



PRODUCT USER MANUAL

OMI_SI

ARCTIC_OMI_SI_extent_obs

Issue: 2.0

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PUM for CMEMS Ocean Monitoring Indicator
OMI_SI

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CHANGE RECORD

Issue	Date	§	Description of Change	Author	Validated By
1.0	25.01.2018	all	Creation of the document	Thomas Lavergne	Cecilie Wettre
2.0	12.04.2019	All	Revision for extension to 2018, and using OSISAF products OSI-450 and OSI-430-b as source.	Thomas Lavergne	Cecilie Wettre

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GLOSSARY AND ABBREVIATIONS

CMEMS	Copernicus Marine Environment Monitoring Service
MOI	Mercator Océan International
NetCDF	Network Common Data Form
OMI	Ocean Monitoring Indicator
PUM	Product User Manual
QUID	Quality Information Document
TAC	Thematic Assembly Centre
SI	Sea Ice
CDR	Climate Data Record
CF	Climate Forecast (convention for NetCDF)
ICDR	Interim Climate Data Record
NRT	Near-Real-Time
OSISAF	EUMETSAT's Ocean and Sea Ice Satellite Application Facility
RMS	Root mean square
SIC	Sea Ice Concentration
SIE	Sea Ice Extent
PC	Production Center
PU	Production Unit
ftp	Protocol to download files
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)
Subsetter	CMEMS service tool to download a NetCDF file of a selected geographical box using values of longitude and latitude, and time range
Directgetfile	CMEMS service tool (FTP like) to download a NetCDF file

I INTRODUCTION

I.1 Summary

This document contains the Product User Manual for the CMEMS Ocean Monitoring Indicator (OMI) ARCTIC_OMI_SI_extent_obs. The data are monthly averaged Sea Ice Extent (SIE) time series.

The product is derived from daily sea ice concentration (SIC) products from the EUMETSAT Ocean and Sea Ice Satellite Application Facility (OSI SAF), developed and delivered by MET Norway and the Danish Meteorological Institute (DMI).

The OMI is based on the EUMETSAT OSI SAF products, distributed through CMEMS as:

- CDR: OSI-450: OSI SAF global reprocessed sea ice concentration: 1979-2015 (https://doi.org/10.15770/EUM_SAF_OSI_0008);
- ICDR: OSI-430-b: OSI SAF global reprocessed sea ice concentration continuous updates: 2016-2018.

The EUMETSAT OSI SAF acknowledges the R&D contribution from the ESA Climate Change Initiative projects to the algorithms running in OSI-450 and OSI-430-b.

I.1.1 Sea Ice Concentration data

The EUMETSAT OSI SAF SIC products (OSI-450 and OSI-430-b) used in this OMI are fully described in OSISAF documents, including:

- OSI SAF Product User Manual for OSI-450 and OSI-430-b (http://osisaf.met.no/docs/osisaf_cdop2_ss2_pum_sea-ice-conc-climate-data-record_v1p0.pdf, http://osisaf.met.no/docs/osisaf_cdop3_ss2_pum_sea-ice-conc-reproc_v2p5.pdf)
- OSI SAF Validation Report for OSI-450 and OSI-430-b (http://osisaf.met.no/docs/osisaf_cdop2_ss2_valrep_sea-ice-conc-climate-data-record_v1p0.pdf, http://osisaf.met.no/docs/osisaf_cdop2_ss2_valrep_ice-conc-reproc_v2p0.pdf)
- OSI SAF Algorithm Theoretical Basis Document for OSI-450 and OSI-430-b (http://osisaf.met.no/docs/osisaf_cdop2_ss2_atbd_sea-ice-conc-climate-data-record_v1p1.pdf, http://osisaf.met.no/docs/osisaf_cdop2_ss2_atbd_sea-ice-conc-reproc_v1p1.pdf).

In addition, a scientific publication describing the algorithms and the validation of the (OSI-450) data record is Lavergne et al. (2019).

Satellite data used in OSI-450 and OSI-430-b are:

Time period	Sensor	Platform
Jan 1979 – Jul 1987	SMMR	Nimbus-7
Jul 1987 – Dec 2008	SSM/I	F8, F11, F13, F14, F15
Nov 2005 – Dec 2018	SSMIS	F16, F17, F18

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Ancillary data used in OSI-450 and OSI-430-b are:

Time period	Sources
Jan 1979 – Dec 2015	ERA-Interim reanalysis (T2m, TCWV, and WS)
Jan 2016 – Dec 2018	ECMWF analysis and forecast (T2m, TCWV, WS)

The OSI SAF reports (particularly the Validation report) document the quality of OSI-450 and OSI-430-b, the consistency at the transition (December 2015 – January 2016), and how OSI-450 and OSI-430-b are superior to their predecessors (OSI-409 and OSI-430).

Note: the previous version of this CMEMS OMI was based on OSI-409 and OSI-430.

I.1.2 The OMI Sea Ice Extent

I.1.2.1 Daily SIE values

Daily SIE values are computed from maps of daily Sea Ice Concentration (SIC). All sea ice covered ocean is included, lake ice is not. SIE is computed as the sum of the area of the grid cells that have a SIC value larger than 15%. Daily SIE values are not accessible in the OMI.

I.1.2.2 Monthly SIE values

Monthly SIE values are computed as averages of the daily SIE values.

Before July 1987, months having less than 5 days of valid data are not kept in the OMI, and a missing value appear in the file. From July 1987 onwards, this limit is set to 10 days. The change in July 1987 is justified because the SMMR instrument (used from 1979 and July 1987, see table in I.1.1) operated only every other day.

The OMI is published on the CMEMS dissemination server after automatic and delayed-mode quality controls. The product is available online and disseminated through the CMEMS Information System. Files downloaded are in NetCDF format and follow CF convention.

Disclaimer: The quality of the product may vary during the proposed time series depending on the possible update of the system.

Product OMI_SI_extent is described in the Quality Information Document (QUID) CMEMS-OMI-QUID-SIE.pdf (<http://marine.copernicus.eu/documents/QUID/CMEMS-OMI-QUID-SIE.pdf>). See also News flash. More detailed information can be obtained from the CMEMS Service Desk (servicedesk.cmems@mercator-ocean.eu).

I.2 History of change

28 February 2018	Publication of ARCTIC_OMI_SI_extent_obs product
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12.04.2019	Publication of updated OMI_SI_extent: <ul style="list-style-type: none">• Extended to 2018;• Use new version of OSI SAF SIC as input.
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II DESCRIPTION OF THE PRODUCT SPECIFICATION

II.1 General Information about products

Product(s) name	ARCTIC_OMI_SI_extent_obs		
Geographical coverage	Ice-covered oceans of the Northern Hemisphere. Lake ice is not included.		
Variables	Monthly mean sea ice extent, and its climatology by month.		
Update frequency	yearly		
Available time series	1979-2018		
Delivery mechanism	FTP		
Temporal/Spatial resolution	Monthly/aggregated		
Integration depth	Surface		
Format	NetCDF CF1.7		

Detailed information on the systems and products are on CMEMS web site: <http://marine.copernicus.eu/documents/QUID/CMEMS-OMI-QUID-SIE.pdf>

II.2 Climatology period

For the ARCTIC OMI a climatology by month is also provided. The climatology period is the whole period (1979-2018).

II.3 Details of the datasets

For each product, one table with details of datasets content

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II.3.1 ARCTIC_OMI_SI_extent_obs

ARCTIC_OMI_SI_extent_obs	
artic_omi_si_extent_obs	contains the 1D monthly Northern Hemisphere Sea Ice Extent time series, and its climatology monthly
	siextent [km2] Monthly averaged Sea Ice Extent sea_ice_extent
	monthlyclimsiextent_mean [km2] Climatology (by month) of the Sea Ice Extent (mean value) sea_ice_extent
	monthlyclimsiextent_std [km2] climatology (by month) of the Sea Ice Extent (one standard deviation) sea_ice_extent

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II.4 Product System Description

For the Arctic – An indicator that gives the monthly mean sea ice extent (SIE in km²) for the northern hemisphere. The time-series starts in January 1979 and ends in December 2018.

II.5 How to download a product

II.5.1 Download a product through the CMEMS Web Portal Ftp Service

You first need to register. Please find below the registration steps:
<http://marine.copernicus.eu/web/34-products-and-services-faq.php#1>

Once registered, the CMEMS FAQ <http://marine.copernicus.eu/web/34-products-and-services-faq.php> will guide you on how to download a product through the CMEMS Web Portal FTP Service.

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III FILES NOMENCLATURE AND FORMAT

III.1 Nomenclature of files when downloaded through the CMEMS FTP Services

OMI_SI_extent files nomenclature when downloaded through the CMEMS FTP Services is based on the following nomenclature:

<datasetname>_<timestep>_P<productiontime>_R<climatologyrange>

Where :

- **<datasetname>** is the dataset reference.
- **<timestep>** is the first time step contained in the file.
- **<productiontime>** is the production time when the file was generated.
- **<climatologyrange>** is the range of years used for the climatology
- **.nc** is the standard NetCDF filename extension.

III.2 File Format: format name

The products are stored using the NetCDF format, using the netCDF-4 classic model.

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 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.

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III.3 File size

DATASET NAME	NAME OF FILE	DIMENSION [MB]*	
		Compressed	Uncompressed
arctic_omi_si_extent_obs	ARCTIC_OMI_SI_extent_1 9790115_P20181231.nc	N/A	63K

III.4 Reading Softwares

The products are stored using the NetCDF-CF format. Note that these data can be browsed and used through several softwares, like:

- ✓ ncBrowse: <http://www.epic.noaa.gov/java/ncBrowse/>
- ✓ NetCDF Operator (NCO): <http://nco.sourceforge.net/>
- ✓ <http://www.unidata.ucar.edu/software/netcdf/>

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IV REFERENCES

See the Quality Information Document (QUID) CMEMS-OMI-QUID-SIE.pdf (<http://marine.copernicus.eu/documents/QUID/CMEMS-OMI-QUID-SIE.pdf>).

Lavergne, T., Sørensen, A. M., Kern, S., Tonboe, R., Notz, D., Aaboe, S., Bell, L., Dybkjær, G., Eastwood, S., Gabarro, C., Heygster, G., Killie, M. A., Brandt Kreiner, M., Lavelle, J., Saldo, R., Sandven, S., and Pedersen, L. T.: Version 2 of the EUMETSAT OSI SAF and ESA CCI sea-ice concentration climate data records, *The Cryosphere*, 13, 49-78, <https://doi.org/10.5194/tc-13-49-2019>, 2019.