PRODUCT USER MANUAL

For Sea Level SLA products

SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038

SEALEVEL_BS_PHY_L3_NRT_OBSERVATIONS_008_039

SEALEVEL_BS_PHY_L3_REP_OBSERVATIONS_008_040

SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043

SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044

SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_045

SEALEVEL_MED_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_048

SEALEVEL_MED_PHY_L3_REP_OBSERVATIONS_008_049

SEALEVEL_BS_PHY_ L4_NRT_OBSERVATIONS_008_041

SEALEVEL_BS_PHY_ L4_REP_OBSERVATIONS_008_042

SEALEVEL_GLO_PHY_ L4_NRT_OBSERVATIONS_008_046

SEALEVEL_GLO_PHY_ L4_REP_OBSERVATIONS_008_047

SEALEVEL_MED_PHY_ L4_NRT_OBSERVATIONS_008_050

SEALEVEL_MED_PHY_ L4_REP_OBSERVATIONS_008_051

SEALEVEL_GLO_NOISE_L4_NRT_OBSERVATIONS_008_032

SEA_LEVEL_GLO_NOISE_L4_REP_OBSERVATIONS_008_033

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CHANGE RECORD

Issue	Date	§	Description of Change	Author	Validated By
1.0	2017/01/01	all	First version of document for V3 products	F. Mertz	
1.1	2017/03/17	all	Review from Mercator	F. Mertz	
1.2	2017/06/25	all	Addition of Sentinel-3A and OSTM/Jason-2 New orbit in REP products	F. Mertz	
1.3	2017/09/18	All	Addition of h2g in REP products and j2g in NRT products	F. Mertz	
1.4	2017/12/15		Version 4 CMEMS	F. Mertz	
1.5	2018/01/15		Vesrion 4 CMEMS Phase II	F. Mertz	CMEMS products team

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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, Jason-3, HY-2A, Saral/AltiKa, Cryosat-2, OSTM/Jason-2, Jason-1, Topex/Poseidon, Envisat, GFO, ERS-1/2.

The products described in this user manual are the following:

1)

SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044
SEALEVEL_MED_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_048
SEALEVEL_BS_PHY_L3_NRT_OBSERVATIONS_008_039
SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043
SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038

and
SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_045
SEALEVEL_MED_PHY_L3_REP_OBSERVATIONS_008_049
SEALEVEL_BS_PHY_L3_REP_OBSERVATIONS_008_040

are **Sea Surface Heights** observations from the altimeters.

The data provided to users have a global coverage (SEALEVEL_GLO_*_OBSERVATIONS_008_*) and regional products are also computed over specific areas: **Mediterranean Sea** (SEALEVEL_MED_*_OBSERVATIONS_008_*) and **Black Sea** (SEALEVEL_BS_*_OBSERVATIONS_008_*).

The following two regional products are available only in Near Real time: **Europe** (SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043) and **Arctic** (SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038).

Specific features of dedicated assimilation product (*ASSIM*):

Those products are added to existing Sea Level TAC products to address the needs of data assimilation and validation in regional models, following the TAPAS (Tailored Altimeter Product for Assimilation System) initiative launched by MyOcean project with all the Modeling and Forecasting Centers (MFCs).

Those products are not filtered and not sub-sampled, contrary to the other SEA LEVEL along-track products. Their resolution is thus 7 km.

Those products propose several variables: the SLA that is usually contained in SL TAC products which in unfiltered, the filtered SLA, but also, the MDT (Mean Dynamic Topography), the DAC (Dynamic Atmospheric Correction),the oceanic tide and the LWE (Long Wavelength Error) correction.

The description is detailed in II.1

2)

SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046
SEALEVEL_MED_PHY_L4_NRT_OBSERVATIONS_008_050
SEALEVEL_BS_PHY_L4_NRT_OBSERVATIONS_008_041

And
SEALEVEL_GLO_PHY_L4_REP_OBSERVATIONS_008_047
SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051
SEALEVEL_BS_PHY_L4_REP_OBSERVATIONS_008_042

are **Maps of Sea Surface Heights and derived variables** observations from the altimeters. Those products were previously distributed by Aviso+ and the scientific content has not changed.

3)

SEALEVEL_GLO_NOISE_L4_NRT_OBSERVATIONS_008_032
SEALEVEL_GLO_NOISE_L4_REP_OBSERVATIONS_008_033

are gridded products containing the noise of filtering of SLA Global Ocean products and are described in the QUID http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf

II DEFINITIONS

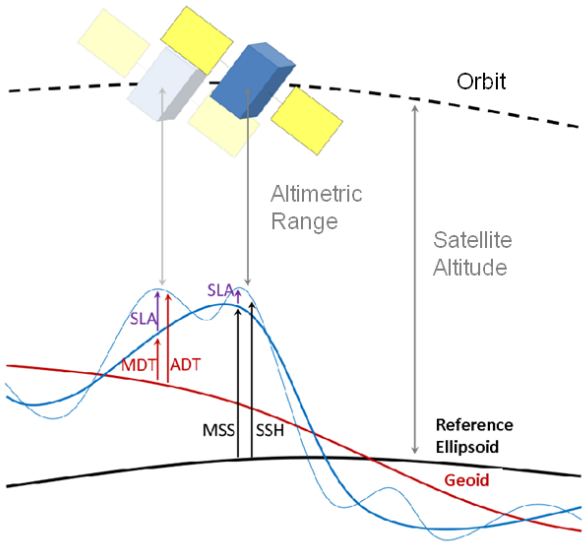

Figure 1: Altimetry principle

- 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 http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf

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

- 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):**

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

II.1 Variables used in SL-TAC products

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 http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf .

Name of products	**physical variables**
SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044 SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038	sla_filtered adt_filtered
SEALEVEL_MED_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_048 SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043	sla_filtered sla_unfiltered mdt dac lwe ocean_tide
SEALEVEL_BS_PHY_L3_NRT_OBSERVATIONS_008_039	sla_filtered
SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_045 SEALEVEL_MED_PHY_L3_REP_OBSERVATIONS_008_049	sla_filtered and adt_filtered for filtered datasets sla_unfiltered and adt_unfiltered for unfiltered datasets
SEALEVEL_BS_PHY_L3_REP_OBSERVATIONS_008_040	sla_filtered for filtered datasets sla_unfiltered for unfiltered datasets
SEALEVEL_GLO_PHY_MAP_L4_NRT_OBSERVATIONS_008_046 SEALEVEL_GLO_PHY_MAP_L4_REP_OBSERVATIONS_008_047 SEALEVEL_MED_PHY_MAP_L4_NRT_OBSERVATIONS_008_050 SEALEVEL_MED_PHY_MAP_L4_REP_OBSERVATIONS_008_051	sla err adt ugosa vgosa ugos vgos
SEALEVEL_BS_PHY_MAP_L4_NRT_OBSERVATIONS_008_041 SEALEVEL_BS_PHY_MAP_L4_REP_OBSERVATIONS_008_042	sla err ugosa vgosa

Table 1: list of variables in the SL-TAC products

Name of variable	**description/comment**
sla_filtered sla_unfiltered	described in II.1Note that for assimilation products, the sla is filtered **but not** subsampled contrary to other L3 products.
adt_filtered adt_unfiltered	described in II.1. Note that for assimilation products, the adt variable is not in the product but can be obtained with adt_filtered = sla_filtered + mdt
ugosa and vgosa ugos and vgos	described in the QUID http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf
mdt	Mean Dynamic Topography, described in II.1
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 http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf 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 2: Description of variables in the SL-TAC products

II.2 CMEMS and Aviso+ Disseminations

- The along-track and maps **SLAs** and **ADTs** for Global ocean, Mediterranean Sea, Black Sea, Arctic Ocean and European Seas are distributed by CMEMS but they are in the Aviso+ Catalogue and can be visualized via the Live Access Server (LAS) http://www.aviso.altimetry.fr/en/data/data-access/las-live-access-server.html

- The Gridded Sea Level Anomalies **Means and Climatologies** are available via the Aviso+ dissemination (with registration) http://www.aviso.altimetry.fr/en/data/products/sea-surface-height-products/global/msla-mean-climatology.html

- The along-track and maps **SLAs** for Mozambique Area are distributed by Aviso+ http://www.aviso.altimetry.fr/en/data/products/sea-surface-height-products/regional/msla-mozambique-area.html

- The **MSS** is available via the Aviso+ dissemination (with registration) http://www.aviso.altimetry.fr/en/data/products/auxiliary-products/mss.html

- The **MDT** is available via the Aviso+ dissemination (with registration) http://www.aviso.altimetry.fr/en/data/products/auxiliary-products/mdt.html

- Other altimetry products are available via the Aviso+ dissemination (with registration), see http://www.aviso.altimetry.fr/en/data/products.html

III COPERNICUS SL-TAC PRODUCTS

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

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

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 real time OGDR or L2P NRT Sentinel-3A data allows the DUACS system to produce multi-mission maps with 0-day and 3-day delay and NRT (IGDR-based) or L2P STC Sentinel-3A production has a 6-day delay see III.1.1.

The quality measurements in the NRT SL-TAC CMEMS component is more sensitive to the number of altimeter missions involved in the system. This is mainly due to the orbit error and the 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).

If two altimeters are acknowledged as the bare minimum needed to observe mesoscale signals in DT maps, three or even four missions are needed to obtain equivalent accuracy in NRT (Pascual et al., 2006).

	Along-track Sea surface height NRT PHY L3 SEALEVEL_*_PHY_L3_NRT_OBSERVATIONS_008_*	Along-track Sea level anomaly for assimilation NRT PHY ASSIM L3 SEALEVEL_*_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_*	Gridded Sea Surface Height and derivated variables NRT PHY L4 SEALEVEL_*_PHY_L4_NRT_OBSERVATIONS_008_*
Global	delivered Sentinel-3A dataset is produced under EUMETSAT responsibility and disseminated by CMEMS	-	delivered
Mediterranean	-	delivered	delivered
Black Sea	delivered	-	delivered
Arctic	delivered	-	-
Europe	-	delivered	-

Table 3: 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 Arctic and Europe products. For Mediterranean and Black seas, one value is given in the QUID http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf.

	Gridded Noise on SLA NRT NOISE SLA SEALEVEL_GLO_NOISE_L4_NRT _OBSERVATIONS_008_*
Global	delivered
Mediterranean	See QUID
Black Sea	See QUID
Arctic	Same as global
Europe	Same as global

Table 4: List of the time invariant product in NRT

III.1.1 Delay of the products

III.1.1.1 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 Saral, Cryosat-2, Jason-2 and Jason-3 OGDRs or L2P NRT Sentinel-3A files. 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 IGDRs or L2P STC input data and the files in orange and red are produced with OGDRs or L2P NRT 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).

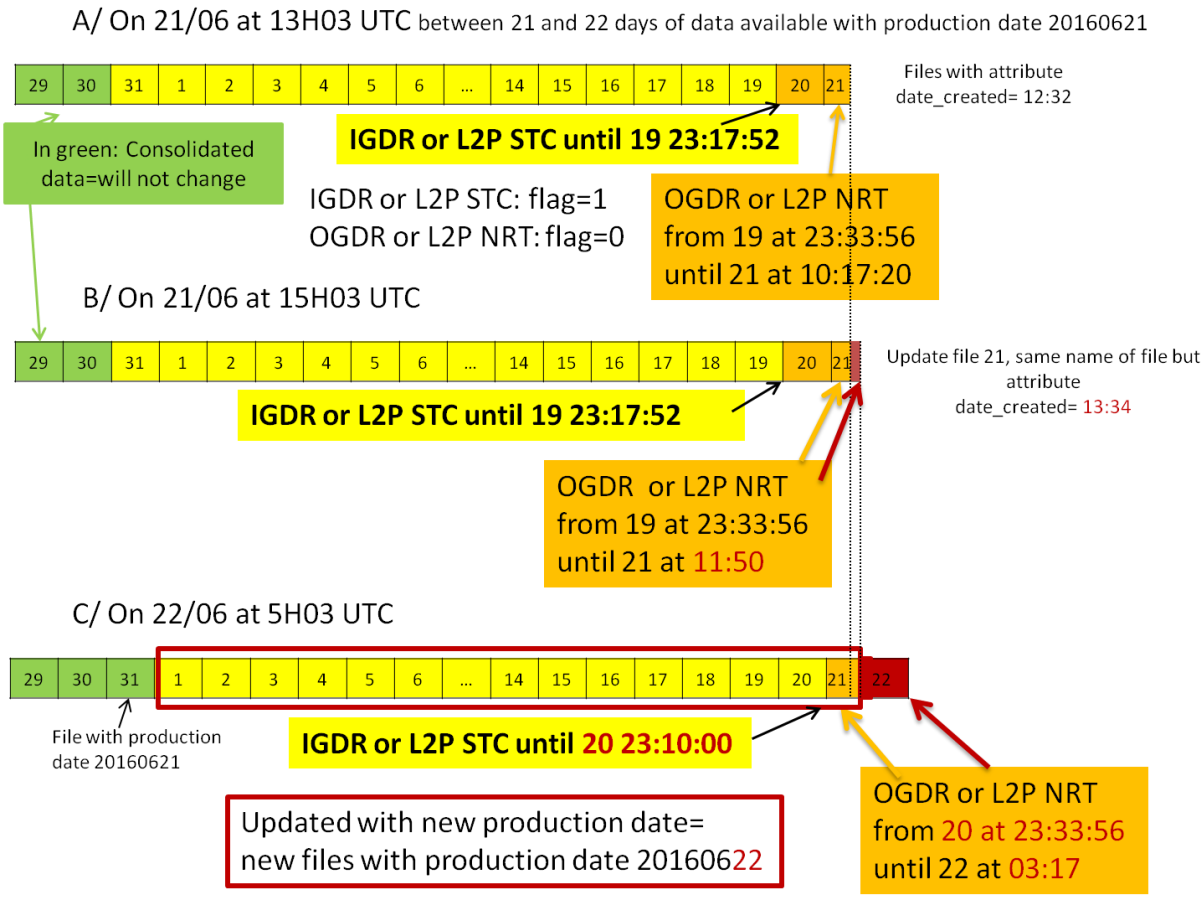

Figure 2: Data delivery flow for Global NRT SL-TAC products

III.1.1.2 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.

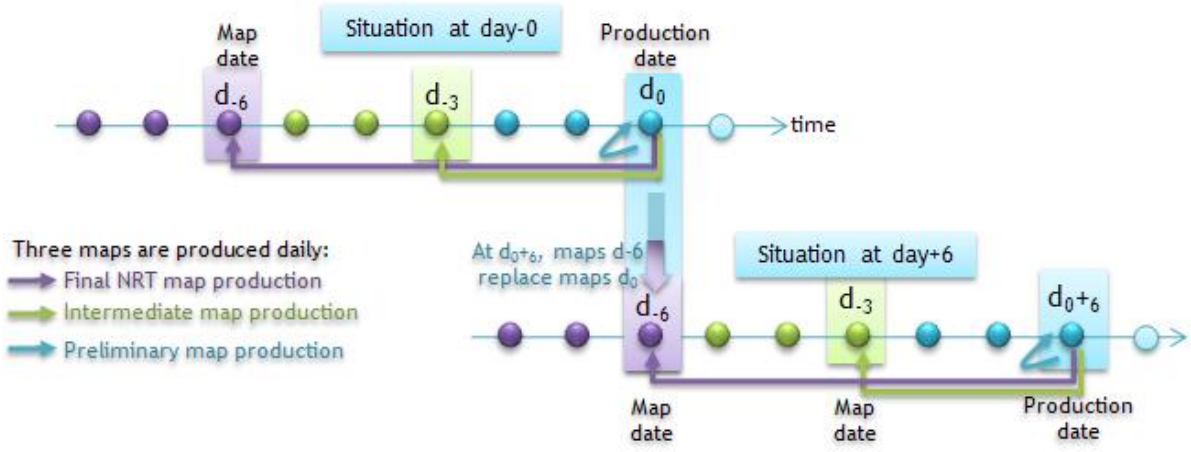

Figure 3: Three merged maps are produced daily: final map (d-6), intermediate map (d-3) and preliminary map (d0)

III.2 Delayed Time Products

The Delayed Time or REP (for REPROCESSING) component of SL-TAC system is responsible for the production of processed Sentinel-3A, Jason-3, HY-2A, Saral/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.

REP products are more precise than NRT products. Two reasons explain this quality difference. The first one is the better intrinsic quality of the POE orbit used in the GDR or NTC for Sentinel-3A processing. The second reason is that in the REP processing, the products can be computed optimally with a centred computation time window for OER, LWE and mapping processes (6 weeks before and after the date). On the contrary in NRT case, "future" data are not available so the computation time window is not centred and therefore not optimal. As for NRT products, improved altimeter corrections and processing algorithms are used: ocean tide model to correct altimeter data, improved methods for orbit error reduction and mapping.

	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 filtered	delivered Sentinel-3A dataset is produced under EUMETSAT responsibility and disseminated by CMEMS	delivered
Global unfiltered	delivered Sentinel-3A dataset is produced under EUMETSAT responsibility and disseminated by CMEMS	-
Mediterranean filtered	delivered	delivered
Mediterranean unfiltered	delivered	-
Black Sea filtered	delivered	delivered
Black Sea unfiltered	delivered	-

Table 5: 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 http://marine.copernicus.eu/documents/QUID/CMEMS-SL-QUID-008-032-051.pdf .

	Gridded Noise on SLA REP NOISE SLA SEALEVEL_GLO_NOISE_L4_REP _OBSERVATIONS_008_*
Global filtered	delivered
Global unfiltered	delivered
Mediterranean filtered	See QUID
Mediterranean unfiltered	See QUID
Black Sea filtered	See QUID
Black Sea unfiltered	See QUID

Table 6: List of the time invariant product in Delayed Time

III.2.1 Delay of the products

Daily products are delivered.

The availability of the products in delayed time is at the best two 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 merged products were obtained with the satellites given in QUID. 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 General information

IV.1.1 Along-track products

Product Specification	SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044 SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_045
Geographical coverage	global
Variables	latitude longitude sla_filtered (Sea level anomaly) adt_filtered (Absolute dynamic topography) sla_unfiltered (Sea level anomaly) for unfiltered REP datasets adt_unfiltered (Absolute dynamic topography) for unfiltered REP datasets 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 resolution	Daily
Target delivery time	up to 6 months for REP and up to 10 times a day for NRT
Delivery mechanism	CMEMS Information System
Horizontal resolution	14km for filtered, 7km for unfiltered
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_GLO_PHY_L3_NRT_OBSERVATIONS_008_044 and
SEALEVEL_GLO_PHY_L3_REP_OBSERVATIONS_008_045 Product Specification

Product Specification	SEALEVEL_MED_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_048
Geographical coverage	6°W-37°E ; 30°N-46°N
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) for unfiltered REP datasets 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 resolution	Daily
Target delivery time	Daily
Delivery mechanism	CMEMS Information System
Horizontal resolution	7km
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_MED_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_048 Product Specification

Product Specification	SEALEVEL_MED_PHY_L3_REP_OBSERVATIONS_008_049
Geographical coverage	6°W-37°E ; 30°N-46°N
Variables	latitude longitude sla_filtered (Sea level anomaly) adt_filtered (Absolute dynamic topography) sla_unfiltered (Sea level anomaly) for unfiltered REP datasets adt_unfiltered (Absolute dynamic topography) for unfiltered REP datasets track time in days since 1950-01-01 00:00:00 UTC cycle
Near Real time	No
Reanalysis	Yes
Available time series	see QUID
Temporal resolution	Daily
Target delivery time	up to 6 months for REP
Delivery mechanism	CMEMS Information System
Horizontal resolution	14km for filtered, 7km for unfiltered
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_MED_PHY_L3_REP_OBSERVATIONS_008_049 Product Specification

Product Specification	SEALEVEL_BS_PHY_L3_NRT_OBSERVATIONS_008_039 SEALEVEL_BS_PHY_L3_REP_OBSERVATIONS_008_040
Geographical coverage	27°E-42°E ; 40°N-47°N
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) for unfiltered REP datasets 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 resolution	Daily
Target delivery time	up to 6 months for REP and daily for NRT
Delivery mechanism	CMEMS Information System
Horizontal resolution	7km for filtered, 7km for unfiltered
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_BS_PHY_L3_NRT_OBSERVATIONS_008_039 and
SEALEVEL_BS_PHY_L3_REP_OBSERVATIONS_008_040 Product Specification

Product Specification	SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043
Geographical coverage	25°W-42°E ; 21°N-66°N
Variables	latitude longitude sla_filtered (Sea level anomaly) sla_unfiltered (Sea level anomaly) for unfiltered REP datasets 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 resolution	Daily
Target delivery time	Daily
Delivery mechanism	CMEMS Information System
Horizontal resolution	7km
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_EUR_PHY_ASSIM_L3_NRT_OBSERVATIONS_008_043 Product Specification

Product Specification	SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038
Geographical coverage	0°W-360°E ; 50°N-82°N
Variables	latitude longitude sla_filtered (Sea level anomaly) adt_filtered (Absolute 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 resolution	Daily
Target delivery time	daily
Delivery mechanism	CMEMS Information System
Horizontal resolution	14km
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_ARC_PHY_L3_NRT_OBSERVATIONS_008_038 Product Specification

IV.1.2 Gridded Sea Level Anomalies

Product Specification	SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS_008_046 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
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

SEALEVEL_GLO_PHY_MAP_L4_NRT_OBSERVATIONS_008_046 and
SEALEVEL_GLO_PHY_MAP_L4_REP_OBSERVATIONS_008_047 Product Specification

Product Specification	SEALEVEL_MED_PHY_L4_NRT_OBSERVATIONS_008_050 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	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	0.125°x0.125°
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_MED_PHY_L4_NRT_OBSERVATIONS_008_050 and
SEALEVEL_MED_PHY_L4_REP_OBSERVATIONS_008_051 Product Specification

Product Specification	SEALEVEL_BS_PHY_L4_NRT_OBSERVATIONS_008_041 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	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	0.125°x0.125°
Number of vertical levels	1
Format	Netcdf CF1.6

SEALEVEL_BS_PHY_L4_NRT_OBSERVATIONS_008_041 and
SEALEVEL_BS_PHY_L4_REP_OBSERVATIONS_008_042 Product Specification

IV.1.3 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

SEALEVEL_GLO_NOISE_L3_NRT_OBSERVATIONS_008_032 and
SEALEVEL_GLO_NOISE_L3_REP_OBSERVATIONS_008_033 Product Specification

V NOMENCLATURE OF FILES

V.1 Nomenclature of files downloaded through the CMEMS Web Portal download Service

V.1.1 Nomenclature of the Along Track products

V.1.1.1 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 medsea blacksea arctic europe	global geographic coverage product Mediterranean products Black Sea products Arctic products (only for nrt) Europe products (only for nrt)
mission	e1 e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g s3a	ERS-1 (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) Sentinel-3A
variable	phy phy-assim phy-unfiltered	contains sla and adt (REP and NRT) contains sla and some corrections (assimilation products, only NRT) non filtered sla and adt (only REP)

V.1.1.2 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 med blacksea arctic europe	global geographic coverage product Mediterranean products Black Sea products Arctic products (only for nrt) Europe products (only for nrt)
mission	e1 e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g s3a	ERS-1 (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) Sentinel-3A
variable	phy-vfec phy-assim phy-vxxc	filtered and sub-sampled sla and adt (REP and NRT) sla and some corrections (assimilation products, only NRT) non filtered and non sub-sampled sla and adt (only for REP)
date	YYYYMMDD	date of the dataset
dateprod	YYYYMMDD	production date of the dataset
format	.nc.gz	compressed NetCdf CF1.6

V.1.2 Nomenclature of the Gridded products

V.1.2.1 Nomenclature of the datasets

The nomenclature used is:

dataset-duacs-<delay>-<zone>-merged-allsat-phy-l4

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

delay	nrt rep	near-real time products delayed time products
zone	global medsea blacksea	global geographic coverage product Mediterranean products Black Sea products

V.1.2.2 Nomenclature of the NetCdf files

The nomenclature used is:

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

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

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

V.1.3 Nomenclature of the Gridded noise of Sea Level Anomalies

V.1.3.1 Nomenclature of the datasets

The nomenclature used is:

dataset-duacs-<delay>-<zone>-<mission>-<type of sla>-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 e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g s3a	ERS-1 (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) Sentinel-3A
type of sla	sla sla_unfiltered	filtered sla non filtered sla (only for rep products)

V.1.3.2 Nomenclature of the NetCdf files

The nomenclature used is:

<delay>_<zone>_<mission>_sla_noise_<variable>.<format>

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 e2 tp tpn g2 j1 j1n j1g j2 j2n j2g j3 en enn c2 al alg h2 h2g s3a	ERS-1 (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) Sentinel-3A
variable	vfec vxxc	filtered and sub-sampled sla non filtered and non sub-sampled sla (only for rep)
format	.nc.gz	compressed 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 classic along-track L3 file

```
netcdf dt_global_al_phy_vxxc_l3
dimensions:
        time = 51327 ;
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 sla_unfiltered(time) ;
                sla_unfiltered:_FillValue = 32767s ;
                sla_unfiltered:add_offset = 0. ;
                sla_unfiltered:coordinates = "longitude latitude" ;
                sla_unfiltered:long_name = "Sea level anomaly not-filtered not-subsampled" ;
                sla_unfiltered:scale_factor = 0.001 ;
                sla_unfiltered:standard_name = "sea_surface_height_above_sea_level" ;
                sla_unfiltered:units = "m" ;
                sla_unfiltered: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" ;
```

short adt_unfiltered(time) ;
adt_unfiltered:_FillValue = 32767s ;
adt_unfiltered:add_offset = 0. ;
adt_unfiltered:coordinates = "longitude latitude" ;
adt_unfiltered:long_name = "Absolute dynamic topography not-filtered not-subsampled" ;
adt_unfiltered:scale_factor = 0.001 ;
adt_unfiltered:standard_name = "sea_surface_height_above_geoid" ;
adt_unfiltered:units = "m" ;
adt_unfiltered: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" ;

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 = "2016-11-14T14:08:44Z" ;
:date_issued = "2016-11-14T14:08:44Z" ;
:date_modified = "2016-11-14T14:08:44Z" ;
:geospatial_lat_max = 66.143568 ;
:geospatial_lat_min = -66.146391 ;
:geospatial_lat_resolution = 0.00395950000000056 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 359.998892 ;
:geospatial_lon_min = 0.004494 ;
:geospatial_lon_resolution = 0.0312305000000208 ;
: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 = "2016-11-14T14:08:44Z: Created by DUACS DT V2.0.3" ;
: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" ;
:processing_level = "L3" ;
:product_version = "5.7" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:source = "AltiKa 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 since 2008-10-19." ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table v37" ;
:summary = "SSALTO/DUACS Delayed-Time Level-3 sea surface height measured by AltiKa altimetry observations over Global Ocean." ;
:time_coverage_duration = "P24H15M37.646370S" ;
:time_coverage_end = "2016-05-05T23:29:24Z" ;
:time_coverage_resolution = "P1S" ;
:time_coverage_start = "2016-05-04T23:13:46Z" ;
:title = "DT AltiKa Global Ocean Along track SSALTO/DUACS Sea Surface Height L3 product" ;

VI.2.2 Example of along-track L3 file dedicated to assimilation

```
netcdf nrt_med_al_phy_assim_l3
dimensions:
        time = 382 ;
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:coordinates = "longitude latitude" ;
dac:long_name = "Dynamic atmospheric correction" ;
dac:scale_factor = 0.0001 ;
dac:units = "m" ;
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 manuel for details" ;

int ocean_tide(time) ;
ocean_tide:_FillValue = 2147483647 ;
ocean_tide:add_offset = 0. ;
ocean_tide:coordinates = "longitude latitude" ;
ocean_tide:long_name = "Ocean tide model" ;
ocean_tide:scale_factor = 0.0001 ;
ocean_tide:units = "m" ;
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 manuel for details" ;

short lwe(time) ;
lwe:_FillValue = 32767s ;
lwe:add_offset = 0. ;
lwe:coordinates = "longitude latitude" ;
lwe:long_name = "Long wavelength error" ;
lwe:scale_factor = 0.001 ;
lwe:units = "m" ;
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 manuel for details" ;

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 sla_unfiltered(time) ;
sla_unfiltered:_FillValue = 32767s ;
sla_unfiltered:add_offset = 0. ;
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:units = "m" ;
sla_unfiltered:comment = "The sea level anomaly is the sea surface height above mean sea surface; the uncorrected sla can be computed as follows: [uncorrected sla] = [sla from product]+[dac]+[ocean_tide]-[lwe]; see the product user manuel for details" ;

sla_unfiltered:standard_name = "sea_surface_height_above_sea_level" ;
short sla_filtered(time) ;
sla_filtered:_FillValue = 32767s ;
sla_filtered:add_offset = 0. ;
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:units = "m" ;
sla_filtered:comment = "The sea level anomaly is the sea surface height above mean sea surface; the uncorrected sla can be computed as follows: [uncorrected sla] = [sla from product]+[dac]+[ocean_tide]-[lwe]; see the product user manuel for details" ;
sla_filtered:standard_name = "sea_surface_height_above_sea_level " ;
short mdt(time) ;
mdt:_FillValue = 32767s ;
mdt:add_offset = 0. ;
mdt:coordinates = "longitude latitude" ;
mdt:long_name = "Mean dynamic topography" ;
mdt:scale_factor = 0.001 ;
mdt:units = "m" ;
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" ;

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 = "2016-11-20T23:50:50Z" ;
:date_issued = "2016-11-20T23:50:50Z" ;
:date_modified = "2016-11-20T23:50:50Z" ;
:geospatial_lat_max = 42.976056 ;
:geospatial_lat_min = 31.678771 ;
:geospatial_lat_resolution = 0.0481970000000018 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 29.194464 ;
:geospatial_lon_min = 1.110606 ;
:geospatial_lon_resolution = 0.0319119999999984 ;
: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 = "2016-11-20T23:50:50Z: Created by DUACS NRT V2.1.0" ;
: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" ;
:processing_level = "L3" ;
:product_version = "17.0" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
:source = "Altika Drifting Phase 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 Altika Drifting Phase altimetry observations over Mediterranean Sea." ;
:time_coverage_duration = "P9H56M23.20437S" ;
:time_coverage_end = "2016-11-16T19:04:32Z" ;
:time_coverage_resolution = "P1S" ;
:time_coverage_start = "2016-11-16T09:08:09Z" ;
:title = "NRT Altika Drifting Phase Mediterranean Sea 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 gridded L4 file

netcdf nrt_global_allsat_phy_l4
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 = 359.875 ;
longitude:valid_min = 0.125 ;
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 sla(time, latitude, longitude) ;
sla:_FillValue = -2147483647 ;
sla:coordinates = "lon lat" ;
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" ;
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" ;
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 = "lon lat" ;
err:grid_mapping = "crs" ;
err:long_name = "Formal mapping error" ;
err:scale_factor = 0.0001 ;
err:units = "m" ;
int ugosa(time, latitude, longitude) ;

ugosa:_FillValue = -2147483647 ;
ugosa:coordinates = "lon lat" ;
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" ;
ugosa:comment = "The geostrophic velocity anomalies are referenced to the [1993, 2012] period" ;
int vgosa(time, latitude, longitude) ;
vgosa:_FillValue = -2147483647 ;
vgosa:coordinates = "lon lat" ;
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" ;
vgosa:comment = "The geostrophic velocity anomalies are referenced to the [1993, 2012] period" ;
int adt(time, latitude, longitude) ;
adt:_FillValue = -2147483647 ;
adt:coordinates = "lon lat" ;
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" ;
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" ;
int ugos(time, latitude, longitude) ;
ugos:_FillValue = -2147483647 ;
ugos:coordinates = "lon lat" ;
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 = "lon lat" ;
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" ;
// 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 derivated 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 = "2016-11-20T23:45:46Z" ;
:date_issued = "2016-11-20T23:45:46Z" ;
:date_modified = "2016-11-20T23:45:46Z" ;
:geospatial_lat_max = 89.875 ;
:geospatial_lat_min = -89.875 ;
:geospatial_lat_resolution = 0.25 ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_max = 359.875 ;
:geospatial_lon_min = 0.125 ;
: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 = "2016-11-20 23:45:46Z: Created by DUACS NRT V2.1.0" ;
: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 OSTM/Jason-2 interleaved Cryosat-2 Jason-3" ;
:processing_level = "L4" ;
:product_version = "17.0" ;
:project = "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE (CMEMS)" ;
:references = "http://marine.copernicus.eu" ;
: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 derivated variables measured by multi-satellite altimetry observations over Global Ocean." ;
:time_coverage_duration = "P1D" ;
:time_coverage_end = "2016-11-21T00:00:00Z" ;
:time_coverage_resolution = "P1D" ;
:time_coverage_start = "2016-11-21T00:00:00Z" ;
:title = "NRT merged all satellites Global Ocean Gridded SSALTO/DUACS Sea Surface Height L4 product and derivated variables" ;

VI.4 Structure and semantic of NetCDF Gridded Noise on Sea Level Anomaly files

Example of a NetCDF noise sla file:

```
netcdf dt_global_al_sla_noise_vfec
dimensions:
        lat = 89 ;
        lon = 180 ;
        nv = 2 ;
variables:
        float lat(lat) ;
                lat:long_name = "Latitude" ;
                lat:standard_name = "latitude" ;
                lat:units = "degrees_north" ;
                lat:bounds = "lat_bnds" ;
                lat:axis = "Y" ;
                lat:valid_min = -90. ;
                lat:valid_max = 90. ;
        float lat_bnds(lat, nv) ;
        float lon(lon) ;
                lon:long_name = "Longitude" ;
                lon:standard_name = "longitude" ;
                lon:units = "degrees_east" ;
                lon:bounds = "lon_bnds" ;
                lon:axis = "X" ;
                lon:valid_min = 0. ;
                lon:valid_max = 360. ;
        float lon_bnds(lon, nv) ;
        int crs ;
                crs:grid_mapping_name = "latitude_longitude" ;
                crs:semi_major_axis = 6371000. ;
                crs:inverse_flattening = 0 ;
        int noise(lat, lon) ;
                noise:_FillValue = -2147483647 ;
                noise:long_name = "Sea Level Anomalies measurement noise" ;
                noise:standard_name = "sea_surface_height_above_sea_level" ;
                noise:units = "m" ;
                noise:scale_factor = 0.0001 ;
global attributes:
            :history = "2013-12-17 16:15:38:creation" ;
            :comment = "Surface product;" ;
            :institution = "CLS/CNES";
            :Conventions = "CF-1.6" ;
                :cdm_data_type = "Grid" ;
                :geospatial_lat_min = -90. ;
                :geospatial_lat_max = 88. ;
                :geospatial_lon_min = -1. ;
```

:geospatial_lon_max = 359. ;
:geospatial_vertical_min = "0.0" ;
:geospatial_vertical_max = "0.0" ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_units = "degrees_east" ;
:geospatial_lat_resolution = 2. ;
:geospatial_lon_resolution = 2. ;
:title = "SSALTO/Duacs Altimetric Level4 product: SARAL/AltiKa sea level anomalies measurement noise on global area" ;
:summary = "This dataset contains the measurement noise for filtered SARAL/AltiKa 1-Hz measurements." ;
:product_version = "5.0" ;
:project = "CNES SSALTO/DUACS" ;
:references = "http://www.aviso.altimetry.fr" ;
:contact = "aviso@altimetry.fr" ;
:license = "http://www.aviso.altimetry.fr/fileadmin/documents/data/License_Aviso.pdf" ;
:date_created = "2013-12-17 16:15:38" ;
:standard_name_vocabulary = "http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/12/cf-standard-name-table.html" ;

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.

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