PRODUCT USER MANUAL

For Wind- Global Ocean L3 Wind

WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002

and

WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005

Issue: 2.20

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Approval Date: JULY 2021

RECORD TABLE

Issue	Date	§	Description of Change	Author	Validated By
1.0		All	Creation of the document		Ad Stoffelen
2.0	15 Sept. 2011		Changes are template change	Tilly Driesenaar	Ad Stoffelen
2.1	28 Sept. 2012		Extended description of product content	Tilly Driesenaar	Ad Stoffelen
2.2	14 Feb. 2013		New datasets added	Tilly Driesenaar	Ad Stoffelen
2.3	10 Feb 2015		U10S, curl, divergence	Ad Stoffelen, Jos de Kloe	Lars-Anders Breivik L. Crosnier
2.4	20 May 2015	all	Change format to fit CMEMS graphical rules		L. Crosnier
2.5	22 Sept. 2015	all	Finish CMEMS rebranding	Jos de Kloe, Bruce Hackett	
2.6	19 Jan 2016		Product change	Jos de Kloe	
2.7	3 Feb. 2016		Revert name change for scat measurements and add standard names	Jos de Kloe	
2.8	12 Jul. 2016		NetCDF format changes and addition of wind curl and divergence fields	Jos de Kloe	B. Hackett
2.9	13 Jul 2016		Minor updates on MOTU and FTP URL/filenames examples	V Forneris	B. Hackett
2.10	6 Dec. 2016	V.2.2	Correct for scaling bug for curl/div in NetCDF description	Jos de Kloe	
2.11	6 Jan. 2017	I, III.1, III.2, IV.1, V.2,	Remove reference to V1 file format for ASCAT products. and add REP product	Jos de Kloe	
2.12	5 Sep. 2017		Extended ASCAT-A REP time-series and added ERS-1/ERS-2	M. Belmonte	

			REP data		
2.13	26 Jan 2018		Rebranding from OSI to Wind TAC	M. Belmonte	
2.14	21 Aug 2018		Added OSCAT2 REP data, ScatSat-1 NRT data, and time-series extension of ASCAT-A REP	M. Belmonte	
2.15	9 Jan 2019		Time-series extension of ASCAT-A REP	M. Belmonte	
2.16	11 April 2019		Time-series extension of ASCAT-A REP	M. Belmonte GJ van Zadelhoff	
2.17	4-Sep-2019		Added Metop-C ASCAT data, NetCDF-4 format, expanded acronym list	R. Giesen	
2.18	25-Mar-2020		Change from ERA-Interim to ERA5 model wind collocation and file format change for REP time-series, time series extension of ASCAT-A REP	R. Giesen	
2.19	10-Sep-2020		Added HY-2B HSCAT NRT datasets and information about REP regular time series extension. Updated Table 3 conform the PUM template.	R. Giesen	C. Derval
2.20	16-Jul-2021		Discontinuation of ScatSat-1 NRT datasets	R. Giesen	C. Derval

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GLOSSARY AND ABBREVIATIONS

BUFR	Binary Universal Form for the Representation of meteorological data
CF	Climate Forecast (convention for netCDF)
CMOD	C-band geophysical model function
CNR	Consiglio Nazionale delle Ricerche
COARE	Coupled Ocean-Atmosphere Response Experiment
Directgetfile	CMEMS service tool (FTP-like) to download a netCDF file
ECMWF	European Centre for Medium-Range Weather Forecasts
ERA	ECMWF Re-analysis
FTP	File Transfer Protocol (protocol to download and upload files)
KNMI	Royal Netherlands Meteorological Institute
IFREMER	Institut Français pour la Recherche et l'Exploitation de la MER
ISRO	Indian Space Research Organisation
netCDF	Network Common Data Form
NRT	Near Real-Time
NWP	Numerical Weather Prediction
OpenDAP	Open-Source Project for a Network Data Access Protocol. Protocol to download subset of data from a n-dimensional gridded dataset (ie: 4 dimensions: lon-lat,depth,time)
OSI SAF	Ocean and Sea Ice Satellite Application Facility
PC	Production Center
PU	Production Unit
REP	Reprocessed
Subsetter	CMEMS service tool to download a netCDF file of a selected geographical box using values of longitude, latitude and time range
U10S	10m-height stress-equivalent winds
Wind Meridional Component	West to East component of wind-to vector

Wind Zonal Component	South to North component of the wind-to vector
WVC	Wind Vector Cell

I INTRODUCTION

This guide describes the data product files from the CMEMS KNMI Production Unit, what data services are available to access them, and how to use the files and services.

The WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 product contains L3 gridded sea surface wind observations from scatterometer. The product is produced by KNMI based on the Near-Real-Time L2 scatterometer product and distributed by CNR.

The WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 product also contains gridded sea surface wind observations from scatterometer. This product is produced by KNMI based on the reprocessed L2 scatterometer products and distributed by CNR.

These CMEMS products contain L3 global daily gridded scatterometer observations relying on upstream L2 scatterometer products from the EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF) Wind Centre at KNMI. The different datasets within the product may have different grid spacings, varying from 12.5 km and 25 km (Metop-A, B and C), 25 km (ERS-1 and ERS-2) to 25 km and 50 km (QuikSCAT, ScatSat-1, Oceansat-2 and HY-2B), depending on the scatterometer and upstream processing. Data from ascending and descending passes are gridded into separate files. OSI SAF L2 quality monitoring flags are transferred to the L3 grid and included in the CMEMS L3 products.

The L3 REP time series are based on the L2 climate data records (CDR) reprocessed with European Centre for Medium-range Weather Forecasts (ECMWF) ERA-Interim reanalysis data within OSI SAF. ECMWF has stopped the production of ERA-Interim data in August 2019, therefore L2 reprocessing with ERA-Interim is no longer possible after this date. A L2 CDR reprocessed with ECMWF ERA5 reanalysis data is not foreseen for 2020 within OSI SAF. Hence, L2 NRT data had to be used to update the L3 REP time series, starting from January 2019. Since the L2 REP and NRT datasets are processed with the same processing software version, the only difference is the source of the ECMWF model wind (ECMWF ERA-Interim and operational model, respectively) used in the scatterometer processing to remove the ambiguity in the wind direction. The effect of this difference on the continuity of the L3 REP time series is expected to be negligible.

The CMEMS L3 global wind product also contains gridded model winds from ECMWF. The NRT products use the ECMWF Operational NWP model, while the REP products use the ECMWF ERA5 reanalyses. This model wind information is first stored in the OSI SAF upstream L2 wind product. The model wind in the CMEMS L3 global wind product is then sampled and processed in exactly the same way as the scatterometer winds, so subject to identical space and time sampling errors. Comparing scatterometer-sampled ECMWF winds with uniformly-sampled ECMWF winds over a period of interest, reveals these spatio-temporal scatterometer sampling errors.

It must be noted that a significant file format change has been implemented in the L3 production, including the addition of wind stress, curl and divergence of wind and wind stress, stress equivalent reference winds, the associated air density field, and some more technical changes in the definition of dimensions and attributes. All the L3 REP products are referred to as version V2. The file format change for ASCAT has been applied to the full period of NRT and REP scatterometer data available in the CMEMS archives. This change is the result of progress in understanding how the scatterometer measurements should be used (stress equivalent reference winds), in addition to user required fields (stress, rotation, divergence). It will be used from now on for all new near real-time and reprocessed data sets.

II DOWNLOADING DATA

After registration, you will be able to download our data. To assist you, our HelpCenter is available, and more specifically its section about download.

Information on operational issues on products and services can be found on our User Notification Service. If you have any questions, please contact us.

III DESCRIPTION OF THE PRODUCT SPECIFICATION

III.1 General Information

The different instruments available in this product have been updated for different CMEMS releases. Details are given in the following table (Table 1).

Product Specification	WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005
Geographical coverage	0°E → 360°E ; 90°S → 90°N
Temporal resolution	Daily files with instantaneous measurements
Target delivery time	Daily
Delivery mechanism	CMEMS Information System: SUBSETTER, FTP
Number of vertical levels	1 at 10 meters
Analysis or processing	Processing
Forecast	No
Data Source	ASCAT on Metop-A ASCAT on Metop-B ASCAT on Metop-C OSCAT on Oceansat-2 OSCAT on ScatSat-1 HSCAT on HY-2B SeaWinds on QuikSCAT SCAT on ERS-1 SCAT on ERS-2
Format	NetCDF-3 CF-1.6 (Metop-A, B and ScatSat-1 NRT time series) NetCDF-4 classic model CF-1.6 (all REP time series and Metop-C, HY-2B NRT)
Horizontal resolution	0.25 degrees and 0.125 degrees for Metop-A, B and C 0.5 degrees and 0.25 degrees for QuikSCAT, Oceansat-2, ScatSat-1 and HY-2B

	0.25 degrees for ERS-1 and ERS-2
Available NRT time series	From 1-Jan-2016 to present day (Metop-A and Metop-B) From 28-Oct-2019 to present day (Metop-C) From 21-Oct-2018 to 28-Feb-2021 (ScatSat-1) From 1-Dec-2020 to present day (HY-2B)
Available REP time series	From 1-Jan-2007 to 30-Dec-2019 (Metop-A) From 15-Dec-2009 to 20-Feb-2014 (Oceansat-2) From 19-Jul-1999 to 21-Nov-2009 (QuikSCAT) From 2-Mar-1992 to 3-Jun-1996 (ERS-1) From 20-Mar-1996 to 15-Jan-2001 (ERS-2)
Dimensions	time, lat, lon
Variables	Measurement Acquisition Time [seconds since 1990-01-01 00:00:00]
	Wvc-index [no unit]
	Wvc-quality-flag [no unit]
	Backscatter Distance [n.a.]
	Air Density [kg/m^3]
	(Stress-equivalent) Wind Speed [m/s]
	Model Stress Equivalent Wind Speed [m/s]
	Wind-to Direction [degree]
	Model Wind-to Direction [degree]
	Zonal (Eastward) (Stress Equivalent) Wind Velocity [m/s]
	Model Zonal (Eastward) Stress Equivalent Wind Velocity [m/s]

	Meridional (Northward) (Stress Equivalent) Wind Velocity [m/s]
	Model Meridional (Northward) Stress Equivalent Wind Velocity [m/s]
	Wind Divergence [1/s]
	Model Stress Equivalent Wind divergence [1/s]
	Wind Curl [1/s]
	Model Stress Equivalent Wind Curl [1/s]
	Wind Stress Magnitude [N/m^2]
	Model Wind Stress Magnitude [N/m^2]
	Zonal (Eastward) Wind Stress [N/m^2]
	Zonal (Eastward) Model Wind Stress [N/m^2]
	Meridional (Northward) Wind Stress [N/m^2]
	Meridional (Northward) Model Wind Stress [N/m^2]
	Wind Stress Divergence [N/m^3]
	Model Wind Stress Divergence [N/m^3]
	Wind Stress Curl [N/m^3]
	Model Wind Stress Curl [N/m^3]

Table 1: Product Specification for WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005

III.1.1 L3 Global Ocean wind and stress

The global ocean L3 wind and stress product relies on L2 scatterometer ocean wind vectors which are regridded to a regular lat-lon grid with fixed spacing. The global ocean L3 wind product contains different datasets depending on satellite, grid spacing and whether the data is originating from ascending or descending passes. The latter is done to avoid temporal averaging in a basic product, as dynamical and transient changes in the wind field are much larger over a day than the required accuracy level. The L3 grid spacing matches the resolution of the input L2 product. The input L2 products are operational products from the EUMETSAT OSI SAF produced at KNMI using the EUMETSAT NWP SAF wind processors. The production of the CMEMS L3 global ocean wind product is appended to the OSI SAF production system at KNMI (Production Centre). The resulting netCDF product files are then made available by the CMEMS Information System at CNR.

The OSI SAF L2 netCDF input data is generated from the original L2 BUFR products and contains several additions. The model wind is converted to 10m-height stress-equivalent winds, U10S, by taking the air density into account (taken from the ECMWF NWP model). The scatterometer wind itself already is a stress equivalent wind by definition because the CMOD function used for wind retrieval reflects ocean surface roughness and no atmospheric effects. In a next step the spatial derivatives of the U10S are calculated on a half grid coordinate system defined by the swath grid and later rotated to a standard north-south oriented coordinate system for user convenience. The wind rotation and divergence and wind stress rotation and divergence are calculated on this half grid.

This innovation was chosen to enable study of error properties. Earlier versions reported only the end result of wind stress and rotation, which contains errors from both calculation of the numerical derivatives and from interpolation from swath to regular grid. The new method splits this. All calculations of numerical derivatives are now done at level 2 without any (L2 to L3) interpolation errors. Moreover, the errors caused by the L2 to L3 regridding can now be studied separately.

The L2 to L3 regridding uses the exact same algorithm as in the previous version of the product and has already been tested. For the actual wind stress calculation, the drag coefficient is taken to be linear with U10S now, and has been derived by fitting a line to a drag versus U10S comparison for a full year of ERA-Interim wave model data. The resulting drag relation is very close to the well-known COARE3 relation[1].
In addition we have chosen to only include the stress equivalent wind fields. If a user needs the equivalent neutral winds, they can be derived from these using the supplied air mass density. The equations needed for this are detailed in the QUID document.

The various datasets of the global ocean L3 wind and stress product in CMEMS and the L2 products they are based on, are listed in Table 2. The various OSI SAF L2 wind products are visualized and fully described at http://www.knmi.nl/scatterometer. As new satellite instrument data will become available within the OSI SAF, the CMEMS L3 functionality will be added and the CMEMS portfolio extended.

The L3 product is derived from the L2 wind product by a gridding tool called nc_L2_to_L3 which sorts the wind vector cell measurements into cells defined by a regular lat-lon grid. The measurements from ascending and descending passes are gridded into separate datasets.

[1] J. B. Edson et al., "On the Exchange of Momentum over the Open Ocean", 2013, DOI: 10.1175/JPO-D-12-0173.1, Journal of Physical Oceanography,43, pp.1589-1610.

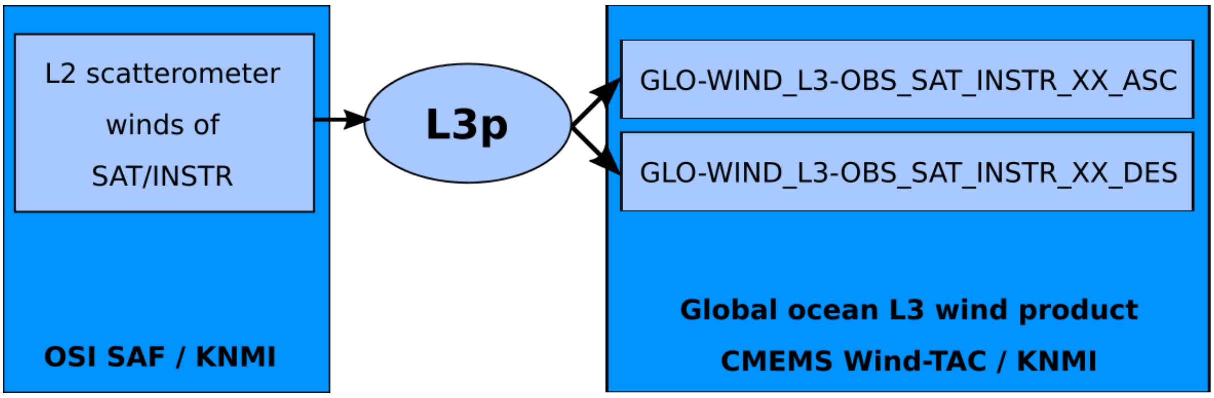

Figure 1 **Schematic view of the L2 to L3 processing (L3p) interfaces for scatterometer instrument "INSTR" on satellite "SAT".**

III.2 Details of datasets

The following tables give details on the datasets that are available in the WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 products.

Table 2 gives the L3 dataset names that are produced for the different scatterometer instruments and the corresponding L2 OSI SAF dataset identifier.

Table 3 defines the variable names and units, their corresponding netCDF long_names and CF standard names.

SATELLITE/ INSTRUMENT	processing type	DATASETS	L2 OSI SAF Identifier
Metop-A/ASCAT	NRT	KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_V2	OSI-102
		KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_25_DES_V2	OSI-102
		KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_12_ASC_V2	OSI-104
		KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_12_DES_V2	OSI-104
Metop-A/ASCAT	REP	KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_25_ASC	OSI-150-a
		KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_25_DES	OSI-150-a
		KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_12_ASC	OSI-150-b
		KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_12_DES	OSI-150-b
Metop-B/ASCAT	NRT	KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_25_ASC_V2	OSI-102-b
		KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_25_DES_V2	OSI-102-b

		KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_12_ASC_V2	OSI-104-b
		KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_12_DES_V2	OSI-104-b
Metop-C/ASCAT	NRT	KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_25_ASC_V2	OSI-102-c
		KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_25_DES_V2	OSI-102-c
		KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_12_ASC_V2	OSI-104-c
		KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_12_DES_V2	OSI-104-c
ScatSat-1/OSCAT	NRT	KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_ASC_V2	OSI-112-b
		KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_DES_V2	OSI-112-b
		KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_ASC_V2	OSI-112-a
		KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_DES_V2	OSI-112-a
HY-2B/HSCAT	NRT	KNMI-GLO-WIND_L3-OBS_HY-2B_HSCAT_50_ASC_V2	OSI-114-b
		KNMI-GLO-WIND_L3-OBS_ HY-2B_HSCAT _50_DES_V2	OSI-114-b
		KNMI-GLO-WIND_L3-OBS_ HY-2B_HSCAT _25_ASC_V2	OSI-114-a
		KNMI-GLO-WIND_L3-OBS_ HY-2B_HSCAT _25_DES_V2	OSI-114-a
Oceansat-2/OSCAT	REP	KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_50_ASC	OSI-153-b
		KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_50_DES	OSI-153-b
		KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_25_ASC	OSI-153-a
		KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_25_DES	OSI-153-a
QuikSCAT/SeaWinds	REP	KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_50_ASC	OSI-151-b
		KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_50_DES	OSI-151-b
		KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_25_ASC	OSI-151-a
		KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_25_DES	OSI-151-a
SCAT/ERS-1	REP	KNMI-GLO-WIND_L3-REP-OBS_ERS-1_SCAT_25_ASC	OSI-152
		KNMI-GLO-WIND_L3-REP-OBS_ERS-1_SCAT_25_DES	OSI-152
SCAT/ERS-2	REP	KNMI-GLO-WIND_L3-REP-OBS_ERS-2_SCAT_25_ASC	OSI-152
		KNMI-GLO-WIND_L3-REP-OBS_ERS-2 SCAT_25_DES	OSI-152

Table 2: List of datasets

WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005
contain the variables
measurement_time [seconds since 1990-01-01 00:00:00] measurement acquisition time time
wvc_index [no unit cross track wind vector cell number across_swath_cell_index (proposed new name)
wvc_quality_flag [no unit] wind vector cell quality status_flag
bs_distance [n.a.] backscatter distance backscatter_distance_to_modelfunction (proposed new name)
air_density [kg m-3] air density at 10 m air_density
wind_speed [m s-1] stress equivalent wind speed at 10 m wind_speed
se_model_speed [m s-1] stress equivalent model wind speed at 10 m wind_speed
wind_to_dir [degree] wind direction at 10 m wind_to_direction
model_wind_to_dir [degree] model wind direction at 10 m wind_to_direction
eastward_wind [m s-1] stress equivalent wind u component at 10 m eastward_wind
se_eastward_model_wind [m s-1] stress equivalent model wind u component at 10 m eastward_wind
northward_wind [m s-1] stress equivalent wind v component at 10 m northward_wind
se_northward_model_wind [m s-1] stress equivalent model wind v component at 10 m northward_wind
wind_divergence [s-1] divergence of stress equivalent wind at 10 m divergence_of_wind
se_model_wind_divergence [s-1] model divergence of stress equivalent wind at 10 m

divergence_of_wind
wind_curl [s-1] rotation of stress equivalent wind at 10 m atmosphere_relative_vorticity
se_model_wind_curl [s-1] model rotation of stress equivalent wind at 10 m atmosphere_relative_vorticity
wind_stress_magnitude [N m-2] wind stress magnitude_of_surface_downward_stress
model_stress_magnitude [N m-2] model stress magnitude_of_surface_downward_stress
eastward_stress [N m-2] wind stress u component surface_downward_eastward_stress
eastward_model_stress [N m-2] model stress u component surface_downward_eastward_stress
northward_stress [N m-2] wind stress v component surface_downward_northward_stress
northward_model_stress [N m-2] model stress v component surface_downward_northward_stress
stress_divergence [N m-3] divergence of ocean surface stress divergence_of_surface_downward_stress (proposed new name)
model_stress_divergence [N m-3] model divergence of ocean surface stress divergence_of_surface_downward_stress (proposed new name)
stress_curl [N m-3] rotation of ocean surface stress vertical_component_of_surface_downward_stress_curl (proposed new name)
model_stress_curl [N m-3] model rotation of ocean surface stress vertical_component_of_surface_downward_stress_curl (proposed new name)

Table 3: List of the variables and units for each dataset (first line), their long_names in the netCDF files (second line) and their CF standard names (third line) for the WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 product and the WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 product

IV NOMENCLATURE OF FILES

The nomenclature of the downloaded files differs on the basis of the chosen download mechanism Subsetter or FTP service.

IV.1 Nomenclature of files when downloaded through the CMEMS Web Portal Subsetter Service

WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 files nomenclature when downloaded through the CMEMS Web Portal Subsetter is based on product dataset name and a numerical reference related to the request date on the CIS.

The scheme is: **datasetname_extractionID.nc**

where :

· **datasetname** is a character string within one of the following :

- KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_25_DES_V2
- KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_12_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_12_DES_V2
- KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_25_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_25_DES_V2
- KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_12_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-B_ASCAT_12_DES_V2
- KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_25_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_25_DES_V2
- KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_12_ASC_V2
- KNMI-GLO-WIND_L3-OBS_METOP-C_ASCAT_12_DES_V2
- KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_ASC_V2
- KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_DES_V2
- KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_ASC_V2
- KNMI-GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_DES_V2
- KNMI-GLO-WIND_L3-OBS_HY-2B_HSCAT_25_ASC_V2
- KNMI-GLO-WIND_L3-OBS_HY-2B_HSCAT_25_DES_V2
- KNMI-GLO-WIND_L3-OBS_HY-2B_HSCAT_50_ASC_V2
- KNMI-GLO-WIND_L3-OBS_HY-2B_HSCAT 50_DES_V2

- KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_25_ASC
- KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_25_DES
- KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_12_ASC
- KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_12_DES
- KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_50_ASC
- KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_50_DES
- KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_25_ASC
- KNMI-GLO-WIND_L3-REP-OBS_QUIKSCAT_SEAWINDS_25_DES
- KNMI-GLO-WIND_L3-REP-OBS_ERS-1_SCAT_25_ASC
- KNMI-GLO-WIND_L3-REP-OBS ERS-1_SCAT_25_DES
- KNMI-GLO-WIND_L3-REP-OBS ERS-2_SCAT_25_ASC
- KNMI-GLO-WIND_L3-REP-OBS_ERS-2_SCAT_25_DES
- KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_50_ASC
- KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_25_DES
- KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_25_ASC
- KNMI-GLO-WIND_L3-REP-OBS_OCEANSAT2_OSCAT_25_DES

Where the name indicates the satellite (Metop-A, Metop-B, Metop-C, Oceansat-2, ScatSat-1, HY-2B, QuikSCAT or ERS-1/ERS-2), the instrument (ASCAT, OSCAT, SeaWinds, HSCAT or SCAT), the scatterometer wind resolution (25, 12.5 or 50 km), and whether the data are coming from ASCending or DEScending passes.

· **extractionID**: 13 digit integer corresponding to the extraction (subsetting) operation (uniquely identified)

.nc: standard netCDF filename extension.

Example:

`KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_12_ASC_V2_1468420761203.nc`

IV.2 Nomenclature of files when downloaded through the CMEMS Web Portal CMEMS FTP Service

You can also download files through the FTP Interface.
WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and
WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 files nomenclature when downloaded through the CMEMS Web Portal FTP is based as follows:

datasetname/{finename }_{valid_date}.nc

where

· datasetname as one of the character strings defined in section IV.1 above

· **valid date** YYYYMMDD is the validity day of the data in the file

· filename is:

- GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC
- GLO-WIND_L3-OBS_METOP-A_ASCAT_25_DES
- GLO-WIND_L3-OBS_METOP-A_ASCAT_12_ASC
- GLO-WIND_L3-OBS_METOP-A_ASCAT_12_DES
- GLO-WIND_L3-OBS_METOP-B_ASCAT_25_ASC
- GLO-WIND_L3-OBS_METOP-B_ASCAT_25_DES
- GLO-WIND_L3-OBS_METOP-B_ASCAT_12_ASC
- GLO-WIND_L3-OBS_METOP-B_ASCAT_12_DES
- GLO-WIND_L3-OBS_METOP-C_ASCAT_25_ASC
- GLO-WIND_L3-OBS_METOP-C_ASCAT_25_DES
- GLO-WIND_L3-OBS_METOP-C_ASCAT_12_ASC
- GLO-WIND_L3-OBS_METOP-C_ASCAT_12_DES
- GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_ASC
- GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_25_DES
- GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_ASC
- GLO-WIND_L3-OBS_SCATSAT-1_OSCAT_50_DES
- GLO-WIND_L3-OBS_HY-2B_HSCAT_25_ASC
- GLO-WIND_L3-OBS_HY-2B_HSCAT_25_DES
- GLO-WIND_L3-OBS_HY-2B_HSCAT_50_ASC
- GLO-WIND_L3-OBS_HY-2B_HSCAT_50_DES
- GLO-WIND_L3-OBS_QUIKSCAT_SEAWINDS_50_ASC
- GLO-WIND_L3-OBS_QUIKSCAT_SEAWINDS_50_DES
- GLO-WIND_L3-OBS_QUIKSCAT_SEAWINDS_25_ASC
- GLO-WIND_L3-OBS_QUIKSCAT_SEAWINDS_25_DES
- GLO-WIND_L3-OBS_ERS-1_SCAT_50_ASC
- GLO-WIND_L3-OBS_ERS-1_SCAT_50_DES
- GLO-WIND_L3-OBS_ERS-2_SCAT_25_ASC
- GLO-WIND_L3-OBS_ERS-2_SCAT_25_DES
- GLO-WIND_L3-OBS_OCEANSAT2_OSCAT_50_ASC
- GLO-WIND_L3-OBS_OCEANSAT2_OSCAT_25_DES
- GLO-WIND_L3-OBS_OCEANSAT2_OSCAT_25_ASC
- GLO-WIND_L3-OBS_OCEANSAT2_OSCAT_25_DES

Examples:

1) KNMI-GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_V2/GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_20150305.nc
2) KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_25_ASC_V2/GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_20150305.nc

IV.3 Grid

The grid that is used is a regular lat-lon grid covering the whole earth.

The grid spacing used is:

- 0.125 degrees for the gridded 12.5 km L3 scatterometer products,
- 0.25 degrees for the gridded 25 km L3 scatterometer products
- and 0.5 degrees for the gridded 50 km L3 scatterometer products.
- For the 12.5 km datasets the grid centre points go from 89.9375 degrees South to 89.9375 degrees North latitude and from 0.0625 degrees East to 359.9375 degrees East longitude.
- For the 25 km datasets the grid centre points go from 89.875 degrees South to 89.875 North latitude and from 0.125 degrees East to 359.875 degrees East longitude.
- For the 50 km datasets the grid centre points go from 89.75 degrees South to 89.75 North latitude and from 0.25 degrees East to 359.75 degrees East.

IV.4 Domain coverage

The L3 global wind product consists of sea surface winds from scatterometer that are interpolated to a regular lat-lon grid. Consequently the L3 wind covers the global ocean and a equidistant cylindrical projection is used with a constant longitude and latitude step of 0.25 degrees, resp. 0.125 degrees or 0.5 degrees.

Regular projection : longitude and latitude step is constant	

IV.5 Update Time

WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 product: the gridded sea surface wind observations are updated daily at around 07:00 AM UTC (4:00 PM UTC for HY-2B) with gridded observations of the day before.

WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 product: the gridded sea surface wind observations are generated off-line when a multi-year L2 reprocessing dataset becomes available and will be added when a new CMEMS version is released. The datasets KNMI-GLO-WIND_L3-REP-OBS_METOP-A_ASCAT_XX_XXX are extended in time every three months, such that these datasets cover the period from 2007 up to three months before present. As L2 datasets reprocessed with ERA5 model winds are not yet available, the L2 NRT datasets are used as input from 2019 onwards.

IV.6 Other information: mean centre of Products, land mask value, missing value

The L3 global wind products WIND_GLO_WIND_L3_NRT_OBSERVATIONS_012_002 and WIND_GLO_WIND_L3_REP_OBSERVATIONS_012_005 only contain observations at sea surface in the measurement swath of the satellite. The variable values for grid cells that are on land or outside the measurement swath are filled with the attribute missing_value or _FillValue. Also grid cells that contain only L3 measurements which are rejected by the OSI SAF KNMI quality control in the L2 processing (KNMI QC flag set), are filled with the attribute missing_value or _FillValue (see section V.2 below). For more information about the quality control in the OSI SAF L2 processing see the scatterometer product handbooks at http://www.knmi.nl/scatterometer .

V FILE FORMAT

V.1 NetCDF

The products are stored using the netCDF format. The NRT datasets are stored in netCDF-3 format, except for ASCAT on Metop-C, which is stored in netCDF-4 classic model format. All REP datasets are stored in netCDF-4 classic model format. The structure and semantic of all datasets is identical as outlined in Section V.2.

NetCDF (network Common Data Form) is an interface for array-oriented data access and a library that provides an implementation of the interface. The netCDF library also defines a machine-independent format for representing scientific data. Together, the interface, library, and format support the creation, access, and sharing of scientific data. The netCDF software was developed at the Unidata Program Center in Boulder, Colorado. The netCDF libraries define a machine-independent format for representing scientific data.

Please see Unidata netCDF pages for more information and to retrieve the netCDF software package.

NetCDF data is:

* Self-Describing. A netCDF file includes information about the data it contains.

* Architecture-independent. A netCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers.

* Direct-access. A small subset of a large dataset may be accessed efficiently, without first reading through all the preceding data.

* Appendable. Data can be appended to a netCDF dataset along one dimension without copying the dataset or redefining its structure. The structure of a netCDF dataset can be changed, though this sometimes causes the dataset to be copied.

* Sharable. One writer and multiple readers may simultaneously access the same netCDF file.

V.2 Structure and semantic of netCDF maps files

As already mentioned in the introduction of this document, significant changes have been implemented as dataset version V2. This format is applicable for the current NRT product based on the ASCAT on Metop-A/B/C data sets and all REP datasets, and it will be used from now on for all new near real time and reprocessed datasets as well. The V2 file format used by all other datasets is detailed next (as generated by “ncdump –h”) :

```
netcdf GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_20160710 {
dimensions:
        time = 1 ;
        lat = 720 ;
        lon = 1440 ;
```

```
variables:
int time(time) ;
        time:standard_name = "time" ;
        time:long_name = "Validity time" ;
        time:units = "seconds since 1990-01-01 00:00:00" ;
        time:calendar = "Gregorian" ;
        time:axis = "T" ;
    float lat(lat) ;
        lat:valid_min = -90.f ;
        lat:valid_max = 90.f ;
        lat:standard_name = "latitude" ;
        lat:long_name = "latitude" ;
        lat:units = "degrees_north" ;
        lat:axis = "Y" ;
    float lon(lon) ;
        lon:valid_min = 0.f ;
        lon:valid_max = 360.f ;
        lon:standard_name = "longitude" ;
        lon:long_name = "longitude" ;
        lon:units = "degrees_east" ;
        lon:axis = "X" ;
    int measurement_time(time, lat, lon) ;
        measurement_time:_FillValue = -2147483647 ;
        measurement_time:missing_value = -2147483647 ;
        measurement_time:valid_min = 0 ;
        measurement_time:valid_max = 2147483647 ;
        measurement_time:standard_name = "time" ;
        measurement_time:long_name = "measurement acquisition time" ;
        measurement_time:units = "seconds since 1990-01-01 00:00:00" ;
        measurement_time:coordinates = "time lat lon" ;
    short wvc_index(time, lat, lon) ;
        wvc_index:_FillValue = -32767s ;
        wvc_index:missing_value = -32767s ;
        wvc_index:valid_min = 0s ;
```

```
        wvc_index:valid_max = 999s ;
        wvc_index:standard_name = "across_swath_cell_index" ;
        wvc_index:long_name = "cross track wind vector cell number" ;
        wvc_index:units = "1" ;
        wvc_index:coordinates = "time lat lon" ;
short air_density(time, lat, lon) ;
        air_density:_FillValue = -32767s ;
        air_density:missing_value = -32767s ;
        air_density:valid_min = 0s ;
        air_density:valid_max = 2000s ;
        air_density:standard_name = "air_density" ;
        air_density:long_name = "air density at 10 m" ;
        air_density:units = "kg m-3" ;
        air_density:scale_factor = 0.001 ;
        air_density:add_offset = 0. ;
        air_density:coordinates = "time lat lon" ;
        air_density:air_density_source = "ECMWF (Operational Model)" ;
int stress_divergence(time, lat, lon) ;
        stress_divergence:_FillValue = -2147483647 ;
        stress_divergence:missing_value = -2147483647 ;
        stress_divergence:valid_min = -500000000 ;
        stress_divergence:valid_max = 500000000 ;
        stress_divergence:standard_name = "divergence_of_surface_downward_stress" ;
        stress_divergence:long_name = "divergence of ocean surface stress" ;
        stress_divergence:units = "N m-3" ;
        stress_divergence:scale_factor = 1.e-10 ;
        stress_divergence:add_offset = 0. ;
        stress_divergence:coordinates = "time lat lon" ;
int stress_curl(time, lat, lon) ;
        stress_curl:_FillValue = -2147483647 ;
        stress_curl:missing_value = -2147483647 ;
        stress_curl:valid_min = -500000000 ;
        stress_curl:valid_max = 500000000 ;
```

stress_curl:standard_name = "vertical_component_of_surface_downward_stress_curl" ;

stress_curl:long_name = "rotation of ocean surface stress" ;

stress_curl:units = "N m-3" ;

stress_curl:scale_factor = 1.e-10 ;

stress_curl:add_offset = 0. ;

stress_curl:coordinates = "time lat lon" ;

int model_stress_divergence(time, lat, lon) ;

model_stress_divergence:_FillValue = -2147483647 ;

model_stress_divergence:missing_value = -2147483647 ;

model_stress_divergence:valid_min = -500000000 ;

model_stress_divergence:valid_max = 500000000 ;

model_stress_divergence:standard_name = "divergence_of_surface_downward_stress" ;

model_stress_divergence:long_name = "model divergence of ocean surface stress" ;

model_stress_divergence:units = "N m-3" ;

model_stress_divergence:scale_factor = 1.e-10 ;

model_stress_divergence:add_offset = 0. ;

model_stress_divergence:coordinates = "time lat lon" ;

model_stress_divergence:background_wind_source = "ECMWF (Operational Model)" ;

int model_stress_curl(time, lat, lon) ;

model_stress_curl:_FillValue = -2147483647 ;

model_stress_curl:missing_value = -2147483647 ;

model_stress_curl:valid_min = -500000000 ;

model_stress_curl:valid_max = 500000000 ;

model_stress_curl:standard_name = "vertical_component_of_surface_downward_stress_curl" ;

model_stress_curl:long_name = "model rotation of ocean surface stress" ;

model_stress_curl:units = "N m-3" ;

model_stress_curl:scale_factor = 1.e-10 ;

model_stress_curl:add_offset = 0. ;

model_stress_curl:coordinates = "time lat lon" ;

model_stress_curl:background_wind_source = "ECMWF (Operational Model)" ;

int wind_divergence(time, lat, lon) ;

wind_divergence:_FillValue = -2147483647 ;

```
        wind_divergence:missing_value = -2147483647 ;
        wind_divergence:valid_min = -500000 ;
        wind_divergence:valid_max = 500000 ;
        wind_divergence:standard_name = "divergence_of_wind" ;
        wind_divergence:long_name = "divergence of stress equivalent wind at 10m" ;
        wind_divergence:units = "s-1" ;
        wind_divergence:scale_factor = 1.e-07 ;
        wind_divergence:add_offset = 0. ;
        wind_divergence:coordinates = "time lat lon" ;
    int wind_curl(time, lat, lon) ;
        wind_curl:_FillValue = -2147483647 ;
        wind_curl:missing_value = -2147483647 ;
        wind_curl:valid_min = -500000 ;
        wind_curl:valid_max = 500000 ;
        wind_curl:standard_name = "atmosphere_relative_vorticity" ;
        wind_curl:long_name = "rotation of stress equivalent wind at 10m" ;
        wind_curl:units = "s-1" ;
        wind_curl:scale_factor =1.e-07 ;
        wind_curl:add_offset = 0. ;
        wind_curl:coordinates = "time lat lon" ;
    int se_model_wind_divergence(time, lat, lon) ;
        se_model_wind_divergence:_FillValue = -2147483647 ;
        se_model_wind_divergence:missing_value = -2147483647 ;
        se_model_wind_divergence:valid_min = -500000 ;
        se_model_wind_divergence:valid_max = 500000 ;
        se_model_wind_divergence:standard_name = "divergence_of_wind" ;
        se_model_wind_divergence:long_name = "model divergence of stress equivalent wind
at 10m" ;
        se_model_wind_divergence:units = "s-1" ;
        se_model_wind_divergence:scale_factor = 1.e-07 ;
        se_model_wind_divergence:add_offset = 0. ;
        se_model_wind_divergence:coordinates = "time lat lon" ;
        se_model_wind_divergence:background_wind_source = "ECMWF (Operational
Model)" ;
    int se_model_wind_curl(time, lat, lon) ;
```

```
		se_model_wind_curl:_FillValue = -2147483647 ;
		se_model_wind_curl:missing_value = -2147483647 ;
		se_model_wind_curl:valid_min = -500000 ;
		se_model_wind_curl:valid_max = 500000 ;
		se_model_wind_curl:standard_name = "atmosphere_relative_vorticity" ;
		se_model_wind_curl:long_name = "model rotation of stress equivalent wind at 10m" ;
		se_model_wind_curl:units = "s-1" ;
		se_model_wind_curl:scale_factor = 1.e-07 ;
		se_model_wind_curl:add_offset = 0. ;
		se_model_wind_curl:coordinates = "time lat lon" ;
		se_model_wind_curl:background_wind_source = "ECMWF (Operational Model)" ;
	short se_model_speed(time, lat, lon) ;
		se_model_speed:_FillValue = -32767s ;
		se_model_speed:missing_value = -32767s ;
		se_model_speed:valid_min = 0s ;
		se_model_speed:valid_max = 5000s ;
		se_model_speed:standard_name = "wind_speed" ;
		se_model_speed:long_name = "stress equivalent model wind speed at 10 m" ;
		se_model_speed:units = "m s-1" ;
		se_model_speed:scale_factor = 0.01 ;
		se_model_speed:add_offset = 0. ;
		se_model_speed:coordinates = "time lat lon" ;
		se_model_speed:background_wind_source = "ECMWF (Operational Model)" ;
	short model_wind_to_dir(time, lat, lon) ;
		model_wind_to_dir:_FillValue = -32767s ;
		model_wind_to_dir:missing_value = -32767s ;
		model_wind_to_dir:valid_min = 0s ;
		model_wind_to_dir:valid_max = 3600s ;
		model_wind_to_dir:standard_name = "wind_to_direction" ;
		model_wind_to_dir:long_name = "model wind direction at 10 m" ;
		model_wind_to_dir:units = "degree" ;
		model_wind_to_dir:scale_factor = 0.1 ;
		model_wind_to_dir:add_offset = 0. ;
		model_wind_to_dir:coordinates = "time lat lon" ;
```

```
model_wind_to_dir:background_wind_source = "ECMWF (Operational Model)" ;
int wvc_quality_flag(time, lat, lon) ;
wvc_quality_flag:_FillValue = -2147483647 ;
wvc_quality_flag:missing_value = -2147483647 ;
wvc_quality_flag:valid_min = 0 ;
wvc_quality_flag:valid_max = 8388607 ;
wvc_quality_flag:standard_name = "status_flag" ;
wvc_quality_flag:long_name = "wind vector cell quality" ;
wvc_quality_flag:coordinates = "time lat lon" ;
wvc_quality_flag:flag_masks = 64, 128, 256, 512, 1024, 2048, 4096, 8192, 16384,
32768, 65536, 131072, 262144, 524288, 1048576, 2097152, 4194304 ;
wvc_quality_flag:flag_meanings = "distance_to_gmf_too_large data_are_redundant
no_meteorological_background_used rain_detected rain_flag_not_usable
small_wind_less_than_or_equal_to_3_m_s large_wind_greater_than_30_m_s
wind_inversion_not_successful some_portion_of_wvc_is_over_ice
some_portion_of_wvc_is_over_land variational_quality_control_fails knmi_quality_control_fails
product_monitoring_event_flag product_monitoring_not_used
any_beam_noise_content_above_threshold poor_azimuth_diversity
not_enough_good_sigma0_for_wind_retrieval" ;
short wind_speed(time, lat, lon) ;
wind_speed:_FillValue = -32767s ;
wind_speed:missing_value = -32767s ;
wind_speed:valid_min = 0s ;
wind_speed:valid_max = 5000s ;
wind_speed:standard_name = "wind_speed" ;
wind_speed:long_name = "stress equivalent wind speed at 10 m" ;
wind_speed:units = "m s-1" ;
wind_speed:scale_factor = 0.01 ;
wind_speed:add_offset = 0. ;
wind_speed:coordinates = "time lat lon" ;
short wind_to_dir(time, lat, lon) ;
wind_to_dir:_FillValue = -32767s ;
wind_to_dir:missing_value = -32767s ;
wind_to_dir:valid_min = 0s ;
wind_to_dir:valid_max = 3600s ;
wind_to_dir:standard_name = "wind_to_direction" ;
wind_to_dir:long_name = "wind direction at 10 m" ;
```

```
        wind_to_dir:units = "degree" ;
        wind_to_dir:scale_factor = 0.1 ;
        wind_to_dir:add_offset = 0. ;
        wind_to_dir:coordinates = "time lat lon" ;
    short eastward_wind(time, lat, lon) ;
        eastward_wind:_FillValue = -32767s ;
        eastward_wind:missing_value = -32767s ;
        eastward_wind:valid_min = -5000s ;
        eastward_wind:valid_max = 5000s ;
        eastward_wind:standard_name = "eastward_wind" ;
        eastward_wind:long_name = "stress equivalent wind u component at 10 m" ;
        eastward_wind:units = "m s-1" ;
        eastward_wind:scale_factor = 0.01 ;
        eastward_wind:add_offset = 0. ;
        eastward_wind:coordinates = "time lat lon" ;
    short northward_wind(time, lat, lon) ;
        northward_wind:_FillValue = -32767s ;
        northward_wind:missing_value = -32767s ;
        northward_wind:valid_min = -5000s ;
        northward_wind:valid_max = 5000s ;
        northward_wind:standard_name = "northward_wind" ;
        northward_wind:long_name = "stress equivalent wind v component at 10 m" ;
        northward_wind:units = "m s-1" ;
        northward_wind:scale_factor = 0.01 ;
        northward_wind:add_offset = 0. ;
        northward_wind:coordinates = "time lat lon" ;
    short se_eastward_model_wind(time, lat, lon) ;
        se_eastward_model_wind:_FillValue = -32767s ;
        se_eastward_model_wind:missing_value = -32767s ;
        se_eastward_model_wind:valid_min = -5000s ;
        se_eastward_model_wind:valid_max = 5000s ;
        se_eastward_model_wind:standard_name = "eastward_wind" ;
        se_eastward_model_wind:long_name = "stress equivalent model wind u component
at 10 m" ;
```

```
        se_eastward_model_wind:units = "m s-1" ;
        se_eastward_model_wind:scale_factor = 0.01 ;
        se_eastward_model_wind:add_offset = 0. ;
        se_eastward_model_wind:coordinates = "time lat lon" ;
        se_eastward_model_wind:background_wind_source = "ECMWF (Operational Model)"
;
    short se_northward_model_wind(time, lat, lon) ;
        se_northward_model_wind:_FillValue = -32767s ;
        se_northward_model_wind:missing_value = -32767s ;
        se_northward_model_wind:valid_min = -5000s ;
        se_northward_model_wind:valid_max = 5000s ;
        se_northward_model_wind:standard_name = "northward_wind" ;
        se_northward_model_wind:long_name = "stress equivalent model wind v component
at 10 m" ;
        se_northward_model_wind:units = "m s-1" ;
        se_northward_model_wind:scale_factor = 0.01 ;
        se_northward_model_wind:add_offset = 0. ;
        se_northward_model_wind:coordinates = "time lat lon" ;
        se_northward_model_wind:background_wind_source = "ECMWF (Operational
Model)" ;
    int wind_stress_magnitude(time, lat, lon) ;
        wind_stress_magnitude:_FillValue = -2147483647 ;
        wind_stress_magnitude:missing_value = -2147483647 ;
        wind_stress_magnitude:valid_min = 0 ;
        wind_stress_magnitude:valid_max = 5000 ;
        wind_stress_magnitude:standard_name = "magnitude_of_surface_downward_stress"
;
        wind_stress_magnitude:long_name = "wind stress" ;
        wind_stress_magnitude:units = "N m-2" ;
        wind_stress_magnitude:scale_factor = 0.01 ;
        wind_stress_magnitude:add_offset = 0. ;
        wind_stress_magnitude:coordinates = "time lat lon" ;
    int model_stress_magnitude(time, lat, lon) ;
        model_stress_magnitude:_FillValue = -2147483647 ;
        model_stress_magnitude:missing_value = -2147483647 ;
```

model_stress_magnitude:valid_min = 0 ;

model_stress_magnitude:valid_max = 5000 ;

model_stress_magnitude:standard_name = "magnitude_of_surface_downward_stress" ;

model_stress_magnitude:long_name = "model stress" ;

model_stress_magnitude:units = "N m-2" ;

model_stress_magnitude:scale_factor = 0.01 ;

model_stress_magnitude:add_offset = 0. ;

model_stress_magnitude:coordinates = "time lat lon" ;

model_stress_magnitude:background_wind_source = "ECMWF (Operational Model)" ;

int eastward_stress(time, lat, lon) ;

eastward_stress:_FillValue = -2147483647 ;

eastward_stress:missing_value = -2147483647 ;

eastward_stress:valid_min = -5000 ;

eastward_stress:valid_max = 5000 ;

eastward_stress:standard_name = "surface_downward_eastward_stress" ;

eastward_stress:long_name = "wind stress u component" ;

eastward_stress:units = "N m-2" ;

eastward_stress:scale_factor = 0.01 ;

eastward_stress:add_offset = 0. ;

eastward_stress:coordinates = "time lat lon" ;

int northward_stress(time, lat, lon) ;

northward_stress:_FillValue = -2147483647 ;

northward_stress:missing_value = -2147483647 ;

northward_stress:valid_min = -5000 ;

northward_stress:valid_max = 5000 ;

northward_stress:standard_name = "surface_downward_northward_stress" ;

northward_stress:long_name = "wind stress v component" ;

northward_stress:units = "N m-2" ;

northward_stress:scale_factor = 0.01 ;

northward_stress:add_offset = 0. ;

northward_stress:coordinates = "time lat lon" ;

int eastward_model_stress(time, lat, lon) ;

eastward_model_stress:_FillValue = -2147483647 ;

```
		eastward_model_stress:missing_value = -2147483647 ;
		eastward_model_stress:valid_min = -5000 ;
		eastward_model_stress:valid_max = 5000 ;
		eastward_model_stress:standard_name = "surface_downward_eastward_stress" ;
		eastward_model_stress:long_name = "model stress u component" ;
		eastward_model_stress:units = "N m-2" ;
		eastward_model_stress:scale_factor = 0.01 ;
		eastward_model_stress:add_offset = 0. ;
		eastward_model_stress:coordinates = "time lat lon" ;
		eastward_model_stress:background_wind_source = "ECMWF (Operational Model)" ;
	int northward_model_stress(time, lat, lon) ;
		northward_model_stress:_FillValue = -2147483647 ;
		northward_model_stress:missing_value = -2147483647 ;
		northward_model_stress:valid_min = -5000 ;
		northward_model_stress:valid_max = 5000 ;
		northward_model_stress:standard_name = "surface_downward_northward_stress" ;
		northward_model_stress:long_name = "model stress v component" ;
		northward_model_stress:units = "N m-2" ;
		northward_model_stress:scale_factor = 0.01 ;
		northward_model_stress:add_offset = 0. ;
		northward_model_stress:coordinates = "time lat lon" ;
		northward_model_stress:background_wind_source = "ECMWF (Operational Model)" ;
	short bs_distance(time, lat, lon) ;
		bs_distance:_FillValue = -32767s ;
		bs_distance:missing_value = -32767s ;
		bs_distance:valid_min = -500s ;
		bs_distance:valid_max = 500s ;
		bs_distance:standard_name = "backscatter_distance_to_modelfunction" ;
		bs_distance:long_name = "backscatter distance" ;
		bs_distance:units = "1" ;
		bs_distance:scale_factor = 0.1 ;
		bs_distance:add_offset = 0. ;
		bs_distance:coordinates = "time lat lon" ;
```

```
// global attributes:
        :title = " Global Ocean - Wind - METOP-A ASCAT - 25km daily Ascending V2" ;
        :title_short_name = "ASCATA-L3-25km" ;
        :Conventions = "CF-1.6" ;
        :institution = "EUMETSAT/OSI SAF/KNMI" ;
        :source = "MetOp-A ASCAT" ;
        :software_identification_level_1 = 1000 ;
        :instrument_calibration_version = 0 ;
        :software_identification_wind = 2401 ;
        :pixel_size_on_horizontal = "25.0 km" ;
        :service_type = "N/A" ;
        :processing_type = "O" ;
        :contents = "ovw" ;
        :granule_name = "GLO-WIND_L3-OBS_METOP-A_ASCAT_25_ASC_20160710.nc" ;
        :processing_level = "L3" ;
        :orbit_number = 50453 ;
        :start_date = "2016-07-10" ;
        :start_time = "00:00:00" ;
        :stop_date = "2016-07-10" ;
        :stop_time = "23:59:56" ;
        :equator_crossing_longitude = " 328.246" ;
        :equator_crossing_date = "2016-07-09" ;
        :equator_crossing_time = "23:35:50" ;
        :rev_orbit_period = "6081.7" ;
        :orbit_inclination = "98.7" ;
        :history = "N/A" ;
        :references = "ASCAT Wind Product User Manual, http://www.osi-saf.org/, http://www.knmi.nl/scatterometer/" ;
        :comment = "Orbit period and inclination are constant values. All wind directions in oceanographic convention (0 deg. flowing North)" ;
        :creation_date = "2016-07-11" ;
        :creation_time = "08:11:18" ;
}
```

V.3 Reading software

NetCDF data can be browsed and used through a number of software, like:

- ncBrowse: http://www.epic.noaa.gov/java/ncBrowse/,
- NetCDF Operator (NCO): http://nco.sourceforge.net/
- Panoply: http://www.giss.nasa.gov/tools/panoply/
- Python: https://github.com/Unidata/netcdf4-python
- IDL, Matlab, GMT…