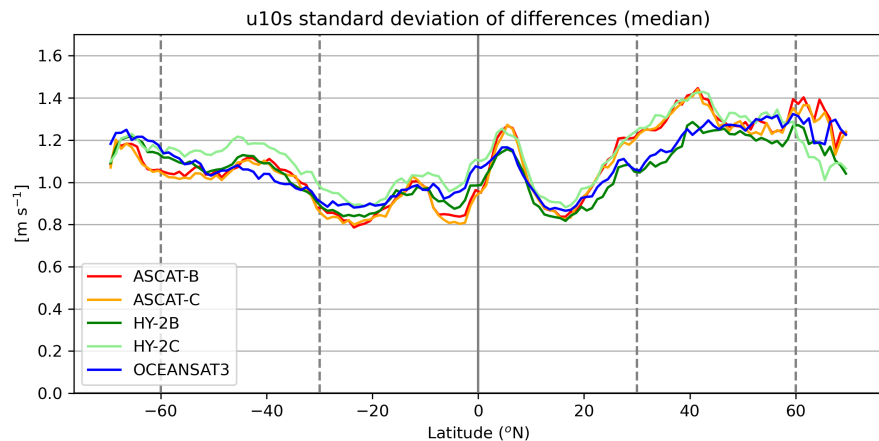
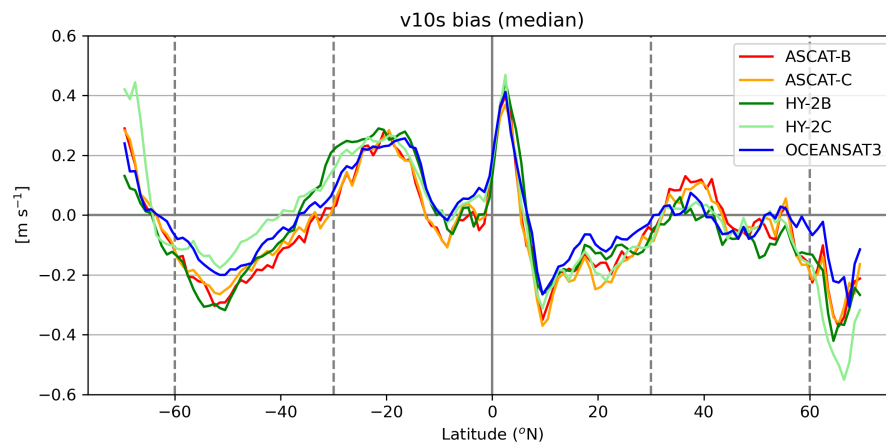
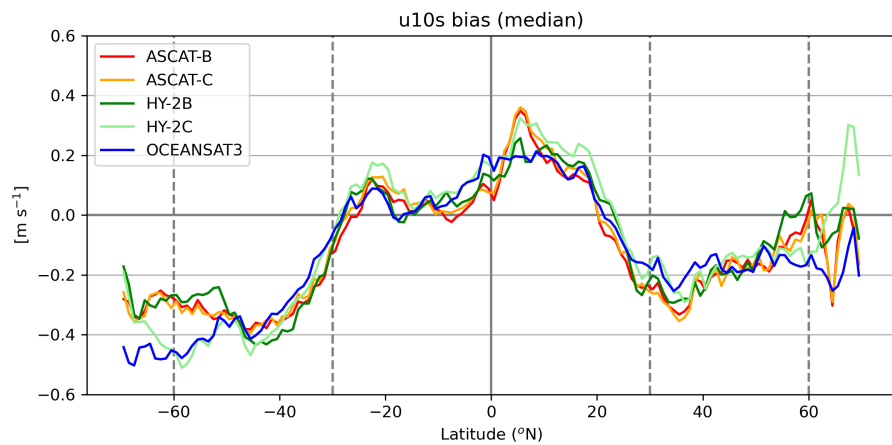
v10s_bias [HY-2B asc-des - ASCAT-C asc-des]





Latitudinal variation of bias differences

- ▷ Good bias and standard deviation of differences (SDD) correspondence at most latitudes
- ▷ SDD is generally largest for ASCAT and lowest for HY-2B and Oceansat-3

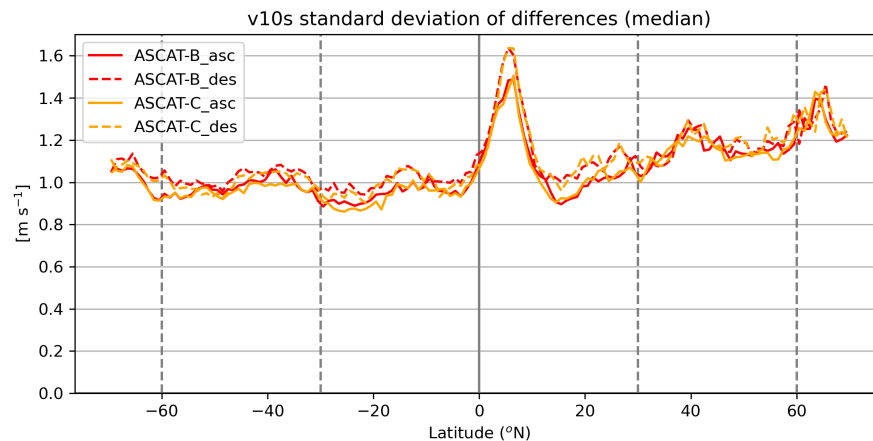
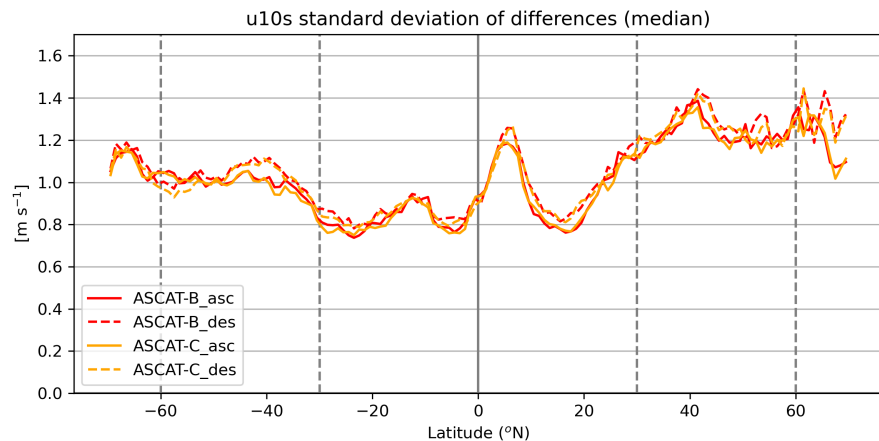
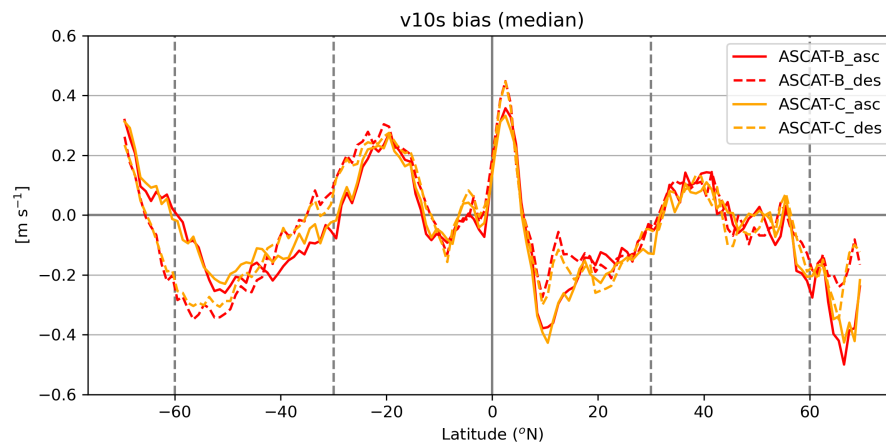
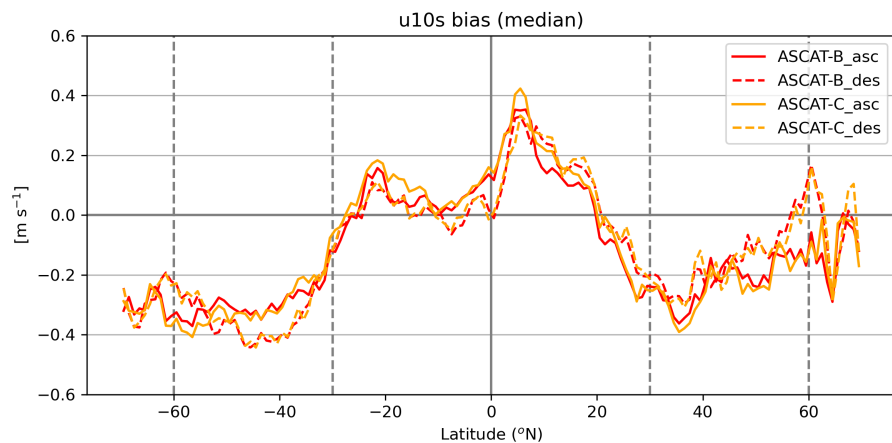


20-day average wind bias
(scat – ECMWF OPS)
[1-20 Jan 2026]



Effect of the daily cycle

- ▷ Bias differences between ascending and descending passes of similar magnitude as between different instruments
- ▷ SDD is generally larger for descending (morning) than for ascending (evening) passes



20-day average wind bias
(scat – ECMWF OPS)
[1-20 Jan 2026]

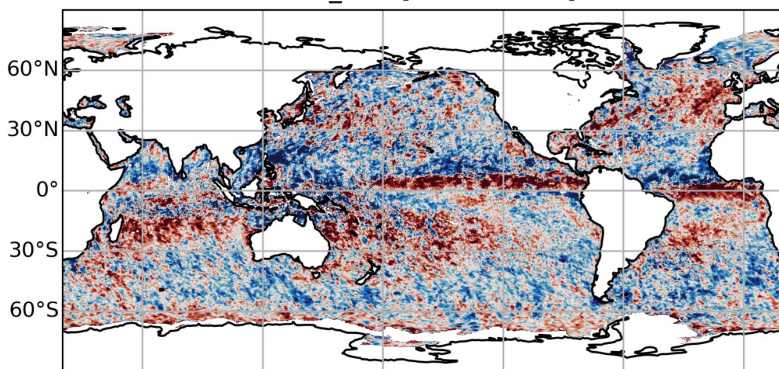


Effect of the daily cycle

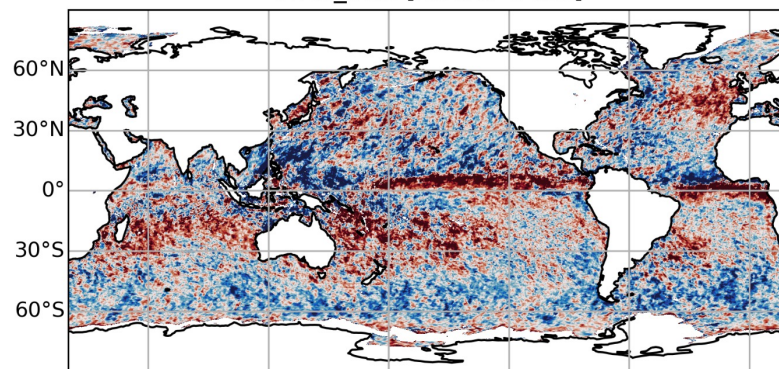
20-day average wind bias
(scat – ECMWF OPS)
[1-20 Jan 2026]

▷ Locally, bias differences between ascending and descending passes are as large as the biases themselves

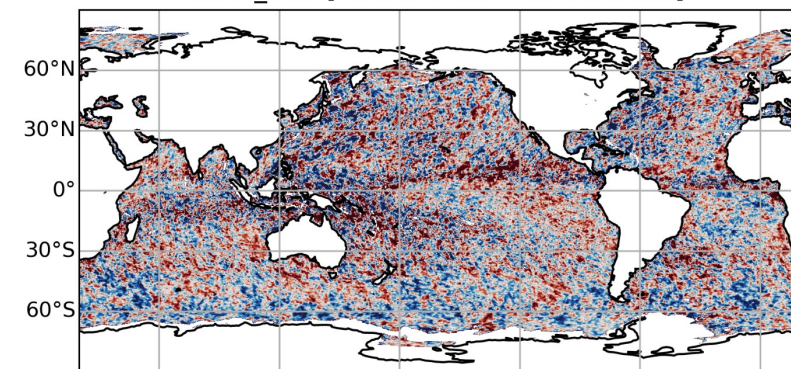
v10s_bias [ASCAT-C asc]



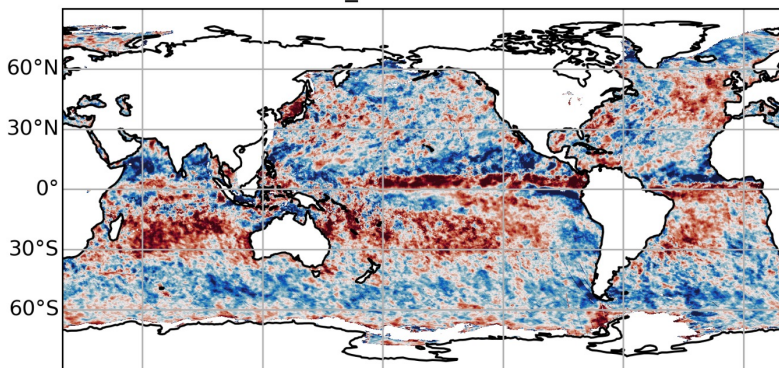
v10s_bias [ASCAT-C des]



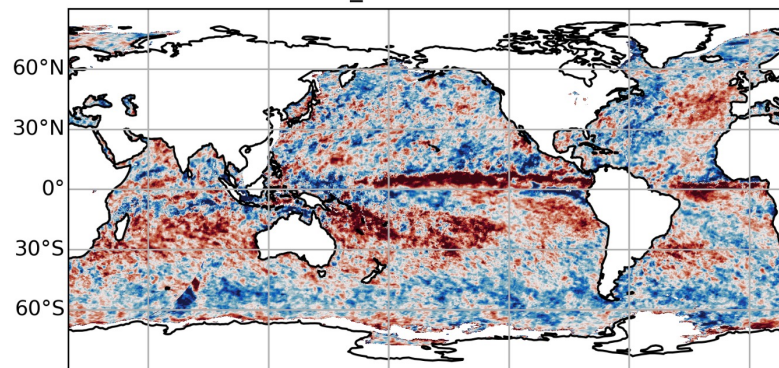
v10s_bias [ASCAT-C des - ASCAT-C asc]



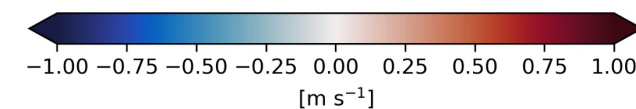
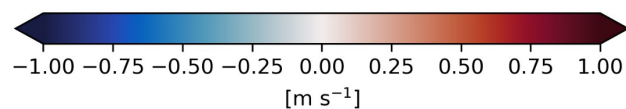
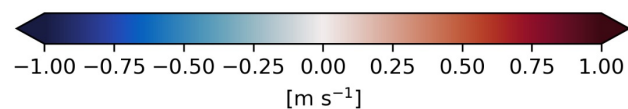
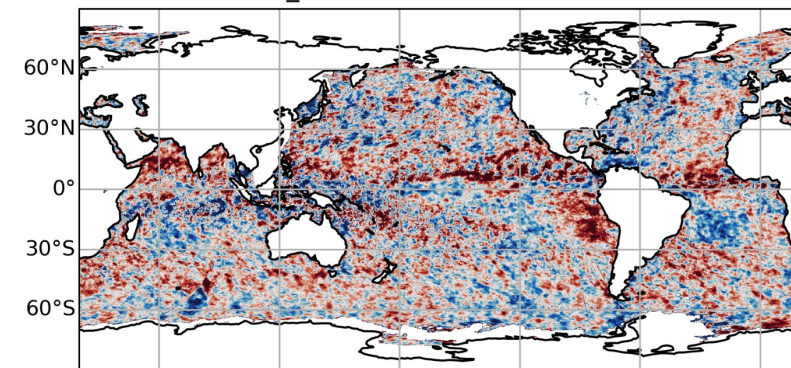
v10s_bias [HY-2B asc]



v10s_bias [HY-2B des]



v10s_bias [HY-2B des - HY-2B asc]





Summary

- ▷ Today, bias corrections can be calculated based on observations from various complementary scatterometers
- ▷ Overall, bias patterns correspond well between different scatterometer types
- ▷ Bias differences between ascending and descending passes are locally substantial
- ▷ There is no visible indication that the bias depends on the forecast lead time

Outlook

- ▷ Analyse bias differences over a longer period than 20 days
- ▷ Analyse bias differences between scatterometers for different averaging windows
- ▷ Exploit HY-2C and harmonic analysis to better understand the errors in the modelled daily cycle