PRODUCT USER MANUAL

For Sea Level Altimeter products

SEALEVEL_GLO_PHY_L3_NRT_008_044

SEALEVEL_GLO_PHY_L4_NRT_ 008_046

SEALEVEL_EUR_PHY_L3_NRT_ 008_059

SEALEVEL_EUR_PHY_L4_NRT_ 008_060

SEALEVEL_GLO_PHY_L3_MY_008_062

SEALEVEL_GLO_PHY_L4_MY_008_047

SEALEVEL_EUR_PHY_L3_MY_008_061

SEALEVEL_EUR_PHY_L4_MY_008_068

SEALEVEL_GLO_NOISE_L4_STATIC_008_033

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RECORD TABLE

Issue	Date	§	Description of Change	Author	Validated By
1.0	2019/01/21	all	First version of document for vApr2019 products	M-I Pujol	M-I Pujol
1.1	2019/04/15		Add Sentinel-3B in datasets nomenclature	M-I Pujol	M-I Pujol
2.0	2019/12/06		Change for Mar20 release	M-I Pujol	M-I Pujol
3.0	2020/04/03		Changes for Jul20 release	M-I Pujol	M-I Pujol
3.1	2020/09/10		update of the AVISO/CMEMS dissemination information	M-I Pujol	M-I Pujol
4.0	2021/09/10		Changes for Dec2120 release	M-I Pujol	M-I Pujol
4.1	2021/12/16		Change for MY automatic extensions Add precision of data storage in Netcdf files	M-I Pujol	M-I Pujol
5.0	2022/02/28	all	Use new template Add Sentinel-6a dataset for NRT production	M-I Pujol	M-I Pujol
6.0	2022/03/01	all	Add Jason-3 Interleaved for NRT production	M-I Pujol	M-I Pujol
7.0	2022/10/27	all	Add L3 5Hz datasets for NRT regional production Add H2B datasets for NRT production Change “Noise” static product information	M-I Pujol	M-I Pujol
8.0	2023/06/15		Add L3 5Hz datasets for NRT global production; Correction of file nomenclature Add SWON datasets Suppression C2 ana dH2C datasets	M-I Pujol	M-I Pujol
8.0	2023/10/19		Add MY interim production	M-I Pujol	M-I Pujol

Table of Contents

GLOSSARY AND ABBREVIATIONS

ADT	Absolute Dynamic Topography
CF	Climate Forecast (convention for NetCDF)
CLS	Collecte Localisation Satellite
CNES	Centre National d'Etude Spatiale (French Space Agency)
CPU	Central Processing Unit
DAC	Dynamic Atmospheric Correction
DT	Delayed Time
DUACS	Data Unification Altimeter Combination System
EUMETSAT	European operational satellite agency
FTP	File Transfer Protocol
GDR	Geophysical Data Record
GLO	Global Ocean
HF	High Frequency
HR	High Resolution
IGDR	Intermediate Geophysical Data Record
L2	Niveau 2
L2P	Niveau 2P
L3	Niveau 3
L4	Niveau 4
LRM	Low Resolution Mode
LWE	Long Wavelength Error
MADT	Map of ADT
MDT	Mean Dynamic Topography
MP	Mean Profile
MSLA	Map of Sea Level Anomaly
MSS	Mean Sea Surface
MY	Multi-Year
MYINT	Multi-Year Interim
NetCDF	Network Common Data Form
NFS	Network File System
NRT	Near Real Time
NTC	None Time Critical (same as GDR)

OGDR	Operational Geophysical Data Record
QUID	Quality Information Document
REP	Reprocessing (MY)
RT	Real Time
SALP	Service d'Altimetrie et Localisation Precise (altimetry and precise positioning service)
SAR	Synthetic Aperture Radar
SL	Sea Level
SLA	Sea Level Anomaly
SL-TAC	Sea Level Thematic Assembly Centre
SQO	Scientific Quality Overwiev
SSALTO	Segment Sol multimissions d'ALTimétrie, d'Orbitographie et de localisation précise
SSH	Sea Surface Height
STC	Short Time Critical (same as IGDR)
TAC	Thematic Assembly Center
WMS	Web Map Service

I. INTRODUCTION

I.1 Summary

The Sea Level TAC (Thematic Assembly Centre) is one of the eight TAC of the Copernicus Marine Service. The aim of this document is to describe the products delivered by the Sea Level TAC.

The data produced in the frame of this TAC are generated by the processing system including data from all altimeter Copernicus missions (Sentinel-6A, Sentinel-3A/B) and other collaborative or opportunity missions (e.g. :Jason-3, Saral[-DP]/AltiKa, Cryosat-2, OSTM/Jason-2, Jason-1, Topex/Poseidon, Envisat, GFO, ERS-1/2, Haiyang-2A/B).

The SL-TAC main products lines consist in **Level-3 (L3; along-track) and Level-4 (L4; gridded) altimeter products**. Both are produced in **Near Real Time (NRT) or Delayed Time/ Multi-Year (DT/MY)**. Through the SL-TAC, the Copernicus Marine Service also disseminates L3 products/datasets produced under the Eumetsat responsibility. They mainly concern the Copernicus altimeter missions (Sentinel-3 & Sentinel-6). Additionally, **auxiliary/statics product** can be delivered for additional information on the L3/L4 products quality. We describe here after the different product lines.

The data provided to users have a **global coverage and regional products** are also computed over European Seas, including Part of the North-East Atlantic, Baltic, Mediterranean and Black Seas.

I.1.1 Near Real time products

The user can check the version of the product used with the global attributes given in netCDF files:

- product_version : gives the information of the main Copernicus Marine release for which the last change has been implemented (e.g. "vDec2021")
- software_version : gives the precise software version used for the production, and information of the reference altimeter standards and processing used (e.g. : "19.0.0_DUACS_DT2021_baseline")

The lists the system's noticeable events, outage or changes, as well as details of the impact on product quality events can be found in the associated QUID document (see section VI)

I.1.2 Multi-Year products

The user can check the version of the product used with the global attributes given in netCDF files:

- product_version : gives the information of the main release for which the last change has been implemented (e.g. "vDec2021")
- software_version : gives the precise software version used for the production, and information of the reference altimeter standards and processing used (e.g. : "7.0_DUACS_DT2021_baseline")

The lists the system's noticeable events, outage or changes, as well as details of the impact on product quality events can be found in the associated QUID document (see section "V.4: V.3 REP/DT sub-system version changes").

II. DESCRIPTION OF THE PRODUCT SPECIFICATION

I.1 General Information

I.1.1 Level-3 along-track products

Product Lines	SEALEVEL_GLO_PHY_L3_NRT _008_044 SEALEVEL_EUR_PHY_L3_NRT _008_059 SEALEVEL_GLO_PHY_L3_MY_008_062 SEALEVEL_EUR_PHY_L3_MY_008_061
Geographical coverage	GLO : Global Ocean EUR : European Area (30.0625°W-42.0625°E ; 19.9375°N-66.0625°N)
Variables	The different variables included in this product are listed in section I.2.1.
Product Type	NRT : Near Real Time MY : Multi Year
Available time series	NRT : usually the last 2 years are available online for historic product/dataset lines. This period can be reduced at the start of production of a new product/dataset line MY : 1993/01/01 ; -5 to 9M before present.
Temporal resolution	Daily
Target delivery time	NRT: up to 10 times a day MY : ~4 times a year
Delivery mechanism	Marine Information System
Horizontal resolution	~7km (1Hz) for "*PT1S" datasets ~1.3km (5Hz) for "PT0.2S" datasets
Number of vertical levels	1
Format	Netcdf CF1.6

Table 1: SL-TAC L3 products

I.1.2 Level-4 gridded products

Product Lines	SEALEVEL_GLO_PHY_L4_NRT _008_046 SEALEVEL_EUR_PHY_L4_NRT _008_060 SEALEVEL_GLO_PHY_L4_MY_008_047 SEALEVEL_EUR_PHY_L4_MY_008_068
Geographical coverage	GLO : Global Ocean EUR : European Area (30.0625°W-42.0625°E ; 19.9375°N-66.0625°N)
Variables	The different variable included in this product are listed in section I.2.2.
Product Type	NRT : Near Real Time MY : Multi Year
Available time series	NRT : usually the last 2 years are available online for historic product/dataset lines. This period can be reduced at the start of production of a new product/dataset line MY : 1993/01/01 ; -5 to 9M before present.
Temporal resolution	Daily
Target delivery time	NRT: daily MY : ~4 times a year
Delivery mechanism	Copernicus Marine Information System
Horizontal resolution	GLO : 0.25°x0.25° EUR : 0.125° x 0.125°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 2: SL-TAC L4 products

I.1.3 Static products

Product Lines	SEALEVEL_GLO_PHY_NOISE_L4_STATIC_008_033
Geographical coverage	GLO : Global Ocean
Variables	The different variable included in this product are listed in section I.2.3
Product Type	Time invariant
Available time series	None
Temporal resolution	/
Target delivery time	/
Delivery mechanism	Copernicus Marine Information System
Horizontal resolution	GLO : 0.25°x0.25°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 3: SL-TAC Static "Noise" products

I.2 Details of datasets

I.2.1 Level-3 along-track products

Different datasets are defined for the L3 products. They relate to the different altimeter missions processed. The following tables list the different datasets available for each product line and give on overview of the different physical variables available. Detailed information on the different altimeters processed in available on the QUID document.

I.2.1.1 L3 NRT 1Hz datasets

SEALEVEL_GLO_PHY_L3_NRT _008_044	**SEALEVEL_EUR_PHY_L3_NRT _008_059**
Dataset: **cmems_obs-sl_glo_phy-ssh_nrt_al-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_c2n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_h2b-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_J3-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_j3n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_s3a-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_s3b-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_nrt_s6a-hr-l3-duacs_PT1S**	**Dataset:** **cmems_obs-sl_eur _phy-ssh_nrt_al-l3-duacs_PT1S** **cmems_obs-sl_eur _phy-ssh_nrt_c2n-l3-duacs_PT1S** **cmems_obs-sl_eur _phy-ssh_nrt_h2b-l3-duacs_PT1S** **cmems_obs-sl_eur _phy-ssh_nrt_J3-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_nrt_j3n-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_nrt_s3a-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_nrt_s3b-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_nrt_s6a-hr-l3-duacs_PT1S**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name	
sla_unfiltered [m] Sea level anomaly not-filtered not-subsampled with dac, ocean_tide and lwe correction applied sea_surface_height_above_sea_level	
sla_filtered [m] Sea level anomaly filtered not-subsampled with dac, ocean_tide and lwe correction applied sea_surface_height_above_sea_level	
mdt [m] Mean dynamic topography sea_surface_height_above_geoid	
dac [m] Dynamic Atmospheric Correction -	
ocean_tide [m] Ocean tide model -	
internal_tide [m] Internal Tide signal: coherent mode M2/K1/O1/S2 -	
lwe [m] Long wavelength error -	
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name	
time [days since 1950-01-01 00:00:00]	

Time of measurement time
longitude [degrees_east] Longitude of measurement (theoretical position for repetitive orbits) longitude
latitude [degrees_north] Latitude of measurement (theoretical position for repetitive orbits) latitude
Other useful variables name in the NetCDF file and Unit: Long_name & Standard_name
Flag [0,1] Data origin -
cycle [1] Cycle the measurement belongs to -
track [1] Track in cycle the measurement belongs to -

Table 4 : List of the datasets and variable names and unit for the 1Hz datasets included in the SEALEVEL_GLO_PHY_L3_NRT_008_044 and SEALEVEL_EUR_PHY_L3_NRT_008_059 products

I.2.1.2 L3 NRT 5Hz datasets

SEALEVEL_GLO_PHY_L3_NRT _008_044	**SEALEVEL_EUR_PHY_L3_NRT _008_059**
Dataset: **cmems_obs-sl_glo_phy-ssh_nrt_h2b-l3-duacs_PT0.2S** **cmems_obs-sl_glo_phy-ssh_nrt_j3n-l3-duacs_PT0.2S** **cmems_obs-sl_glo_phy-ssh_nrt_s3a-l3-duacs_PT0.2S** **cmems_obs-sl_glo_phy-ssh_nrt_s3b-l3-duacs_PT0.2S** **cmems_obs-sl_glo_phy-ssh_nrt_s6a-hr-l3-duacs_PT0.2S** **cmems_obs-sl_glo_phy-ssh_nrt_swon-l3-duacs_PT0.2S**	**Dataset:** **cmems_obs-sl_eur_phy-ssh_nrt_h2b-l3-duacs_PT0.2S** **cmems_obs-sl_eur_phy-ssh_nrt_j3n-l3-duacs_PT0.2S** **cmems_obs-sl_eur_phy-ssh_nrt_s3a-l3-duacs_PT0.2S** **cmems_obs-sl_eur_phy-ssh_nrt_s3b-l3-duacs_PT0.2S** **cmems_obs-sl_eur_phy-ssh_nrt_s6a-hr-l3-duacs_PT0.2S** **cmems_obs-sl_eur_phy-ssh_nrt_swon-l3-duacs_PT0.2S**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name	
sla_unfiltered [m] Sea level anomaly not filtered and 5Hz subsampled with dac, ocean_tide, iw and lwe correction applied sea_surface_height_above_sea_level	
sla_filtered [m] Sea level anomaly low-pass filtered and 5Hz subsampled with dac, ocean_tide, iw and lwe correction applied sea_surface_height_above_sea_level	
mdt [m] Mean dynamic topography sea_surface_height_above_geoid	
dac [m] Dynamic Atmospheric Correction -	
ib_lf [m] Low frequency part of inverse barometer	

sea_surface_height_correction_due_to_air_pressure_at_low_frequency
ocean_tide [m] Ocean tide model sea_surface_height_amplitude_due_to_geocentric_ocean_tide
internal_tide [m] Internal Tide signal: coherent mode M2/K1/O1/S2 -
lwe [m] Long wavelength error -
xtgosa [$m.s^{-1}$] Anomaly of the geostrophic velocity in the across-track direction -
xtgosm [$m.s^{-1}$] Mean geostrophic velocity in the across-track direction -
xtdir [degrees] Across-Track direction sea_water_velocity_to_direction
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name
time [days since 1950-01-01 00:00:00] Time of measurement time
longitude [degrees_east] Longitude of measurement longitude
latitude [degrees_north] Latitude of measurement latitude
longitude_theoretical [degrees_east] Theoretical longitude of measurement (defined for repetitive orbits) longitude
latitude_theoretical [degrees_north] Theoretical latitude of measurement (defined for repetitive orbits) latitude
distance_from_theoretical [m] Distance between the real position and the theoretical position of measurement -
Other useful variables name in the NetCDF file and Unit: Long_name & Standard_name
flag [0,1] Data origin -
cycle [1] Cycle the measurement belongs to -
track [1] Track in cycle the measurement belongs to -

Table 5 : List of the datasets and variable names and unit for the 5Hz datasets included in the SEALEVEL_GLO_PHY_L3_NRT _008_044 and SEALEVEL_EUR_PHY_L3_NRT _008_059 products

I.2.1.3 L3 MY 1Hz datasets

SEALEVEL_GLO_PHY_L3_MY_008_062	**SEALEVEL_EUR_PHY_L3_MY_008_061**
Dataset: **cmems_obs-sl_glo_phy-ssh_my[int]_alg-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_al-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_c2-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_c2n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_e1g-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_e1-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_e2-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_enn-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_en-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_g2-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_h2ag-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_h2a-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_h2b-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j1g-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j1n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j1-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j2g-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j2n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j2-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_j3-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_j3n-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_s3a-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_s3b-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my[int]_s6a-lr-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_tpn-l3-duacs_PT1S** **cmems_obs-sl_glo_phy-ssh_my_tp-l3-duacs_PT1S**	**Dataset:** **cmems_obs-sl_eur_phy-ssh_my[int]_alg-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_al-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_c2-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_c2n-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_e1g-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_e1-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_e2-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_enn-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_en-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_g2-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_h2ag-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_h2a-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_h2b-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j1g-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j1n-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j1-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j2g-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j2n-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j2-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_j3-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_j3n-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_s3a-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_s3b-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my[int]_s6a-lr-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_tpn-l3-duacs_PT1S** **cmems_obs-sl_eur_phy-ssh_my_tp-l3-duacs_PT1S**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name	
sla_unfiltered [m] Sea level anomaly not-filtered not-subsampled with dac, ocean_tide and lwe correction applied sea_surface_height_above_sea_level	
sla_filtered [m] Sea level anomaly filtered not-subsampled with dac, ocean_tide and lwe correction applied sea_surface_height_above_sea_level	
mdt [m] Mean dynamic topography sea_surface_height_above_geoid	
dac [m] Dynamic Atmospheric Correction -	
ocean_tide [m] Ocean tide model -	
internal_tide [m]	

Internal Tide signal: coherent mode M2/K1/O1/S2 -
lwe [m] Long wavelength error -
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name
time [days since 1950-01-01 00:00:00] Time of measurement time
longitude [degrees_east] Longitude of measurement (theoretical position for repetitive orbits) longitude
latitude [degrees_north] Latitude of measurement (theoretical position for repetitive orbits) latitude
Other useful variables name in the NetCDF file and Unit: Long_name & Standard_name
tpa_correction [m] TOPEX-A instrumental drift correction derived from altimetry and tide gauges global comparisons (WCRP Sea Level Budget Group, 2018) sea_surface_height_above_sea_level
cycle [1] Cycle the measurement belongs to -
track [1] Track in cycle the measurement belongs to -
track [1] Track in cycle the measurement belongs to -

Table 6 : List of the datasets and variable names and unit for the SEALEVEL_EUR_PHY_L3_MY_008_061 and SEALEVEL_GLO_PHY_L3_MY_008_062 products

I.2.2 Level-4 gridded products

I.2.2.1 L4 NRT datasets

SEALEVEL_GLO_PHY_L4_NRT_008_046	**SEALEVEL_EUR_PHY_L4_NRT_008_060**
Dataset: **cmems_obs-sl_glo_phy-ssh_nrt_allsat-l4-duacs-0.25deg _P1D**	**Dataset:** **cmems_obs-sl_eur_phy-ssh_nrt_allsat-l4-duacs-0.125deg _P1D**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name	
sla [m] Sea level anomaly sea_surface_height_above_sea_level	
err_sla [m] Formal mapping error	

sea_surface_height_above_sea_level standard_error
ugosa [m/s] Geostrophic velocity anomalies: zonal component surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid
err_ugosa [m/s] Formal mapping error on zonal geostrophic velocity anomalies surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid standard_error
vgosa [m/s] Geostrophic velocity anomalies: meridian component surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid
err_vgosa [m/s] Formal mapping error on meridional geostrophic velocity anomalies surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid standard_error
adt [m] Absolute dynamic topography sea_surface_height_above_geoid
ugos [m/s] Absolute geostrophic velocity: zonal component surface_geostrophic_eastward_sea_water_velocity
vgos [m/s] Absolute geostrophic velocity: meridian component surface_geostrophic_northward_sea_water_velocity
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name
time [days since 1950-01-01 00:00:00] Time of measurement time
longitude [degrees_east] Longitude of measurement longitude
latitude [degrees_north] Latitude of measurement latitude
lon_bnds [degrees_east] - -
Lat_bnds[degrees_north] - -
Other useful variables name in the NetCDF file and Unit: Long_name & Standard_name
flag_ice [0,1] Ice Flag for a 15% criterion of ice concentration status_flag

Table 7 : List of the datasets and variable names and unit for the SEALEVEL_GLO_PHY_L4_NRT_008_046 and SEALEVEL_EUR_PHY_L4_NRT_008_060 products

I.2.2.2 L4 MY datasets

SEALEVEL_GLO_PHY_L4_MY_008_047	**SEALEVEL_EUR_PHY_L4_MY_008_068**
Dataset: **cmems_obs-sl_glo_phy-ssh_my[int]_allsat-l4-duacs-0.25deg_P1D**	**Dataset:** **cmems_obs-sl_eur_phy-ssh_my[int]_allsat-l4-duacs-0.125deg_P1D**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name	
sla [m] Sea level anomaly sea_surface_height_above_sea_level	
err_sla [m] Formal mapping error sea_surface_height_above_sea_level standard_error	
ugosa [m/s] Geostrophic velocity anomalies: zonal component surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid	
err_ugosa [m/s] Formal mapping error on zonal geostrophic velocity anomalies surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid standard_error	
vgosa [m/s] Geostrophic velocity anomalies: meridian component surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid	
err_vgosa [m/s] Formal mapping error on meridional geostrophic velocity anomalies surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid standard_error	
adt [m] Absolute dynamic topography sea_surface_height_above_geoid	
ugos [m/s] Absolute geostrophic velocity: zonal component surface_geostrophic_eastward_sea_water_velocity	
vgos [m/s] Absolute geostrophic velocity: meridian component surface_geostrophic_northward_sea_water_velocity	
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name	
time [days since 1950-01-01 00:00:00] Time of measurement time	
longitude [degrees_east] Longitude of measurement longitude	
latitude [degrees_north] Latitude of measurement latitude	
lon_bnds [degrees_east] - -	
Lat_bnds[degrees_north]	

- -
Other useful variables name in the NetCDF file and Unit: Long_name & Standard_name
flag_ice [0,1] Ice Flag for a 15% criterion of ice concentration status_flag
tpa_correction [m] TOPEX-A instrumental drift correction derived from altimetry and tide gauges global comparisons (WCRP Sea Level Budget Group, 2018) sea_surface_height_above_sea_level
Dataset: **cmems_obs-sl_glo_phy-ssh_my_allsat-l4-duacs-0.25deg_P1M-m**
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name
sla [m] Sea level anomaly sea_surface_height_above_sea_level
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name
time [days since 1950-01-01 00:00:00] Time of measurement time
longitude [degrees_east] Longitude of measurement longitude
latitude [degrees_north] Latitude of measurement latitude
lon_bnds [degrees_east] - -
Lat_bnds[degrees_north] - -

Table 8 : List of the datasets and variable names and unit for the SEALEVEL_GLO_PHY_L4_MY_008_047 and SEALEVEL_EUR_PHY_L4_MY_008_068 products

I.2.3 Static products

SEALEVEL_GLO_PHY_NOISE_L4_STATIC_008_033
Dataset: cmems_obs-sl_glo_phy-noise_mynrt_multi-L4-duacs-0.25deg_P1Y
Physical variables name in the NetCDF file and Unit: Long_name & Standard_name
noise [m] Sea Level Anomalies normalized measurement noise: yearly-mean pattern. sea_surface_height_above_sea_level
Coordinate variables name in the NetCDF file and Unit: Long_name & Standard_name
longitude [degrees_east] Longitude of measurement longitude
latitude [degrees_north] Latitude of measurement latitude
lon_bnds [degrees_east] - -
Lat_bnds[degrees_north] - -

Table 9 : List of the datasets and variable names and unit for the SEALEVEL_GLO_PHY_NOISE_L4_STATIC_008_033 product

I.3 Additional Information on parameters

sla sla_filtered sla_unfiltered	Sea Level Anomaly (see Annex) Unfiltered : raw measurement including noises Filtered: low-pass filtered SLA for noise reduction
err_sla err_ugosa err_vgosa	Formal mapping error (see QUID document) associated to sla, ugosa and vgosa variables
ugosa & vgosa ugos & vgos	Anomalies of the geostrophic current and absolute geostrophic current components (see QUID document) in the zonal and meridian directions
xtgosa & xtgosm xtdir	Anomalies of the geostrophic current and mean geostrophic current in the across-track direction. Across-track direction
mdt	Mean Dynamic Topography (see Annex)

adt	Absolute Dynamic Topography (see Annex)
dac	This correction allows for the removal of high frequency variability induced by the atmospheric forcing and aliased by the altimetric measurements. The high frequency part is based on a barotropic model simulation forced by atmospheric pressure and winds (MOG2D; Carrère and Lyard 2003); the low frequency part is an inverse barometer response. A 20-day cutoff-period was chosen because it corresponds to the Nyquist period of T/P-Jason reference altimeters sampling and because the variability is mostly barotropic in this high frequency band. This correction is already included in the SLA so if the user wants to uncorrect it or to use another correction instead, he must add it to the SLA from the product: sla_filtereduncorrected = sla_filteredfrom product + dac. sla_unfiltereduncorrected = sla_unfilteredfrom product + dac.
Ib_lf	Low frequency (periods > 20 days) part of inverse barometer. This is the low frequency component of the DAC correction, induced by atmospheric pressure only.
lwe	This correction allows correcting along track altimeter signals from long wavelengths errors remaining in the signal. LWE are defined to be orbit errors (very long spatial scales) and residual high-frequency signals (short time scale and large spatial scales); LWE are assumed to be uncorrelated between tracks and cycles. The LWE estimation is similar to the optimal interpolation technique described in Le Traon et al.[1998]; the main difference is that along-track LWE are estimated instead of the ocean signal. This correction is already included in the SLA but it is stored with opposite sign compared to the other corrections so if the user wants to uncorrect it or to use another correction instead, he must subtract it from the SLA in the product: sla_filtereduncorrected = sla_filteredfrom product - lwe. sla_unfiltereduncorrected = sla_unfilteredfrom product - lwe.
ocean_tide	The oceanic tide combines the ocean tide model and the loading tide model. The models are described in the QUID document This correction is already included in the SLA so if the user wants to uncorrect it or to use another correction instead, he must add it to the SLA from the product: sla_filtereduncorrected = sla_filteredfrom product + oceanic_tide. sla_unfiltereduncorrected = sla_unfilteredfrom product + oceanic_tide.
internal_tide	The internal tide contains to the coherent part of the baroclinic tide. The model used is described in the QID document. The sla in this file is already corrected for the internal_tide; the uncorrected sla can be computed as follows: sla_filtereduncorrected = sla_filteredfrom product + internal_tide. sla_unfiltereduncorrected = sla_unfilteredfrom product + internal_tide.

tpa_correction	TOPEX-A instrumental drift correction derived from altimetry and tide gauges global comparisons (WCRP Sea Level Budget Group, 2018). This variable can be added to the SLA to correct for the observed instrumental drift during the lifetime of the TOPEX-A mission (the correction is null after this period). This is a global mean correction to be added a posteriori (and not before) on the global mean sea level estimate derived from the sea level variable. It can be applied at regional or local scale as a best estimate (better than no correction, since the regional variation of the instrumental drift is unknown) Global_MSLTPA_drift_corrected(d) = Global_MSLdeduced from SLA from product(d) + tpa_correction(d). Where d is the date of the day considered
noise	The normalized measurement noise gives the average geographic pattern of the residual measurement noise included in the L3 sea level products. The absolute noise amplitude for the variables "sla_filtered" and "sla_unfiltered" can be reconstructed by applying a multiplicative coefficient. This coefficient corresponds to the average noise associated with the mission considered. The values are given in the Quality Information Document. Ex: noise amplitude parttern for Jason-3 “sla_unfiltered » = noise * 2.6 (in cm rms)

I.4 Production System Description

The SEALEVEL altimeter products are processed with the CNES/CLS DUACS (Data Unification and Altimeter Combination System) system.

The DUACS processing steps are described in the QUID document.

The altimeter measurements used as input of the DUACS system consist in a majority of Level 2p products from different missions, that are available under three forms, with different delay of availability:

- Fast delivery or Near Real Time products (OGDR or NRT). These products do not always benefit from precise orbit determination, nor from some external model-based corrections (Dynamic Atmospheric Correction (DAC), Global Ionospheric Maps (GIM)).
- The Intermediate or Slow Time Critical products (IGDR or STC) that are the latest high-quality altimeter data produced in near-real-time
- Delayed Time or Non-Time Critical product (GDR or NTC).

Details of the different L2p altimeter products sources and delay of availability are given in the QUID document.

I.5 Grid

All L4 products are delivered onto cartesian grids. The resolution of the grid varies according to the product considered (see section I.1.2). All the variables are defined at the center of the output grid cell.

I.6 Vertical Levels

All the SEALEVEL products are defined on the surface layer.

I.7 Processing information

I.7.1 Update Time for Near real time production

I.7.1.1 Level-3 along-track products

As described in Figure 2 below, there is a nominal run of the SL-TAC chain each day, combining IGDR or L2P STC and OGDR or L2P NRT data. This run produces every day along-track products 3 to 12 hours after the last measurement. Moreover, several times per day a secondary run for GLOBAL area only takes into account the last measurements available (i.e fast-delivery upstream). This allows producing GLOBAL along-track files within nearly 2 hours for the last measurement. This was implemented in order to allow downloading the latest measurement available whenever during the day.

The delivery data flow is described below with an example on a real situation. The consolidated data are in green and will not be updated in the future processing. The files in yellow are computed with near-real-time input data and the files in orange and red are produced with fast-delivery input data. Once a day, the nominal processing is run with all the input data available. Several times per day, the global and regional processing are run and integrate the available fast delivery products leading to increase the number of measurements available to users.

The situation A/ describes the available data after a nominal processing (processing date is 20160621) and several secondary processing. In the situation B/, after a new secondary processing, the consolidated files are the same as in A/, the yellow files are the same as in A/, the file of day 20 is the same as in A/ and the file of day 21 contains the measurements as in situation A/ plus the measurements acquired in the meanwhile (in red). Each time new data is ingested, the resultant file (of day 21) is overwritten with the attribute "date_created" updated.

In the situation C/ the day after A/ and B/, another file has been consolidated (day 31). The yellow, orange and red files have been updated with a new production date (20160622) and new measurements have been ingested (in red).

Both Global and Regional products are available over a maximal temporal period corresponding to the past 2 years. This period can be reduced to a minimal 20 days period after the implementation of a product evolution affecting the homogeneity of the time series (e.g. product format change; add/rm variables).

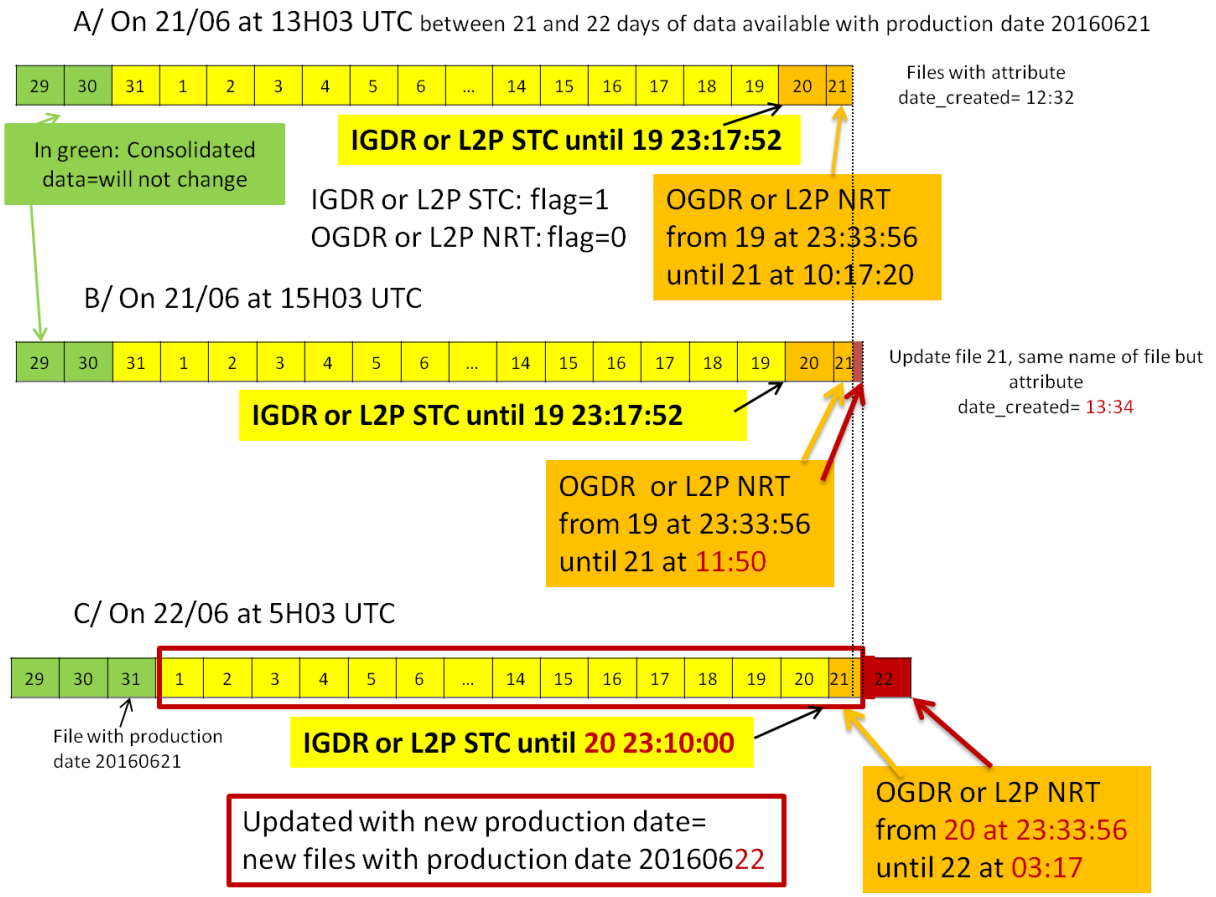

Figure 1: Data delivery flow for Global and regional NRT SL-TAC products

I.7.1.2 Level-4 gridded products

The exploitation of near-real-time and fast-delivery data allows the DUACS system to produce multi-mission maps with 0-day, 3-day and 6-day delay, using non-centered processing time-window (in NRT case, "future" data are not available; the computation time window takes into account only the 6 weeks before the date).

Those products are delivered every day.

Three merged maps are produced daily, each with a different delay and quality:

- A 6-day delay, which represents a final NRT map production,
- A 3-day delay, which represents an intermediate map production,
- and a 0-day delay, which represents a preliminary map production, based on IGDR+OGDR production.

Then, these maps are replaced when a better quality data is available:

- At d_{0+6}, the final NRT map replaces the preliminary map which was produced at d_0.

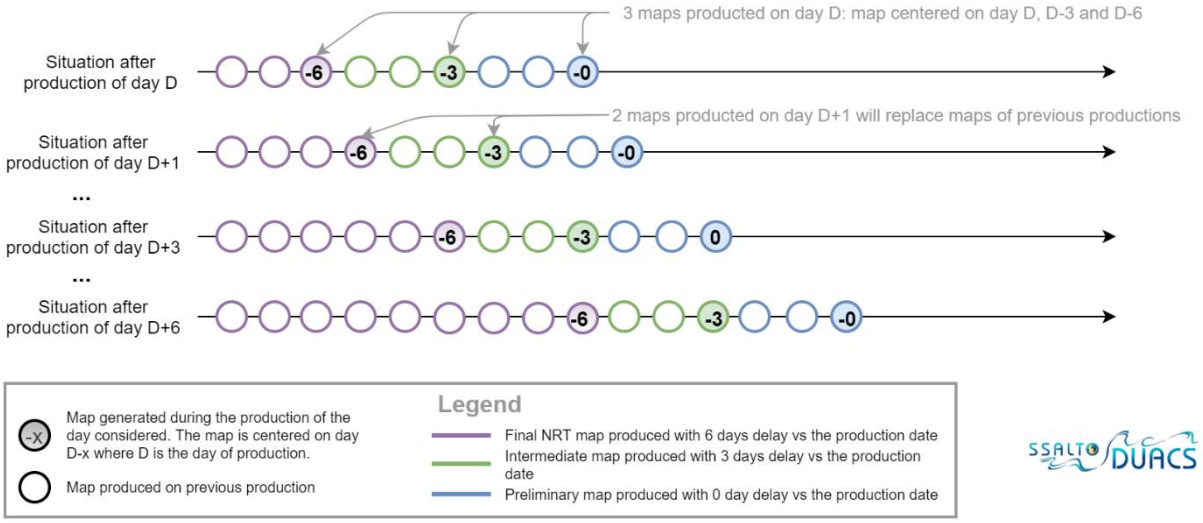

Figure 2: Three merged maps are produced daily: final map (d-6), intermediate map (d-3) and preliminary map (d0)

I.7.2 Update Time for Multi-Year production

The products/datasets are extended in time four times a year, so that these datasets cover from 1993 up to five to nine months before present. These datasets benefit from the highest quality altimeter measurements and geophysical corrections, and are produced with a unique system (no changes in time in the set up, extended in time using the same system) to minimize the risk of quality loss or spurious signals appearing in time.

The Multi-Year Interim (MYINT) series covers the last months available. It is generated with the same system than the previous months production (MY), but using new upstream products, including new altimeter standards and corrections, selected for a future full reprocessing campaign. The global and regional sea level biases that may be introduced by the standards/correction changes are managed by the DUACS processing to ensure the sea level continuity and a seamless transition for users.

A full reprocessing of the Multi-Year series is usually delivery each 3 to 4 years.

I.7.3 Time averaging

L4 monthly mean dataset is obtained by simple temporal average of the L4 daily products available over the month considered.

III. DOWNLOAD A PRODUCT

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.

IV. FILES NOMENCLATURE

I.8 Nomenclature of files when downloaded through the Copernicus Marine Web Portal Subsetter Service

Files nomenclature when downloaded through the Web Portal Subsetter is based on product dataset name and a numerical reference related to the request date on the MIS.

The scheme is: **datasetname_nnnnnn.nc**

where :

- **datasetname** is a character string within one of the datasets listed in section I.2.2 and I.2.3 :
- **nnnnnn**: 6 digit integer corresponding to the current time (download time) in milliseconds since January 1, 1970 midnight UTC.
- **nc**: standard NetCDF filename extension.

Example:

cmems_obs-sl_glo_phy-ssh_my_allsat-l4-duacs-0.25deg_P1D_1644250104522.nc

I.9 Nomenclature of files when downloaded through the Copernicus Marine Web FTP Service

I.9.1 Level-3 along-track products

The nomenclature used is:

<delay>_<zone>_<mission>_<variable>_l3<resolution>_<date>_<dateprod>.<format>

where the fields in "<>" are described below:

delay	nrt dt	near-real time products delayed time products
zone	global europe	global geographic coverage product Europe products
mission	e1 e1g e2 tp tpn g2	ERS-1 (only for dt) ERS-1 geodetic phase (only for dt) ERS-2 (only for dt) TOPEX/Poseidon (only for dt) TOPEX/Poseidon on its new orbit (only for dt) GFO (only for dt)

	j1 j1n j1g j2 j2n j2g j3 j3n en enn c2 c2n al alg h2a h2ag h2b s3a s3b s6a-hr s6a-lr swon	Jason-1 (only for dt) Jason-1 on its new orbit (only for dt) Jason-1 on its geodetic orbit (only for dt) OSTM/Jason -2 (only for dt) OSTM/Jason -2 on its interleaved orbit OSTM/Jason-2 on its long repeat orbit (LRO) Jason-3 Jason-3 on its new (interleaved) orbit Envisat (only for dt) Envisat on its new orbit (only for dt) Cryosat-2 Cryosat-2 on its new orbit Saral/AltiKa Saral/AltiKa on its geodetic orbit (only for dt) HaiYang-2A (only for dt) HaiYang-2A on its geodetic orbit (only for dt) HaiYang-2B Sentinel-3A Sentinel-3B Sentinel-6A with SAR mode measurement Sentinel-6A with LRM mode measurement SWOT-nadir
variable	phy	Ex: sla, mdt and some corrections
resolution	*Not defined* _1hz _5hz	Product with 1Hz (~7km) posting rate Product with 1Hz (~7km) posting rate Product with 5Hz (~1km) posting rate
date	YYYYMMDD	date of the dataset For NRT products : the file contains the measurements dated exactly on the day considered. This means that the altimeter tracks, for which the first measurement is dated at the end of a day and the last one at the beginning of the next day, are stored on two successive files For MY products: the whole altimeter track is stored in a unique file. This means that the file containing measurements of one day can also contain part of the measurements for the end of the previous day or beginning of the next day.
dateprod	YYYYMMDD	production date of the dataset
format	.nc	NetCdf CF1.6

I.9.2 Level-4 gridded products

I.9.2.1 daily datasets

The nomenclature used is:

<delay>_<zone>_allsat_phy_l4_<datemap>_<dateprod>.<format>

where the fields in "<>" are described below:

delay	nrt dt	near-real time products delayed time products
zone	global europe	global geographic coverage product Europe products
date	YYYYMMDD	date of the map
dateprod	YYYYMMDD	production date of the map
format	.nc	NetCdf CF1.6

I.9.2.2 Monthly mean datasets

The nomenclature used is:

<delay>_<zone>_allsat_msla_h_y<YYYY>_m<MM>.<format>

where the fields in "<>" are described below:

delay	dt	delayed time products
zone	global	global geographic coverage product
date	YYYY MM	year of the map month of the map
format	.nc	NetCdf CF1.6

I.9.3 Static products

The nomenclature used is:

<delay>_<zone>_ multi_phy_noise_l4.<format>

where the fileds in "<>" are described below:

delay	static	near-real time products delayed time products
zone	global	global geographic coverage product
format	.nc	NetCdf CF1.6

I.10 Other information: mean centre of Products, land mask value, missing value

In the Copernicus Marine online system data from the latest 2 years (running window) are available via these download interfaces: Subsetter and FTP download

I.11 File size

The following table give an estimation of the typical size of one the daily file for L3 and L4 products, when downloaded through the Copernicus Marine FTP Service.

Area	**Product Level**	**NetCDF file size**
Global	L3	450 to 550 Ko; 2500 Ko (5Hz)
	L4	9.2 Mo
Europe	L3	90 to 110 Ko (1Hz) ; 500 Ko (5Hz)
	L4	1.8 Mo

V. FILE FORMAT

I.12 NetCDF

The SEALEVEL products are compliant with the NetCDF Climate and Forecast Convention CF-1.6 (see http://cf-pcmdi.llnl.gov/).

To know more about the NetCDF format, please follow this link: What is the format of Copernicus Marine products ? NetCDF

I.13 Structure and semantic of netCDF maps files

See ANNEX

VI. REFERENCES

Quality Information Document : the associated QUID document is CMEMS-SL-QUID-008-032-068

VII. ANNEX

I.13.1 Level-3 along-track products

An example output NetCDF file header for the dataset-duacs-nrt-global-s3a-phy-l3 dataset is given bellow.

```
netcdf nrt_global_s3a_phy_l3_20210830_20210908 {
dimensions:
    time = 48017 ;
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:scale_factor = 1.e-06 ;
        longitude:add_offset = 0. ;
        longitude:long_name = "Longitude of measurement" ;
        longitude:standard_name = "longitude" ;
        longitude:units = "degrees_east" ;
    int latitude(time) ;
        latitude:scale_factor = 1.e-06 ;
        latitude:add_offset = 0. ;
        latitude:long_name = "Latitude of measurement" ;
        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 sla_filtered(time) ;
        sla_filtered:_FillValue = 32767s ;
        sla_filtered:scale_factor = 0.001 ;
        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]+[internal_tide]-[lwe]; see the product user manual for details" ;
        sla_filtered:coordinates = "longitude latitude" ;
        sla_filtered:long_name = "Sea level anomaly filtered not-subsampled with dac, ocean_tide and lwe correction applied" ;
        sla_filtered:standard_name = "sea_surface_height_above_sea_level" ;
        sla_filtered:units = "m" ;
    short sla_unfiltered(time) ;
        sla_unfiltered:_FillValue = 32767s ;
        sla_unfiltered:scale_factor = 0.001 ;
        sla_unfiltered:add_offset = 0. ;
        sla_unfiltered: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]+[internal_tide]-[lwe]; see the product user manual for details" ;
        sla_unfiltered:coordinates = "longitude latitude" ;
        sla_unfiltered:long_name = "Sea level anomaly not-filtered not-subsampled with dac, ocean_tide and lwe correction applied" ;
        sla_unfiltered:standard_name = "sea_surface_height_above_sea_level" ;
        sla_unfiltered:units = "m" ;
    short flag(time) ;
        flag:_FillValue = 32767s ;
```

flag:comment = "The origin of the data is determined by the types of geophysical data records (GDR) used in computation of the SLA: 1 for the Interim GDR (IGDR) or Short Time Critical (STC) and 0 for Operational GDR (OGDR) or Near Real Time (NRT)." ;
flag:coordinates = "longitude latitude" ;
flag:long_name = "Data origin" ;
flag:meaning = "OGDR_or_NRT, IGDR_or_STC" ;
flag:units = "1" ;
flag:values = 0s, 1s ;
short dac(time) ;
dac:_FillValue = 32767s ;
dac:scale_factor = 0.0001 ;
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:units = "m" ;
short ocean_tide(time) ;
ocean_tide:_FillValue = 32767s ;
ocean_tide:scale_factor = 0.001 ;
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:units = "m" ;
short internal_tide(time) ;
internal_tide:_FillValue = 32767s ;
internal_tide:scale_factor = 0.001 ;
internal_tide:add_offset = 0. ;
internal_tide:comment = "The sla in this file is already corrected for the internal_tide; the uncorrected sla can be computed as follows: [uncorrected sla]=[sla from product]+[internal_tide]; see the product user manual for details" ;
internal_tide:coordinates = "longitude latitude" ;
internal_tide:long_name = "Internal Tide signal: coherent mode M2/K1/O1/S2" ;
internal_tide:units = "m" ;
short lwe(time) ;
lwe:_FillValue = 32767s ;
lwe:scale_factor = 0.001 ;
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:units = "m" ;
short mdt(time) ;
mdt:_FillValue = 32767s ;
mdt:scale_factor = 0.001 ;
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:standard_name = "sea_surface_height_above_geoid" ;
mdt:units = "m" ;

// global attributes:
:Conventions = "CF-1.6" ;
:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
:cdm_data_type = "Swath" ;
:comment = "Sea Surface Height measured by altimeters referenced to the [1993, 2012] period" ;
:contact = "servicedesk.cmems@mercator-ocean.eu" ;
:creator_email = "servicedesk.cmems@mercator-ocean.eu" ;
:creator_name = "CMEMS - Sea Level Thematic Assembly Center" ;
:creator_url = "http://marine.copernicus.eu" ;
:date_created = "2021-09-07T23:32:28Z" ;
:date_issued = "2021-09-07T23:32:28Z" ;
:date_modified = "2021-09-07T23:32:28Z" ;
:geospatial_lat_max = 81.420212 ;
:geospatial_lat_min = -65.716474 ;

:geospatial_lat_resolution = 0.0363635000000073 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 179.998249 ;
:geospatial_lon_min = -179.98889 ;
:geospatial_lon_resolution = 0.017043000000001 ;
: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 = "2021-09-07T23:32:28Z: Creation" ;
:institution = "CLS, CNES, EUMETSAT" ;
:keywords = "Oceans > Ocean Topography > Sea Surface Height" ;
:keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard Names" ;
:license = "http://marine.copernicus.eu/web/27-service-commitments-and-licence.php" ;
:platform = "Sentinel-3A" ;
:processing_level = "L3" ;
:product_version = "vDec2021" ;
:project = "EUMETSAT Sentinel-3 L2P/L3 Marine Altimetry Service" ;
:references = "http://marine.copernicus.eu" ;
:software_version = "19.0.0_DUACS_DT2021_baseline" ;
:source = "Sentinel-3A measurements" ;
:ssalto_duacs_comment = "Jason-3 is the reference mission used for the altimeter inter-calibration processing" ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table v37" ;
:summary = "SSALTO/DUACS Near-Real-Time Level-3 sea surface height measured by Sentinel-3A altimetry observations over Global Ocean." ;
:time_coverage_duration = "P23H45M29.607653S" ;
:time_coverage_end = "2021-08-30T23:59:59Z" ;
:time_coverage_resolution = "P1S" ;
:time_coverage_start = "2021-08-30T00:14:29Z" ;
:title = "NRT Sentinel-3A Global Ocean Along track SSALTO/DUACS Sea Surface Height L3 product" ;

I.13.2 Level-4 gridded products

An example output NetCDF file header for the cmems_obs-sl_glo_phy-ssh_my_allsat-l4-duacs-0.25deg_P1D dataset is given bellow.

netcdf dt_global_allsat_phy_l4_20200101_20210726 {
dimensions:
time = 1 ;
latitude = 720 ;
longitude = 1440 ;
nv = 2 ;
variables:
int crs ;
crs:comment = "This is a container variable that describes the grid_mapping used by the data in this file. This variable does not contain any data; only information about the geographic coordinate system." ;
crs:grid_mapping_name = "latitude_longitude" ;
crs:inverse_flattening = 298.257 ;
crs:semi_major_axis = 6378136.3 ;
float time(time) ;
time:axis = "T" ;
time:calendar = "gregorian" ;
time:long_name = "Time" ;
time:standard_name = "time" ;
time:units = "days since 1950-01-01 00:00:00" ;
float latitude(latitude) ;
latitude:axis = "Y" ;
latitude:bounds = "lat_bnds" ;
latitude:long_name = "Latitude" ;
latitude:standard_name = "latitude" ;
latitude:units = "degrees_north" ;
latitude:valid_max = 89.875 ;
latitude:valid_min = -89.875 ;

float lat_bnds(latitude, nv) ;
lat_bnds:comment = "latitude values at the north and south bounds of each pixel." ;
lat_bnds:units = "degrees_north" ;
float longitude(longitude) ;
longitude:axis = "X" ;
longitude:bounds = "lon_bnds" ;
longitude:long_name = "Longitude" ;
longitude:standard_name = "longitude" ;
longitude:units = "degrees_east" ;
longitude:valid_max = 179.875 ;
longitude:valid_min = -179.875 ;
float lon_bnds(longitude, nv) ;
lon_bnds:comment = "longitude values at the west and east bounds of each pixel." ;
lon_bnds:units = "degrees_east" ;
int nv(nv) ;
nv:comment = "Vertex" ;
nv:long_name = "Number of cell vertices" ;
nv:units = "1" ;
int sla(time, latitude, longitude) ;
sla:_FillValue = -2147483647 ;
sla:ancillary_variables = "err_sla" ;
sla:comment = "The sea level anomaly is the sea surface height above mean sea surface; it is referenced to the [1993, 2012] period; see the product user manual for details" ;
sla:coordinates = "longitude latitude" ;
sla:grid_mapping = "crs" ;
sla:long_name = "Sea level anomaly" ;
sla:scale_factor = 0.0001 ;
sla:standard_name = "sea_surface_height_above_sea_level" ;
sla:units = "m" ;
int err_sla(time, latitude, longitude) ;
err_sla:_FillValue = -2147483647 ;
err_sla:comment = "The formal mapping error represents a purely theoretical mapping error. It mainly traduces errors induced by the constellation sampling capability and consistency with the spatial/temporal scales considered, as described in Le Traon et al (1998) or Ducet et al (2000)" ;
err_sla:coordinates = "longitude latitude" ;
err_sla:grid_mapping = "crs" ;
err_sla:long_name = "Formal mapping error" ;
err_sla:scale_factor = 0.0001 ;
err_sla:standard_name = "sea_surface_height_above_sea_level standard_error" ;
err_sla:units = "m" ;
int ugosa(time, latitude, longitude) ;
ugosa:_FillValue = -2147483647 ;
ugosa:ancillary_variables = "err_ugosa" ;
ugosa:comment = "The geostrophic velocity anomalies are referenced to the [1993, 2012] period" ;
ugosa:coordinates = "longitude latitude" ;
ugosa:grid_mapping = "crs" ;
ugosa:long_name = "Geostrophic velocity anomalies: zonal component" ;
ugosa:scale_factor = 0.0001 ;
ugosa:standard_name = "surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid" ;
ugosa:units = "m/s" ;
int err_ugosa(time, latitude, longitude) ;
err_ugosa:_FillValue = -2147483647 ;
err_ugosa:comment = "The formal mapping error represents a purely theoretical mapping error. It mainly traduces errors induced by the constellation sampling capability and consistency with the spatial/temporal scales considered, as described in Le Traon et al (1998) or Ducet et al (2000)" ;
err_ugosa:coordinates = "longitude latitude" ;
err_ugosa:grid_mapping = "crs" ;
err_ugosa:long_name = "Formal mapping error on zonal geostrophic velocity anomalies" ;
err_ugosa:scale_factor = 0.0001 ;
err_ugosa:standard_name = "surface_geostrophic_eastward_sea_water_velocity_assuming_sea_level_for_geoid standard_error" ;
err_ugosa:units = "m/s" ;
int vgosa(time, latitude, longitude) ;
vgosa:_FillValue = -2147483647 ;
vgosa:ancillary_variables = "err_vgosa" ;
vgosa:comment = "The geostrophic velocity anomalies are referenced to the [1993, 2012] period" ;
vgosa:coordinates = "longitude latitude" ;
vgosa:grid_mapping = "crs" ;
vgosa:long_name = "Geostrophic velocity anomalies: meridian component" ;

vgosa:scale_factor = 0.0001 ;
vgosa:standard_name = "surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid" ;
vgosa:units = "m/s" ;
int err_vgosa(time, latitude, longitude) ;
err_vgosa:_FillValue = -2147483647 ;
err_vgosa:comment = "The formal mapping error represents a purely theoretical mapping error. It mainly traduces errors induced by the constellation sampling capability and consistency with the spatial/temporal scales considered, as described in Le Traon et al (1998) or Ducet et al (2000)" ;
err_vgosa:coordinates = "longitude latitude" ;
err_vgosa:grid_mapping = "crs" ;
err_vgosa:long_name = "Formal mapping error on meridional geostrophic velocity anomalies" ;
err_vgosa:scale_factor = 0.0001 ;
err_vgosa:standard_name = "surface_geostrophic_northward_sea_water_velocity_assuming_sea_level_for_geoid standard_error" ;
err_vgosa:units = "m/s" ;
int adt(time, latitude, longitude) ;
adt:_FillValue = -2147483647 ;
adt:comment = "The absolute dynamic topography is the sea surface height above geoid; the adt is obtained as follows: adt=sla+mdt where mdt is the mean dynamic topography; see the product user manual for details" ;
adt:coordinates = "longitude latitude" ;
adt:grid_mapping = "crs" ;
adt:long_name = "Absolute dynamic topography" ;
adt:scale_factor = 0.0001 ;
adt:standard_name = "sea_surface_height_above_geoid" ;
adt:units = "m" ;
int ugos(time, latitude, longitude) ;
ugos:_FillValue = -2147483647 ;
ugos:coordinates = "longitude latitude" ;
ugos:grid_mapping = "crs" ;
ugos:long_name = "Absolute geostrophic velocity: zonal component" ;
ugos:scale_factor = 0.0001 ;
ugos:standard_name = "surface_geostrophic_eastward_sea_water_velocity" ;
ugos:units = "m/s" ;
int vgos(time, latitude, longitude) ;
vgos:_FillValue = -2147483647 ;
vgos:coordinates = "longitude latitude" ;
vgos:grid_mapping = "crs" ;
vgos:long_name = "Absolute geostrophic velocity: meridian component" ;
vgos:scale_factor = 0.0001 ;
vgos:standard_name = "surface_geostrophic_northward_sea_water_velocity" ;
vgos:units = "m/s" ;
int flag_ice(time, latitude, longitude) ;
flag_ice:_FillValue = -2147483647 ;
flag_ice:comment = "Ice Flag based on CDR OSI SAF products until 2016 (OSI-450), Interim products from 2016 (OSI-430-b) (Lavergne et al., 2019). The flag corresponds to the 15% sea ice concentration." ;
flag_ice:long_name = "Ice Flag for a 15% criterion of ice concentration" ;
flag_ice:standard_name = "status_flag" ;
flag_ice:flag_values = 0, 1 ;
flag_ice:flag_meanings = "data_on_sea data_on_ice" ;
flag_ice:grid_mapping = "crs" ;
flag_ice:coordinates = "longitude latitude" ;
int tpa_correction(time) ;
tpa_correction:_FillValue = -2147483647 ;
tpa_correction:comment = "This variable can be added to the gridded SLA to correct for the observed instrumental drift during the lifetime of the TOPEX-A mission (the correction is null after this period). This is a global correction to be added a posteriori (and not before) on the global mean sea level estimate derived from the gridded sea level map. It can be applied at regional or local scale as a best estimate (better than no correction, since the regional variation of the instrumental drift is unknown). See product manual for more details." ;
tpa_correction:long_name = "TOPEX-A instrumental drift correction derived from altimetry and tide gauges global comparisons (WCRP Sea Level Budget Group, 2018)" ;
tpa_correction:scale_factor = 0.0001 ;
tpa_correction:standard_name = "sea_surface_height_above_sea_level" ;
tpa_correction:units = "m" ;

// global attributes:
:Conventions = "CF-1.6" ;
:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
:cdm_data_type = "Grid" ;
:comment = "Sea Surface Height measured by Altimetry and derived variables" ;
:contact = "servicedesk.cmems@mercator-ocean.eu" ;

:creator_email = "servicedesk.cmems@mercator-ocean.eu" ;
:creator_name = "CMEMS - Sea Level Thematic Assembly Center" ;
:creator_url = "http://marine.copernicus.eu" ;
:date_created = "2021-07-27T15:26:37Z" ;
:date_issued = "2021-07-27T15:26:37Z" ;
:date_modified = "2021-07-27T15:26:37Z" ;
:geospatial_lat_max = 89.875 ;
:geospatial_lat_min = -89.875 ;
:geospatial_lat_resolution = 0.25 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 179.875 ;
:geospatial_lon_min = -179.875 ;
:geospatial_lon_resolution = 0.25 ;
: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 = "2021-07-27 15:26:39Z: Creation" ;
:institution = "CLS, CNES" ;
:keywords = "Oceans > Ocean Topography > Sea Surface Height" ;
:keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard Names" ;
:license = "http://marine.copernicus.eu/web/27-service-commitments-and-licence.php" ;
:platform = Altika Drifting Phase, Cryosat-2, Haiyang-2A Geodetic Phase, Haiyang-2B, Jason-3, Sentinel-3A, Sentinel-3B";
:processing_level = "L4" ;
:product_version = "vDec2021" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:software_version = "7.0_DUACS_DT2021_baseline" ;
:source = "Altimetry measurements" ;
:ssalto_duacs_comment = "The reference mission used for the altimeter inter-calibration processing is Topex/Poseidon between 1993-01-01 and 2002-04-23, Jason-1 between 2002-04-24 and 2008-10-18, OSTM/Jason-2 between 2008-10-19 and 2016-06-25, Jason-3 since 2016-06-25." ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table v37" ;
:summary = "SSALTO/DUACS Delayed-Time Level-4 sea surface height and derived variables measured by multi-satellite altimetry observations over Global Ocean." ;
:time_coverage_duration = "P1D" ;
:time_coverage_end = "2020-01-01T12:00:00Z" ;
:time_coverage_resolution = "P1D" ;
:time_coverage_start = "2019-12-31T12:00:00Z" ;
:title = "DT merged all satellites Global Ocean Gridded SSALTO/DUACS Sea Surface Height L4 product and derived variables" ;
}

I.13.3 Static products

An example output NetCDF file header for the dataset-duacs-rep-global_j3-noise-l4 dataset is given bellow.

netcdf dt_global_j3_sla_noise :
dimensions:
latitude = 90 ;
longitude = 180 ;
nv = 2 ;
variables:
int crs ;
crs:comment = "This is a container variable that describes the grid_mapping used by the data in this file. This variable does not contain any data; only information about the geographic coordinate system." ;
crs:grid_mapping_name = "latitude_longitude" ;
crs:inverse_flattening = 298.257 ;
crs:semi_major_axis = 6378136.3 ;
float latitude(latitude) ;
latitude:axis = "Y" ;
latitude:bounds = "lat_bnds" ;
latitude:long_name = "Latitude" ;

```
            latitude:standard_name = "latitude" ;
            latitude:units = "degrees_north" ;
            latitude:valid_max = -89. ;
            latitude:valid_min = 89. ;
        float lat_bnds(latitude, nv) ;
            lat_bnds:comment = "latitude values at the north and south bounds of each pixel." ;
            lat_bnds:units = "degrees_north" ;
        float longitude(longitude) ;
            longitude:axis = "X" ;
            longitude:bounds = "lon_bnds" ;
            longitude:long_name = "Longitude" ;
            longitude:standard_name = "longitude" ;
            longitude:units = "degrees_east" ;
            longitude:valid_max = 1. ;
            longitude:valid_min = 359. ;
        float lon_bnds(longitude, nv) ;
            lon_bnds:comment = "longitude values at the west and east bounds of each pixel." ;
            lon_bnds:units = "degrees_east" ;
        int nv(nv) ;
            nv:comment = "Vertex" ;
            nv:units = "1" ;
        int noise_sla_filtered(latitude, longitude) ;
            noise_sla_filtered:_FillValue = -2147483647 ;
            noise_sla_filtered:coordinates = "longitude latitude" ;
            noise_sla_filtered:grid_mapping = "crs" ;
            noise_sla_filtered:long_name = "Sea Level Anomalies measurement noise for filtered 1-Hz measurements" ;
            noise_sla_filtered:scale_factor = 0.0001 ;
            noise_sla_filtered:standard_name = "sea_surface_height_above_sea_level" ;
            noise_sla_filtered:units = "m" ;
        int noise_sla_unfiltered(latitude, longitude) ;
            noise_sla_unfiltered:_FillValue = -2147483647 ;
            noise_sla_unfiltered:coordinates = "longitude latitude" ;
            noise_sla_unfiltered:grid_mapping = "crs" ;
            noise_sla_unfiltered:long_name = "Sea Level Anomalies measurement noise for raw (unfiltered) 1-Hz measurements" ;
            noise_sla_unfiltered:scale_factor = 0.0001 ;
            noise_sla_unfiltered:standard_name = "sea_surface_height_above_sea_level" ;
            noise_sla_unfiltered:units = "m" ;

    // global attributes:
            :cdm_data_type = "Grid" ;
            :comment = "Surface product" ;
            :contact = "servicedesk.cmems@mercator-ocean.eu" ;
            :Conventions = "CF-1.6" ;
            :creator_email = "servicedesk.cmems@mercator-ocean.eu" ;
            :creator_name = "CMEMS - Sea Level Thematic Assembly Center" ;
            :creator_url = "http://marine.copernicus.eu" ;
            :date_created = "2019-01-16T10:28:12Z" ;
            :date_issued = "2019-01-16T10:28:12Z" ;
            :date_modified = "2019-01-16T10:28:12Z" ;
            :geospatial_lat_max = 89. ;
            :geospatial_lat_min = -89. ;
            :geospatial_lat_resolution = 2. ;
            :geospatial_lat_units = "degrees_north" ;
            :geospatial_lon_max = 1. ;
            :geospatial_lon_min = 359. ;
            :geospatial_lon_resolution = 2. ;
            :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 = "2019-01-16 10:28:12Z: Creation" ;
            :institution = "CLS, CNES" ;
            :keywords = "Oceans > Ocean Topography > Sea Surface Height" ;
            :keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard Names" ;
            :license = "http://marine.copernicus.eu/web/27-service-commitments-and-licence.php" ;
            :Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
```

:platform = "Jason-3" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:summary = "This dataset contains the measurement noise for raw (unfiltered) and filtered Jason-3 1-Hz measurements." ;

:title = "SSALTO/Duacs Altimetric Level4 product: Jason-3 sea level anomalies measurement noise on global area" ;