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Climate data records from OSI SAF scatterometer winds

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Outline

- Motivation
- Planning
- Preparation and methods
- Quality Monitoring
- Output data and formats



Motivation

- The EUMETSAT Ocean and Sea Ice Satellite Application Facility produces near-real time wind data from several scatterometer instruments since many years
- An increasing number of users uses scatterometer wind data for climate studies
- However, the wind retrieval algorithms have been continuously improved over the years and the currently existing archives of near-real time data are not always suitable to fulfil the need for homogeneous data sets spanning a longer period of time
- Most of the archives contain near-real time processed data and currently only few consistent and validated vector wind climate data sets are available



Planning

We plan to re-process the following inter-calibrated data sets

- Metop-A ASCAT winds and ice probabilities, 25 km and 12.5 km Coastal, 2007-2013, data set to become available in 2014
- QuikSCAT SeaWinds winds and ice probabilities, 50 and 25 km, 1999-2009, data set to become available in 2014
- ERS-1 and ERS-2 winds, 25 km, 1991-2001, availability depending on the ESA SCIROCCO project to provide consistency between ERS and ASCAT backscatter records (2015)
- Oceansat-2 OSCAT winds and ice probabilities, 50 and 25 km, 2009 to 2014, to be reprocessed in 2015

In this way we can create a continuous ocean winds data record from 1991 to today

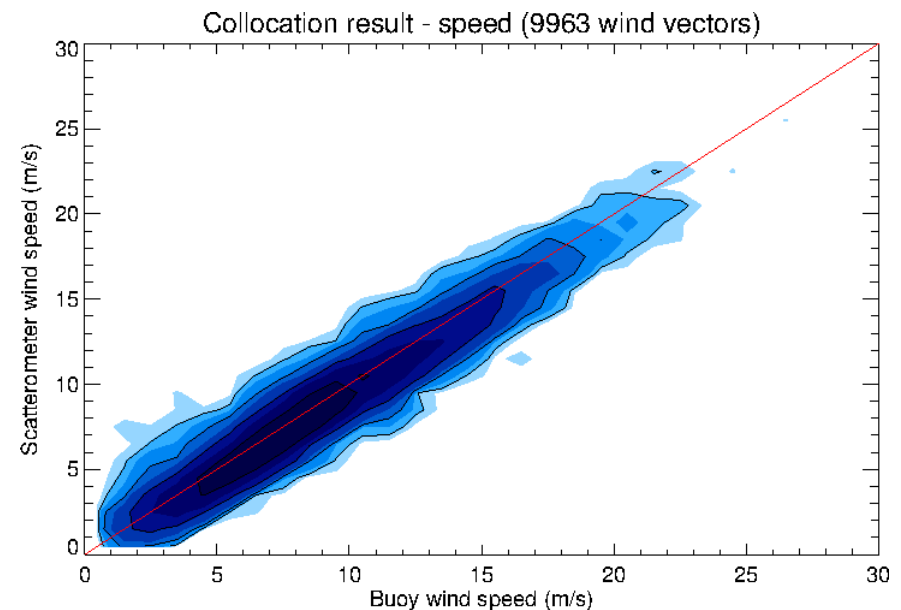
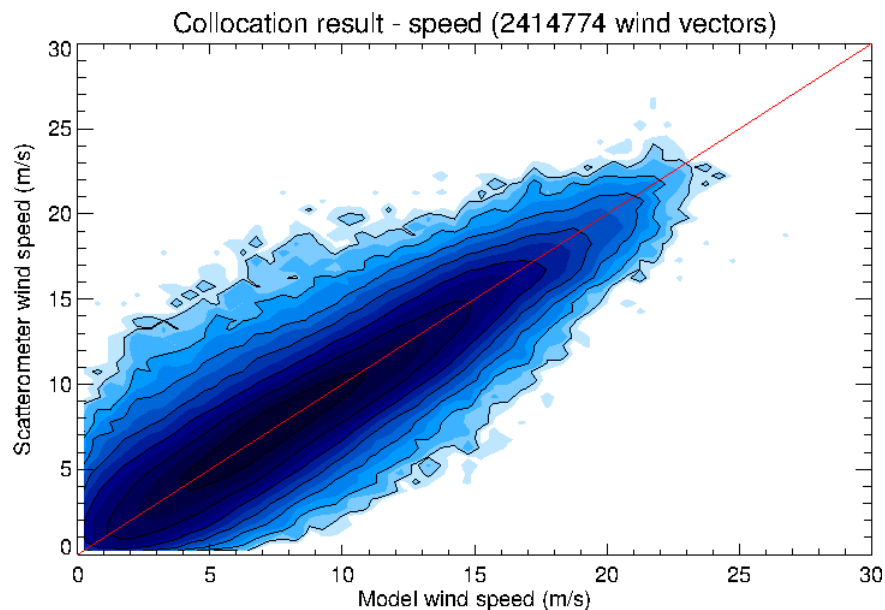


Reprocessing – software and calibration

- Reprocessing will be done using the wind processing software packages which are publicly available in the NWP SAF (AWDP, SDP, OWDP, ...)
- Data from different sensors will be inter-calibrated using buoy winds, ECMWF model winds and triple collocations
- Our goal is to calibrate the winds to a level as close as possible to the buoy winds

Work on Ku-band instrument processing

- The NSCAT-2 GMF still has superior performance and is available for all necessary incidence angles, so usable for QuikSCAT, OSCAT and other instruments
- NSCAT-2 has evolved to NSCAT-3 to reduce wind speed biases at high wind speeds (left: ECMWF, right: buoys)





Work on Ku-band instrument processing (2)

- NWP Ocean Calibration works very well for ASCAT to calibrate the winds using a limited amount of data
- This method is more challenging for Ku-band due to issues with Quality Control and representativeness of data, but we are better understanding the issues now
- We are also working on improvements in Quality Control, moving the actual QC step from before to after the Ambiguity Removal, results look promising in terms of buoy verifications

Current method:

Wind inversion -> Quality Control -> Ambiguity Removal

New method:

Wind inversion -> Preliminary QC -> Ambiguity Removal -> Quality Control



NWP model data

- ECMWF ERA-Interim wind forecast data will be used to initialise the ambiguity removal step and to monitor the data records
- ERA-Interim data are available over the entire period (in fact from 1979 to present) and produced with a single version of ECMWF's Integrated Forecast System
- ERA-Interim fields are retrieved without error on a reduced Gaussian grid with approximately 79 km spacing
- Although data from the operational model are available at higher resolution for most periods, they have varying characteristics over time so we will not use them (up to 0.2 m/s changes)
- ERA-Interim does not have equivalent neutral 10m winds (U10N) archived; we compute them from the real 10m winds, SST, T and Q using a stand-alone implementation of the ECMWF model surface layer physics (tested using real 10m and U10N winds from the operational model)



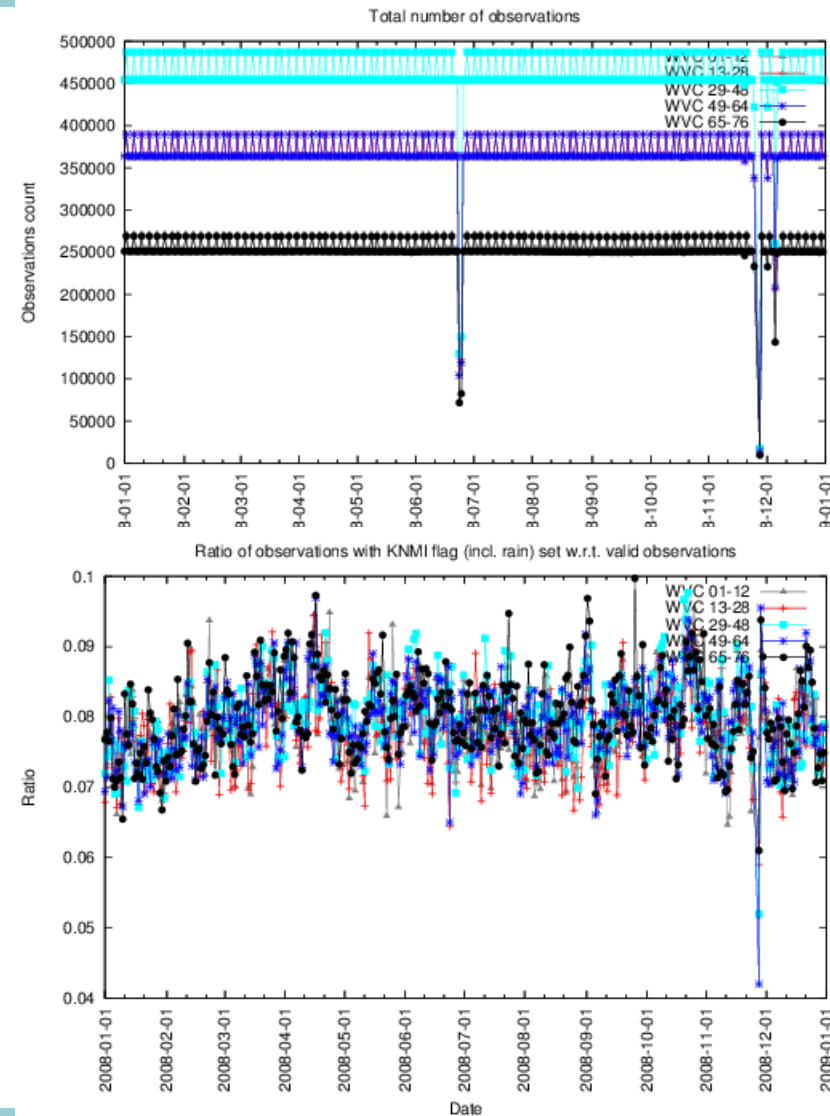
Sampling error

- All scatterometers sample the atmosphere spatially and temporally in a non-uniform way due to swath geometry and QC (rain); this causes substantial sampling errors
- ERA-interim U10N is collocated in time and space with all (valid) scatterometer winds and processed to the same L2 and L3 products
- Users may thus compare the spatial and temporal mean ERA-interim values as sampled by the scatterometer with uniformly sampled ERA-interim values in order to obtain an estimate of the sampling error fields of the scatterometer
- Improved spatial and temporal averages are thus obtained by subtracting the estimated sampling error from ERA-interim from the scatterometer climatology



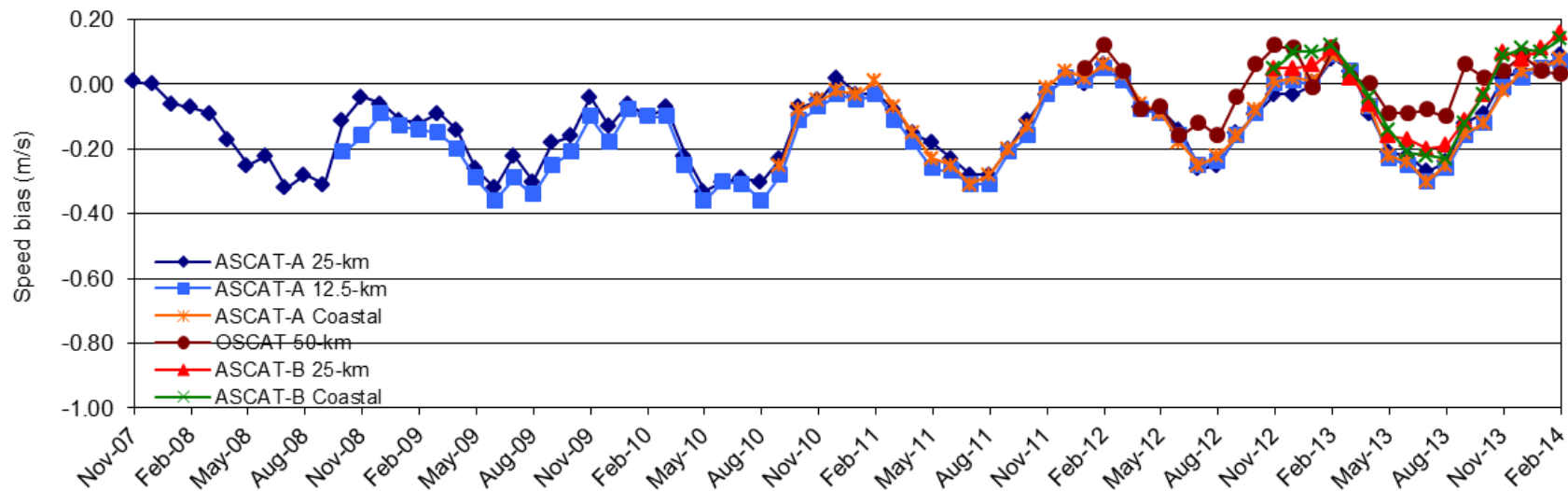
Monitoring

- Daily averages of several parameters are plotted over the entire time range in order to detect any missing data or anomalies
- Different parts of the swath are considered separately
- Important quality indicators are wind speed difference w.r.t. ECMWF winds, MLE and number of Quality Controlled WVCs
- Deviations in product quality usually appear as a step in one or more of the plots
- Weekly ocean calibration



Monitoring - buoy collocations

- Monthly statistics of scatterometer winds vs. buoy winds will be made
- Plot below shows the buoy statistics of several near-real time OSI SAF wind products over time, the same will be done in the reprocessing and this will help to get optimal calibration of data from different instruments.





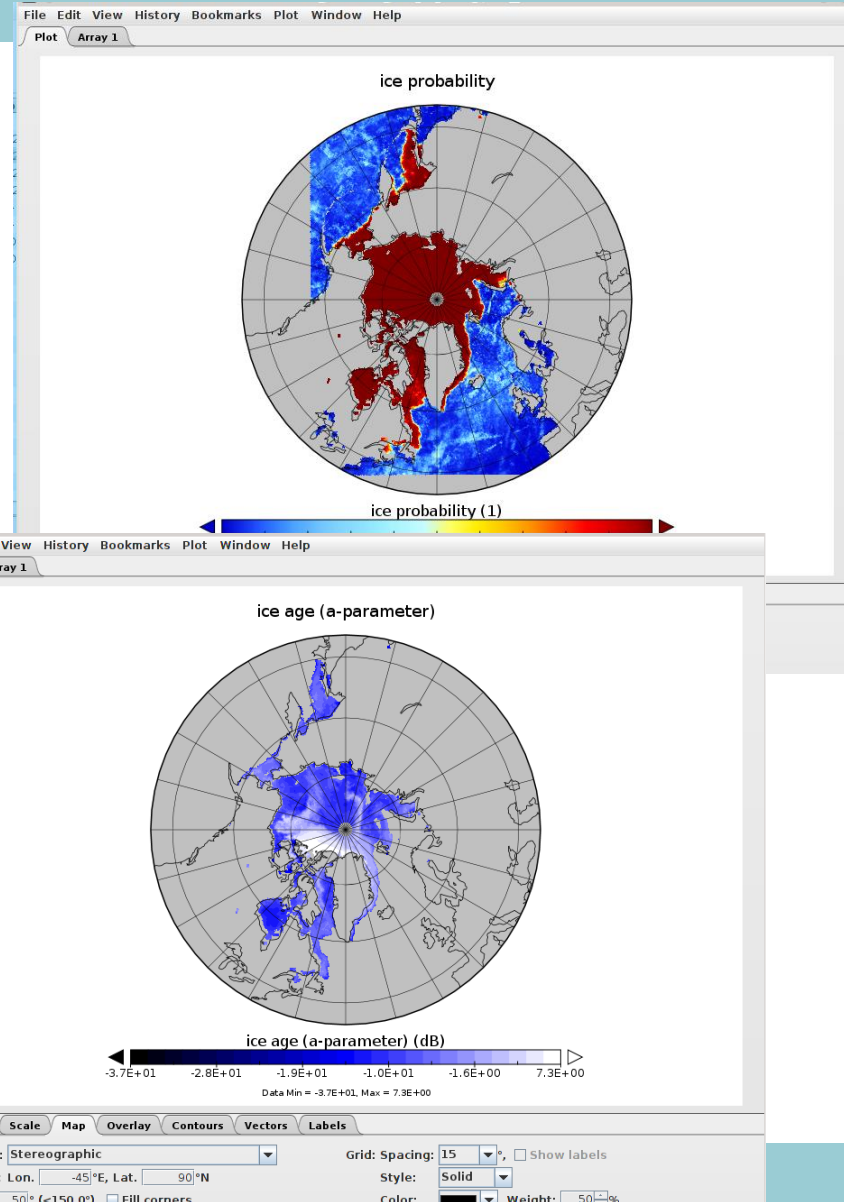
Wind and stress products and formats

- Level 2 swath backscatter, wind and ice data will be provided in BUFR format, identical to the near-real time data
- Level 2 swath data for wind, stress, rotation and divergence in NetCDF
- Separate level 2 products for wind/stress on one hand and rotation/divergence on the other hand are considered since the swath grids are slightly different and to maintain continuity in the current NetCDF level 2 products
- Level 3 data on lat/lon grid for wind, stress, rotation and divergence in NetCDF
- Data will be archived and made available in the EUMETSAT Data Centre, MyOcean archive and PO.DAAC (TBC)
- All NetCDF data according to the CF conventions



Ice maps

- Ice probability and ice age (A-parameter, albedo) are computed as part of the Bayesian ice screening procedure
- Daily ice maps in Polar Stereographic projection will be made available in NetCDF format
- The format is according to the NetCDF-CF conventions





Summary

- Wind climate data records will be created from several scatterometer missions spanning more than 20 years in total
- Focus will be on a proper inter-calibration of the various data records
- The latest versions of wind processing software will be used to get state of the art wind products
- Information will be provided to estimate sampling errors
- Wind and ice map data will be provided by various archives both in BUFR and user-friendly NetCDF formats

Thank you!