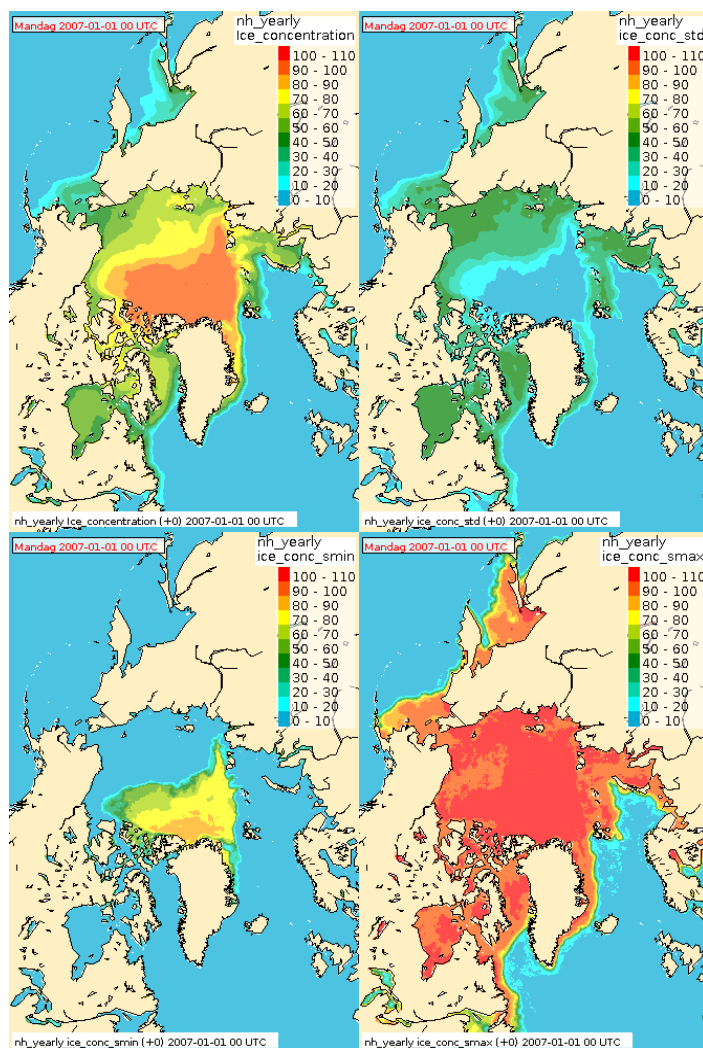


CryoClim sea ice product documentation

CryoClim sub-service for sea ice



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1.0	M.A. Killie	First version	24/10-2013

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1 Introduction

CryoClim is an Internet service providing cryospheric climate products, primarily based on satellite observations. The service is delivered through a web service and web portal (www.cryoclim.net). The portal includes manual searching, viewing and downloading capabilities. CryoClim is an operational and permanent service for long-term systematic climate monitoring of the cryosphere. The product production and the product repositories are hosted by mandated organisations. The databases are connected over the Internet in a seamless and scalable network, open for inclusion of more databases/sub-services. CryoClim provides sea ice and snow products of global coverage and glacier products covering Norway (mainland and Svalbard). The service has been developed by CryoClim project (2008–2013) by the Norwegian Computing Center (NR; project coordinator), Norwegian Meteorological Institute (MET Norway), Norwegian Water Resources and Energy Directorate (NVE) and Norwegian Polar Institute (NPI). CryoClim was an ESA PRODEX project funded by the Norwegian Space Centre.

The sub-service for sea ice builds on reprocessed daily sea ice concentration products from the EUMETSAT OSI SAF project, and delivers aggregated sea ice concentration products and sea ice extent. The period 1978 to 2009 is currently covered. The CryoClim sea ice products will be updated following future work in the OSI SAF project.

2 Product overview

Category	Description
Cryospheric variable	Monthly and yearly aggregated sea ice concentration and sea ice extent
Version	1.1 for monthly aggregated SIC, 1.0 for yearly aggregated SIC
Sensor(s)	SMMR, SSM/I
Temporal aggregation periods	Month, year
Spatial coverage	Northern hemisphere, Southern hemisphere
Spatial resolution	10 km
Temporal coverage	October 1978 – October 2009
Temporal resolution	Month, year
Grid size	Northern hemisphere: 860 columns, 1120 lines Southern hemisphere: 790 columns, 830 lines
Projection	Polar stereographic
PROJ-4 string	Northern hemisphere: +proj=stere +a=6378273 +b=6356889.44891 +lat_0=90 +lat_ts=70 +lon_0=-45 Southern hemisphere: +proj=stere +a=6378273 +b=6356889.44891 +lat_0=-90 +lat_ts=-70 +lon_0=0
Metadata format	CF-1.5
Data file format	NetCDF
File size	Northern hemisphere: 32MB (uncompressed) Southern hemisphere: 25MB (uncompressed)
Product contents, Layer 1	[Monthly/Yearly] averaged total ice concentration
Product contents, Layer 2	Standard deviation in averaged total ice

	concentration
Product contents, Layer 3	Second minimum ice concentration value
Product contents, Layer 4	Second maximum ice concentration value
Product contents, Layer 5	Averaged sea ice edge
Product contents, Layer 6	Status flag for [monthly/yearly] sea ice concentration
Product contents, Layer 7	Number of days with sea ice data on which the averaged product is based
Product contents, Layer 8	Land mask
Product access	http://www.cryoclim.net/cryoclim/subsites/data_portal/

3 Detailed product description

3.1 Product structure

The product files are netCDF and contain the [monthly/yearly] aggregated sea ice concentration, standard deviation in averaged concentration and layers for second minimum and second maximum sea ice concentration during the aggregation period. A sea ice edge field is derived from the daily sea ice concentration fields. The files also contain a status flag field, as well as a land mask, a field giving the number of days with valid data, and a set of global attributes. The files follow the Climate and Forecast (CF) metadata convention.

3.2 Metadata

Global attributes describing the product set.

Global attribute	Description
title	[Monthly/Yearly] aggregated sea ice concentration product
product_name	EUMETSAT OSI SAF sea ice
product_status	Offline
abstract	[Monthly/Yearly] sea ice concentration estimated from satellite data within the framework of EUMETSAT Ocean and Sea Ice SAF.
topiccategory	Oceans ClimatologyMeteorologyAtmosphere
keywords	[Monthly/Yearly] Sea Ice Concentration, [Monthly/Yearly] Sea Ice Extent, Sea Ice, Oceanography, Meteorology, Climate, Remote Sensing
gcmd_keywords	Cryosphere > Sea Ice > Sea Ice Concentration Oceans > Sea Ice > Sea Ice Concentration Cryosphere > Sea Ice > Sea Ice Extent Oceans > Sea Ice > Sea Ice Extent Cryosphere > Sea Ice > Sea Ice Edge

Oceans > Sea Ice > Sea Ice Edge

Geographical Region > [Northern/Southern]
Hemisphere

Vertical Location > Sea Surface

NO/MET > Norwegian Meteorological Institute,
Norway

northernmost_latitude	Northern hemisphere: 90 Southern hemisphere: -39.28702
southernmost_latitude	Northern hemisphere: 31.03945 Southern hemisphere: -90
easternmost_longitude	180
westernmost_longitude	-180
activity_type	Space borne instrument
area	[Northern/Southern] Hemisphere
start_date	YYYY-MM-DD 00:00:00 UTC
stop_date	YYYY-MM-DD 23:59:00 UTC
project_name	CryoClim
institution	Norwegian Meteorological Institute
PI_name	Mari Anne Killie
contact	mari.a.killie@met.no
distribution_statement	free
url	http://osisaf.met.no/ , http://www.cryoclim.net/
source	EUMETSAT OSISAF ice concentration product
history	YYYY-MM-DD creation
comment	For the OSI SAF daily product the Northern hemisphere polar observation hole and other missing sectors are filled using interpolation. If possible, the averaged [monthly/yearly] sea ice concentration is based on nominal and corrected values only, avoiding

	the interpolated values
projection	Polar Stereographic
resolution	10.00 km
Conventions	CF-1.5

3.3 Data layers and coding

3.3.1 Digital layer representation

Name of variable	Description of layer	Representation	Code value	
ice_conc_avg	averaged total ice concentration	float	0-100%	
ice_conc_std	standard deviation in averaged total ice concentration	float	0-100%	
ice_conc_smin	second minimum ice concentration value	float	0-100%	
ice_conc_smax	second maximum ice concentration value	float	0-100%	
ice_edge_avg	averaged sea ice edge	byte	0-1	
status_flag	status flag for [monthly/yearly] sea ice concentration	byte	0-101	0 = nominal value from algorithm used 1 = over lake possibly less accurate 10 = value based on coast corrected values and/or values changed by applying climatology 11 = value based on interpolated values 100 = missing value due to over land 101 = missing value due to missing data

numdays	number of days with sea ice data on which averaged product is based	integer		
lmask	land mask	byte	0-3	0 = ocean, 2 = land, 3 = land ice/ice shelf

3.4 Product time-series information

This section explains which time periods have been covered with which sensors/satellite platforms for the entire time period covered by the product time series.

Time period	Sensor	Platform	Comments
1978-1987	SMMR	Nimbus-7	Until 9 July 1987
1987-2009	SSM/I	F8, F10, F11, F13, F14, F15	From 10 July 1987

3.5 File naming convention

Product example name for monthly aggregated sea ice concentration file:

osisaf-[nh/sh]_aggregated_ice_concentration_[nh/sh]_polstere-100_YYYYMMDDhhmm.nc

Product example name for yearly aggregated sea ice concentration file:

yearly-osisaf-[nh/sh]_aggregated_ice_concentration_[nh/sh]_polstere-100_YYYYMMDDhhmm.nc

String element	Explanation
nh/sh	Northern or Southern hemisphere
polstere-100	10km Polar stereographic grid

3.6 Known limitations of the product

The uncertainties in the input data are higher during the melting season due to melt ponds (see Tonboe and Nielsen 2011 for details).

4 Sample products

Figure 1 shows an example of a monthly averaged sea ice concentration product for the Northern hemisphere as it appears in the web portal.

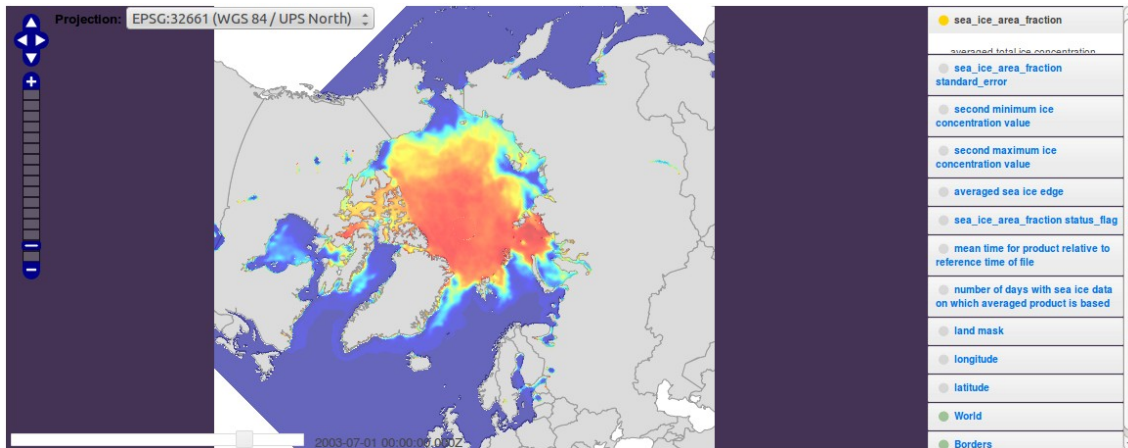


Figure 1: example of monthly aggregated sea ice concentration product for the Northern hemisphere when visualized through the CryoClim portal.

Other layers from the file (conf. Chapter 2) can be selected for immediate visualization. The bar in the lower left can be used for quick visualization of other time steps in the dataset.

Figure 2 shows the monthly aggregated datasets available from the CryoClim portal, and Figure 3 shows the yearly aggregated datasets available. There is one dataset for each hemisphere.

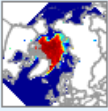
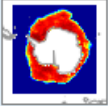
<p>+ osisaf-nh</p> <p>Show metadata</p> <p>RSS Feed</p> <p>Subscribe</p> <p>Add to basket</p> <p>Visualize</p> 	<p>met.no Norwegian Meteorological Institute</p>	<p>Northern Hemisphere</p>	<p>Space borne instrument</p>	<p>Monthly sea ice concentration estimated from satellite data within the framework of EUMETSAT Ocean and Sea Ice SAF.</p>
<p>+ osisaf-sh</p> <p>Show metadata</p> <p>RSS Feed</p> <p>Subscribe</p> <p>Add to basket</p> <p>Visualize</p> 	<p>met.no Norwegian Meteorological Institute</p>	<p>Southern Hemisphere</p>	<p>Space borne instrument</p>	<p>Monthly sea ice concentration estimated from satellite data within the framework of EUMETSAT Ocean and Sea Ice SAF.</p>

Figure 2: screenshot from the CryoClim portal showing the list of monthly aggregated sea ice concentration datasets available.

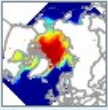
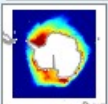
<p>+ yearly-osisaf-nh</p> <p>Show metadata</p> <p>RSS Feed</p> <p>Subscribe</p> <p>Add to basket</p> <p>Visualize</p> 	<p>met.no Norwegian Meteorological Institute</p>	<p>Northern Hemisphere</p>	<p>Space borne instrument</p>	<p>Yearly sea ice concentration estimated from satellite data within the framework of EUMETSAT Ocean and Sea Ice SAF.</p>
<p>+ yearly-osisaf-sh</p> <p>Show metadata</p> <p>RSS Feed</p> <p>Subscribe</p> <p>Add to basket</p> <p>Visualize</p> 	<p>met.no Norwegian Meteorological Institute</p>	<p>Southern Hemisphere</p>	<p>Space borne instrument</p>	<p>Yearly sea ice concentration estimated from satellite data within the framework of EUMETSAT Ocean and Sea Ice SAF.</p>

Figure 3: screenshot from the CryoClim portal showing the list of yearly aggregated sea ice concentration datasets available.

5 Product version history

Monthly sea ice concentration product:

Version	Release date	Comments
1.0	2010	First version
1.1	Dec 2012	Updated due to new version of the input data set

Yearly sea ice concentration product:

Version	Release date	Comments
1.0	Dec 2012	First version

6 Citing products

When CryoClim products are used in a publication, the data set is required to be cited. List the principal investigators, name of product, product version, year of product release, product producer and “Delivered by CryoClim service”, as shown in the following examples:

M.A. Killie, S. Eastwood, T. Lavergne, Monthly Aggregated Global Sea Ice Concentration, v1.1, (2012), Norwegian Meteorological Institute. Delivered by CryoClim service.

M.A. Killie, S. Eastwood, T. Lavergne, Yearly Aggregated Global Sea Ice Concentration, v1.0, (2012), Norwegian Meteorological Institute. Delivered by CryoClim service.

7 Contact information

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8 Acknowledgements

The sub-service for sea ice builds on reprocessed daily sea ice concentration products from the EUMETSAT OSI SAF. CryoClim is funded and managed by the European Space Agency and the Norwegian Space Centre.

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- Tonboe, R., and E. Nielsen 2011: OSI SAF Global Sea Ice Concentration Reprocessing Validation Report.

Acronyms and definitions

AMSR-E	Advanced Microwave Scanning Radiometer - Earth Observing System
ASAR	Advanced Synthetic Aperture Radar
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
AVHRR	Advanced Very High Resolution Radiometer
CEOS	Committee of Earth Observation Satellites
CSW	Catalogue Services for the Web
DB	Data Base
DOKIPY	Data handling and coordination service for Norwegian IPY projects
DOS	Dark Object Subtraction
ECMWF	European Centre for Medium-Range Weather Forecasts
ECV	Essential Climate Variable
EEA	European Environment Agency
ERA-40	ECMWF 40 Year Re-analysis
ERS	European Remote-Sensing Satellite
ESA	European Space Agency
ETM+	Enhanced Thematic Mapper plus
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
FCC	False Colour Composite
FCDR	Fundamental Climate Data Record
FMI	Finish Meteorological Institute
FSC	Fractional Snow Cover
FTP	File Transfer Protocol
GAO	Glacier Area Outline
GBA	Glacier Balance Area
GCOS	Global Climate Observing System
GEO	Group on Earth Observations
GEOSS	Global Earth Observation System of Systems
GFL	Glacier Firn Lines
GLO	Glacier-dammed Lake Outline
GLOF	Glacier Lake Outburst Flood
GMES	Global Monitoring for Environment and Security
GPP	Glacier Periodic Photo series
GSL	Glacier Snow Lines
GST	Glacier Surface Type
GSV	Glacier Surface Velocity
HTTP	Hypertext Transfer Protocol
ICT	Information and Communication Technology
IGOS	Integrated Global Observing Strategy
IHS	Intensity-hue-saturation
INSPIRE	Infrastructure for Spatial Information in the European Community
IPY	International Polar Year
ISO 19115	Defines schema required for describing geographic info. and services
ISO 23950	Information retrieval, application service def. and protocol specification
LSA SAF	Land Surface Analysis Satellite Application Facility (EUMETSAT)
N50	The most detailed of the national map data bases in Norway
NASA	National Astronautic and Space Administration
NDWI	Normalized Difference Water Index
NetCDF	Network Common Data Form
NOAA	National Oceanic and Atmospheric Administration
NPI	Norwegian Polar Institute
NPOESS	National Polar-orbiting Operational Environmental Satellite System
NR	Norwegian Computing Center

NRT	Near Real-Time
NSC	Norwegian Space Centre
NTNU	Norwegian University of Science and Technology
NVE	Norwegian Water Resources and Energy Directorate
METNO	Norwegian Meteorological Institute
MODIS	Moderate Resolution Imaging Spectroradiometer
MPI	Max Planck Institute for Meteorology
OAI-PMH	Open Archives Initiative - Protocol for Metadata Harvesting
OGC	OpenGeoSpatial Consortium
OpenDAP	Open-source Project for a Network Data Access Protocol
OSI SAF	Ocean and Sea Ice Satellite Application Facility (EUMETSAT)
PHP	Originally, scripting language for web pages, now extended functionality
PMR	Passive Microwave Radiometer
PLT	Project Leader Team
PMB	Project Management Board
REST	Representational state transfer
RESTful	Systems following REST principles
RGB	Red Green Blue
SAR	Synthetic Aperture Radar
SCA	Snow Cover Area
SCE	Snow Cover Extent
SCF	Snow Cover Fraction
SCE	Snow Cover Extent
SD	Snow Depth
SIC	Sea Ice Concentration
SIE	Sea Ice Edge
SMMR	Scanning Multichannel Microwave Radiometer
SOA	Service Oriented Architecture
SRU	Search/Retrieve via URL
SSM/I	Special Sensor Microwave/Imager
STAG	Scientific and Technical Advisory Group
SWE	Snow Water Equivalent
THREDDS	Thematic Realtime Environmental Distributed Data Services
TM	Thematic Mapper
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNIDATA	Diverse community vested in sharing data and tools to access and visualize
URL	Uniform Resource Locator
UTM	Universal Transverse Mercator
WCRP	World Climate Research Programme
WCS	Web Coverage Service
Web portal	Presents information from diverse sources in a unified way
Web service	Supports interoperable machine-to-machine interaction over a network
WFS	Web Feature Service
WGS	World geodetic system
WIS	WMO Information System
WMO	World Meteorological Organisation
WMS	Web Map Service
WPS	Web Processing Service
XML	Extensible Markup Language



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	<p>Norwegian Polar Institute Polar Environmental Centre NO-9296 Tromsø</p> <p>Contact person: Max König E-mail: max.koenig@npolar.no</p> <p>Role in project: Glacier service for Svalbard</p>

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