

INDES

Product User Manual - SST and ChlA composite satellite observations

Reference: IN-WP6.2-PUM-297

Nomenclature: -

Issue: 1. 0

Date: Sep. 4, 15

Chronology Issues:			
Issue:	Date:	Reason for change:	Author:
0.1	22/04/15	Preliminary version	V. Rosmorduc
0.2	31/08/15	expert revision	J. Stum
1.0	04/09/15	Initial version	V. Rosmorduc

People involved in this issue:		
Written by (*):	V. Rosmorduc	Date + Signature:(visa ou réf)
Checked by (*):	B. Pirrotta	Date + Signature:(visa ou réf)
Approved by (*):		Date + Signature:(visa ou réf)
Application authorized by (*):	R. De Dianous	Date + Signature:(visa ou réf)

**In the opposite box: Last and First name of the person + company if different from CLS*

Index Sheet:	
Context:	
Keywords:	[Mots clés]
Hyperlink:	

Distribution:		
Company	Means of distribution	Names
CLS	Notification	CLS Management review team
CLS	Soft copy	CLS INDES0 team
Balitbang KP	Soft copy	Balitbang KP INDES0 team

List of tables and figures

List of tables:

Aucune entrée de table d'illustration n'a été trouvée.

List of figures:

Aucune entrée de table d'illustration n'a été trouvée.

List of Contents

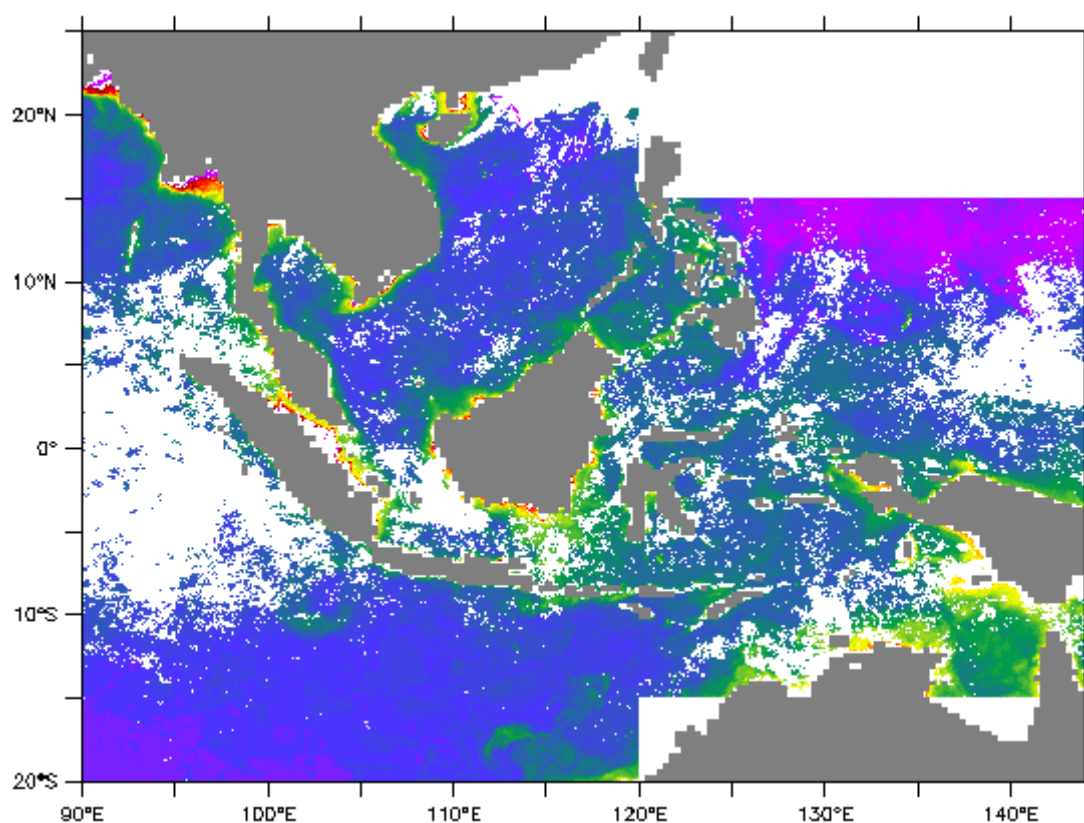
1. Purpose	1
2. Processing	1
2.1. Chlorophyll	1
2.1.1. product content.....	1
2.1.2. Data acquisition	2
2.1.3. Level 2 processing	2
2.1.4. Level 2 editing	2
2.1.5. Level 3 processing	2
2.2. Sea surface temperature (SST)	2
2.2.1. product content.....	2
2.2.2. MODIS SST data acquisition and processing	3
2.2.3. AVHRR data acquisition and processing	3
2.2.4. Level 3 processing	3
3. Description of the product specification	3
3.1. Product general content and specifications	3
3.2. Nomenclature of files	4
3.3. Acknowledgments	4
4. Data format	4
4.1. NetCdf	4
4.2. Structure and semantic of NetCDF files	5
5. How to download a product	5
5.1. Registration	5
5.2. Access Services	6
6. References	6

1. PURPOSE

This document presents the information needed by users for the **SST and ChLA composite satellite observations** products provided in the frame of the Indeso project.

This document is organized as follows:

- Chapter 2; processing: input data and method applied.
- Chapter 3; the product description, with the different files provided, the nomenclature
- Chapter 4; the file format
- Chapter 5; how to download products.
- Chapter 6; bibliographical references



2. PROCESSING

2.1. CHLOROPHYLL

2.1.1. PRODUCT CONTENT

The product is a geographical map of phytoplankton concentration. It is a simple average over the 5 previous days of the satellite measurements (giving more weight to the most recent data), and has a resolution of 0.02 degrees in latitude and longitude. It may have gaps due to the persistence of cloud cover. The map is built with the data of the VIIRS sensor on board the Suomi-NPP satellite.



Proprietary information: no part of this document may be reproduced, divulged or used in any form without prior permission from CLS.

2.1.2. DATA ACQUISITION

VIIRS Level 1A products are acquired at the Ocean Color Web (NASA) in near real time with a delay of about 5 hours. Three different steps are required to build the final product :

- Level 2 processing
- Level 2 editing
- Level 3 processing

2.1.3. LEVEL 2 PROCESSING

Level 1A products are top-of-atmosphere products (they contain reflectances of the Earth-atmosphere system in different wavelengths from blue to near infra-red). To derive the phytoplankton concentration from these reflectances, the so-called level 2 processing has to be applied. The level 2 processing in use in CLS is using the Polymer algorithm (Steinmetz et al., 2011), adapted to VIIRS sensor. The main advantage of this Polymer processing of the VIIRS data is to be able to compute the phytoplankton in presence of semi-transparent clouds, heavy dust, and part of sunglint areas.

2.1.4. LEVEL 2 EDITING

The so-called editing processing consists in removing poor-quality pixels, (e.g., contaminated by cloud shadows or high sunglint), in image destriping (based on Gaussian filtering), and in data re-mapping on regular latitude-longitude grid to produce Level 2 grid products at 0.01° resolution.

2.1.5. LEVEL 3 PROCESSING

The so-called Level 3 processing is the final step for building the product. A composite map (mosaics) of VIIRS Level 2 grid products at 0.01° resolution is built to produce the map of phytoplankton concentration. When filling in a pixel of the mosaics, the data are weighted according to the two following criterias :

- Time criteria : older pixels of Level 2 grid products have lower weights
- Cloud criteria : pixels of Level 2 grid products with presence of clouds in their vicinity have lower weights

A pixel of the mosaics is filled in if at least one valid pixel is found in the corresponding Level 2 grid products. Finally, an averaging is made in 0.02° cells to produce the map.

2.2. SEA SURFACE TEMPERATURE (SST)

2.2.1. PRODUCT CONTENT

The product is a geographical map of SST. It is a simple average over the 5 previous days of the satellite measurements (giving more weight to the most recent data), and has a resolution of 0.02 degrees in latitude and longitude. It may have gaps due to the persistence of cloud cover. The map is built with the data of 4 sensors :

- the MODIS sensor on board the AQUA satellite,



Proprietary information: no part of this document may be reproduced, divulged or used in any form without prior permission from CLS.

- the MODIS sensor on board the TERRA satellite,
- the AVHRR sensor on board the METOP-A satellite
- the AVHRR sensor on board the METOP-B satellite

Only nighttime sensor measurements are considered, to avoid using daytime measurements that may be contaminated by diurnal heating effects.

2.2.2. MODIS SST DATA ACQUISITION AND PROCESSING

MODIS/AQUA and MODIS/TERRA SST Level 2 swath products (SST4 products) are acquired at the Ocean Color Web in near real time with a delay of about 6 hours. Processing consists in keeping the most accurate pixels (quality flag set to 0), and data remapping on regular latitude-longitude grid to produce Level 2 grid products at 0.01° resolution.

2.2.3. AVHRR DATA ACQUISITION AND PROCESSING

Full Resolution Area Coverage (FRAC) AVHRR Level 1b swath products from METOP-A and METOP-B satellites are acquired at NOAA through its Comprehensive Large Array-data Stewardship System (CLASS) in near real time with a delay of about 4 hours. A dedicated level 1b to level 2 processing is then applied, including pixel navigation, raw counts calibration, brightness temperature calculation, cloud masking, and SST calculation to produce level 2 swath products. Cloud masking consists in declaring a pixel cloudy if the derived SST is colder than the closest (in time and in distance) OSTIA analysis pixel by 1°. Remapping is then applied to produce Level 2 grid products at 0.01° resolution.

2.2.4. LEVEL 3 PROCESSING

The so-called Level 3 processing is the final step which produces the Catsat products. It starts from the Level 2 grid products described in the previous sub-sections. Only the compositing method is used to build Level 3, and is the same as done for the phytoplankton.

3. DESCRIPTION OF THE PRODUCT SPECIFICATION

3.1. PRODUCT GENERAL CONTENT AND SPECIFICATIONS

Each Indeso product includes a series of related datasets. Those datasets are delivered with different names (see nomenclature), contents (see NetCDF contents) and format (below).

Note that the datasets available for a given user depend on the user profile.

Dataset Name	Dataset time cove-	Production frequency	Geographical coverage	Spatial Resolution	File format
--------------	--------------------	----------------------	-----------------------	--------------------	-------------



Proprietary information: no part of this document may be reproduced, divulged or used in any form without prior permission from CLS.

	rage				
Map of HR CHla historical & real-time	from start to T0	3 times a week	20S-25N/90E-144E	0.02°	netCDF CF
Map of HR CHla historical	from start to (T0-30 days)	3 times a week	20S-25N/90E-144E	0.02°	netCDF CF
Map of HR SST historical & real-time	from start to T0	3 times /week	20S-25N/90E-144E	0.02°	netCDF CF
Map of HR SST historical	from start to (T0-30 days)	3 times /week	20S-25N/90E-144E	0.02°	netCDF CF

Table 1: Chlorophylla & SST high resolution datasets

3.2. NOMENCLATURE OF FILES

Files downloaded using Indeso downloading services are named using a unique identifier (13 digits, corresponding to the current time (downloading time) in milliseconds since January 1, 1970 midnight UTC.) at the end of the file name.

Map of HR SST historical&real-time

SST_HR-RT_%nnnnnnnnnnnnn.nc

Map of HR SST historical&real-time

SST_HR_%nnnnnnnnnnnnn.nc

Map of HR Chla historical&real-time

CHLA_HR-RT_%nnnnnnnnnnnnn.nc

Map of HR Chla historical

CHLA_HR_%nnnnnnnnnnnnn.nc

Where %nnnnnnnnnnnn is the identifier inserted by the downloading service

3.3. ACKNOWLEDGMENTS

Original INDESOS Products - or Value Added Products or Derivative Works developed from INDESOS Products including pictures - shall include the following credit conspicuously displayed and written in full:

"© INDESOS, 2013, a system implemented by CLS for Balitbang KP, all rights reserved".

(b) In case of any publication, the Licensees will ensure credit INDESOS in the following manner:

"© INDESOS, 2013, a system implemented by CLS for Balitbang KP, all rights reserved".

4. DATA FORMAT

4.1. NETCDF

The products are stored using the NetCDF CF format. 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.



Proprietary information: no part of this document may be reproduced, divulged or used in any form without prior permission from CLS.

Please see Unidata NetCDF pages for more information, and to retrieve NetCDF software package on: <http://www.unidata.ucar.edu/packages/netcdf/>

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.

4.2. STRUCTURE AND SEMANTIC OF NETCDF FILES

Variable name	Description (long_name)	Standard_name	Dimensions	Units
SST_HR-RT_%nnnnnnnnnnnn.nc or SST_HR_%nnnnnnnnnnnn.nc				
Netcdf-CF Grid Dimensions: lat=2251, lon=2701, time=1				
lat	Latitude	latitude	(NbLatitudes)	degrees_north
lon	Longitude	longitude	(NbLongitudes)	degrees_east
time	time	time	(time)	hours since 1950-01-01
SST	infrared_hr_sst	sea_surface_temperature	(time,NbLongitudes, NbLatitudes)	°C

Variable name	Description (long_name)	Standard_name	Dimensions	Units
CHLA_HR-RT_%nnnnnnnnnnnn.nc or CHLA_HR_%nnnnnnnnnnnn.nc				
Netcdf-CF Grid Dimensions: lat=2251, lon=2701, time=1				
lat	Latitude	latitude	(NbLatitudes)	degrees_north
lon	Longitude	longitude	(NbLongitudes)	degrees_east
time	time	time	(time)	hours since 1950-01-01
CHLA	hr_plankton	chloro- phyll_concentration_in_sea _water	(time,NbLongitudes, NbLatitudes)	mg/m ³

5. HOW TO DOWNLOAD A PRODUCT

5.1. REGISTRATION

To access data, registration is required. During registration process, the user shall accept using licenses for the use of INDES products and services.



Proprietary information: no part of this document may be reproduced, divulged or used in any form without prior permission from CLS.

License shall include:

- Data use conditions,
- Legal and contractual clauses

5.2. ACCESS SERVICES

Different services enable registered users to access the data. Depending on the dataset, not all of them are relevant.

Dataset Name	File format	Discover	View	Get
Map of HR CHla historical & real-time	netCDF CF	Yes	Yes	Yes
Map of HR CHla historical	netCDF CF	Yes	Yes	Yes
Map of HR SST historical & real-time	netCDF CF	Yes	Yes	Yes
Map of HR SST historical	netCDF CF	Yes	Yes	Yes

6. REFERENCES

Steinmetz F., P.Y.Deschamps and D. Ramon, 2011. Atmospheric correction in presence of sun glint: application to MERIS. Optics Express, Vol. 19, Issue 10, pp. 9783-9800