



Data User Manual

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Acronyms

C2	Cryosat-2
CLS	Collecte Localisation Satellites
DT	Delayed Time
DUM	Data User Manual
HR	High Resolution (here 5Hz)
L3	Level 3
S3A	Sentinel-3A
SLA	Sea Level Anomaly

Table 1 : List of acronyms

1. Introduction

1.1. Scope of this document

This document holds the Data User Manual (DUM) prepared by EO4SIBS team, as part of the activities included in the [WP4] of the Proposal (Task 3 from SoW ref. ESA AO/1-9487/18/IEF/ESA-IPL-POE-EF-cb-LE-2018-588). The objective of this document is to provide a detailed description of the dataset of the EO4SIBS Sea Surface Height along-track (L3) 5Hz product.

1.2. Structure of this document

The DUM is structured as follow:

- Section 1: covers the introduction of this document
- Section 2: Describes the format of the EO4SIBS altimeter Sea Surface Height L3 product generated in the project

2. EO4SIBS Sea Surface Height datasets

2.1. Format file and global attributes

The altimeter L3 5Hz products are distributed in netCDF-4 format following the Climate and Forecast (CF) Metadata conventions (at least v1.6). Compression is applied for variables stored in netCDF files and time dimension is defined as a record dimension.

As a general procedure, the global attributes included in the produced netCDF files are the following:

- **conventions:** CF-version
- **copyright:** copyright associated to the product
- **Metadata_Conventions** = "Unidata Dataset Discovery v1.0" ;
- **cdm_data_type** : type of the measurement considered
- **comment:** "Sea surface height measured by altimeters referenced to the [1993, 2012] period; with additional corrections; the proposed sla is already corrected for dac, ocean_tide, iw and lwe; [uncorrected sla]=[sla from product]+[dac]+[ocean_tide]+[iw]-[lwe]"
- **creator_name** name of the processing chain that generated the product
- **date_created / date_issued:** the date in which the file has been created
- **date_modified** : date of last modification
- **funding:** source of funding
- **geospatial_lat_min / geospatial_lat_max:** minimum and maximum value for latitude, range -90 to +90
- **geospatial_lat_resolution:** mean latitude resolution in degrees along the satellite pass
- **geospatial_lat_units:** usually "degrees_north"
- **geospatial_lon_min / geospatial_lon_max:** minimum and maximum value for longitude, range -180 to +180
- **geospatial_lon_resolution:** mean longitude resolution in degrees along the satellite pass
- **geospatial_lon_units:** usually "degrees_east"
- **history** : history of the file production/modification
- **institution:** where the data was produced
- **keywords** : metadata/keyword ;
- **keywords_vocabulary** : guideline used for the keywords definition
- **platform:** satellite considered
- **processing_level** : Level of the altimeter processing ;
- **product_version:** the version of the product
- **project:** the project name "An Earth Observation Data Exploitation Platform for Science and Innovation in the Black Sea (EO4SIBS)"
- **reference:** reference of the product/project
- **software_version:** version of the software used for the production
- **source:** measurement considered
- **standard_name_vocabulary** : convention used for the variables standard name definition;
- **time_coverage_duration** : format ISO8601 duration string
- **time_coverage_end:** format ISO8601 date
- **time_coverage_resolution:** format ISO8601 duration string
- **time_coverage_start:** format ISO8601 date
- **title:** brief description of the dataset

2.2. Data distribution

Data will be distributed through the EO4SIBS website.

2.3. Spatial sampling and coverage

The L3 altimeter products are distributed along the tracks of the different altimeters considered, with a sampling of 5Hz i.e. nearly 1.3km between two consecutive measurements.

The geographical coverage of the regional EO4SIBS altimeter products is defined as: longitude range [26E-42E] and latitude range [40N-48N].

2.4. Temporal resolution and coverage

Nine years (2011-2019) of altimeter data are available with a different temporal coverage according to the altimeter considered:

- Cryosat-2 is available over the period [2011/01/01; 2019/12/31]
- Sentinel-3A is available over the period [2016/07/01; 2018/12/29]

The measurement are available with a 5Hz sampling i.e. nearly 0.2 s between two consecutive measurements.

The measurement repetitivity depends on the orbit characteristics:

- Cryosat-2 is on a geodetic orbit with a cycle duration of nearly 1 year. This means that it samples the sea surface along the same ground track location every nearly 1 year.
- Sentinel-3A is on a repetitive orbit with a cycle duration on 27 days.

The measurements are disseminated on daily files.

2.5. NetCDF file format

We give here an example of dump of a L3 NetCDF file.

```
dimensions:  
  time = 260 ;  
variables:  
  double time(time) ;  
    time:axis = "T" ;  
    time:calendar = "gregorian" ;  
    time:long_name = "Time of measurement" ;  
    time:standard_name = "time" ;  
    time:units = "days since 1950-01-01 00:00:00" ;  
  int longitude(time) ;  
    longitude:add_offset = 0. ;  
    longitude:long_name = "Longitude of measurement" ;  
    longitude:scale_factor = 1.e-06 ;  
    longitude:standard_name = "longitude" ;  
    longitude:units = "degrees_east" ;  
  int latitude(time) ;  
    latitude:add_offset = 0. ;  
    latitude:long_name = "Latitude of measurement" ;  
    latitude:scale_factor = 1.e-06 ;  
    latitude:standard_name = "latitude" ;
```

```

latitude:units = "degrees_north" ;
short cycle(time) ;
cycle:coordinates = "longitude latitude" ;
cycle:long_name = "Cycle the measurement belongs to" ;
cycle:units = "1" ;
short track(time) ;
track:coordinates = "longitude latitude" ;
track:long_name = "Track in cycle the measurement belongs to" ;
track:units = "1" ;
short dac(time) ;
dac:_FillValue = 32767s ;
dac:add_offset = 0. ;
dac:comment = "The sla in this file is already corrected for the dac; the uncorrected
sla can be computed as follows: [uncorrected sla]=[sla from product]+[dac]; see the product
user manual for details" ;
dac:coordinates = "longitude latitude" ;
dac:long_name = "Dynamic Atmospheric Correction" ;
dac:scale_factor = 0.001 ;
dac:units = "m" ;
short ib_lf(time) ;
ib_lf:_FillValue = 32767s ;
ib_lf:add_offset = 0. ;
ib_lf:coordinates = "longitude latitude" ;
ib_lf:long_name = "Low Frequency component of the inverse barometer" ;
ib_lf:scale_factor = 0.001 ;
ib_lf:units = "m" ;
short iw(time) ;
iw:_FillValue = 32767s ;
iw:add_offset = 0. ;
iw:comment = "The sla in this file is already corrected for the iw; the uncorrected sla
can be computed as follows: [uncorrected sla]=[sla from product]+[iw]; see the product user
manual for details" ;
iw:coordinates = "longitude latitude" ;
iw:long_name = "Internal Tide signal: coherent mode M2/K1/O1/S2" ;
iw:scale_factor = 0.001 ;
iw:units = "m" ;
short lwe(time) ;
lwe:_FillValue = 32767s ;
lwe:add_offset = 0. ;
lwe:comment = "The sla in this file is already corrected for the lwe; the uncorrected
sla can be computed as follows: [uncorrected sla]=[sla from product]-[lwe]; see the product
user manual for details" ;
lwe:coordinates = "longitude latitude" ;
lwe:long_name = "Long wavelength error" ;
lwe:scale_factor = 0.001 ;
lwe:units = "m" ;
short mdt(time) ;
mdt:_FillValue = 32767s ;
mdt:add_offset = 0. ;
mdt:comment = "The mean dynamic topography is the sea surface height above
geoid; it is used to compute the absolute dynamic tyopography adt=sla+mdt" ;
mdt:coordinates = "longitude latitude" ;
mdt:long_name = "Mean Dynamic Topography" ;
mdt:scale_factor = 0.001 ;
mdt:standard_name = "sea_surface_height_above_geoid" ;
mdt:units = "m" ;
short mdt_velocity(time) ;
mdt_velocity:_FillValue = 32767s ;
mdt_velocity:add_offset = 0. ;
mdt_velocity:coordinates = "longitude latitude" ;

```

```

mdt_velocity:long_name = "Across-Track velocity from Mean Dynamic Topography"
;
mdt_velocity:scale_factor = 0.001 ;
mdt_velocity:units = "m/s" ;
short ocean_tide(time) ;
ocean_tide:_FillValue = 32767s ;
ocean_tide:add_offset = 0. ;
ocean_tide:comment = "The sla in this file is already corrected for the ocean_tide;
the uncorrected sla can be computed as follows: [uncorrected sla]=[sla from
product]+[ocean_tide]; see the product user manual for details" ;
ocean_tide:coordinates = "longitude latitude" ;
ocean_tide:long_name = "Ocean tide model" ;
ocean_tide:scale_factor = 0.001 ;
ocean_tide:units = "m" ;
short sla_filtered(time) ;
sla_filtered:_FillValue = 32767s ;
sla_filtered:add_offset = 0. ;
sla_filtered:comment = "The sea level anomaly is the sea surface height above
mean sea surface height; the uncorrected sla can be computed as follows: [uncorrected
sla]=[sla from product]+[dac]+[ocean_tide]+[iw]-[lwe]; see the product user manual for details"
;
sla_filtered:coordinates = "longitude latitude" ;
sla_filtered:long_name = "Sea level anomaly low-pass filtered and 5Hz subsampled
with dac, ocean_tide, iw and lwe correction applied" ;
sla_filtered:scale_factor = 0.001 ;
sla_filtered:standard_name = "sea_surface_height_above_sea_level" ;
sla_filtered:units = "m" ;
short sla_velocity(time) ;
sla_velocity:_FillValue = 32767s ;
sla_velocity:add_offset = 0. ;
sla_velocity:coordinates = "longitude latitude" ;
sla_velocity:long_name = "Across-Track velocity from Sea Level Anomaly" ;
sla_velocity:scale_factor = 0.001 ;
sla_velocity:units = "m/s" ;

// global attributes:
:_NCProperties = "version=2,netcdf=4.7.3,hdf5=1.10.5" ;
:Conventions = "CF-1.6" ;
:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
:cdm_data_type = "Swath" ;
:copyright = "If this data is used for publication, the following acknowledgment
should be included: Black Sea altimeter data were produced by CLS (https://www.cls.fr/en/)
and their production was funded by ESA under project EO4SIBS (contract 4000127237/19/I-
EF)" ;
:creator_name = "DUACS - Data Unification and Altimeter Combination System" ;
:creator_url = "http://www.eo4sibs.uliege.be" ;
:date_created = "2020-11-05T10:28:15Z" ;
:date_issued = "2020-11-05T10:28:15Z" ;
:date_modified = "2020-11-05T10:28:15Z" ;
:funding = "European Space Agency under contract reference 4000127237/19/I-EF"
;

:geospatial_lat_max = 43.935227 ;
:geospatial_lat_min = 40.686324 ;
:geospatial_lat_resolution = 0.0108850000000018 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 29.134472 ;
:geospatial_lon_min = 28.700935 ;
:geospatial_lon_resolution = 0.00145700000000204 ;
:geospatial_lon_units = "degrees_east" ;
:geospatial_vertical_max = 0. ;

```

```

:geospatial_vertical_min = 0. ;
:geospatial_vertical_positive = "down" ;
:geospatial_vertical_resolution = "point" ;
:geospatial_vertical_units = "m" ;
:history = "2020-11-05T10:28:15Z: Creation" ;
:institution = "CLS" ;
:keywords = "Oceans > Ocean Topography > Sea Surface Height" ;
:keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard
Names" ;
:platform = "Cryosat-2" ;
:processing_level = "L3" ;
:product_version = "1.0.0" ;
:project = "An Earth Observation Data Exploitation Platform for Science and
Innovation in the Black Sea (EO4SIBS)" ;
:references = "http://www.eo4sibs.uliege.be" ;
:software_version = "1.0" ;
:source = "Cryosat-2 measurements" ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata
Convention Standard Name Table v37" ;
:time_coverage_duration = "P0H0M55.990790S" ;
:time_coverage_end = "2018-12-25T14:09:11Z" ;
:time_coverage_resolution = "P1S" ;
:time_coverage_start = "2018-12-25T14:08:15Z" ;
:title = "Experimental delayed time Cryosat-2 Along track Sea Level Anomalies L3
product for the Black Sea" ;

```

2.6. Name convention

The file naming will follow the following convention:

<processing_delay>_<resolution_level>_<area>_<altimeter_mission>_<type_of_content>_<product_level>-<measurement_date>-<production_date>.nc

whith

processing_delay	dt
resolution_level	hr
area	blacksea
altimeter_mission	c2 or s3a
type_of_content	phy
product_level	l3
measurement_date	Day covered by the measurements (YYYYMMDD format)
production_date	Date of production of the file (YYYYMMDD format)

Therefore, two examples for the L3 products are:

- dt_hr_blacksea_c2_phy_l3_20141027_20200801.nc
- dt_hr_blacksea_s3a_phy_l3_20181228_20200801.nc