Along-track Level-2+ (L2P) Sea Level Anomaly

Sentinel-3 / Jason-CS-Sentinel-6 Product Handbook

Nomenclature: SALP-MU-P-EA-23014-CLS
Issue: 5 rev 1
Date: February 2024

Chronology Issues:			
Issue:	Date:	Validated by	Reason for change:
1.0	2016/05/20		Creation of the document
1.1	2016/09/10		EUMETSAT inputs taken into account
1.2	2016/12/08		EUMETSAT inputs taken into account
1.3	2017/01/16		Start period of L2P STC products added
1.4	2017/05/19		Taking into account RID remarks from SRR1
1.5	2017/06/27	F. Montagner (EUMETSAT)	Taking into account RID remarks from SRR2/ORR
1.6	2017/10/30		Taking into account the Spring Reprocessing
1.7	2018/11/12		Taking into account S3B mission
1.8	2019/01/11		Taking into account RID remarks from S3B SRR
1.9	2019/02/18		Taking into account L2P S3A NTC reprocessing based on L2 NTC from Spring Reprocessing 2018
1.10	04/06/2020		Taking into account evolutions for L2P NRT/STC sea level anomaly product content (new standards)
1.11	03/07/2020		Taking into account remarks from C.Nogueira Loddo (EUMETSAT)
1.12	16/10/2020		Taking into account evolutions for L2P NTC sea level product content (2021 standards from L2P reprocessing v3.0)
2.0	19/10/2020		Taking into account L2P 20 Hz data
2.1	19/11/2020		Taking into account remarks from EUMETSAT at SICP
2.2	15/02/2021		Precisions concerning standards for 2.3L2P 20 Hz production
2.3	13/12/2021		Implementation of 2021 standards in L2P NRT/STC products
3.0	23/04/2021		Add of S6A mission
3.1	11/02/2022		Taking into account RIDS
3.2	05/04/2022		Taking into account RIDS from ORR
3.3	10/11/2022		Add of S6A NTC correction (LUT)
4.0	24/11/2022		Taking into account USO correction for S3B BC004 (L2P NTC S3B v3.01) and add of S6A HR 20Hz

Chronology Issues:			
Issue:	Date:	Validated by	Reason for change:
5.0	16/02/2024		Taking into account evolutions for L2P NTC sea level product content (2024 standards from L2P reprocessing v4.0) Taking into account EUMETSAT comments on previous version
5.1	29/02/2024		Taking into account RIDS

List of Acronyms:

ATBD	Algorithm Theoretical Baseline Document
ATP	Along Track Product
Aviso+	Archiving, Validation and Interpretation of Satellite Oceanographic data
CLS	Collecte, Localisation, Satellites
CMA	Centre Multimissions Altimetriques
Cnes	Centre National d'Etudes Spatiales
ECMWF	European Centre for Medium-range Weather Forecasting
EUMETSAT	European Organisation for the Exploitation of Meteorological Satellites
GDR	Geophysical Data Record(s)
GOT	Global Ocean Tides
IB	Inverse Barometer
IGDR	Interim Geophysical Data Record(s)
LRM/LR	Low Resolution Mode
LWE	Large Wavelength Error
L2P	Level-2+ product: global 1 Hz along-track data (sea level anomaly, its components and validity flag) over marine surfaces based on Level-2 products
MSS	Mean Sea Surface
MWR	Microwave Radiometer
Nasa	National Aeronautics and Space Administration
NRT	Near Real Time
NTC	Non Time Critical
OER	Orbit Error Reduction
OSDR	Operational Sensor Data Records
POE	Precise Orbit Ephemeris
RD	Reference Document
SAR/HR	Synthetic Aperture Radar
Ssalto	Segment Sol multimissions d'ALTimétrie, d'Orbitographie et de localisation précise.
SLA	Sea Level Anomaly
SSB	Sea State Bias
SSH	Sea Surface Height
STC	Short Time Critical
TAI	IAT – International Atomic Time
T/P	Topex/Poseidon
UTC	Universal Time Coordinated

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Applicable documents / reference documents

RD 1: Sentinel-3 Marine Altimetry L2P/L3 Service: Product Format Specification.
Reference: SALP-BC-S3_COP-OP-16778-CN v2.0

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Contents

1. Introduction

The purpose of this document is to describe products generated by the monomission along-track altimeter data processing segment for Sentinel-3A, Sentinel-3B and Sentinel-6 (formally known as Jason-CS for Jason Continuity Service) missions, named along-track L2P SLA products.

The generation of Sentinel-3 products is part of the EUMETSAT Sentinel-3 Marine Altimetry L2P/L3 Service. The dissemination of those products is part of the Cnes AVISO-SALP (Service d'Altimétrie et Localisation Précise). The generation of Sentinel-6 products is part of the Jason-CS/Sentinel-6 Cooperation Agreement between CNES and EUMETSAT. Sentinel-6 products will be disseminated also by EUMETSAT.

After a description of the input data, a short overview of the processing steps is presented. Then complete information about user products (netCDF files) is provided, giving nomenclature, format description, and software routines.

Note that L2P SLA products are also available for other altimeter missions (Cryosat-2, SARAL/AltiKA, HaiYang-2A, HaiYang-2B, Jason-3, OSTM/Jason-2, Jason-1, TOPEX/Poseidon, Geosat Follow On, ERS-1, ERS-2 and Envisat). The generation and dissemination of those products is part of the CNES SALP (Service d'Altimétrie et Localisation Précise). The handbook for these L2P products is available at :

https://www.aviso.altimetry.fr/fileadmin/documents/data/tools/hdbk_L2P_all_missions_except_S3_S6.pdf

Several product types of L2P Sea Level Anomaly products exist:

- L2P NRT/STC products and NTC products
- 20Hz products and 1Hz products

Several versions of products were produced over time, please refer to section 7.2 and Table 9 for complete information about the versions and product types.

2. Overview

2.1. Altimetry principle

The altimeter measures the **'Altimeter Range'** which is the distance between the center of mass of satellite to the surface of the Earth (figure 1). This allows computing the **'Sea Surface Height'** which is the height of the sea surface above the reference ellipsoid. The **'Satellite Altitude'** refers to the distance of the center of mass of the satellite above a reference point. The reference point will usually be either on the reference ellipsoid or the center of the Earth.

'Sea Surface Height' = 'Satellite Altitude' - 'Altimeter Range' - 'Corrections'

The **'Corrections'** due to environmental conditions need to be applied in order to retrieve the correct **'Sea Surface Height'**. They are listed in Table 2 and depend on the timeliness of the product.

Moreover another variable is often used in altimetry:

'Sea Level Anomaly'= 'Sea Surface Height' - 'Mean Sea Surface'

The **'Mean Sea Surface'** is the mean of the sea surface height relative to ellipsoid over 20 years. It is computed on a regular grid and combines the data of all satellites.

Two different reference ellipsoids are used as detailed in Table 9:

- WGS84 ellipsoid reference:

For L2P 1 Hz NRT/STC/**NTC** products from version 3.0 onwards and L2P 20 Hz (which use the same standards as the L2P NTC version 3.0 products) the WGS84 reference ellipsoid is used (as in L2 S3 products).

- TOPEX/Poseidon ellipsoid reference

For Sentinel-3 Along-track L2P 1 Hz **NRT/STC**/**NTC** prior to version 3.0, the Reference ellipsoid used for was the first-order definition of the non-spherical shape of Earth with (same as for TOPEX/Poseidon, Jason-1/2/3 series):

- equatorial radius of 6378.1363 kilometers
- flattening coefficient of 1/298.257

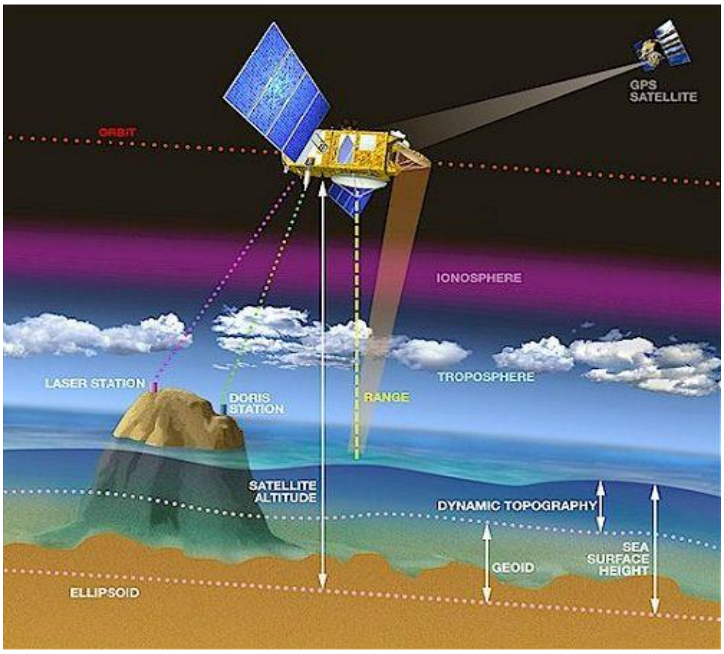


Figure 1. Altimetry principle

2.1.1. Orbits, Passes and Repeat cycle

'Orbit' is one revolution around the Earth by the satellite.

A satellite **'Pass' or 'Track'** is half a revolution of the Earth by the satellite from one extreme latitude to the opposite extreme latitude. Passes with odd numbers correspond to ascending orbits, from minimum to maximum latitude; passes with even numbers correspond to descending orbits, from maximum to minimum latitude.

'Repeat Cycle' is the time period that elapses until the satellite flies over the same location again. Every "pass file" of a given cycle (identified by its track number) flies over the same path as the pass file of every other cycle in the same repeat-cycle phase, and covers oceans basins continuously.

For Sentinel-3A and Sentinel-3B:

- the inclination is 98.65 deg;
- the passes are numbered from 1 to 770 representing a full repeat cycle ground track for the repetitive orbit;
- the repeat cycle is 27 days.

For Sentinel-6 Michael Freilich (Jason-CS):

- the inclination is 66 deg;
- the passes are numbered from 1 to 254 representing a full repeat cycle ground track for the repetitive orbit;
- the repeat cycle is almost 10 days.

2.2. Operating modes

In the Sentinel missions, there are two main modes of operation:

- High Resolution Mode, also known as Synthetic Aperture Radar mode (SAR)
- Low Resolution Mode (LRM)

For Sentinel-3, the SRAL mission will normally be operated at High Resolution Mode (commonly called SAR mode). Low Resolution Mode (LRM) will be a back-up mode only.

For Sentinel-6 Michael Freilich (Jason-CS) both modes are operated. Sentinel-6 (Jason-CS) L2P products are therefore available in both modes (SAR and LRM) for NTC timeliness, but they are only produced in SAR mode in STC/NRT timeliness.

SAR mode is designed to achieve high along-track resolution over relatively flat surfaces. This property can be exploited to increase the number of independent measurements over a given area and is a prerequisite for sea-ice thickness measurements, coastal waters, ice sheet margins, land and inland waters. The scientific justification of High Resolution Mode 100% coverage over the Earth is also applicable to open ocean surfaces because studies have shown that the best performance of this mode is over open ocean surfaces where topography is homogeneous (areas at least as large as the antenna footprint).

The detailed information can be found in User Handbooks:

- Sentinel-3 SRAL Marine User Handbook (EUM/OPS-SEN3/MAN/17/920901)
- The Sentinel-6 Michael Freilich (Jason-CS) User handbook is available in the confluence page.

Note that compared to LRM (on current altimetry missions such as SARAL/AltiKa, Envisat, Jason-1/2/3, ERS-1/2), the along-track resolution is reduced with the SAR technology and the noise on the measurement is reduced.

3. Data Processing

3.1. Overview

The processing steps of the system are overviewed on Figure 2. The L2P products are delivered in 1Hz frequency in Near-Real-Time (NRT), Short Time Critical (STC), and Non Time Critical (NTC) timeliness. For 20 Hz products only Near-Real-Time (NRT) and Short Time Critical (STC) timelinesses are available for L2P. The objective of L2P is:

- To provide operational applications with directly useable continuous and high quality altimeter data.
- To provide user friendly altimeter database where users can directly access to valid sea level height content without additional processing.
- In Non Time Critical, it is to maintain a consistent and user friendly altimeter database using the state-of-the-art recommendations from altimetry community before the complete reprocessing of L2 products.

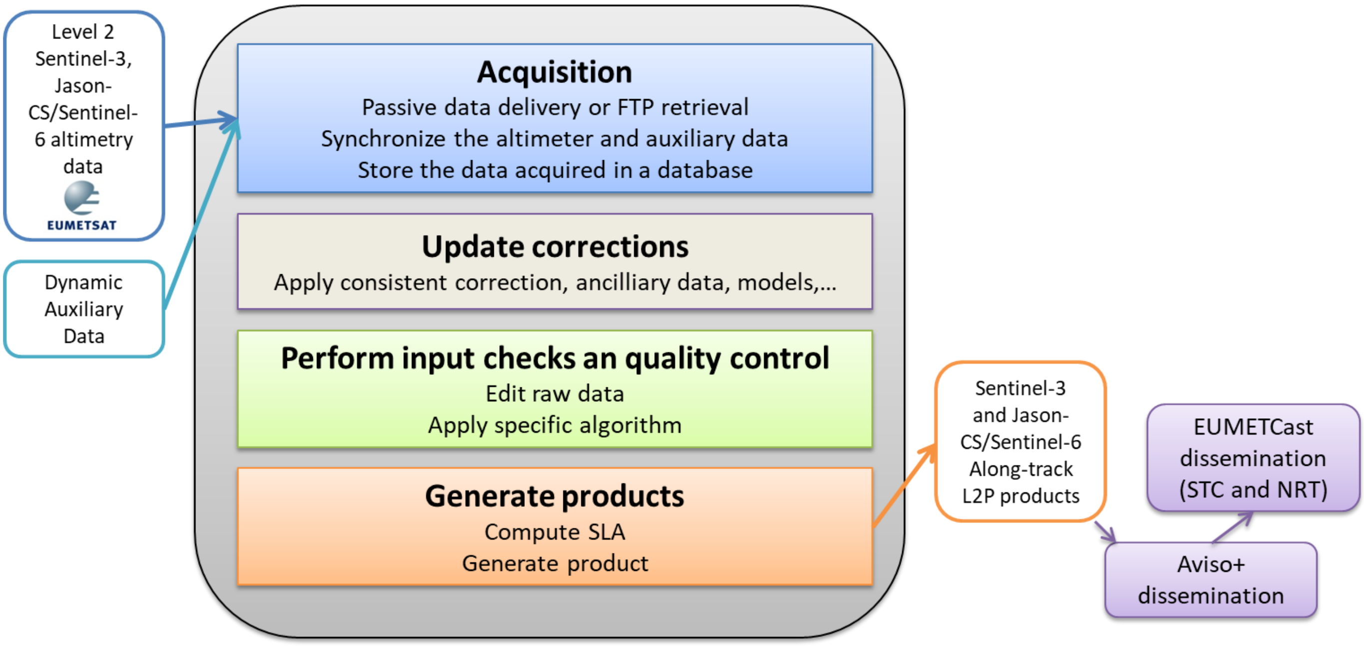


Figure 2. Processing steps of the system

The L2P products are along-track products that contain time, sea level anomaly, information of validity of the data and all corrections which were necessary to compute the sea level anomaly (range, orbital altitude, environmental and geophysical corrections). These products contain only marine surfaces (for Sentinel-3). They have a homogenized format and content for all altimeter missions. Note that the variable inter_mission_bias can be different between L2P NRT/STC and L2P NTC data. L2P products are the input data for the L3 production (which are distributed by CMEMS). Note that the sea level anomaly considered in Sentinel-3 L2P products is always based on Synthetic Aperture Radar (or if not available on Low Resolution Mode) data, but never on Pseudo LRM data.

3.2. Input Data

3.2.1. Level-2 altimeter data

In order to produce Sentinel-3A, Sentinel-3B and Jason-CS/Sentinel-6 along-track L2P products, the system **uses Level-2** (for Sentinel-3: L2 **Water** (containing Ocean data)**)** instrumental measurements. Indeed, there are different data products associated with the three levels of processing of altimeter data:

- Level-0 (L0) is the raw telemetered data
- Level-1 (L1) contains calibrated measurements (waveform)
- Level-2 (L2) contains the geophysical estimations computed via retracking of the level-1 waveform and all necessary geophysical corrections and ancillary data to define a sea level anomaly.

Level-2 products are available to users via EUMETCast dissemination and Data Store. Level-0 products are not available to users and are considered only as inputs to Level-1 processing.

There are different levels of data latency related to the Level-2 availability of the auxiliary or ancillary data as detailed in Table 1:

Altimetry product	Source	Availability	Orbit
Near Real Time (NRT) Sentinel-3A and Sentinel-3B	EUMETSAT	3 hours	Fast delivery orbit
Short Time Critical (STC) Sentinel-3A and Sentinel-3B	EUMETSAT	48 hours	Intermediate orbit
Non Time Critical (NTC) Sentinel-3A and Sentinel-3B	EUMETSAT	30 days	Precise Orbit Determination
Near Real Time (NRT) Sentinel-6 (Jason-CS) HR	EUMETSAT/CNES	3 hours	Fast delivery orbit
Short Time Critical (STC) Sentinel-6 (Jason-CS) HR	EUMETSAT/CNES	36 hours	Intermediate orbit
Non Time Critical (NTC) Sentinel-6 (Jason-CS) HR and LR	EUMETSAT/CNES	60 days	Precise Orbit Determination

Table 1. Sentinel-3A, Sentinel-3B and Sentinel-6 (Jason-CS) timeliness Input data overview.

3.2.1.1. Dynamic and static auxiliary data

In order to compute the Sea Level Anomaly, various corrections are needed, some of them replace the ones from the L2 input product such as the Mean Sea Surface, the tidal model, ... The complete description of all the corrections used in the different L2P products is given in Table 11.

3.3. Applying altimetric corrections

Altimetric measurements need to be corrected for instrumental errors, environmental perturbations (wet tropospheric, dry tropospheric and ionospheric effects), the ocean sea state influence (sea state bias), the tide influence (ocean tide, earth tide and pole tide) and atmospheric pressure (combined atmospheric correction: high frequency fluctuations of the sea surface topography and inverted barometer height correction).

A bias correction (inter_mission_bias) is computed and applied to L2P Sea level anomaly to insure the continuity between each mission. Note that we observe regional bias on NRT/STC SAR S6A MF L2 data compared to J3 which are dependant to significant wave height. To minimise these bias until they are resolved by upstream processing updates, a look up table was implemented as regional bias. The empirical correction uses J3 sea level anomaly as baseline for fixing S6A MF SAR NRT/STC sea level anomaly as a function of SAR sea wave height. A technical note details the model implemented and its impacts over sea level anomaly (Kocha et al. 2022, https://doi.org/10.24400/527896/A04-2022.001.)*For NTC S6A MF LRM and SAR data, the empirical correction uses S6PP (Sentinel-6 Processing Prototype [Dinardo et al., 2024]) as baseline for fixing S6A MF sea level anomalies as a function of sea wave height. L2P processing aims to correct the explained bias using CNES/CLS S6PP which already include the forthcoming PDAP evolutions. For more informations about the impacts see kocha et al. 2022, OSTST). Thanks to the F08 version S6A MF with numerical retracking, the regional bias compared to J3 are less dependent to significant wave height and do not need any more to be corrected with a look up table. In L2P version 4, S6A is the regional reference mission.*

Note that other corrections could be applied if needed, such as a datation bias correction. Note that this algorithm is not yet used.

The detail of the corrections applied is given in Table 11. This table corresponds to the current available L2P standard (global attribute “product_version” in the L2P files) for NRT, STC and NTC products. Note that the product_version may develop differently between L2P NRT/STC and L2P NTC products and also differently between L2P 1 Hz and 20 Hz products.

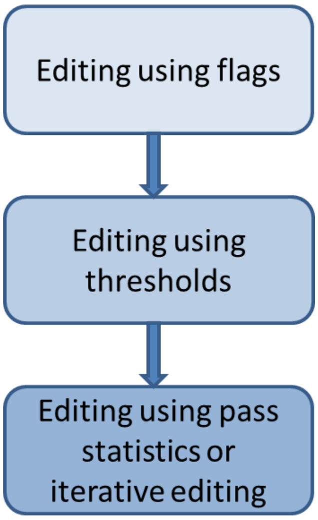
Note that in Non-Time Critical (NTC) delivery, the products may be delivered in two versions:

- the reference version containing the corrections consistent with the Sentinel-3A, Sentinel-3B or Sentinel-6 products delivered in the frame of the Copernicus Marine Service project. This version will be reprocessed roughly every 3 years.
- an updated version with corrections more up-to-date. This version will be reprocessed more often.

3.4. Selecting valid data

The processing starts with quality control and validation of altimetric data and geophysical corrections in order to select valid ocean data.

Editing criteria are used to select valid measurements over ocean. The editing process is divided into 3 parts as described below:



1/ Editing using flags:

A first step is to select the points where the editing thresholds will be applied. The points where:

- the ice flag is 0 (Ocean) or 5 (not evaluated),
- and the surface_type flag is 0 (Open Sea or Semi-enclosed sea) or 1 (enclosed sea or lake)
- only for NRT : the orbit source has to be ROE or Doris
- only for 20 Hz: no out-of-plane maneuver is taking place

are taken into account.

2/ Editing with parameters thresholds:

The editing criteria are defined as minimum and maximum thresholds for altimeter, radiometer and geophysical parameters. They differ between 1Hz processing (Table 2) and 20 Hz processing (Table 3). They are expected to remain constant throughout the mission, so that monitoring the number of edited measurements allows an observation of data quality. Measurements are edited if at least one of the parameters does not lie within those thresholds.

Parameters	Minimum value	Maximum value
Sea Surface Height	-130m	100m
Sea Level Anomaly	-2m for NRT/STC, -7m for NTC	2m for NRT/STC, 7m for NTC
Standard deviation on the range	0	0.12 + 0.02*SWH m if instrument mode is SAR, 0.2m otherwise
Nb measurements of range	10	DV
Dry troposphere correction	-2.5m	-1.9m
Dynamical Atmospheric correction	-2m	2m
Wet troposphere correction	-0.5m	-0.001m
Sea State Bias	-0.5m	0.00m
Standard deviation of backscatter coefficient	0	0.7 dB if instrument mode is SAR, 1dB otherwise
Oceanic tide	-5m	5m
Earth tide	-1m	1m
Pole tide	-15m	15m
Altimeter wind speed	0m/s	30m/s
Backscattering coefficient	5dB	28dB
Significant wave height	0m	15m
Filtered ionosphere correction	-0.4m	0.04m

Table 2. Editing thresholds for each parameter for NTC, NRT and STC timeliness during L2P 1 Hz processing

Parameters	Minimum value	Maximum value
Sea Level Anomaly	-2m	2 m

Significant wave height	0m	15m

Table 3. Editing thresholds for each parameter for L2P 20 Hz processing

3a/ Editing by statistical validation on the track for 1 Hz NRT/STC data:

A final editing is used in order eliminate entire passes where orbit error can be very high (for example due to manoeuvres).

This editing criteria is applied to passes with a minimum of 200 points. Mean and standard deviation are computed for each pass using measurements in open ocean situation (and outside of currents) fulfilling the following conditions:

- the bathymetry <-1000m,
- the oceanic variability <0.1m,
- the distance to the coast >10km,
- the latitude is <66°.

An entire pass is eliminated if one of these criteria is true for the pass statistics computed with the selected open ocean situations:

- the mean of Sea Level Anomaly >0.15m,
- the standard deviation of the Sea Level Anomaly > 0.2m.

3b/ Iterative editing of sea level anomaly for 1 Hz NTC data:

Data are edited with a median filter, taking into account the ocean variability.

$|R| > 3 [\sigma(R) + \sigma (MSLA)]$

Where :

R= SLA - SLA low pass filtered at 500 km

σ (MSLA) is the standard deviation of a mean ocean variability.

3c/ Iterative editing of sea level anomaly for 20 Hz NRT/STC data:

Robust statistics along each track are used to reject aberrant values on SLA based on a n*sigma criteria. A modulation with the ocean variability is used in order to limit the rejection of measurements in high variability areas (e.g. Gulf Stream). Then, the standard deviation of the SLA around its mean on a defined window (SLARunSTD) is calculated. As this quantity is linearly dependent on waves at first order, it is possible to estimate an expected SLARunSTD in relation with observed waves. By the comparison between observed and expected SLARunSTD it is possible to detect the incoherent values of SLA.

Note that the selection of valid data for L2P 20 Hz data is based on the valid data selection done for the DUACS R&D v2 experimental L3 along-track Sea Level Anomalies 5Hz dataset (available on AVISO and CMEMS), see SSALTO/DUACS handbook.

3.5. Product Generation

The **'Sea Level Anomalies'** as described in section 2.1 are computed with the corrections given in Table 11.

In order to allow the user to compute himself its own **'Sea Surface Height'** depending on his needs, the corrections used to compute the **'Sea Level Anomalies'** are present in the output product (see Table 7 for details about the names of variables). This allows computing the raw **'Sea Surface Height'**

Each product will contain one file per pass. The files are zipped (*.gz). The files are delivered in cycles folders for L2P NTC products on AVISO. The following table gives the frequency of delivery and the number of files delivered.

Note that Sentinel-6 (Jason-CS) products will also be available in SAFE format to be distributed by EUMETSAT dissemination systems via (EUMETCast, EO Portal).

L2P altimetry output product	Frequency	Number of files delivered
Near Real Time (NRT) Sentinel-3A and Sentinel-3B	Several times a day	28 passes net per day (as soon as a L2 file is available, it is produced into a L2P pass file and delivered to ftp. Only the most complete L2P pass file for each pass is kept, the less complete L2P files are removed from ftp)
Near Real Time (NRT) Sentinel-6A (Jason-CS)		25 passes net per day (as soon as a L2 file is available, the file is processed and added to its corresponding L2P pass file. Each generated L2P file is provided up until the complete L2P pass file is available. Note that on Aviso ftp, Only the most complete L2P pass file for each pass is kept, the less complete L2P files are removed from Aviso ftp)
Short Time Critical (STC) Sentinel-3A and Sentinel-3B	Several times per day	28 passes net per day (note that generally two L2P STC files (a first very short, later the complete file) are produced for even passes, as the pass splitting in high northern latitudes is slightly different between L2 and L2P data, but only the more complete L2P pass file will be kept on ftp)
Short Time Critical (STC) Sentinel-6A (Jason-CS)		25 passes net per day

Non Time Critical (NTC) Sentinel-3A and Sentinel-3B	Once per cycle (every 27 days)	770
Non Time Critical (NTC) Sentinel-6A (Jason-CS)	Once per cycle (every 10 days)	254

Table 4. Number of L2P Sentinel-3A, Sentinel-3B and Sentinel-6A (Jason-CS) files delivered for each timeliness

4. Product Presentation

4.1. Temporal availability

Mission	Begin date	End date	Characteristics
NRT Sentinel-3A	13-12-2016 (cycle 12)	Ongoing	27-day cycles
STC Sentinel-3A	12-01-2017 (cycle 13, pass 241)	Ongoing	27-day cycles
NTC Sentinel-3A	28-06-2016 (cycle 6)	Ongoing	27-day cycles
NRT Sentinel-3B	21-01-2019	Ongoing	27-day cycles
STC Sentinel-3B	20-01-2019	Ongoing	27-day cycles
NTC Sentinel-3B	27-11-2018 (cycle 19)	Ongoing	27-day cycles
NRT HR Sentinel-6A (Jason-CS)	06-04-2022	Ongoing	10-days cycles
STC HR Sentinel-6A (Jason-CS)	05-04-2022	Ongoing	10-days cycles
NTC LR/HR Sentinel-6A (Jason-CS)	21/09/2021 (cycle 32)	Ongoing	10-days cycles

Table 5. Temporal availability of 1 Hz LP2 Sentinel-3A, Sentinel-3B and Sentinel-6A (Jason-CS) products.

Mission	Begin date	End date	Characteristics
NRT/STC Sentinel-3A	01-07-2021	Ongoing	27-day cycles
NRT/STC Sentinel-3B	01-07-2021	Ongoing	27-day cycles
NRT/STC HR Jason-CS/Sentinel-6A	22-09-2022 (STC) 17-11-2022 (NRT)	Ongoing	10-days cycles

Table 6. Temporal availability of 20 Hz L2P products

Note that in L2P NTC version 03_00 the temporal coverage was extended into the past (compared to other versions). Nevertheless, users should be careful using early mission data:

- from Sentinel-3A cycles 1 to 5, as several issues described for BC003 in https://www-cdn.eumetsat.int/files/2020-04/pdf_s3a_tn_stm_repro.pdf in could still persist in the input data for L2P NTC version 03_00 (L2 BC004) (radiometer calibration timeline, erroneous centring of the return waveform in open loop tracking mode)

- during cycles 2 and 3 of Sentinel-3A and cycles 9 and 10 of Sentinel-3B the altimeters operated mostly in LRM mode. For L2P processing the bias between SAR and LRM mode was estimated and corrected for.

Note that from 16/10/2018 to 23/11/2018, Sentinel-3B went from the tandem phase orbit to its final intertrack orbit. During this drift phase the cycle duration is shorter than nominal, as cycle number was increase at each maneuver.

4.2. Nomenclature

The generic model of L2P filename is:

global_<frequency>_sla_l2p_<data_type>_<mission>_<mode>_<cycle>_<pass>_<begin_date>_ <end_date>_<production_date>.nc

The L2P products name components are:

- The frequency of the data: <frequency> (Filled if the L2P file contains high frequency (e.g. 20 Hz) data: hf or nothing for 1 Hz products)
- The type of data (NRT/STC/NTC): <data_type>
- The mission (s3a/s3b/s6a): <mission>
- The mode hr or lr (only for s6a): <mode>
- The cycle/pass considered: <cycle>_<pass>
- The begin and end dates of the data: <begin_date>_<end_date>
- The production date: <production_date>

This is a filename example for 1 Hz data:

global_sla_l2p _nrt_s3a_C0006_P0407_20160713T031500_20160713T035759_20160902T175905.nc

global_sla_l2p _nrt_s6a_hr_C0006_P0407_20160713T031500_20160713T035759_20160902T175905.nc

global_sla_l2p_ntc_s6a_lr_C0042_P0253_20220108T011659_20220108T021015_20220202T131742.nc

This is an example of a 20 Hz L2P sea level anomaly filename:

global_hf_sla_l2p_stc_s3a_C0061_P0380_20200805T052402_20200805T061026_20200922T091405.nc

In case of L2P reprocessing activities, the GLOBAL_SLA_L2P_NTC product will be available in two versions :

- The reference product
- The reprocessed product

The nomenclature of these two products is the same, but a global attribute containing the version number within the L2P product allows distinguishing them. Furthermore the files will be available in distinct directories.

5. Data Format

This chapter presents the data storage format and convention used for L2P products. All products are distributed in NetCDF with norm CF.

NetCDF (Network Common Data Form) is an open source, generic and multi-platform format developed by Unidata. An exhaustive presentation of NetCDF and additional conventions is available on the following web site:

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

All basic NetCDF conventions are applied to files.

Additionally the files are based on the attribute data tags defined by the Cooperative Ocean/Atmopshere Reasearch Data Service (COARDS) and Climate 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 made available by UNIDATA (http://www.unidata.ucar.edu/software/netcdf):

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

5.1. L2P Format

5.1.1. Dimensions

1 Dimension is defined:

- **time:** number of data in current file, sampled at 1Hz or 20 Hz.

5.1.2. Data Handling Variables

You will find hereafter the definitions of the variables defined in the product:

Name of variable	Type	Content	Unit	Available in timeliness	
				1 Hz (Nrt/Stc/Ntc)	20 Hz (Nrt/Stc)
time	double	Time of measurements	seconds since 2000-01-01 00:00:00 UTC	all	
latitude	int	Latitude value of measurements	degrees_north	all	
longitude	int	Longitude value of measurements	degrees_east	all	
range	int	Range	meters	all	
altitude	int	Altitude of the satellite	meters	all	
wet_tropospheric_correction	short	Wet tropospheric correction	meters	all	
wet_tropospheric_correction_model	short	Model wet tropospheric correction	meters	all	
ionospheric_correction	int	Ionospheric correction	meters	all	
sea_state_bias	short	Sea state bias	meters	all	
solid_earth_tide	short	Solid Earth tide height	meters	all	
pole_tide	short	Pole tide height	meters	all	
internal_tide	int	Internal tide height	meters	all	
dry_tropospheric_correction_model	short	Dry tropospheric correction	meters	all	
dynamic_atmospheric_correction	short	Combined atmospheric correction	meters	all	
ocean_tide_height	int	Ocean tide height	meters	all	
mean_sea_surface	int	Mean sea surface height	meters	all	
inter_mission_bias	int	Bias to have consistent time series since TOPEX/Poseidon	meters	all	
high_frequency_adjustment	short	high frequency adjustment for 20 Hz	meters	-	all

		altimeter sea level data.			
lf_inverse_barometer	short	low frequency part of inverse barometer	meters	-	all
sea_level_anomaly	int	Sea Level Anomaly relative to MSS	meters	all	
validation_flag	byte	Flag indicating if Sea Level Anomaly is valid (validation_flag=0) or not (validation_flag=1)	none	all	

Table 7. Overview of data handling variables in L2P NetCDF file.

The mapping between variables of L2 products and variables of L2P products is available in Table 8.

5.1.2.1. Attributes

Additional attributes may be available in L2P files. They are providing information about the type of product or the processing and parameter used.

5.1.2.2. Examples of 1 Hz and 20 Hz L2P files

Examples of 1 Hz and 20 Hz L2P files are shown in chapters 9.1 and 9.2.

5.2. Mapping between L2 and L2P variables

Hereafter the mapping between variables of L2 and L2P products is listed (in the case that L2P product contain the same content as L2 products):

Name of L2P variable	Name of L2 variable S3	Name of L2 variable S6	Comment
time	time_01	time	
latitude	lat_01	latitude	
longitude	lon_01	longitude	
range	range_ocean_01_ku	Range_ocean	
altitude	alt_01	altitude	Before version 3 of the L2P products, the altitude field includes a conversion from WGS84 to TOPEX reference ellipsoid (see Table 9)
wet_tropospheric_correction	rad_wet_tropo_cor_01_ku	Rad_wet_tropo_cor	
wet_tropospheric_correction_model	mod_wet_tropo_cor_zero_altitude_01	Model_wet_tropo_cor_zero_altitude	

ionospheric_correction	iono_cor_alt_filtered_01	Iono_cor_alt_filtered	Since v3.0 for L2P NRT/STC/NTC and L2P 20 Hz NRT/STC products the L2 variable iono_cor_alt_filtered_01_ku is used
sea_state_bias	sea_state_bias_01_ku	Sea_state_bias	
solid_earth_tide	solid_earth_tide_01	Solid_earth_tide	
pole_tide		Pole_tide	
internal_tide		Internal_tide	internal tide height is updated in L2P NRT/STC products
dry_tropospheric_correction_model	model_dry_tropo_cor_zero_altitude_01	Model_dry_tropo_cor_zero_altitude	Since V3.0 L2P NTC products the dry tropospheric correction is updated (different from L2)
dynamic_atmospheric_correction	inv_bar_cor_01 + hf_fluct_cor_01	dac	note that for L2P NRT product the DAC correction is updated (not read in L2 products)
ocean_tide_height		Ocean_tide_non_eq + ocean_tide_sol2	ocean tide height is updated in L2P products (but is equivalent to the sum of ocean_tide_sol2_01 + ocean_tide_non_eq_01 from L2)
mean_sea_surface			mean sea surface is updated in L2P products
inter_mission_bias			
high_frequency_adjustment			
lf_inverse_barometer			
sea_level_anomaly			
validation_flag			

Table 8. Mapping between variables in L2 and L2P files for Sentinel-3 and Sentinel-6

6. Products accessibility

The Sentinel-3 and Sentinel-6A (Jason-CS) L2P products are available by EUMETSAT via EUMETCast and by AVISO+ as follows:

- On authenticated **AVISO+ FTP (online products)**:
  - You first need to register via the Aviso+ web portal and sign the License Agreement: http://www.aviso.altimetry.fr/en/en/data/data-access/registration-form.html and select the product "Sea Level Anomalies Along-track Level-2+ (L2P) Sentinel-3&6"

  A login /Password will be provided via email with all the necessary information to access the products.

  - Once you are registered, the access to the products is given in your personal MY AVISO+ account in the 'product page' available on:

    https://www.aviso.altimetry.fr/no_cache/en/my-aviso-plus.html

- On the authenticated **AVISO+ CNES Data Center (archived products) only for Sentinel-3**:

  Register and download on https://aviso-data-center.cnes.fr/

- NRT/STC products via EUMETCast and data Store (S3 and S6)
- S6 and S3 NTC products via Data Centre

Citation:

Please refer to the licence agreement to mention credits explicitly in function of your use (section 13. Licence specific to Sentinel-3 L2P products).

7. News, updates and reprocessing

7.1. Operational news

To be kept informed about events occurring on the satellites and on the potential services interruption, see the [Duacs] operational news on the Aviso+ website:

https://www.aviso.altimetry.fr/en/news/operational-news-and-status.html.

7.2. Updates and reprocessing

In this section, the history of L2P products updates (new standards, introduction of new missions) and reprocessing is summarized.

March 2024: The L2P sea level NTC products switched to product version 04_00 (equivalent to CMEMS 2024 standard). Also the whole Sentinel L2P NTC period was reprocessed with the 2024 standards. The input products for the reprocessing were the reprocessed L2 data in Baseline Collection 005 version for Sentinel 3 A and B and in version F08 for Sentinel 6 A. Some information about this reprocessing can be found in Kocha et al. (2023).

On 6th of December 2022 the Sentinel-6A (Jason-CS) 1 Hz L2P sea level NTC LR and HR products became available. A correction was implemented on L2P Sentinel-6 MF to reduce the dependence of sea level anomaly to waves until it is corrected upstream into L2 products.

On 21st of November 2022 the 20 Hz L2P sea level NRT and STC became available for Sentinel-6 (Jason-CS).

October 2022 : L2P NTC Sentinel 3B products switched to product version 03_01 and all period was reprocessed. In this product version the USO sign was corrected to follow Eumetsat recommendation for products based on L2 S3B BC004. Impacted variables are sea_level_anomaly and inter_mission_bias.

On 6th of April 2022 the Sentinel-6 (Jason-CS) 1 Hz L2P sea level NRT/STC products become available. A correction was implemented on L2P Sentinel-6 MF to reduce the dependence of sea level anomaly to waves until it is corrected upstream into L2 products.

December 2021: The L2P sea level NRT/STC products switch to product version 03_00 (using combined MSS (SCRIPPS/ CNES/CLS15 / DTU15)).

July 2021 : The 20 Hz L2P sea level NRT and STC will become available for Sentinel-3.

November 2020: The L2P sea level NTC products switched to product version 03_00 (equivalent to CMEMS 2021 standard). Also the whole S3 L2P NTC period was reprocessed with the 2021 standards. The input products for the reprocessing were the reprocessed L2 S3 data in Baseline Collection 004 (PB 2.61) version. Some information about this reprocessing can be found in Lievin et al. (2020).

July 2020: The L2P sea level NRT/STC products switch to product version 02_10 (including internal tides).

February 2019 : a new NTC L2P S3A version (02_01) is available on the ftp server. It takes into account the “spring 2018 reprocessed” version of input NTC L2 products fully detailed in the following documents: https://user.eumetsat.int/s3/eup-strapi-media/pdf_s3a_pn_sral_l2_repro_2018_14ae5f00a7.pdf and https://user.eumetsat.int/s3/eup-strapi-media/pdf_s3a_tn_stm_repro_8bcaa1c5a9.pdf

January 2019: The Sentinel-3B L2P data are available on the ftp server in NRT, STC and NTC timeliness.

November 2017: a new NTC L2P S3A version (02_00) is available on the ftp server. It takes into account the "spring 2017 reprocessed" version of input NTC L2 products fully detailed in the following document: https://user.eumetsat.int/s3/eup-strapi-media/pdf_s3a_pn_stm_l2_repro_e80af8bfc6.pdf and "S3A STM Reprocessing 'Spring' 2017": Ref: EUM/OPSSEN3/REP/17/940906, Issue 1, Date: 31/08/2017

An Aviso+ web page is dedicated to updates and reprocessing of mono-mission products such as L2P products:
http://www.aviso.altimetry.fr/en/data/product-information/updates-and-reprocessing/monomission-data-updates.html

7.3. Versions of upstream L2 data used in Sentinel-3 L2P processing

Since March 2024 the L2P NTC are processed in product version 04_00 (see Table 11 for standards used). They are based on L2 NTC products processed with L2 marine processing baselines 005 onwards.

Since 13 December 2021 the L2P NRT and STC are processed in product version 03_00 (see Table 11 for standards used). They are based on L2 NRT and STC products processed with L2 marine processing baselines 2.68 onwards.

From 6 July 2020 to 13 December the L2P NRT and STC were processed in product version 02_10. They are based on L2 NRT and STC products processed with processing baselines 2.61 and 2.68.

Previously, the L2P NRT and STC were processed in product version 01_01 (see Table 10 for standards used). They were based on L2 NRT and STC products processed with processing baselines 2.09 onwards.

The current product version of the L2P S3A and S3B NTC data is 03_00. It is based on L2 NTC from Baseline Collection 004 reprocessing (PB 2.61) and further processing baselines.

Figure **3** shows an overview of the L2 processing baseline versions used in the S3A L2P processing. Information about the content of the different L2 processing baselines can be found in the product notices available on https://user.eumetsat.int/ as well as in the user guide of the Sentinel-3 SRAL altimetry processing baseline (https://user.eumetsat.int/resources/user-guides/sentinel-3-sral-altimetry-processing-baseline)

Table 9 gives some information about the L2P NTC versions.

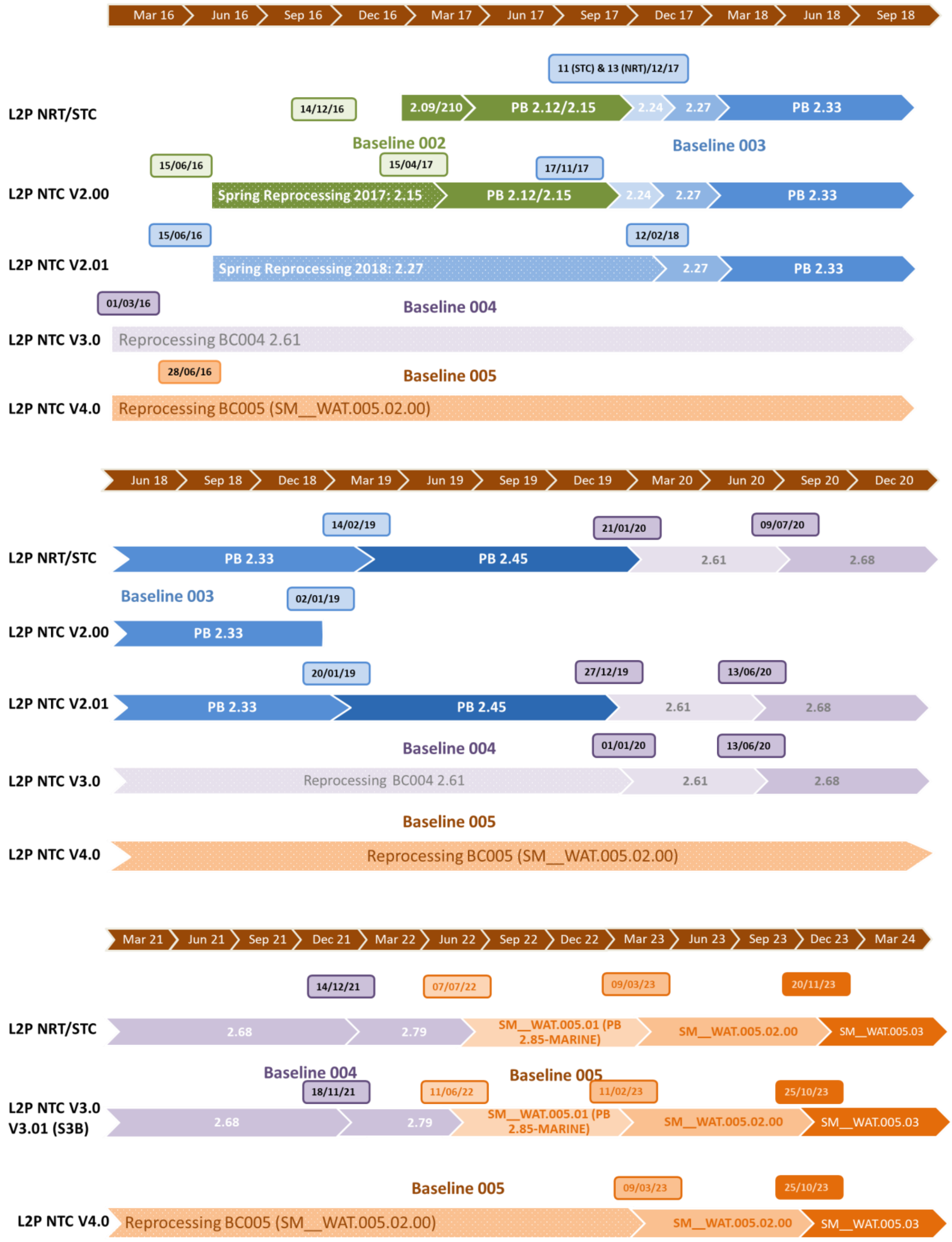


Figure 3 Overview of the L2 processing baseline versions used in the L2P processing for Sentinel-3

	L2P product version	Standards used	Temporal coverage	Based on L2 baseline collection	Based on L2 processing baselines	Reference Ellipsoid used
	S3B L2P NTC version 03_01	see Table 11	06/06/2018 → present	004/005	2.85 and onwards	WGS84
	S3A/S3B L2P NRT/STC version 03_00	see Table 11	13/12/2021 → present	004	2.68 and onwards	WGS84
	S3A L2P NTC version 03_00	see Table 11	01/03//2016 → present	004	2.61 and onwards	WGS84
	S3B L2P NTC version 03_00	see Table 11	06/06/2018 → 07/06/2022	004	2.61 and onwards	WGS84
	S3A/S3B L2P NRT/STC version 02_10	see Table 11	L2P production date : 06/06/2020 → present	004	2.61 and onwards	Same as TOPEX/Poseidon (equatorial radius: 6378.1363 kilometers, flattening coefficient: 1/298.257)
	S3A L2P NTC version 02_01	see Table 10	15/06/2016 → 11/10/2020	003 / 004	2.27 2.33 2.45 (and onwards)	
	S3A L2P NTC version 02_00	see Table 10	15/06/2016 → 02/01/2019	002 (till 17/11/2017) and 003	2.12 2.15 2.24 2.27 2.33	
	S3B L2P NTC version 02_00 baselines	see Table 10	27/11/2018 → 24/09/2020	003 / 004	1.13 2.45 (and onwards)	
	S3A L2P NTC version 01_01	see Table 10	24/12/2016 → 30/09/2017	002	2.09 2.10 2.12 2.15	
	S3A L2P NRT/STC version 01_01	see Table 10	13/12/2016 (NRT)/ 12/01/2017 (STC) → 06/07/2020	002 / 003 / 004	2.09 till 2.61	
	S3B L2P NRT/STC version 01_01	see Table 10	21 (NRT) or 22 (STC)/01/2019 → 06/07/2020	003 / 004	1.13 2.45 2.61	

Table 9. Information about the S3 L2P product versions (NRT/STC/NTC)

7.4. Versions of upstream L2 data used in Sentinel-6 L2P processing

The Sentinel-6 Micheal Freilich L2P NRT and STC and NTC sea level anomaly products are processed in product version 03_00 (see Table 11 for standards used). They are based on L2 NRT, STC and NTC products processed with L2 PDAP Baseline Collection F05 onwards.

The version 4_00 of L2P products (see Table 12 for standards used) is based on L2 PDAP Baseline Collection F08 onwards.

7.5. Standards used for L2P processing

Hereafter past and current standards used are listed. For information which L2P product version uses which standards please refer to Table 9. Note that evolution of standards (especially for NTC products) occur generally prior to CMEMS L3 reprocessing activities, as L2P products are input data for L3 products.

7.5.1. Standards equivalent CMEMS 2018 processing

The following L2P products/versions used these standards:

- 1 Hz L2P NRT/STC version 01_01

- 1 Hz L2P NTC version 01_01, 02_00 and 02_01.

	Sentinel-3A and Sentinel-3B		
Timeliness	**NRT**	**STC**	**NTC**
Orbit	Navigator (GNSS for baseline and DORIS for backup)*	MOE*	POE*
Dry troposphere	Model computed from ECMWF Gaussian grids		
Wet troposphere	From Sentinel-3A or Sentinel-3B MicroWave Radiometer		
Ionosphere	Filtered dual-frequency altimeter range measurements [Guibbaud et al., 2015]		
Sea State Bias	Non parametric SSB [Tran et al., 2012]		
Ocean tide and loading tide	FES2014 [Carrère et al., 2015]		
Solid Earth tide	Elastic response to tidal potential [Cartwright and Tayler, 1971], [Cartwright and Edden, 1973]		
Pole tide	[Wahr, 1985]		[Desai, 2015]
Dynamic atmospheric correction	MOG2D High frequencies forced with **predicted** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] +	MOG2D High frequencies forced with **analysed+predicted** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] + inverse	MOG2D High frequencies forced with **analysed** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] + inverse barometer Low frequencies

	inverse barometer Low frequencies	barometer Low frequencies	
Mean Sea Surface used	CNES_CLS15 (with reference period of 20 year)		

(*) The **Reference ellipsoid** for Sentinel-3A or Sentinel-3B L2P products has been changed in order to take into account the first-order definition of the non-spherical shape of Earth with (same as for TOPEX/Poseidon, Jason-1/2/3 series): equatorial radius of 6378.1363 kilometers and flattening coefficient of 1/298.257, see also Table 9 for information which reference ellipsoid is used in the different L2P products and versions.

Table 10. Sentinel-3A and Sentinel-3B Reference corrections (equivalent CMEMS 2018 standards) overview (in pink same standards as L2 products, in green standards updated in L2P products)

7.5.2. L2P standards equivalent to CMEMS 2021 reprocessing

The following L2P products/versions are using these standards:

- 1Hz L2P NRT/STC version 03_00
- 1 Hz L2P NTC version 03_00/ 1 Hz S3B L2P NTC version 03_01
- 20 Hz L2P NRT/STC products

Product	Sentinel-3A,Sentinel-3B and Sentinel-6 (Jason-CS)		
	1 Hz and 20 Hz L2P		1 Hz L2P
Correction	**NRT**	**STC**	**NTC**
Orbit	Navigator (GNSS for baseline and DORIS for backup)	MOE	POE
Dry troposphere	Model computed from ECMWF Gaussian grids from L2		ERA 5
Wet troposphere	L2 MicroWave Radiometer		
Ionosphere	filtered from L2		
Sea State Bias	Non parametric SSB [Tran et al., 2012] for Sentinel-3 based on BC004/ Non parametric SSB [Tran et al. 2020] for Sentinel-3 based on BC005 Non parametric [Tran 2020] J3 GDRF for Sentinel-6 (updated only for 20Hz data)		
Ocean tide and loading tide	FES2014b [Carrère et al., 2016]		
Solid Earth tide	Elastic response to tidal potential [Cartwright and Tayler, 1971], [Cartwright and Edden, 1973] (updated only for 20Hz datas)		
Pole tide	[Desai et al., 2015 + mean pole location 2017 (Ries et al., 2017)]		
Internal tide	Internal tide [Zaron, 2019] HRET v8.1		

Dynamic atmospheric correction	MOG2D High frequencies forced with **predicted** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] + inverse barometer Low frequencies	MOG2D High frequencies forced with **analysed+predicted** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] + inverse barometer Low frequencies (updated only for 20Hz data)	MOG2D High frequencies forced with **analysed** ECMWF pressure and wind field [Carrere and Lyard, 2003; operational version used, current version is 3.2.0] + inverse barometer Low frequencies
high frequency adjustment	Not yet available (set to default value for S3 and S6 L2P 20 Hz)		
Low frequency inverse barometer	Low frequency (20 days filtering) part of inverse barometer. **(only for 20Hz)**		
Mean Sea Surface used	Combined (SCRIPPS,CNES/CLS15,DTU15)		

Table 11. Reference corrections overview (in pink same standards as L2 products, in green standards updated in L2P products)

7.5.3. L2P standards equivalent to CMEMS 2024 reprocessing (currently used)

The version 4 of L2P products are using these standards

Product	Sentinel-3A,Sentinel-3B and Sentinel-6 (Jason-CS)		
	1 Hz and 20 Hz L2P		1 Hz L2P
Correction	**NRT**	**STC**	**NTC**
retracking	SAMOSA for Sentinel-3 and Numerical for Sentinel-6		
Orbit	Navigator (GNSS for baseline and DORIS for backup)	MOE	POE
Dry troposphere	Model computed from ECMWF Gaussian grids from L2		ERA 5
Wet troposphere	L2 MicroWave Radiometer		GPD+ for Sentinel-3 L2 MicroWave Radiometer for Sentinel-6
Ionosphere	filtered from L2		
Sea State Bias	Non parametric SSB [Tran et al. 2021] for Sentinel-3 and Non parametric SSB [Tran 2020] J3 MLE4 GDRF for Sentinel-6 (updated only for 20Hz data)		
Ocean tide and loading tide	FES2022 [Carrère et al., 2024]		
Solid Earth tide	Elastic response to tidal potential [Cartwright and Tayler, 1971], [Cartwright and Edden, 1973] (updated only for 20Hz datas)		
Pole tide	[Desai et al., 2015] + mean pole location 2017 [Ries et al., 2017]		
Internal tide	Internal tide [Zaron, 2019] HRET v8.1		
Dynamic atmospheric correction	TUGO High frequencies forced with **predicted** ECMWF pressure and wind field [Carrere et al. 2024] + inverse barometer Low frequencies	TUGO High frequencies forced with **analysed+predicted** ECMWF pressure and wind field [Carrere et al. 2024] + inverse barometer Low frequencies (updated only for 20Hz data)	TUGO High frequencies forced with pressure and wind field from **analysed** ERA5 model and from ECMWF model from S6A onwards [Carrere et al. 2024] + inverse barometer Low frequencies
high frequency adjustment	Not yet available (set to default value for S3 and S6 L2P 20 Hz)		
Low frequency inverse barometer	Low frequency (20 days filtering) part of inverse barometer. **(only for 20Hz)**		
Mean Sea Surface	Hybride (SCRIPPS22,CNES/CLS22,DTU21) [P. Scheaffer et al. 2024]		

Table 12. Reference corrections overview (in pink same standards as L2 products, in green standards updated in L2P products)

8. Contacts

For more information, please contact:

Aviso+ User Services
CLS
11 rue Hermès
Parc Technologique du canal
F-31520 Ramonville Cedex
France
E-mail: aviso@altimetry.fr
On Internet: https://www.aviso.altimetry.fr/

The user service is also interested in user feedbacks; questions, comments, proposals, requests are much welcome.

The EUMETSAT User Service Helpdesk is available:
During normal working hours, Monday to Thursday 08:30–17:15 CET, Friday 08:30–16:00 CET.

Tel: +49 6151 807 3660/3770
Fax: +49 6151 807 3790

Email ops@eumetsat.int

9. Annex

9.1. Example of 1 Hz L2P file

Note the format is the same for all the L2P Sea Level Anomaly products (Sentinel-3 and Sentinel-6).

netcdf global_sla_l2p_nrt_s3a_C0055_P0541_20200301T200448_20200301T204914_20200301T233833 {

dimensions:

time = 1331 ;

variables:

double time(time) ;

time:units = "seconds since 2000-01-01 00:00:00.0" ;

time:long_name = "time (sec. since 2000-01-01)" ;

time:standard_name = "time" ;

time:calendar = "gregorian" ;

int latitude(time) ;

latitude:scale_factor = 1.e-06 ;

latitude:comments = "Positive latitude is North latitude, negative latitude is South latitude." ;

latitude:long_name = "latitude" ;

latitude:standard_name = "latitude" ;

latitude:units = "degrees_north" ;

int longitude(time) ;

longitude:scale_factor = 1.e-06 ;

longitude:comments = "East longitude relative to Greenwich meridian" ;

longitude:long_name = "longitude" ;

longitude:standard_name = "longitude" ;

longitude:units = "degrees_east" ;

int range(time) ;

range:_FillValue = 2147483647 ;

range:comment = "All instrumental corrections included, i.e. distance antenna-COG, USO drift correction, internal path correction, Doppler correction, modeled instrumental errors corrections and system bias." ;

range:scale_factor = 0.0001 ;

range:coordinates = "longitude latitude" ;

range:add_offset = 700000. ;

range:long_name = "corrected 1 Hz altimeter range in main altimeter frequency band" ;

range:standard_name = "altimeter_range" ;

range:units = "m" ;

short wet_tropospheric_correction(time) ;

wet_tropospheric_correction:_FillValue = 32767s ;

wet_tropospheric_correction:comment = "A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse . This correction is computed from the data of the onboard radiometer." ;

wet_tropospheric_correction:scale_factor = 0.0001 ;

wet_tropospheric_correction:coordinates = "longitude latitude" ;

wet_tropospheric_correction:long_name = "radiometer wet tropospheric correction" ;

wet_tropospheric_correction:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;

wet_tropospheric_correction:units = "m" ;

short wet_tropospheric_correction_model(time) ;

wet_tropospheric_correction_model:_FillValue = 32767s ;

wet_tropospheric_correction_model:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse." ;

wet_tropospheric_correction_model:scale_factor = 0.0001 ;

wet_tropospheric_correction_model:source = "European Center for Medium Range Weather Forecasting" ;

wet_tropospheric_correction_model:coordinates = "longitude latitude" ;

wet_tropospheric_correction_model:long_name = "operational ECMWF model wet tropospheric correction" ;

wet_tropospheric_correction_model:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;

wet_tropospheric_correction_model:units = "m" ;

wet_tropospheric_correction_model:institution = "ECMWF" ;

short dry_tropospheric_correction_model(time) ;

dry_tropospheric_correction_model:_FillValue = 32767s ;

dry_tropospheric_correction_model:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A dry tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for dry tropospheric range delays of the radar pulse." ;

dry_tropospheric_correction_model:scale_factor = 0.0001 ;

dry_tropospheric_correction_model:source = "European Center for Medium Range Weather Forecasting" ;

dry_tropospheric_correction_model:coordinates = "longitude latitude" ;

dry_tropospheric_correction_model:long_name = "operational ECMWF model dry tropospheric correction" ;

dry_tropospheric_correction_model:standard_name = "altimeter_range_correction_due_to_dry_troposphere" ;

dry_tropospheric_correction_model:units = "m" ;

dry_tropospheric_correction_model:institution = "ECMWF" ;

short dynamic_atmospheric_correction(time) ;

dynamic_atmospheric_correction:_FillValue = 32767s ;

dynamic_atmospheric_correction:comment = "MOG2D high resolution forced with operational ECMWF pressure and wind fields plus inverse barometer. This correction is computed by adding the high frequency fluctuations of the sea surface topography and the inverted barometer height correction computed from rectangular grids." ;

dynamic_atmospheric_correction:scale_factor = 0.0001 ;

dynamic_atmospheric_correction:coordinates = "longitude latitude" ;

dynamic_atmospheric_correction:long_name = "dynamic atmospheric correction" ;

dynamic_atmospheric_correction:units = "m" ;

dynamic_atmospheric_correction:institution = "LEGOS/CNES" ;

int ocean_tide_height(time) ;

ocean_tide_height:_FillValue = 2147483647 ;

ocean_tide_height:comment = "Includes high frequency and long period ocean tide height and the corresponding loading tide height." ;

ocean_tide_height:scale_factor = 0.0001 ;

ocean_tide_height:source = "FES2014b" ;

ocean_tide_height:coordinates = "longitude latitude" ;

ocean_tide_height:long_name = "FES model geocentric ocean tide height" ;

ocean_tide_height:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;

ocean_tide_height:units = "m" ;

ocean_tide_height:institution = "LEGOS/NOVELTIS/CNES/CLS" ;

short solid_earth_tide(time) ;

solid_earth_tide:_FillValue = 32767s ;

solid_earth_tide:comment = "Calculated using Cartwright and Tayler tables and consisting of the second and third degree constituents. The permanent tide (zero frequency) is not included." ;

solid_earth_tide:scale_factor = 0.0001 ;

solid_earth_tide:source = "Cartwright and Edden [1973] Corrected tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;

solid_earth_tide:coordinates = "longitude latitude" ;

solid_earth_tide:long_name = "solid earth tide height" ;

solid_earth_tide:standard_name = "sea_surface_height_amplitude_due_to_earth_tide" ;

solid_earth_tide:units = "m" ;

solid_earth_tide:institution = "National Institute of Oceanography (UK)" ;

short pole_tide(time) ;

pole_tide:_FillValue = 32767s ;

pole_tide:scale_factor = 0.0001 ;

pole_tide:source = "Desai, S., Wahr, J. & Beckley, B. J Geod [2015] 89: 1233. J. C. Ries and S. Desai: Conventional model update for rotational deformation. In Fall AGU Meeting, New Orleans, LA, 2017" ;

pole_tide:coordinates = "longitude latitude" ;

pole_tide:long_name = "geocentric pole tide height" ;

pole_tide:standard_name = "sea_surface_height_amplitude_due_to_pole_tide" ;

pole_tide:units = "m" ;

short sea_state_bias(time) ;

sea_state_bias:_FillValue = 32767s ;

sea_state_bias:comment = "A sea state bias correction must be added (negative value) to the instrument range to correct this range measurement for sea state delays of the radar pulse." ;

sea_state_bias:scale_factor = 0.0001 ;

sea_state_bias:source = "Empirical solution fitted on Jason-2 GDR_C data" ;

sea_state_bias:coordinates = "longitude latitude" ;

sea_state_bias:long_name = "sea surface height bias due to sea surface roughness on main altimeter frequency band" ;

sea_state_bias:standard_name = "sea_surface_height_bias_due_to_sea_surface_roughness" ;

sea_state_bias:units = "m" ;

sea_state_bias:institution = "CNES" ;

short ionospheric_correction(time) ;

ionospheric_correction:_FillValue = 32767s ;

ionospheric_correction:scale_factor = 0.0001 ;

ionospheric_correction:coordinates = "longitude latitude" ;

ionospheric_correction:long_name = "altimeter filtered ionospheric correction on main altimeter frequency band" ;

ionospheric_correction:standard_name = "altimeter_range_correction_due_to_ionosphere" ;

ionospheric_correction:units = "m" ;

int internal_tide(time) ;

internal_tide:_FillValue = 2147483647 ;

internal_tide:comment = " Version of the model is HRET_v8.1. The following tidal frequencies are included: M2, K1, O1, S2" ;

internal_tide:scale_factor = 0.0001 ;

internal_tide:source = "E. D. Zaron. Baroclinic tidal sea level from exact-repeat mission altimetry. Journal of Physical Oceanography, 49 (1): 193-210, 2019" ;

internal_tide:coordinates = "longitude latitude" ;

internal_tide:long_name = "Internal tide height" ;

internal_tide:units = "m" ;

int mean_sea_surface(time) ;

mean_sea_surface:_FillValue = 2147483647 ;

mean_sea_surface:comment = "referenced to 20 year period" ;

mean_sea_surface:scale_factor = 0.0001 ;

mean_sea_surface:source = "MSS_CNES_CLS-2015" ;

mean_sea_surface:coordinates = "longitude latitude" ;

mean_sea_surface:long_name = "mean sea surface height above reference ellipsoid" ;

mean_sea_surface:units = "m" ;

mean_sea_surface:institution = "CLS/CNES" ;

short sea_level_anomaly(time) ;

sea_level_anomaly:_FillValue = 32767s ;

sea_level_anomaly:quality_flag = "validation_flag" ;

sea_level_anomaly:comment = "altitude of satellite (altitude) - Ku band corrected ocean altimeter range (range) - altimeter ionospheric correction on Ku band (ionospheric_correction) - model dry tropospheric correction (dry_tropospheric_correction_model) - radiometer wet tropospheric correction (wet_tropospheric_correction) - sea state bias correction in Ku band (sea_state_bias) - solid earth tide height (solid_earth_tide) - geocentric ocean tide height (ocean_tide_height) - geocentric pole tide height (pole_tide) - dynamic atmospheric correction (dynamic_atmospheric_correction) - internal tide model correction (internal_tide) - mean sea surface (mean_sea_surface) - inter mission bias (inter_mission_bias)" ;

sea_level_anomaly:scale_factor = 0.0001 ;

sea_level_anomaly:coordinates = "longitude latitude" ;

sea_level_anomaly:long_name = "sea level anomaly" ;

sea_level_anomaly:standard_name = "sea_surface_height_above_sea_level" ;

sea_level_anomaly:units = "m" ;

int inter_mission_bias(time) ;

inter_mission_bias:_FillValue = 2147483647 ;

inter_mission_bias:units = "m" ;

inter_mission_bias:long_name = "bias to have consistent time series since TOPEX/Poseidon" ;

inter_mission_bias:scale_factor = 0.0001 ;

inter_mission_bias:coordinates = "longitude latitude" ;

int altitude(time) ;

altitude:_FillValue = 2147483647 ;

altitude:comment = "Altitude of satellite above the reference ellipsoid (TOPEX)." ;

altitude:scale_factor = 0.0001 ;

altitude:coordinates = "longitude latitude" ;

altitude:add_offset = 700000. ;

altitude:long_name = "1Hz altitude of satellite" ;

altitude:standard_name = "height_above_reference_ellipsoid" ;

altitude:units = "m" ;

byte validation_flag(time) ;

```
		validation_flag:_FillValue = 127b ;
		validation_flag:flag_meanings = "valid_data_over_ocean rejected_data" ;
		validation_flag:long_name = "validation flag" ;
		validation_flag:coordinates = "longitude latitude" ;
		validation_flag:flag_values = 0b, 1b ;

// global attributes:
		:Conventions = "CF-1.6" ;
		:cycle_number = 55LL ;
		:pass_number = 541LL ;
		:absolute_pass_number = 42121LL ;
		:first_meas_time = "2020-03-01 20:04:48" ;
		:last_meas_time = "2020-03-01 20:49:14" ;
		:creator_email = "aviso@altimetry.fr" ;
		:cdm_data_type = "swath" ;
		:references = "http://aviso.altimetry.fr" ;
		:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
		:institution = "CLS,CNES,EUMETSAT" ;
		:creator_name = "AVISO" ;
		:title = "NRT Sentinel-3A Global Ocean Along track Sea Level Anomalies L2P products" ;
		:standard_name_vocabulary = "http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/25/cf-standard-name-table.html" ;
		:summary = "The Near Real Time Level-2P sea surface height above mean sea surface products for Sentinel-3A mission." ;
		:project = "EUMETSAT Sentinel-3 L2P/L3 marine altimetry service" ;
		:platform = "Sentinel-3A" ;
		:contact = "aviso@altimetry.fr" ;
		:source = "Sentinel-3A measurements" ;
		:based_on = "Sentinel-3A NRT" ;
		:creator_url = "http://aviso.altimetry.fr" ;
		:processing_level = "L2P" ;
		:product_version = "02_10" ;
		:equator_time = "2020-03-01T20:24:05.635000" ;
		:equator_longitude = 24. ;
		:creation_date = "2020-03-01T23:38:33" ;
		:software_version = "L2PRT_SLA_EUMETSAT: 2.3.0; OCTANT: 12.18.0-20190211" ;
}
```

9.2. Example of 20 Hz L2P file

```
netcdf global_hf_sla_l2p_stc_s3a_C0061_P0380_20200805T052402_20200805T061026_20200922T091405 {
dimensions:
	time = 52409 ;
variables:
	double time(time) ;
		time:units = "seconds since 2000-01-01 00:00:00.0" ;
		time:long_name = "time (sec. since 2000-01-01)" ;
		time:standard_name = "time" ;
		time:calendar = "gregorian" ;
	int latitude(time) ;
		latitude:scale_factor = 1.e-06 ;
		latitude:comments = "Positive latitude is North latitude, negative latitude is South latitude." ;
		latitude:long_name = "latitude" ;
		latitude:standard_name = "latitude" ;
		latitude:units = "degrees_north" ;
	int longitude(time) ;
		longitude:scale_factor = 1.e-06 ;
		longitude:comments = "East longitude relative to Greenwich meridian" ;
		longitude:long_name = "longitude" ;
		longitude:standard_name = "longitude" ;
		longitude:units = "degrees_east" ;
	int range(time) ;
		range:_FillValue = 2147483647 ;
		range:comment = "All instrumental corrections included, i.e. distance antenna-COG, USO drift correction, internal path correction, Doppler correction, modeled instrumental errors corrections and system bias." ;
		range:scale_factor = 0.0001 ;
		range:coordinates = "longitude latitude" ;
		range:add_offset = 700000. ;
		range:long_name = "corrected 20 Hz altimeter range in main altimeter frequency band" ;
		range:standard_name = "altimeter_range" ;
		range:units = "m" ;
	short high_frequency_adjustment(time) ;
		high_frequency_adjustment:_FillValue = 32767s ;
		high_frequency_adjustment:comment = "This correction has to be substracted from the sea surface height. Currently not available for Sentinel-3." ;
		high_frequency_adjustment:scale_factor = 1.e-05 ;
		high_frequency_adjustment:source = "Tran, N., Vandemark, D., Zaron, E.D., Thibaut, P., Dibarboure, G., Picot, N. Assessing the effects of sea-state related errors on the precicion of high-rate Jason-3 altimeter sea level data. ASR (2019)." ;
		high_frequency_adjustment:coordinates = "longitude latitude" ;
		high_frequency_adjustment:long_name = "high frequency adjustment for 20 Hz altimeter sea level data." ;
		high_frequency_adjustment:units = "m" ;
	short wet_tropospheric_correction(time) ;
		wet_tropospheric_correction:_FillValue = 32767s ;
		wet_tropospheric_correction:comment = "A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse . The radiometer solution is used." ;
		wet_tropospheric_correction:scale_factor = 0.0001 ;
		wet_tropospheric_correction:coordinates = "longitude latitude" ;
```

wet_tropospheric_correction:long_name = "radiometer or model wet tropospheric correction" ;
wet_tropospheric_correction:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
wet_tropospheric_correction:units = "m" ;
short wet_tropospheric_correction_model(time) ;
wet_tropospheric_correction_model:_FillValue = 32767s ;
wet_tropospheric_correction_model:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A wet tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for wet tropospheric range delays of the radar pulse." ;
wet_tropospheric_correction_model:scale_factor = 0.0001 ;
wet_tropospheric_correction_model:source = "European Center for Medium Range Weather Forecasting" ;
wet_tropospheric_correction_model:coordinates = "longitude latitude" ;
wet_tropospheric_correction_model:long_name = "operational ECMWF model wet tropospheric correction" ;
wet_tropospheric_correction_model:standard_name = "altimeter_range_correction_due_to_wet_troposphere" ;
wet_tropospheric_correction_model:units = "m" ;
wet_tropospheric_correction_model:institution = "ECMWF" ;
short dry_tropospheric_correction_model(time) ;
dry_tropospheric_correction_model:_FillValue = 32767s ;
dry_tropospheric_correction_model:comment = "Computed at the altimeter time-tag from the interpolation of 2 meteorological fields that surround the altimeter time-tag. A dry tropospheric correction must be added (negative value) to the instrument range to correct this range measurement for dry tropospheric range delays of the radar pulse." ;
dry_tropospheric_correction_model:scale_factor = 0.0001 ;
dry_tropospheric_correction_model:source = "European Center for Medium Range Weather Forecasting" ;
dry_tropospheric_correction_model:coordinates = "longitude latitude" ;
dry_tropospheric_correction_model:long_name = "operational ECMWF model dry tropospheric correction" ;
dry_tropospheric_correction_model:standard_name = "altimeter_range_correction_due_to_dry_troposphere" ;
dry_tropospheric_correction_model:units = "m" ;
dry_tropospheric_correction_model:institution = "ECMWF" ;
short dynamic_atmospheric_correction(time) ;
dynamic_atmospheric_correction:_FillValue = 32767s ;
dynamic_atmospheric_correction:comment = "Based on MOG2D high resolution model forced with operational ECMWF pressure and wind speed fields for STC / with ECMWF operational forecasts of pressure and wind speed fields for NRT. This correction is computed by adding the high frequency fluctuations of the sea surface topography computed by MOG2D and the low-frequency of the inverted barometer effect computed from Mean Sea Level Pressure. The cut-period between high/low frequencies is 20 days." ;
dynamic_atmospheric_correction:scale_factor = 0.0001 ;
dynamic_atmospheric_correction:coordinates = "longitude latitude" ;
dynamic_atmospheric_correction:long_name = "dynamic atmospheric correction" ;
dynamic_atmospheric_correction:units = "m" ;
dynamic_atmospheric_correction:institution = "LEGOS/CNES/CLS" ;
short lf_inverse_barometer(time) ;
lf_inverse_barometer:_FillValue = 32767s ;
lf_inverse_barometer:comment = "Low frequency (20 days filtering) part of inverse barometer. This correction is already included in the dynamic_atmospheric_correction." ;
lf_inverse_barometer:scale_factor = 0.0001 ;
lf_inverse_barometer:coordinates = "longitude latitude" ;
lf_inverse_barometer:long_name = "low frequency part of inverse barometer" ;
lf_inverse_barometer:units = "m" ;

lf_inverse_barometer:institution = "LEGOS/CNES" ;
int ocean_tide_height(time) ;
ocean_tide_height:_FillValue = 2147483647 ;
ocean_tide_height:comment = "Includes high frequency and long period ocean tide height and the corresponding loading tide height." ;
ocean_tide_height:scale_factor = 0.0001 ;
ocean_tide_height:source = "FES2014b" ;
ocean_tide_height:coordinates = "longitude latitude" ;
ocean_tide_height:long_name = "FES model geocentric ocean tide height" ;
ocean_tide_height:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
ocean_tide_height:units = "m" ;
ocean_tide_height:institution = "LEGOS/NOVELTIS/CNES/CLS" ;
short internal_tide(time) ;
internal_tide:_FillValue = 32767s ;
internal_tide:comment = "Version of the model is HRET_v8.1. The following tidal frequencies are included: M2, K1, O1, S2." ;
internal_tide:scale_factor = 0.0001 ;
internal_tide:source = "E. D. Zaron. Baroclinic tidal sea level from exact-repeat mission altimetry. Journal of Physical Oceanography, 49(1):193-210, 2019." ;
internal_tide:coordinates = "longitude latitude" ;
internal_tide:long_name = "internal tide height" ;
internal_tide:units = "m" ;
short solid_earth_tide(time) ;
solid_earth_tide:_FillValue = 32767s ;
solid_earth_tide:comment = "Calculated using Cartwright and Tayler tables and consisting of the second and third degree constituents. The permanent tide (zero frequency) is not included." ;
solid_earth_tide:scale_factor = 0.0001 ;
solid_earth_tide:source = "Cartwright and Edden [1973] Corrected tables of tidal harmonics - J. Geophys. J. R. Astr. Soc., 33, 253-264." ;
solid_earth_tide:coordinates = "longitude latitude" ;
solid_earth_tide:long_name = "solid earth tide height" ;
solid_earth_tide:standard_name = "sea_surface_height_amplitude_due_to_earth_tide" ;
solid_earth_tide:units = "m" ;
solid_earth_tide:institution = "National Institute of Oceanography (UK)" ;
short pole_tide(time) ;
pole_tide:_FillValue = 32767s ;
pole_tide:scale_factor = 0.0001 ;
pole_tide:source = "Desai, Shailen & Wahr, John & Beckley, B. (2015). Revisiting the pole tide for and from satellite altimetry. Journal of Geodesy. 89. DOI:10.1007/s00190-015-0848-7; J. C. Ries and S. Desai: Conventional model update for rotational deformation. In Fall AGU Meeting, New Orleans, LA, 2017" ;
pole_tide:coordinates = "longitude latitude" ;
pole_tide:long_name = "geocentric pole tide height" ;
pole_tide:standard_name = "sea_surface_height_amplitude_due_to_pole_tide" ;
pole_tide:units = "m" ;
short sea_state_bias(time) ;
sea_state_bias:_FillValue = 32767s ;
sea_state_bias:comment = "A sea state bias correction must be added (negative value) to the instrument range to correct this range measurement for sea state delays of the radar pulse." ;
sea_state_bias:scale_factor = 0.0001 ;
sea_state_bias:source = "Empirical solution fitted on Jason-2 GDR_D data (Tran 2012)" ;
sea_state_bias:coordinates = "longitude latitude" ;

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		sea_state_bias:long_name = "sea surface height bias due to sea surface roughness on main altimeter frequency band" ;
		sea_state_bias:standard_name = "sea_surface_height_bias_due_to_sea_surface_roughness" ;
		sea_state_bias:units = "m" ;
		sea_state_bias:institution = "CNES" ;
	short ionospheric_correction(time) ;
		ionospheric_correction:_FillValue = 32767s ;
		ionospheric_correction:scale_factor = 0.0001 ;
		ionospheric_correction:coordinates = "longitude latitude" ;
		ionospheric_correction:long_name = "altimeter filtered ionospheric correction on main altimeter frequency band" ;
		ionospheric_correction:standard_name = "altimeter_range_correction_due_to_ionosphere" ;
		ionospheric_correction:units = "m" ;
	int mean_sea_surface(time) ;
		mean_sea_surface:_FillValue = 2147483647 ;
		mean_sea_surface:comment = "Combined SIO/CNES-CLS-15/DTU15 mean sea surface (referenced to 20 year period)." ;
		mean_sea_surface:scale_factor = 0.0001 ;
		mean_sea_surface:source = "SIO-CNESCLS15-DTU15" ;
		mean_sea_surface:coordinates = "longitude latitude" ;
		mean_sea_surface:long_name = "mean sea surface height above reference ellipsoid" ;
		mean_sea_surface:units = "m" ;
		mean_sea_surface:institution = "SIO/CNES/CLS/DTU" ;
	short sea_level_anomaly(time) ;
		sea_level_anomaly:_FillValue = 32767s ;
		sea_level_anomaly:quality_flag = "validation_flag" ;
		sea_level_anomaly:comment = "altitude of satellite (altitude) - (Ku band corrected ocean altimeter range (range) - altimeter ionospheric correction on Ku band (ionospheric_correction) - model dry tropospheric correction (dry_tropospheric_correction_model) - wet tropospheric correction (wet_tropospheric_correction) - sea state bias correction in Ku band (sea_state_bias) - solid earth tide height (solid_earth_tide) - geocentric ocean tide height (ocean_tide_height) - geocentric pole tide height (pole_tide) - internal tide height (internal_tide)- dynamic atmospheric correction (dynamic_atmospheric_correction) - mean sea surface (mean_sea_surface) - inter mission bias (inter_mission_bias)" ;
		sea_level_anomaly:scale_factor = 0.0001 ;
		sea_level_anomaly:coordinates = "longitude latitude" ;
		sea_level_anomaly:long_name = "sea level anomaly" ;
		sea_level_anomaly:standard_name = "sea_surface_height_above_sea_level" ;
		sea_level_anomaly:units = "m" ;
	int inter_mission_bias(time) ;
		inter_mission_bias:_FillValue = 2147483647 ;
		inter_mission_bias:units = "m" ;
		inter_mission_bias:long_name = "bias to have consistent time series since TOPEX/Poseidon" ;
		inter_mission_bias:scale_factor = 0.0001 ;
		inter_mission_bias:coordinates = "longitude latitude" ;
	int altitude(time) ;
		altitude:_FillValue = 2147483647 ;
		altitude:comment = "Altitude of satellite above the reference ellipsoid (WGS84)." ;
		altitude:scale_factor = 0.0001 ;
		altitude:coordinates = "longitude latitude" ;
		altitude:add_offset = 700000. ;
		altitude:long_name = "20 Hz altitude of satellite" ;
		altitude:standard_name = "height_above_reference_ellipsoid" ;
		altitude:units = "m" ;
```

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        byte validation_flag(time) ;
                validation_flag:_FillValue = 127b ;
                validation_flag:flag_meanings = "valid_data_over_ocean rejected_data" ;
                validation_flag:long_name = "validation flag" ;
                validation_flag:flag_values = "0, 1" ;
                validation_flag:coordinates = "longitude latitude" ;

// global attributes:
                :Conventions = "CF-1.6" ;
                :cycle_number = 61LL ;
                :pass_number = 380LL ;
                :absolute_pass_number = 46580LL ;
                :first_meas_time = "2020-08-05 05:24:02.661915" ;
                :last_meas_time = "2020-08-05 06:10:26.499938" ;
                :creator_email = "aviso@altimetry.fr" ;
                :product_version = "TBD" ;
                :cdm_data_type = "swath" ;
                :references = "http://aviso.altimetry.fr" ;
                :platform = "Sentinel-3A" ;
                :Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
                :institution = "CLS,CNES,EUMETSAT" ;
                :creator_name = "AVISO" ;
                :title = "20 Hz Short Time Critical Sentinel-3A Global Ocean Along track Sea Level
Anomalies L2P products" ;
                :standard_name_vocabulary = "http://cf-pcmdi.llnl.gov/documents/cf-standard-
names/standard-name-table/25/cf-standard-name-table.html" ;
                :summary = "The 20 Hz Short Time Critical Level-2P sea surface height above mean
sea surface products for Sentinel-3A mission." ;
                :project = "EUMETSAT Sentinel-3 L2P/L3 marine altimetry service" ;
                :source = "Sentinel-3A measurements" ;
                :contact = "aviso@altimetry.fr" ;
                :based_on = "Sentinel-3A L2 STC" ;
                :creator_url = "http://aviso.altimetry.fr" ;
                :processing_level = "L2P" ;
}
```