Updating Advice on Selecting Level-2,3 Surface Vector Wind Datasets: Applications Perspective

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What this review <u>is</u> about:

1. Definitions L2B, L3 SVW datasets
2. Validation of SVW in applications using L2, L3 datasets
3. Updating/Coordinating SVW dataset repositories on the web
4. How to comment on/recommend L2, L3 SVW datasets to colleagues
5. <u>Draft Project Statement</u> (i.e. recommendations to "the community")
6. Some L2 and L3 datasets on the (near?) horizon

What this review <u>is not</u> about:

1. Validation vs. buoys
2. Special products (e.g. UHR, coastal winds, σ_0, τ, L4, etc.)
3. "Beauty Contests" or "My Favorite" L2, L3 SVW dataset
4. Similarly, "My Favorite" L2, L3 SVW distribution web sites

Definitions:

- ❑ L2B or Level-2B

  In-Swath SVW retrievals (i.e. wind speed and direction) organized in along- and across-track arrays of wind vector cells (WVCs). Daily representations of L2 SVW exhibit gaps in coverage; i.e. between swaths.

  \- *flavors* include: ASCAT; ERS-1,2; NSCAT and QuikSCAT
  50km, 25km and 12.5km standard spatial resolutions
  Near Real-Time (NRT) and "science quality"

- ❑ L3 or Level-3

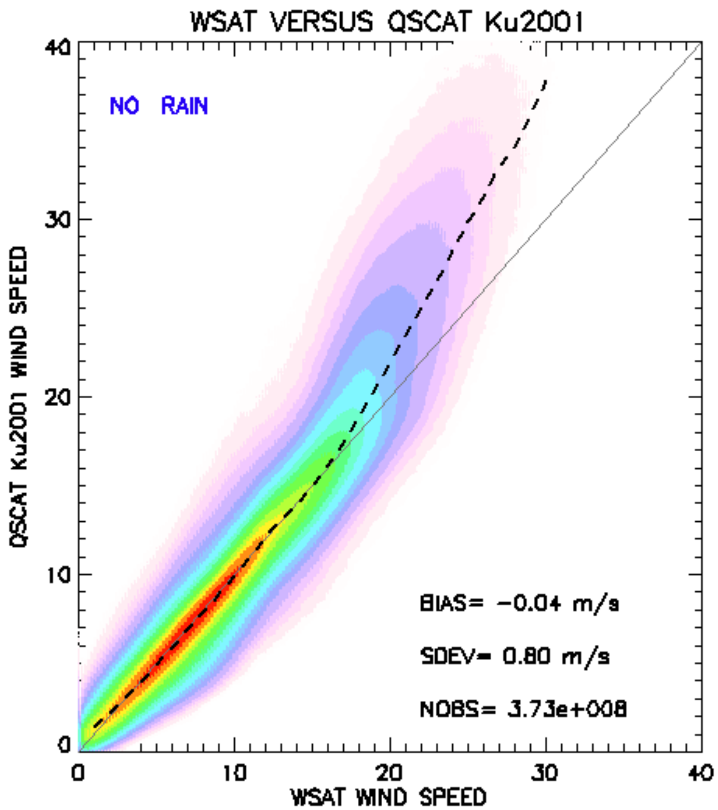
  Gridded SVW fields (usually regular global grids in deg. Lat, Lon) based on L2 SVW inputs. Daily representations of L3 SVW do not exhibit gaps, but gaps have been filled by ancillary processing, often involving ancillary datasets (e.g. weather-center analyses).

  \- *flavors* include: single or multi-platform L2 inputs
  methods-based constructions (smoothing, Kriging, extrapolation)
  ancillary data based constructions
  0.25° to 2° presentations
  4x daily, daily, 3-daily, climatologies

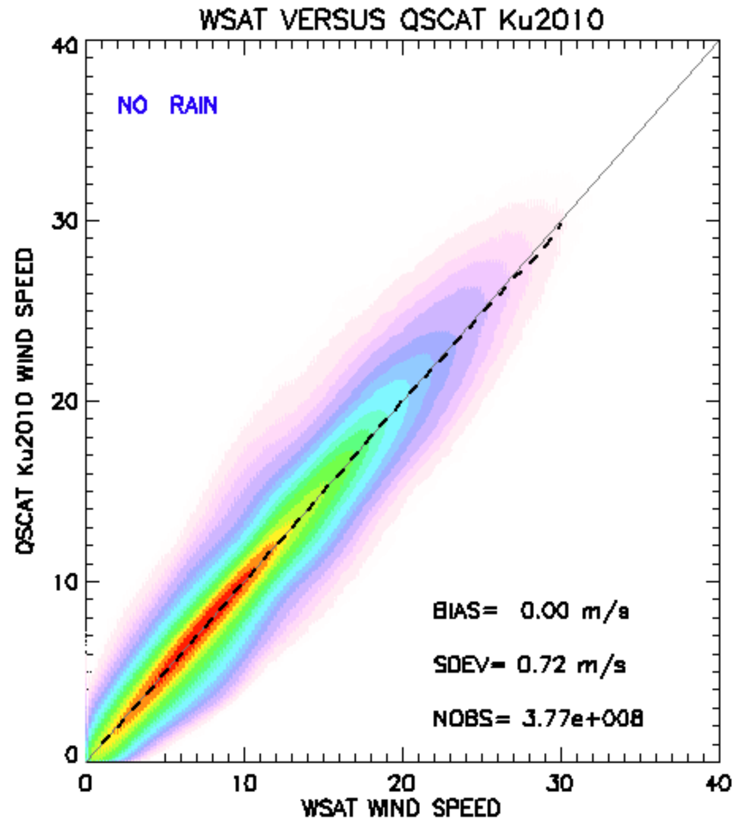
SVW Retrieval:

- ❑ L2 SVW datasets different, even given same σ_0
  - different/improved methods
  - additional validation data

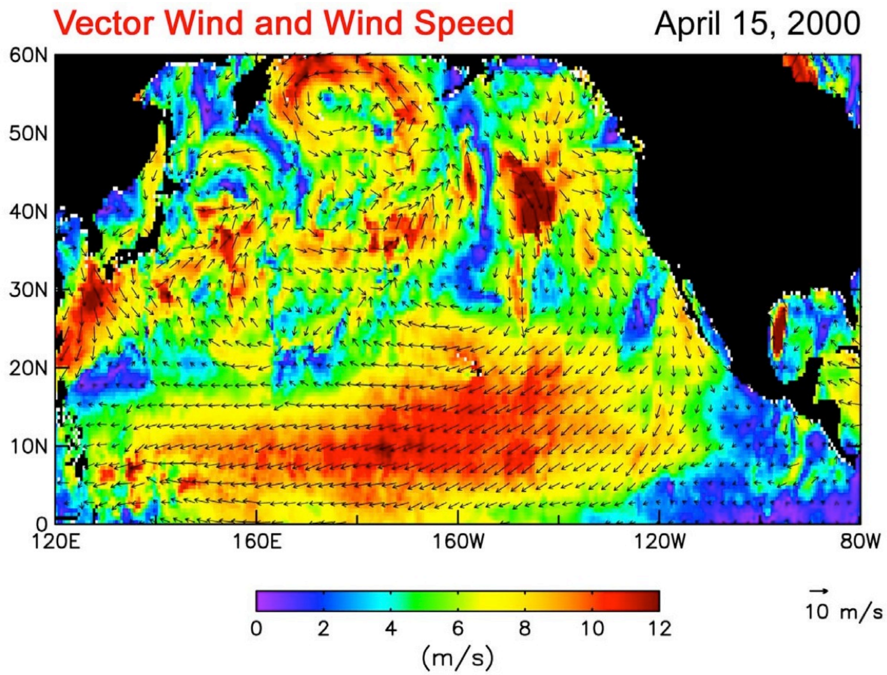
- ❑ Gaps in L2 SVW datasets due to swath configs, rain



KU2001

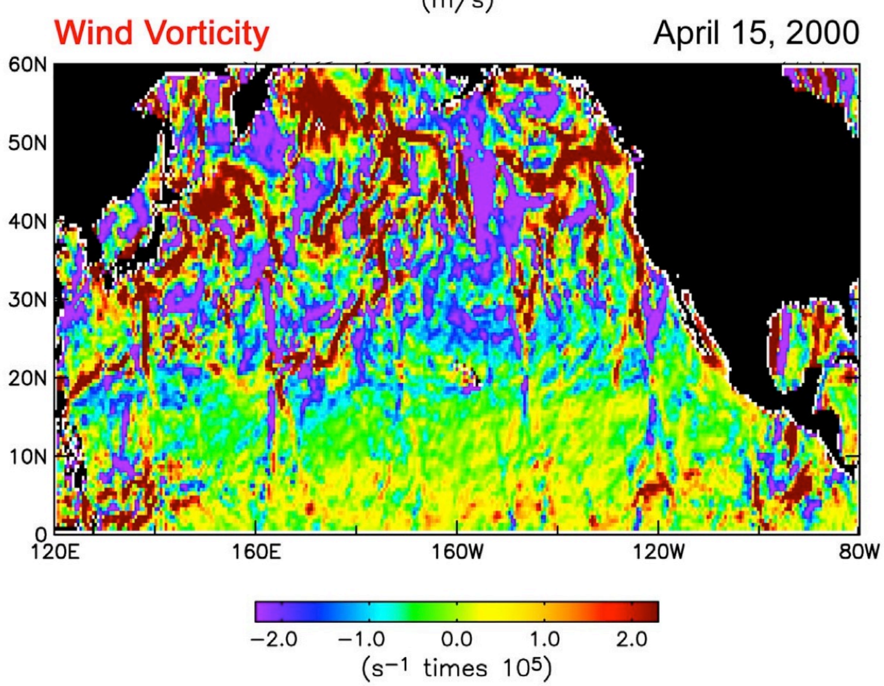


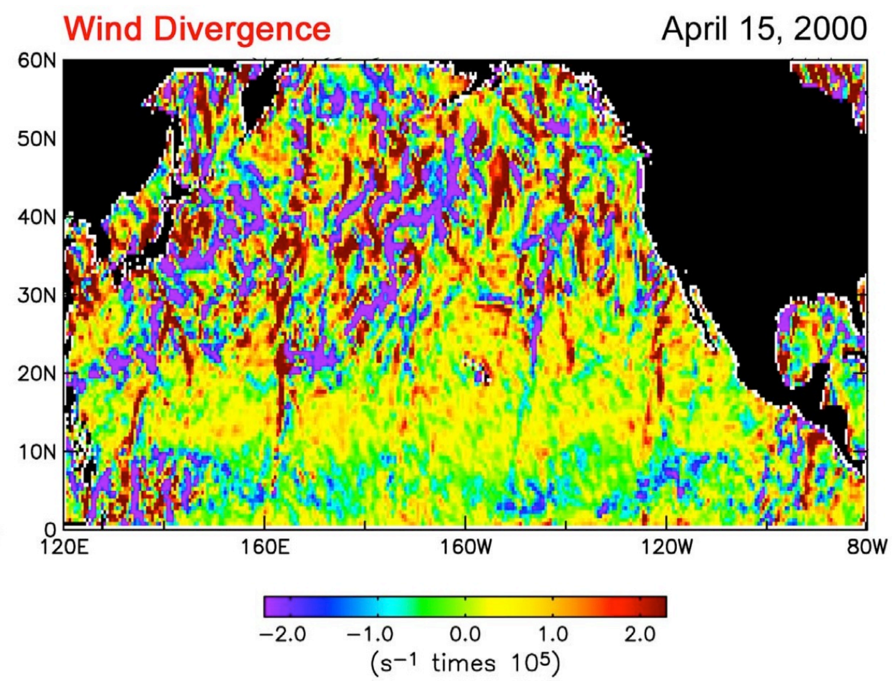
KU2010



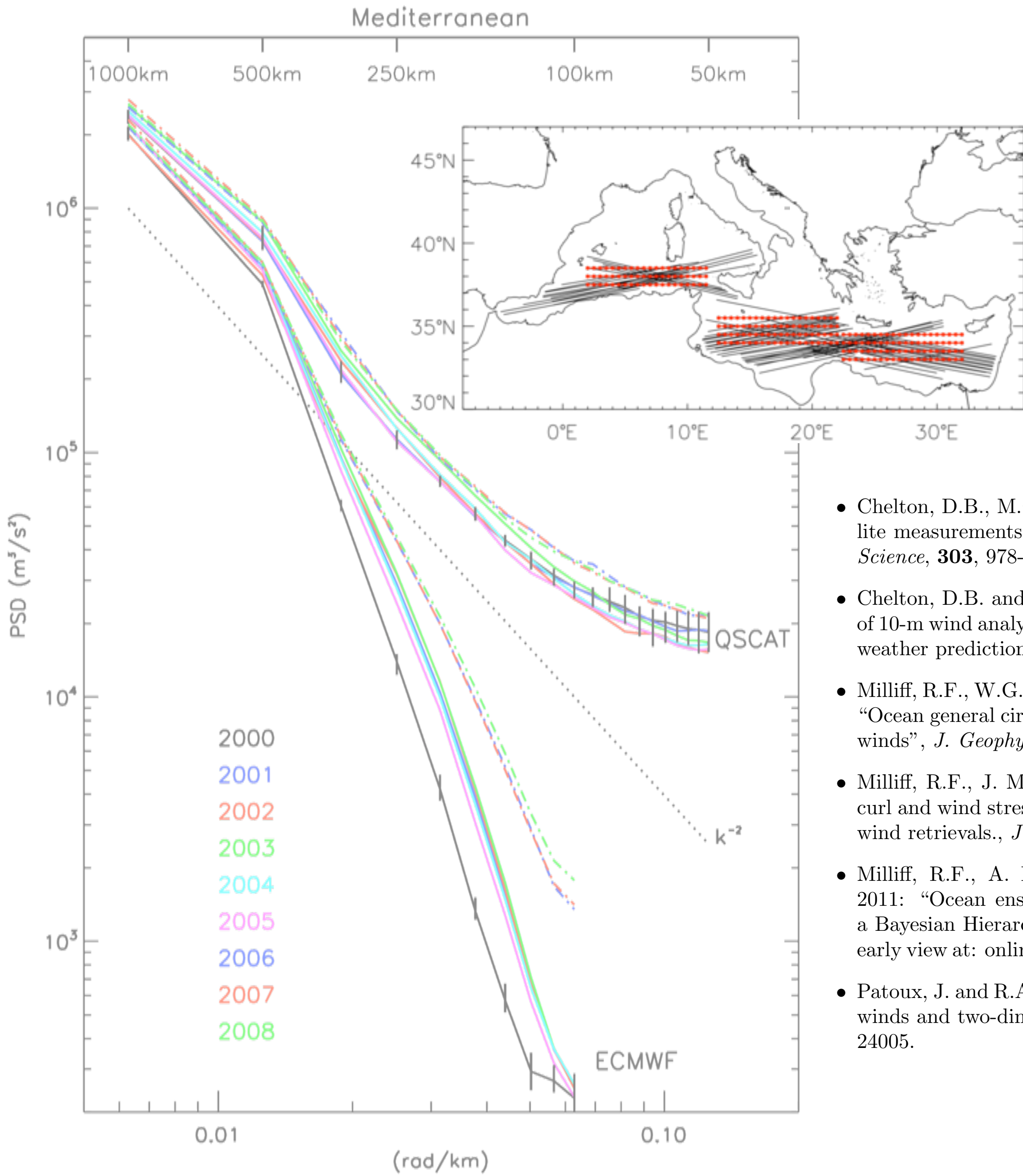
Feature-based Validation L3:

Derivative fields for first-cut assessment of L3 product; i.e. do you see the swath?





Kinetic energy as a function of spatial scale



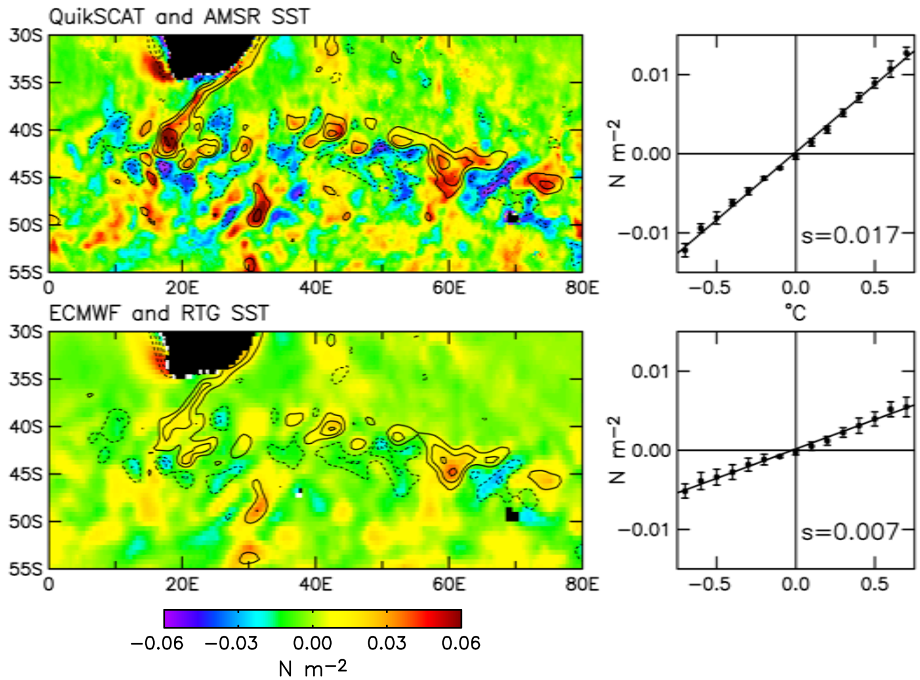
Order of Magnitude difference at ocean Synoptic and Mesoscales

- Chelton, D.B., M.G. Schlax, M.H. Freilich and R.F. Milliff, 2004: "Satellite measurements reveal persistent small-scale features in ocean winds". *Science*, **303**, 978-983.
- Chelton, D.B. and M.H. Freilich, 2005: "Scatterometer-based assessment of 10-m wind analyses from the operational ECMWF and NCEP numerical weather prediction models", *Mon Wea. Rev.*, **133**, 409-429.
- Milliff, R.F., W.G. Large, J. Morzel, G. Danabasoglu and T.M. Chin, 1999: "Ocean general circulation model sensitivity to forcing from scatterometer winds", *J. Geophys. Res.*, **104**C5, 11337-11358.
- Milliff, R.F., J. Morzel, D.B. Chelton, M.H. Freilich, 2004: Wind stress curl and wind stress divergence biases from rain effects on QSCAT surface wind retrievals., *J. Atmos. Ocean. Tech.*, **21**, 1216-1231.
- Milliff, R.F., A. Bonazzi, C.K. Wikle, N. Pinardi and L.M. Berliner, 2011: "Ocean ensemble forecasting, Part I: Mediterranean Winds from a Bayesian Hierarchical Model", *Quart. J. Roy. Met. Soc.*, in press (see early view at: onlinelibrary.wiley.comjournal10.1002(ISSN)1477-870Xearlyview).
- Patoux, J. and R.A. Brown, 2001: "Spectral analysis of QuikSCAT surface winds and two-dimensional turbulence", *J. Geophys. Res.*, **106**D, 23995-24005.

Air-Sea Coupling Amplitude:

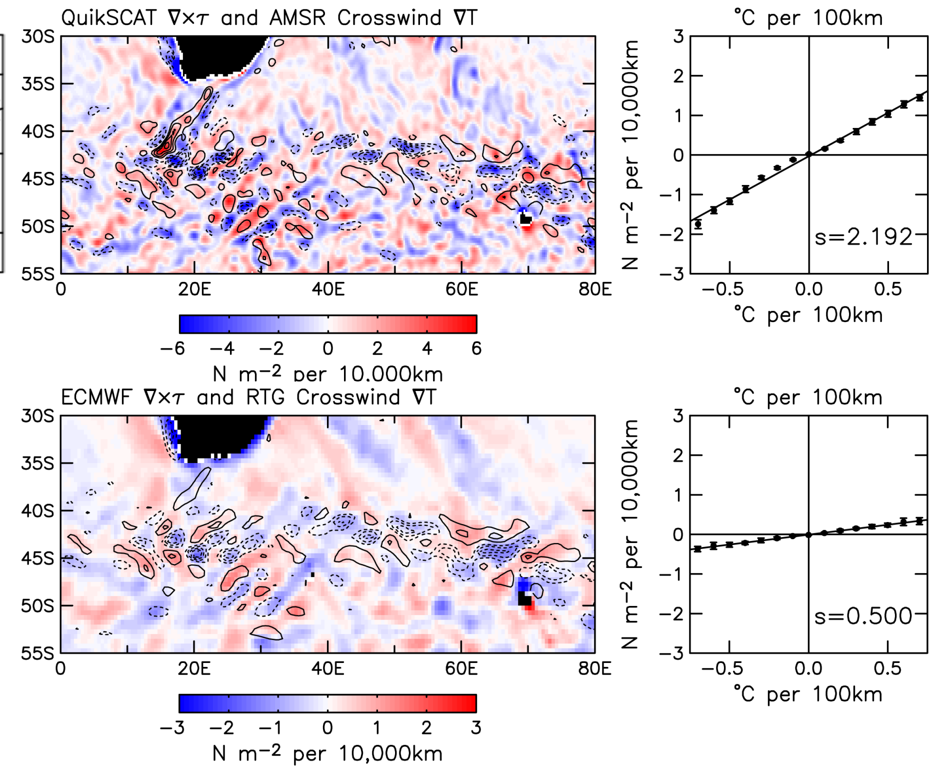
Satellite-to-Satellite comparisons yield Strongest Coupling Coefficients

Wind Stress and SST



- Ocean scales 10km – 1000km
- Slope of linear relation is coupling coeff
- Important for fluxes

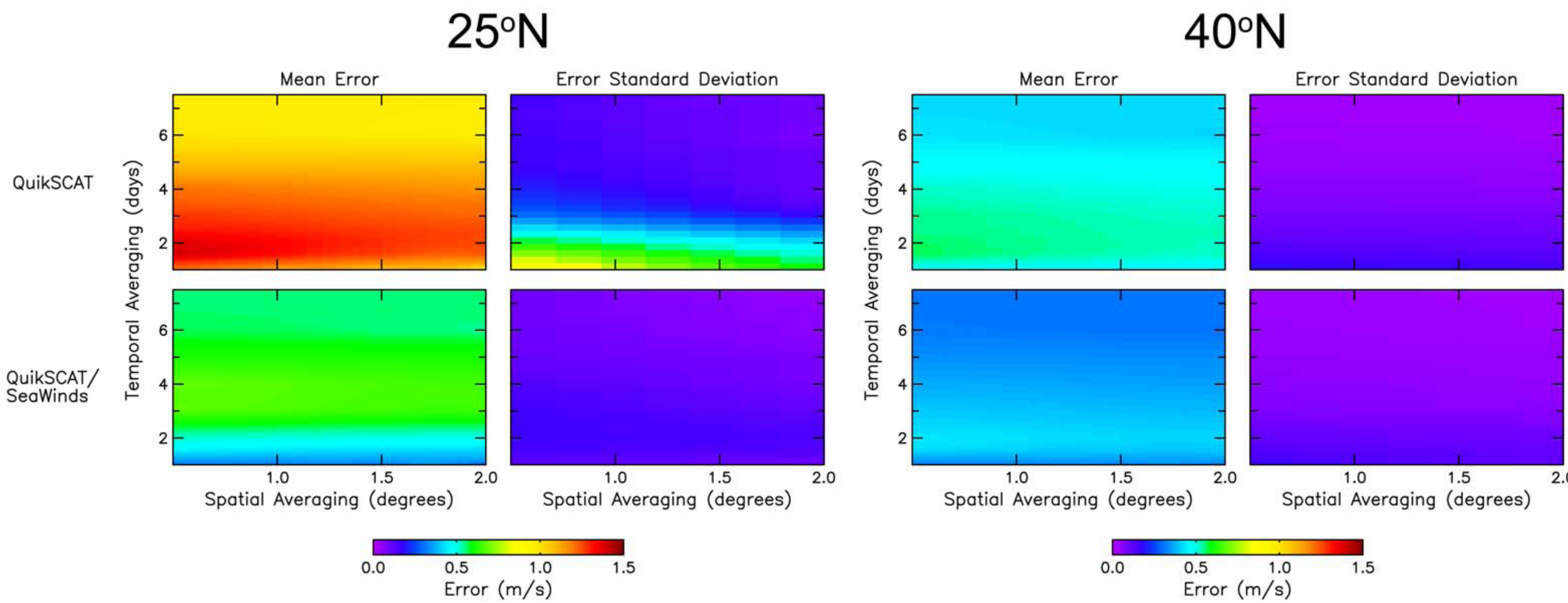
Wind Stress Curl and SST Gradient



Chelton, D.B. and S-P Xie, 2010: "Coupled Ocean-Atmosphere Interaction at Oceanic Mesoscales", *Oceanography*, **23**(4), 52-69.

Dependencies of Mean and Standard Deviation of Mapping Errors on Spatial and Temporal Smoothing

for QuikSCAT and Tandem QuikSCAT/SeaWinds



Note that errors are more sensitive to temporal smoothing than to spatial smoothing.

This is an indication that mapping errors are dominated by temporal sampling.

Schlax, M.G., D.B. Chelton and M.H. Freilich, 2001: "Sampling errors in wind fields constructed from single and tandem scatterometer datasets", *J. Atmospheric and Oceanic Technology,* **18**(6), 1014-1036.

Repositories:

§ - Near Real-Time products

Comprehensive, Services Driven

Update, Coordinate Emphasis

podaac-www.jpl.nasa.gov

www.osi-saf.org§

coaps.fsu.edu/scatterometry

manati.orbit.nesdis.noaa.gov/datasets§

cersat.ifremer.fr

www.ssmi.com

Less Comprehensive, Research Driven

www.ssmi.com

www.atmos.washington.edu/~jerome/WINDS/

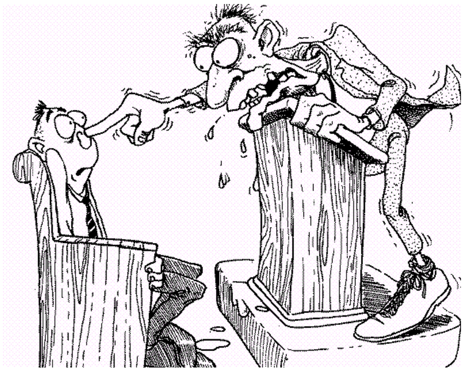
dss.ucar.edu/datasets/ds744.*

www.mers.byu.edu/

	SASS	ESCAT	NSCAT	SeaWinds	ASCAT	Oscat
FREQUENCY	14.6 GHz	5.3 GHz	13.995 GHz	13.6 GHz	5.3 GHz	13.6 GHz
ANTENNA AZIMUTHS						
POLARIZATIONS	V-H, V-H	V ONLY	V, V-H, V	V-OUTER/H-INNER	V ONLY	V-OUTER/H-INNER
BEAM RESOLUTION	FIXED DOPPLER	RANGE GATE	VARIABLE DOPPLER	PENCIL-BEAM	RANGE GATE	PENCIL-BEAM
SCIENCE MODES	MANY	SAR, WIND	WIND ONLY	WIND/HI-RES	WIND ONLY	WIND/HI-RES
RESOLUTION (s °)	nomally 50 km	50 km	25 km	Egg: 25x35 km Slice: 6x25km	25/50 km	Egg: 30x68 km
SWATH, km	~750 ~750	500	600 600	1400,1800	500 500	1400,1836
INCIDENCE ANGLES	0° - 70°	18° - 59°	17° - 60°	46° & 54.4°	25°- 65°	49° & 57°
DAILY COVERAGE	VARIABLE	< 41 %	78 %	92 %	65 %	> 90 %
MISSION & DATES	SEASAT: 6/78 Ð 10/78	ERS-1: 92Ð96 ERS-2: 95Ð01	ADEOS-I: 8/96 Ð 6/97	QuikSCAT: 6/99-11/09 ADEOS-II: 1/02-10/02	METOP: 6/2007-	OceanSat-2: 10/09-

Table stolen from BYU/MERS web site

Advice to Community:



1. Match space-time coherence in SVW with application
   a) feature-based; more than matching Δx, Δt

2. Areal average of instantaneous σ_0 *vs.* point support (some time averaging)

3. Kinetic energy content as a function of spatial scale
   a) commonly depicted in Fourier spectra; KE vs. k, for spatial wavenumber k
   b) power-law relations with spectral slopes k^{-2} (mid-latitudes), $k^{-5/3}$ (tropics)
      - ambiguities in Fourier spectral techniques
   c) true spatial resolution corresponds to spatial scale at which L3 winds depart from k^{-2} or $k^{-5/3}$
      - L3 products should not present on grids finer than true resolution

4. Use latest validated datasets from authoritative sources (repositories)

5. Air-Sea coupling coefficient magnitudes are strongest for satellite datasets; e.g. slope of linear relation between SST anomaly and wind stress derivatives (curl and divergence) on scales 10km to 1000km.

Project Statement:

- ❑ Read and comment on Draft Statement (here)
- ❑ Edits by co-author team (here)
- ❑ Action items for Project leaders (committees)
- ❑ Post Advice (KNMI, PO.DAAC, COAPS, Ifremer, etc.)

Related and Forthcoming L2,L3 SVW Datasets

OceanSat-2 (OSCAT) community datasets

Reprocessing:

OVWST Project at JPL; L2 and L3, when ???
Ku2011 *just released* (RSS; Lucrezia Ricciardulli)
KNMI ASCAT L3???

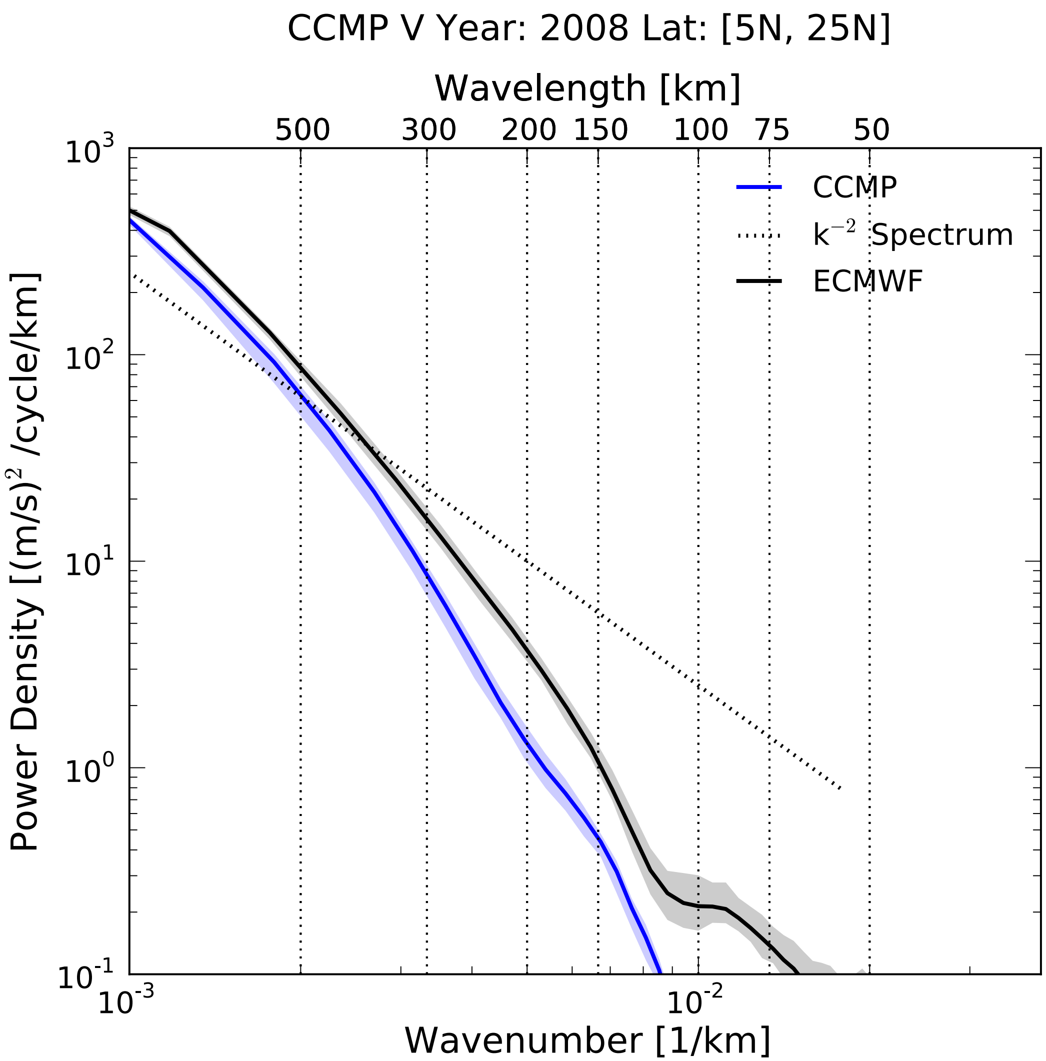
Multi-Platform:

CCMP
NWRA/CoRA Global Surface Wind BHM (ensemble winds)

Special Purpose:

BYU Ultra-High-Resolution
OSU COAS Coastal Winds L3

Global wind products with 6 hour temporal sampling



Wind products that assimilate many different data sources to produce maps with high temporal sampling typically underestimate the high spatial frequency component of the wind field.

Plots based on 1 year of data.

R. Atlas, R. Hoffman, J. Ardizzone, S. Leidner, and J. C. Jusem, "Development of a new cross-calibrated, multi-platform (CCMP) ocean surface wind product," in AMS 13th Conference on Integrated Observing and Assimilation Systems for Atmosphere,Oceans, and Land Surface (IOAS-AOLS), 2009.

Summary:

- L2 datasets can differ for same σ_0
- Gaps in L2 from swath configurations and rain
- L3 datasets fill gaps in a variety of ways
- Applications Users have to evaluate feature/phenomena resolution in L3 data
- KE vs k and true spatial resolution
- Air-Sea coupling coefficients strongest in satellite datasets
- Filtering/Averaging to improve S/N at expense of resolution
- Temporal filtering has most dramatic effects
- Prominent SVW dataset repositories should be coordinated (updated)
- Project statement to guide potential users (need feedback)
- New datasets

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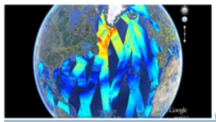
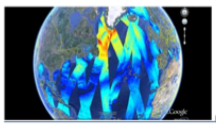
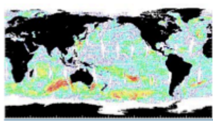
1. 
(/dataset/ASCAT-L2-12.5km?ids=&values=)

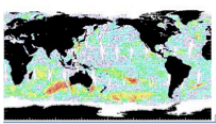
MetOp-A ASCAT Level 2 12.5km Ocean Surface Wind Vector Product (/dataset/ASCAT-L2-12.5km?ids=&values=) (ASCAT-L2-12.5km)
Surface Winds
Platform/Sensor: METOP-A/ASCAT
Processing Level: 2
Along/Across Track Resolution: 12.5 km x 12.5 km
Start/End Date: 2009-Mar-2 to Present
Description: KNMIs operational Near-Real-Time ASCAT Level 2 dataset containing ocean surface wind vector retrievals at 12.5 km sampling resolution (note: the effective resolution is 25 km). Eac ... more

2. 
(/dataset/ASCAT-L2-25km?ids=&values=)

MetOp-A ASCAT Level 2 25.0 km Ocean Surface Wind Vector Product (/dataset/ASCAT-L2-25km?ids=&values=) (ASCAT-L2-25km)
Surface Winds
Platform/Sensor: METOP-A/ASCAT
Processing Level: 2
Along/Across Track Resolution: 25 km x 25 km
Start/End Date: 2007-Mar-27 to Present
Description: KNMIs operational Near-Real-Time ASCAT Level 2 dataset containing ocean surface wind vector retrievals at 25 km sampling resolution (note: the effective resolution is 50 km). Each ... more

3. 
(/dataset/SEAWINDS LEVEL 2B AMSR?ids=&values=)

SeaWinds on ADEOS-II Level 2B Ocean Wind Vectors with AMSR Corrections in 25 Km Swath Grid (/dataset/SEAWINDS LEVEL 2B AMSR?ids=&values=) (SEAWINDS LEVEL 2B AMSR)
Surface Winds
Platform/Sensor: ADEOS-II/SEAWINDS , ADEOS-II/AMSR
Processing Level: 2
Along/Across Track Resolution: 25 km x 25 km
Start/End Date: 2003-Apr-9 to 2003-Oct-24
Description: This dataset is designed to compliment the SeaWinds on ADEOS-II Level 2B dataset by providing ocean surface wind vectors in 25 km wind vector cell (WVC) swaths with AMSR correction ... more

4. 
(/dataset/SEAWINDS LEVEL 3?ids=&values=)

SeaWinds on ADEOS-II Level 3 Gridded Ocean Wind Vectors (JPL) (/dataset/SEAWINDS LEVEL 3?ids=&values=) (SEAWINDS LEVEL 3)
Surface Winds
Platform/Sensor: ADEOS-II/SEAWINDS
Processing Level: 3
Longitude/Latitude Resolution: 0.25 degrees x 0.25 degrees
Start/End Date: 2003-Apr-9 to 2003-Oct-24
Description: The SeaWinds on ADEOS-II Level 3 ocean vector winds on a 0.25 degree grid contains daily data from ascending and descending passes; where adjacent satellite passes overlap, the mos ... more

5. 
(/dataset/NSCAT LEVEL 2?ids=&values=)

NSCAT Level 2 Ocean Wind Vector Geophysical Data Record (/dataset/NSCAT LEVEL 2?ids=&values=) (NSCAT LEVEL 2)
Surface Winds
Platform/Sensor: ADEOS/NSCAT
Processing Level: 2
Along/Across Track Resolution: 50 km x 50 km
Start/End Date: 1996-Sep-14 to 1997-Jun-29
Description: The NASA Scatterometer (NSCAT) Level 2 ocean wind vectors in 50 km wind vector cell (WVC) swaths contain daily data from ascending and descending passes. Wind vectors are accurate ... more

6. 

NSCAT High Resolution R-MGDR, Selected Ocean Wind Vectors (JPL) (/dataset/Product086?ids=&values=) (Product086)
Surface Winds
Platform/Sensor: ADEOS/NSCAT

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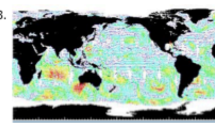
11. 
(/dataset/UCLA DEALIASED SASS?ids=&values=)

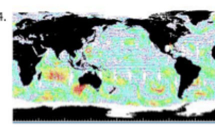
SEASAT SCATTEROMETER DEALIASED OCEAN WIND VECTORS (JPL-UCLA-AES) (/dataset/UCLA DEALIASED SASS?ids=&values=) (UCLA DEALIASED SASS)
Surface Winds
Platform/Sensor: SEASAT-A/SASS
Processing Level: 3
Longitude/Latitude Resolution: 1 degrees x 1 degrees
Start/End Date: 1978-Jul-6 to 1978-Oct-10
Description: Contains dealiased ocean wind vector components (zonal and meridional) derived from the Seasat-A Scatterometer (SASS) provided on a global 1x1 degree grid. Dealiasing of the SASS d ... more

12. 
(/dataset/CHELTON SEASAT SASS?ids=&values=)

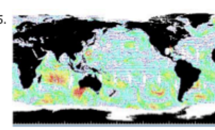
SEASAT SCATTEROMETER DERIVED GLOBAL GRIDDED MONTHLY OCEAN WIND STRESS (Chelton) (/dataset/CHELTON SEASAT SASS?ids=&values=) (CHELTON SEASAT SASS)
Wind Stress
Platform/Sensor: SEASAT-A/SASS
Processing Level: 3
Longitude/Latitude Resolution: 2.5 degrees x 2.5 degrees
Start/End Date: 1978-Jul-6 to 1978-Oct-10
Description: Contains monthly averaged ocean surface wind stress derived from Seasat-A Scatterometer (SASS) wind retrievals, from July 1978 until October 1978, gridded on a 2.5-degree by 2.5 de ... more

13. 
(/dataset/QSCAT_LEVEL_2B_COMP_12?ids=&values=)

SeaWinds on QuikSCAT L2B Ocean Wind Vectors in 12.5km Slice Composites (/dataset/QSCAT_LEVEL_2B_COMP_12?ids=&values=) (QSCAT_LEVEL_2B_COMP_12)
Surface Winds
Platform/Sensor: QUIKSCAT/SEAWINDS
Processing Level: 2
Along/Across Track Resolution: 12.5 km x 12.5 km
Start/End Date: 1999-Jul-19 to 2009-Nov-21
Description: This dataset contains Level 2B science-quality ocean surface wind vector retrievals from the QuikSCAT scatterometer. The retrievals are provided on a non-uniform grid within the sw ... more

14. 
(/dataset/QSCAT_LEVEL_3?ids=&values=)

SeaWinds on QuikSCAT Level 3 Daily Gridded Ocean Wind Vectors (JPL) (/dataset/QSCAT_LEVEL_3?ids=&values=) (QSCAT_LEVEL_3)
Surface Winds
Platform/Sensor: QUIKSCAT/SEAWINDS
Processing Level: 3
Longitude/Latitude Resolution: 0.25 degrees x 0.25 degrees
Start/End Date: 1999-Jul-19 to 2009-Nov-21
Description: This dataset contains 0.25 degree gridded ocean surface wind vector fields from daily ascending and descending satellite passes; where multiple passes occur over a given point, the ... more

15. 
(/dataset/QSCAT_L3_OW_JPL_BROWSE_IMAGES?ids=&values=)

QuikSCAT Level 3 Daily Gridded 0.25 Degree Browse Images (/dataset/QSCAT_L3_OW_JPL_BROWSE_IMAGES?ids=&values=) (QSCAT_L3_OW_JPL_BROWSE_IMAGES)
Surface Winds
Platform/Sensor: QUIKSCAT/SEAWINDS
Processing Level: 3
Longitude/Latitude Resolution: 0.25 degrees x 0.25 degrees
Start/End Date: 1999-Jul-18 to 2009-Nov-21
Description: This dataset contains images of daily averaged ocean surface wind vectors derived from the gridded Level 3 QuikSCAT ocean surface wind vector dataset. These images are provided in ... more

16. 

SeaWinds on QuikSCAT Level 2B Ocean Wind Vectors in 25 Km Swath Grid (/dataset/QSCAT_LEVEL_2B?ids=&values=)

Ocean and Sea Ice SAF

Wind Processing Centre

GO TO OSI SAF CENTRAL WEB SITE

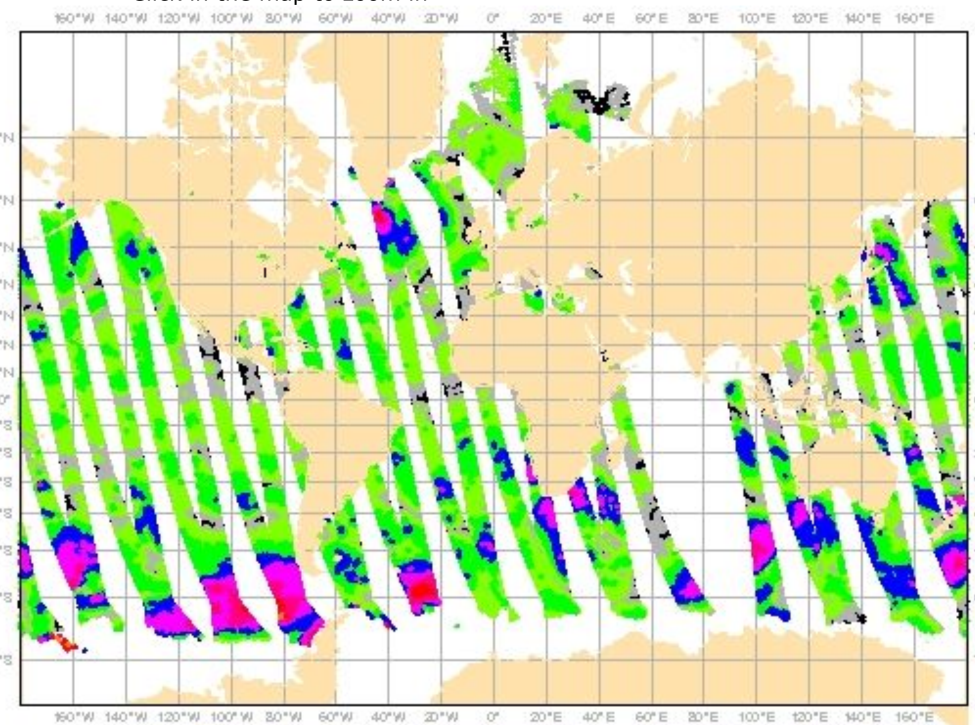
Updated @ 2011-04-28 16:44 utc

OSI SAF ASCAT 12.5-km product viewer

ASCAT12, status: operational

Ascending passes

Click in the map to zoom in



Descending passes

Click in the map to zoom in

Select view

- Monitoring information
- Buoy validations
- Data from previous day

Background information

- Modifications/anomalies
- Description of plots
- Access to products
- Acknowledgements
- ASCAT Product User Manual
- ASCAT 12.5-km Validation report
- Home OSI SAF Wind Centre

OSI SAF Wind Products

- ASCAT 25-km winds
  Operational status
- ASCAT Coastal winds
  Demonstration status
- QuikSCAT winds
  Discontinued status
- Wind Products
  Processing Status

Other Wind Services at KNMI

- ASCAT 25-km winds

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Satellite Studies

Documentation

QSCAT

A tabular summary provides key details. Additional information is given in written descriptions following the table. The names of the products in the table are linked to the written descriptions. These descriptions include contact information, sites from which the data is available (or email contact with the people who will send the data), links to documentation, links to read routines, and references.

Data Set	Spatial Coverage	Spatial Grid	Temporal Coverage	Temporal Grid	Data Fields	Non-QSCAT Input	Processing Technique
Project Level 3	Global (in swaths)	0.25x0.25°	20 July 1999 and ongoing	Daily	u, v, ?	None	Vector average within swaths
COAPS/FSU Objectively Analyzed	Global	1x1°	20 July 1999 and ongoing	6 hourly	UW, VW	None	Variational method, with objectively determined weights
COAPS/FSU Objectively Analyzed	Gulf of Mexico	0.5x0.5°	20 July 1999 and ongoing	6 hourly	UW, VW	None	Variational method, with objectively determined weights
Blended QSCAT/NCEP u,v Surface Winds from Morzel, Milliff, and Chin	Global	0.5x0.5°	July 1999 and ongoing	6 hourly	u, v	NCEP winds	wavelet based multiresolution analysis: QSCAT in swaths; NCEP in gaps, enhanced with QSCAT-derived high-wavenumber variability
Tang and Liu	Global	0.5x0.5°	20 July 1999 and ongoing	12 hourly	u, v	ECMWF	Successive correction

Definitions for Symbols

All scatterometer derived wind and pseudostress quantities are equivalent neutral values, unless explicitly stated otherwise. Further explanations for the winds, pseudostresses, and stresses are available.

Field Variable	Definition
u	West-to-East component of the wind (positive Eastward)
v	South-to-North component of the wind (positive Northward)
w	Wind speed. Note that wind speeds can be averaged as vectors or scalars, and that the differences can be substantial. See the detailed product description for the type of averaging.
UW	West-to-East component of the pseudostress (positive Eastward)
VW	South-to-North component of the pseudostress (positive Northward)
τx	West-to-East component of the surface stress (positive Eastward)
τy	South-to-North component of the surface stress (positive Northward)

Additional Information