PRODUCT USER MANUAL

For Sea Level SLA products

SEALEVEL_BS_PHY_L4_REP_OBSERVATIONS_008_042

SEALEVEL_EUR_PHY_L3_NRT_OBSERVATIONS_008_059

SEALEVEL_EUR_PHY_L3_REP_OBSERVATIONS_008_061

SEALEVEL_EUR_PHY_L4_NRT_OBSERVATIONS_008_060

SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_062

SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044

SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046

SEALEVEL_GLO_PHY_L4_REP_OBSERVATIONS_008_047

SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051

SEALEVEL_GLO_NOISE_L4_NRT_OBSERVATIONS_008_032

SEALEVEL_GLO_NOISE_L4_REP_OBSERVATIONS_008_033

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CHANGE RECORD

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	V.1	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	II	update of the AVISO/CMEMS dissemination information	M-I Pujol	M-I Pujol

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I INTRODUCTION

The Sea Level TAC (Thematic Assembly Centre) is one of the five TAC of the Copernicus Marine Environment Monitoring Service (CMEMS) project. 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 missions: Sentinel-3A/B, Jason-3, HY-2A, Saral[-DP]/AltiKa, Cryosat-2, OSTM/Jason-2, Jason-1, Topex/Poseidon, Envisat, GFO, ERS-1/2.

The data provided to users have a global coverage and regional products are also computed over specific areas: European Seas, including Mediterranean Sea, Black Sea (see §III for more details)

They correspond to along-track (L3) and gridded (L4) Sea Level Anomalies (SLA) and derivates products deduced from altimeter measurements.

II CMEMS AND AVISO+ DISSEMINATIONS

The **along-track and maps SLAs and ADTs** for Global ocean and regional Seas are distributed by CMEMS. They are available with a daily sampling. Monthly mean maps are delivered for REP products.

Other altimetry products, derivates and auxiliaries are available via the Aviso+ dissemination (with registration; see http://www.aviso.altimetry.fr/en/data/products.html) and/or via CMEMS (see SEALEVEL* products on CMEMS portfolio)

The list of the different altimeter products disseminated on AVISO+ a/o CMEMS is available on the following document: https://www.aviso.altimetry.fr/fileadmin/documents/data/tools/AVISO__CMEMS_C3S_migration.pdf

III SEALEVEL-TAC PRODUCTS OVERVIEW

The CMEMS SL-TAC produces two components: one Reprocessing (REP) component and on Near-real-Time (NRT) component described in this part.

III.1 Near Real Time Products

III.1.1 Products overview

The purpose of the NRT CMEMS component is the acquisition of altimeter data from various altimeter missions in

- near-real-time (IGDRs) or in short time critical (L2P STC for Sentinel-3A&B) i.e. within a few days at most and
- in fast delivery: real time (OGDRs) or near real time (L2P NRT for Sentinel-3A&B),

the validation and correction of these altimeter data sets (i.e edition and selection, update of corrections and homogenization, orbit error reduction) in order to produce each day along-track and gridded products.

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 (see III.1.2), 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). .

	Along-track NRT PHY L3 SEALEVEL_*_PHY_L3_NRT _OBSERVATIONS_008_*	Gridded Sea Surface Height and derivated variables NRT PHY L4 SEALEVEL_*_PHY_L4_NRT _OBSERVATIONS_008_*
Global	delivered Sentinel-3A&B datasets are produced under EUMETSAT responsibility and disseminated by CMEMS	delivered
Mediterranean	-	-
Black Sea	-	-
Europe	delivered	delivered

Table 1: List of the time varying products in NRT

A time invariant product SEALEVEL_GLO_NOISE_L4_NRT_OBSERVATIONS_008_032 is also delivered: it describes the noise level of along-track measurements. This is a gridded product. One file is provided for the global ocean and those values must be applied for Europe products. For Mediterranean and Black seas, one value is given in the QUID document.

	Gridded Noise on SLA NRT NOISE SLA SEALEVEL_GLO_NOISE_L4_NRT _OBSERVATIONS_008_*
Global	delivered
Europe	Same as global

Table 2: List of the time invariant product in NRT

III.1.2 Delay of the products

III.1.2.1 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 fas-delivery upstream). This allows producing GLOBAL along-track files within 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 processing is run and integrates 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 processings. 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).

Regional products are produced one a day during the run C/, using both IGDR/STC and OGDR/NRT measurements available.

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).

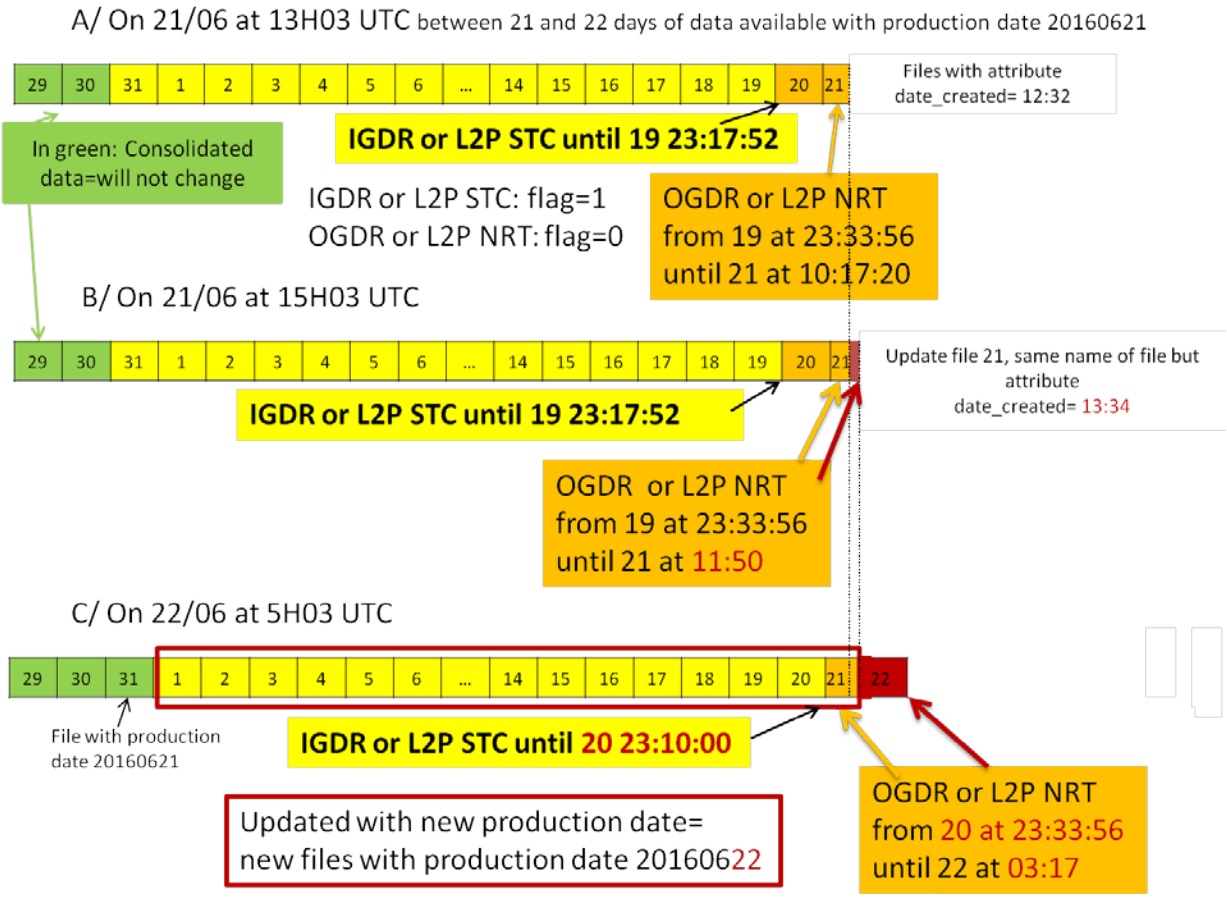

Figure 1: Data delivery flow for Global NRT SL-TAC products

III.1.2.2 Gridded products

The availability of the gridded products in near real time is day-0 , day-3 and day-6 days.

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.

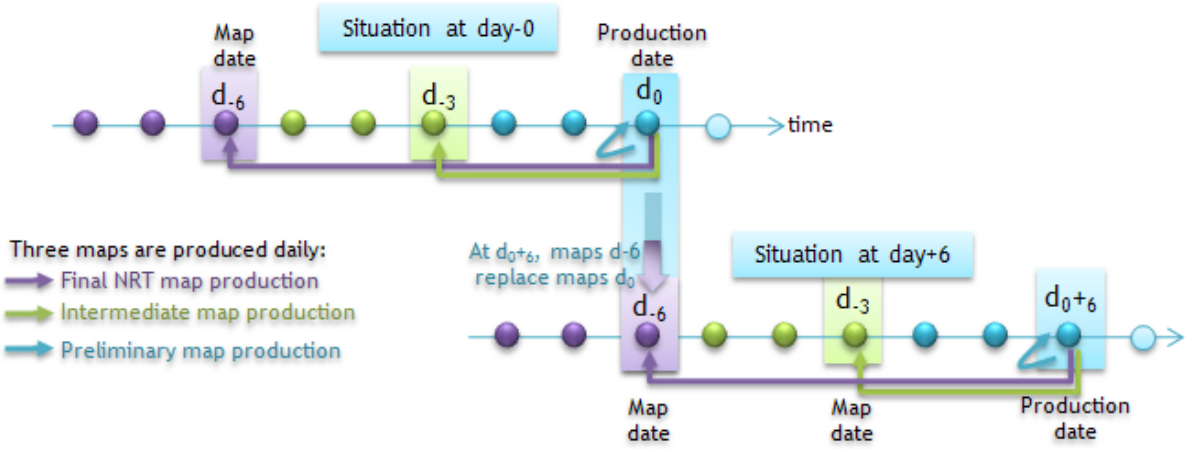

Figure 2: Three merged maps are produced daily: final map (d-6), intermediate map (d-3) and preliminary map (d0)

III.2 Delayed Time Products

III.2.1 Products overview

The Delayed Time or REP (for REPROCESSING) component of SL-TAC system is responsible for the production of processed Sentinel-3A/B, Jason-3, HY-2A, Saral[-DP]/AltiKa, Cryosat-2, Jason-1, OSTM/Jason-2, T/P, Envisat, GFO, ERS1/2 data in order to provide a homogeneous, inter-calibrated and highly accurate long time series of all altimeter data.

	Along-track Sea surface height REP PHY L3 SEALEVEL_*_PHY_L3_REP_OBSERVATIONS_008_*	Gridded sea surface height and derivated variables REP PHY L4 SEALEVEL_*_PHY_L4_REP_OBSERVATIONS_008_*
Global	delivered Sentinel-3A&B datasets are produced under EUMETSAT responsibility and disseminated by CMEMS	delivered
Mediterranean	-	delivered
Black Sea	-	delivered
Europe	delivered	-

Table 3: List of the time varying products in delayed-time (REP)

A time invariant product SEALEVEL_GLO_NOISE_L4_REP_OBSERVATIONS_008_033 is also delivered: it describes the noise level of along-track measurements. This is a gridded product delivered only on global ocean. For each mission two files are provided: one for filtered products and one for unfiltered products.

For Mediterranean and Black seas, one value is given, as described in the QUID document.

	Gridded Noise on SLA REP NOISE SLA SEALEVEL_GLO_NOISE_L4_REP _OBSERVATIONS_008_*
Global	delivered
Europe	Same as global

Table 4: List of the time invariant product in Delayed Time

III.2.2 Delay of the products

Daily sampling products are delivered for both REP and NRT series. Monthly mean gridded (L4) products, deduced from the daily products, are also delivered for the REP series.

The availability of the products in delayed time is at the best three months after the date of the measurement. The product generation needs all the GDR data of all the missions to take into account the best corrections as possible. The time delay can be longer in the case of a missing mission. The different satellites used for the merged products are given in QUID document. Moreover, the global attribute in the gridded file called "platform" gives the list of satellites used to compute the map.

IV DESCRIPTION OF THE PRODUCT SPECIFICATION

IV.1 Overwiev of the variables delivered

This part gives an overview of the variables used in the SL-TAC products and their signification. The complete processing to calculated the variables is described in the QUID document .

Name of products	**physical variables**
SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044 SEALEVEL_EUR_PHY_L3_NRT_OBSERVATIONS_008_059 SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_062 SEALEVEL_EUR_PHY_L3_REP_OBSERVATIONS_008_061	sla_filtered sla_unfiltered mdt dac lwe ocean_tide
SEALEVEL_EUR_PHY_L4_NRT_OBSERVATIONS_008_060 SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046 SEALEVEL_GLO_PHY_L4_REP_OBSERVATIONS_008_047 SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051	sla err adt ugosa vgosa ugos vgos err_ugosa err_vgosa
SEALEVEL_BS_PHY_MAP_L4_REP_OBSERVATIONS_008_042	sla err ugosa vgosa err_ugosa err_vgosa

Table 5: list of variables in the SL-TAC products

Name of variable	**description/comment**
sla sla_filtered sla_unfiltered	Sea Level Anomaly (see Annex)
err	Formal mapping error (see QUID document)
ugosa & vgosa ugos & vgos	Anomalies of the geostrophic current and absolute geostrophic current components (see QUID document)
mdt	Mean Dynamic Topography (see Annex)

adt adt_filtered	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: $sla\_filtered_{uncorrected} = sla\_filtered_{from\ product} + dac.$ $sla\_unfiltered_{uncorrected} = sla\_unfiltered_{from\ product} + dac.$
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: $sla\_filtered_{uncorrected} = sla\_filtered_{from\ product} - lwe.$ $sla\_unfiltered_{uncorrected} = sla\_unfiltered_{from\ product} - lwe.$
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: $sla\_filtered_{uncorrected} = sla\_filtered_{from\ product} + oceanic\_tide.$ $sla\_unfiltered_{uncorrected} = sla\_unfiltered_{from\ product} + oceanic\_tide.$

Table 6: Description of variables in the SL-TAC products

IV.2 Along-track products

Product Specification	SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044
Geographical coverage	global
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) dac (Dynamic Atmospheric correction) lwe (Long wavelength correction)

	ocean_tide mdt (Mean dynamic topography) track time in days since 1950-01-01 00:00:00 UTC flag cycle
Near Real time	Yes
Reanalysis	No
Available time series	see QUID
Temporal sampling	Daily
Target delivery time	up to 10 times a day
Delivery mechanism	CMEMS Information System
Horizontal sampling	7km
Number of vertical levels	1
Format	Netcdf CF1.6

Table 7: SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044 Product Specification

Product Specification	SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_062
Geographical coverage	global
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) dac (Dynamic Atmospheric correction) lwe (Long wavelength correction) ocean_tide mdt (Mean dynamic topography) track time in days since 1950-01-01 00:00:00 UTC flag cycle
Near Real time	No
Reanalysis	Yes
Available time series	see QUID
Temporal sampling	Daily

Target delivery time	every 3 to 6 months
Delivery mechanism	CMEMS Information System
Horizontal sampling	7km
Number of vertical levels	1
Format	Netcdf CF1.6

Table 8: SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_047 Product Specification

Product Specification	SEALEVEL_EUR_PHY_L3_NRT_OBSERVATIONS_008_059 SEALEVEL_EUR_PHY_L3_REP_OBSERVATIONS_008_061
Geographical coverage	30.0625°W-42.0625°E ; 19.9375°N-66.0625°N
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) dac (Dynamic Atmospheric correction) lwe (Long wavelength correction) ocean_tide mdt (Mean dynamic topography) track time in days since 1950-01-01 00:00:00 UTC flag cycle
Near Real time	Yes
Reanalysis	Yes
Available time series	see QUID
Temporal sampling	Daily
Target delivery time	up to 6 months for REP and daily for NRT
Delivery mechanism	CMEMS Information System
Horizontal sampling	7km
Number of vertical levels	1
Format	Netcdf CF1.6

Table 9: : SEALEVEL_EUR_PHY_L3_[NRT/REP]_OBSERVATIONS_008_0* Product Specification

IV.3 Gridded Sea Level Anomalies

Product Specification	SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046
Geographical coverage	global
Variables	latitude longitude time in days since 1950-01-01 00:00:00 UTC sla (Sea level anomaly) err (Formal mapping error) adt (Absolute dynamic topography) ugosa (Geostrophic velocity anomalies: zonal component) vgosa (Geostrophic velocity anomalies: meridian component) ugos (Absolute geostrophic velocity: zonal component) vgos (Absolute geostrophic velocity: meridian component) err_ugosa (Formal mapping error on geostrophic velocity anomalies: zonal component) err_vgosa (Formal mapping error on geostrophic velocity anomalies: meridian component)
Near Real time	Yes
Reanalysis	Yes
Available time series	see QUID
Temporal resolution	Daily
Target delivery time	up to 6 months for REP and daily for NRT
Delivery mechanism	CMEMS Information System
Horizontal resolution	0.25°x0.25°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 10: SEALEVEL_GLO_PHY_MAP_L4_NRT_OBSERVATIONS_008_0* Product Specification

Product Specification	SEALEVEL_GLO_PHY_L4_REP_OBSERVATIONS_008_047
Geographical coverage	global
Variables	latitude longitude time in days since 1950-01-01 00:00:00 UTC

	sla (Sea level anomaly) err (Formal mapping error) adt (Absolute dynamic topography) ugosa (Geostrophic velocity anomalies: zonal component) vgosa (Geostrophic velocity anomalies: meridian component) ugos (Absolute geostrophic velocity: zonal component) vgos (Absolute geostrophic velocity: meridian component)
Near Real time	Yes
Reanalysis	Yes
Available time series	see QUID
Temporal resolution	Daily and monthly
Target delivery time	up to 6 months for REP and daily for NRT
Delivery mechanism	CMEMS Information System
Horizontal resolution	0.25°x0.25°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 11: SEALEVEL_GLO_PHY_MAP_L4_ REP_OBSERVATIONS_008_0* Product Specification

Product Specification	SEALEVEL_EUR_PHY_L4_NRT_OBSERVATIONS_008_060
Geographical coverage	30.0625°W-42.0625°E ; 19.9375°N-66.0625°N
Variables	latitude longitude time in days since 1950-01-01 00:00:00 UTC sla (Sea level anomaly) err (Formal mapping error) adt (Absolute dynamic topography) ugosa (Geostrophic velocity anomalies: zonal component) vgosa (Geostrophic velocity anomalies: meridian component) ugos (Absolute geostrophic velocity: zonal component) vgos (Absolute geostrophic velocity: meridian component) err_ugosa (Formal mapping error on geostrophic velocity anomalies: zonal component) err_vgosa (Formal mapping error on geostrophic velocity anomalies: meridian component)
Near Real time	Yes
Reanalysis	No

Available time series	see QUID
Temporal resolution	Daily
Target delivery time	Daily
Delivery mechanism	CMEMS Information System
Horizontal resolution	0.25°x0.25°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 12: SEALEVEL_EUR_PHY_L4_NRT_OBSERVATIONS_008_060 product specification

Product Specification	SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051
Geographical coverage	6°W-37°E ; 30°N-46°N
Variables	latitude longitude time in days since 1950-01-01 00:00:00 UTC sla (Sea level anomaly) err (Formal mapping error) adt (Absolute dynamic topography) ugosa (Geostrophic velocity anomalies: zonal component) vgosa (Geostrophic velocity anomalies: meridian component) ugos (Absolute geostrophic velocity: zonal component) vgos (Absolute geostrophic velocity: meridian component)
Near Real time	No
Reanalysis	Yes
Available time series	see QUID
Temporal resolution	Daily
Target delivery time	up to 6 months
Delivery mechanism	CMEMS Information System
Horizontal resolution	0.125°x0.125°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 13: SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051 Product Specification

Product Specification	SEALEVEL_BS_PHY_L4_REP_OBSERVATIONS_008_042
Geographical coverage	27°E-42°E ; 40°N-47°N
Variables	latitude longitude time in days since 1950-01-01 00:00:00 UTC sla (Sea level anomaly) err (Formal mapping error) ugosa (Geostrophic velocity anomalies: zonal component) vgosa (Geostrophic velocity anomalies: meridian component)
Near Real time	No
Reanalysis	Yes
Available time series	see QUID
Temporal resolution	Daily
Target delivery time	up to 6 months
Delivery mechanism	CMEMS Information System
Horizontal resolution	0.125°x0.125°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 14: SEALEVEL_BS_PHY_L4_REP_OBSERVATIONS_008_042 Product Specification

IV.4 Gridded Noise on Sea Level Anomalies

Product Specification	SEALEVEL_GLO_NOISE_L4_NRT_OBSERVATIONS_008_032 SEALEVEL_GLO_NOISE_L4_REP_OBSERVATIONS_008_033
Geographical coverage	global
Variables	lat lon noise lat_bnds lon_bnds crs
Near Real time	Yes
Reanalysis	Yes

Available time series	They are time invariant
Temporal resolution	/
Target delivery time	/
Delivery mechanism	CMEMS Information System
Horizontal resolution	2°x2°
Number of vertical levels	1
Format	Netcdf CF1.6

Table 15: SEALEVEL_GLO_NOISE_L3_[NRT/REP]_OBSERVATIONS_008_0 Product Specification

V NOMENCLATURE OF FILES

We describe in this section the nomenclature of the SL-TAC products files that can be downloaded through the CMEMS Web Portal download Service.

V.1 Nomenclature of the Along Track products

V.1.1 Nomenclature of the datasets

The nomenclature used is:

dataset-duacs-<delay>-<zone>-<mission>-<variable>-l3

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

delay	nrt rep	near-real time products delayed time products
zone	global europe	global geographic coverage product Europe products
mission	e1 e1g e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g h2b s3a s3b	ERS-1 (only for rep) ERS-1 geodetic phase (only for rep) ERS-2 (only for rep) TOPEX/Poseidon (only for rep) TOPEX/Poseidon on its new orbit (only for rep) GFO (only for rep) Jason-1 (only for rep) Jason-1 on its new orbit (only for rep) Jason-1 on its geodetic orbit (only for rep) OSTM/Jason-2 (only for rep) OSTM/Jason-2 on its interleaved orbit OSTM/Jason-2 on its long repeat orbit (LRO) Jason-3 Envisat (only for rep) Envisat on its new orbit (only for rep) Cryosat-2 Saral/AltiKa Saral/AltiKa on its geodetic orbit (only for rep) HY-2A (only for rep) HY-2A on its geodetic orbit (only for rep) HY-2B Sentinel-3A Sentinel-3B
variable	phy	contains sla, adt and some corrections

V.1.2 Nomenclature of the NetCdf files

The nomenclature used is:

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

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

delay	nrt rep	near-real time products delayed time products
zone	global europe	global geographic coverage product Europe products
mission	e1 e1g e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g h2b s3a s3b	ERS-1 (only for rep) ERS-1 geodetic phase (only for rep) ERS-2 (only for rep) TOPEX/Poseidon (only for rep) TOPEX/Poseidon on its new orbit (only for rep) GFO (only for rep) Jason-1 (only for rep) Jason-1 on its new orbit (only for rep) Jason-1 on its geodetic orbit (only for rep) OSTM/Jason -2 (only for rep) OSTM/Jason -2 on its interleaved orbit OSTM/Jason-2 on its long repeat orbit (LRO) Jason-3 Envisat (only for rep) Envisat on its new orbit (only for rep) Cryosat-2 Saral/AltiKa Saral/AltiKa on its geodetic orbit (only for rep) HY-2A (only for rep) HY-2A on its geodetic orbit (only for rep) HY-2B Sentinel-3A Sentinel-3B
variable	Phy	sla and some corrections
date	YYYYMMDD	date of the dataset
dateprod	YYYYMMDD	production date of the dataset
format	.nc	NetCdf CF1.6

V.2 Nomenclature of the Gridded products

V.2.1 Nomenclature of the datasets

The nomenclature used is:

dataset-duacs-<delay>-<zone>-merged-allsat-phy-l4[-<temporal-resolution>]

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

delay	nrt rep	near-real time products delayed time products
zone	global medsea blacksea europe	global geographic coverage product Mediterranean products Black Sea products Europe products
Temporal-resolution	*Not defined* monthly	If not defined : daily products Monthly: monthly mean products

V.2.2 Nomenclature of the NetCdf files

V.2.2.1 daily datasets

The nomenclature used is:

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

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

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

V.2.2.2 Monthly mean datasets

The nomenclature used is:

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

where the fileds 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

V.3 Nomenclature of the Gridded noise of Sea Level Anomalies

V.3.1 Nomenclature of the datasets

The nomenclature used is:

dataset-duacs-<delay>-<zone>-<mission>-noise-l4

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

delay	nrt rep	near-real time products delayed time products
zone	global	global geographic coverage product
mission	e1 e1g e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g h2b s3a s3b	ERS-1 (only for rep) ERS-1 geodetic phase (only for rep) ERS-2 (only for rep) TOPEX/Poseidon (only for rep) TOPEX/Poseidon on its new orbit (only for rep) GFO (only for rep) Jason-1 (only for rep) Jason-1 on its new orbit (only for rep) Jason-1 on its geodetic orbit (only for rep) OSTM/Jason-2 (only for rep) OSTM/Jason-2 on its interleaved orbit OSTM/Jason-2 on its long repeat orbit (LRO) Jason-3 Envisat (only for rep) Envisat on its new orbit (only for rep) Cryosat-2 Saral/AltiKa Saral/AltiKa on its geodetic orbit (only for rep) HY-2A (only for rep) HY-2A on its geodetic orbit (only for rep) HY-2B Sentinel-3A Sentinel-3B

V.3.2 Nomenclature of the NetCdf files

The nomenclature used is:

<delay>_<zone>_<mission>_sla_noise.<format>

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

delay	nrt dt	near-real time products delayed time products
zone	global	global geographic coverage product
mission	e1 e1g e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g h2b s3a s3b	ERS-1 (only for rep) ERS-1 geodetic phase (only for rep) ERS-2 (only for rep) TOPEX/Poseidon (only for rep) TOPEX/Poseidon on its new orbit (only for rep) GFO (only for rep) Jason-1 (only for rep) Jason-1 on its new orbit (only for rep) Jason-1 on its geodetic orbit (only for rep) OSTM/Jason-2 (only for rep) OSTM/Jason-2 on its interleaved orbit OSTM/Jason-2 on its long repeat orbit (LRO) Jason-3 Envisat (only for rep) Envisat on its new orbit (only for rep) Cryosat-2 Saral/AltiKa Saral/AltiKa on its geodetic orbit (only for rep) HY-2A (only for rep) HY-2A on its geodetic orbit (only for rep) HY-2B Sentinel-3A Sentinel-3B
format	.nc	NetCdf CF1.6

VI DATA FORMAT

This chapter presents the data storage format used for CMEMS products.

VI.1 NetCdf

The products are stored using the NetCDF 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. Please see Unidata NetCDF pages for more information, and to retreive NetCDF software package on:

http://www.unidata.ucar.edu/packages/netcdf/index.html

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.

The NetCDF SEA LEVEL TAC files are based on the attribute data tags defined by the Cooperative Ocean/Atmosphere Research Data Service (COARDS) and Climate and Forecast (CF) metadata conventions. The CF convention generalises and extends the COARDS convention but relaxes the COARDS constraints on dimension and order and specifies methods for reducing the size of datasets.

A wide range of software is available to write or read NetCDF/CF files. API are made available by UNIDATA http://www.unidata.ucar.edu/software/netcdf:

- C/C++/Fortran
- Java
- MATLAB, Objective-C, Perl, Python, R, Ruby, Tcl/Tk

In addition to these conventions, the files are using a common structure and semantic as described below:

VI.2 Structure and semantic of NetCDF along-track (L3) files

VI.2.1 Example of along-track L3 file

```
ncdump -h nrt_global_s3a_phy_l3_20200220_20200227.nc
netcdf nrt_global_s3a_phy_l3_20200220_20200227 {
dimensions:
	time = 48055 ;
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 = 0.0001 ;
		dac: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 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" ;
int ocean_tide(time) ;
ocean_tide:_FillValue = 2147483647 ;
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 = 0.0001 ;
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]-[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:scale_factor = 0.001 ;
sla_filtered:standard_name = "sea_surface_height_above_sea_level" ;
sla_filtered:units = "m" ;
short sla_unfiltered(time) ;
sla_unfiltered:_FillValue = 32767s ;
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]-[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:scale_factor = 0.001 ;
sla_unfiltered:standard_name = "sea_surface_height_above_sea_level" ;
sla_unfiltered: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; with additional corrections; the proposed sla is already corrected for dac, ocean_tide and lwe; [uncorrected sla]=[sla from product]+[dac]+[ocean_tide]-[lwe]" ;
: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 = "2020-02-26T23:12:19Z" ;
:date_issued = "2020-02-26T23:12:19Z" ;
:date_modified = "2020-02-26T23:12:19Z" ;
:geospatial_lat_max = 80.603064 ;
:geospatial_lat_min = -78.098852 ;
:geospatial_lat_resolution = 0.0539170000000055 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 179.99994 ;
:geospatial_lon_min = -179.997883 ;
:geospatial_lon_resolution = 0.0170010000000005 ;
: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 = "2020-02-26T23:12:19Z: 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 = "2020" ;
:project = "EUMETSAT Sentinel-3 L2P/L3 Marine Altimetry Service" ;
:references = "http://marine.copernicus.eu" ;
:software_version = "18.5.0_DUACS_DT2018_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 = "P23H53M54.795958S" ;
:time_coverage_end = "2020-02-20T23:59:59Z" ;
:time_coverage_resolution = "P1S" ;
:time_coverage_start = "2020-02-20T00:06:04Z" ;
:title = "NRT Sentinel-3A Global Ocean Along track SSALTO/DUACS Sea Surface Height L3 product" ;

VI.3 Structure and semantic of NetCDF maps (L4) files

VI.3.1 Example of classic NRT gridded L4 file

netcdf nrt_global_allsat_phy_l4_20191124_20191130 {
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 err(time, latitude, longitude) ;

err:_FillValue = -2147483647 ;
err: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:coordinates = "longitude latitude" ;
err:grid_mapping = "crs" ;
err:long_name = "Formal mapping error" ;
err:scale_factor = 0.0001 ;
err:standard_name = "sea_surface_height_above_sea_level standard_error" ;
err:units = "m" ;
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 sla(time, latitude, longitude) ;
sla:_FillValue = -2147483647 ;
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 ugosa(time, latitude, longitude) ;
ugosa:_FillValue = -2147483647 ;
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 vgosa(time, latitude, longitude) ;
vgosa:_FillValue = -2147483647 ;
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_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 (ugosa) as unit of signal variance" ;
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 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 (vgosa) as unit of signal variance" ;
err_vgosa:scale_factor = 0.0001 ;
err_vgosa:standard_name = "surface_geostrophic_nothward_sea_water_velocity_assuming_sea_level_for_geoid standard_error" ;
err_vgosa:units = "m/s" ;

// 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 = "2019-11-30T02:40:48Z" ;
:date_issued = "2019-11-30T02:40:48Z" ;
:date_modified = "2019-11-30T02:40:48Z" ;
: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 = "2019-11-30 02:40:49Z: 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, Cryosat-2, Jason-3, Sentinel-3A, Sentinel-3B" ;
:processing_level = "L4" ;
:product_version = "2019" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:software_version = "18.4.2_DUACS_DT2018_baseline" ;
:source = "Altimetry 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-4 sea surface height and derived variables measured by multi-satellite altimetry observations over Global Ocean." ;
:time_coverage_duration = "P1D" ;
:time_coverage_end = "2019-11-24T12:00:00Z" ;
:time_coverage_resolution = "P1D" ;
:time_coverage_start = "2019-11-23T12:00:00Z" ;
:title = "NRT merged all satellites Global Ocean Gridded SSALTO/DUACS Sea Surface Height L4 product and derived variables" ;

VI.3.2 Example of classic REP gridded L4 file

netcdf nrt_europe_allsat_phy_l4_20190111_20190117 :
dimensions:

time = 1 ;
latitude = 370 ;
longitude = 578 ;
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 = 66.0625 ;
latitude:valid_min = 19.9375 ;
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 = 42.0625 ;
longitude:valid_min = -30.0625 ;
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 err(time, latitude, longitude) ;
err:_FillValue = -2147483647 ;
err: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:coordinates = "longitude latitude" ;
err:grid_mapping = "crs" ;
err:long_name = "Formal mapping error" ;
err:scale_factor = 0.0001 ;
err:units = "m" ;
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 sla(time, latitude, longitude) ;
                sla:_FillValue = -2147483647 ;
                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 ugosa(time, latitude, longitude) ;
                ugosa:_FillValue = -2147483647 ;
                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 vgosa(time, latitude, longitude) ;
                vgosa:_FillValue = -2147483647 ;
                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" ;

// 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 = "2019-01-17T23:27:31Z" ;
                :date_issued = "2019-01-17T23:27:31Z" ;
                :date_modified = "2019-01-17T23:27:31Z" ;
                :geospatial_lat_max = 66.0625 ;
                :geospatial_lat_min = 19.9375 ;
                :geospatial_lat_resolution = 0.125 ;
                :geospatial_lat_units = "degrees_north" ;
                :geospatial_lon_max = 42.0625 ;
                :geospatial_lon_min = -30.0625 ;
                :geospatial_lon_resolution = 0.125 ;
                :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 = "2019-01-17 23:27:31Z: 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, Cryosat-2, Jason-3, OSTM/Jason-2 Long Repeat Orbit, Sentinel-3A" ;
```

:processing_level = "L4" ;
:product_version = "2019" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:software_version = "18.2.0_DUACS_DT2018_baseline" ;
:source = "Altimetry 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-4 sea surface height and derived variables measured by multi-satellite altimetry observations over European Ocean." ;
:time_coverage_duration = "P1D" ;
:time_coverage_end = "2019-01-11T00:00:00Z" ;
:time_coverage_resolution = "P1D" ;
:time_coverage_start = "2019-01-11T00:00:00Z" ;
:title = "NRT merged all satellites European Ocean Gridded SSALTO/DUACS Sea Surface Height L4 product and derived variables" ;

VI.3.3 Structure and semantic of NetCDF Gridded Noise on Sea Level Anomaly files

Example of a NetCDF noise sla file:

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" ;

VII HOW TO DOWNLOAD A PRODUCT

VII.1 Download a product through the CMEMS Web Portal Directgetfile Service

You first need to register. Please find below the registration steps:
http://marine.copernicus.eu/web/56-user-registration-form.php.

Once registered, the CMEMS FAQ http://marine.copernicus.eu/web/34-products-and-services-faq.php#2 will guide you on How to download a product through the CMEMS Web Portal Directgetfile Service.

VII.2 Download a product through the CMEMS Web Portal Ftp Service

You first need to register. Please find below the registration steps:
http://marine.copernicus.eu/web/56-user-registration-form.php.

Once registered, the CMEMS FAQ http://marine.copernicus.eu/web/34-products-and-services-faq.php#2 will guide you on How to download a product through the CMEMS Web Portal FTP Service.

VII.3 Download a product through the CMEMS Web Portal Subsetter Service

You first need to register. Please find below the registration steps:
http://marine.copernicus.eu/web/56-user-registration-form.php.

Once registered, the CMEMS FAQ http://marine.copernicus.eu/web/34-products-and-services-faq.php#2 will guide you on How to download a product through the CMEMS Web Portal Subsetter Service.

VIII REFERENCES

QUID: SL-TAC product Quality Information Document. Available at http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf

Ray R.D. and Zaron E.D.: M2 internal tides and their observed wavenumber spectra from satellite altimetry, J. Phys. Oceanogr., 46, doi: 10.1175/JPO-D-15-0065.1, 2015.

ANNEX : DIFFERENTS HEIGTH USED IN ALTIMETRY

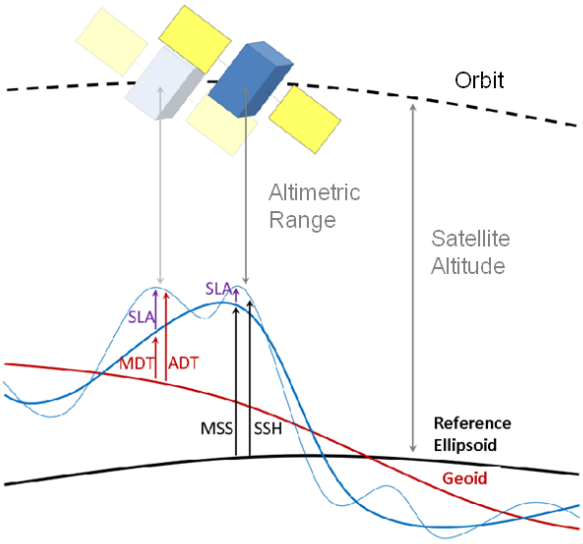

Figure 3: Altimetry principle

- The Altimetry gives access to the Sea Surface Height (SSH) above the reference ellipsoïd (see figure 1)

$$\mathbf{SSH} = \text{Orbit} - \text{Altimetric Range}$$

- The **Mean Sea Surface (MSS)** is the temporal mean of the **SSH** over a period N.

  It is a mean surface above the **ellipsoïd** and it includes the **Geoid**. See the detailed computation in QUID document

$$\mathbf{MSS}_N = \langle \mathbf{SSH} \rangle_N$$

- The dynamical part of the signal: **Sea Level Anomaly (SLA)** is deduced from the **SSH** using a **Mean Sea Surface (MSS):**

$$\mathbf{SLA}_N = \mathbf{SSH} - \mathbf{MSS}_N$$

- The **Mean Dynamic Topography (MDT)** is the temporal mean of the **SSH** above the **Geoid** over a period N.

$$\mathbf{MDT}_N = \mathbf{MSS}_N - \mathbf{Geoid}$$

- The dynamical part of the absolute signal: **Absolute Dynamic Topography (ADT)** is deduced from the **SLA** using a **Mean Dynamic Topography (MDT):**

$$\mathbf{ADT} = \mathbf{SLA}_N + \mathbf{MDT}_N = \mathbf{SSH} - \mathbf{MSS}_N + \mathbf{MDT}_N$$