SSALTO/DUACS Experimental Product Handbook:

Along-track Sea Level Anomalies 5Hz

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Chronology Issues:			
Issue:	Date:	Validated by	Reason for change:
1.0	2022/03/21		Creation of the document from existing document

List of Acronyms:

ADT	Absolute Dynamic Topography
Aviso+	Archiving, Validation and Interpretation of Satellite Oceanographic data
CMEMS	Copernicus Marine Environment Monitoring Service
Cnes	Centre National d'Etudes Spatiales
DAC	Dynamic Atmospheric Correction
DUACS	Data Unification and Altimeter Combination System
FES	Finite Element Solution tidal model
IW	Internal Wave
LRM	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
L3	Level-3 products (along-track)
L4	Level 4 products (gridded)
MOG2D	Modèle aux Ondes de Gravité 2D
MSS	Mean Sea Surface
MWR	Microwave Radiometer
Nasa	National Aeronautics and Space Administration
NOAA	National Oceanic and Atmospheric Administration
NRT	Near Real Time
NTC	Non Time Critical
OSDR	Operational Sensor Data Records
SALP	Service d'Altimétrie et de Localisation Précise
SAR(M)	Synthetic Aperture Radar (Mode)
Ssalto	Segment Sol multimissions d'ALTimétrie, d'Orbitographie et de localisation précise.
SSB	Sea State Bias
SST	Sea Surface Temperature
SLA	Sea Level Anomaly
SSB	Sea State Bias
SSH	Sea Surface Height
STC	Short Time Critical

Contents

1 Introduction

For 20 years, the DUACS system has been producing, as part of the CNES/SALP project, the Copernicus Marine Environment and Monitoring Service (CMEMS) and the Copernicus Climate Change Service (C3S), high quality multimission altimetry Sea Level products for oceanographic applications, climate forecasting centers, geophysic and biology communities... While the operational production of the Sea Level along track and maps is now generated as part as CMEMS and C3S, the development of a new experimental DUACS products started mid 2016 at CNES **aiming at improving the resolution of the current products and designing new products**. Using the global Synthetic Aperture Radar mode (SARM) coverage of Sentinel3A/B and optimizing the LRM altimeter processing (retracking, editing, ...) will notably allow us to fully exploit the fine-scale content of the altimetric missions. Thanks to this increase of real time altimetry observations we will also be able to improve Level-4 products by combining these new Level-3 products and new mapping methodology, such as dynamic interpolation. Finally, these improvements will benefit to downstream products: geostrophic currents, Lagrangian products, eddy atlas…

This document describes the along-track (level3) Sea Level Anomalies at 5 Hz for 2 areas: agulhas and north_atlantic.

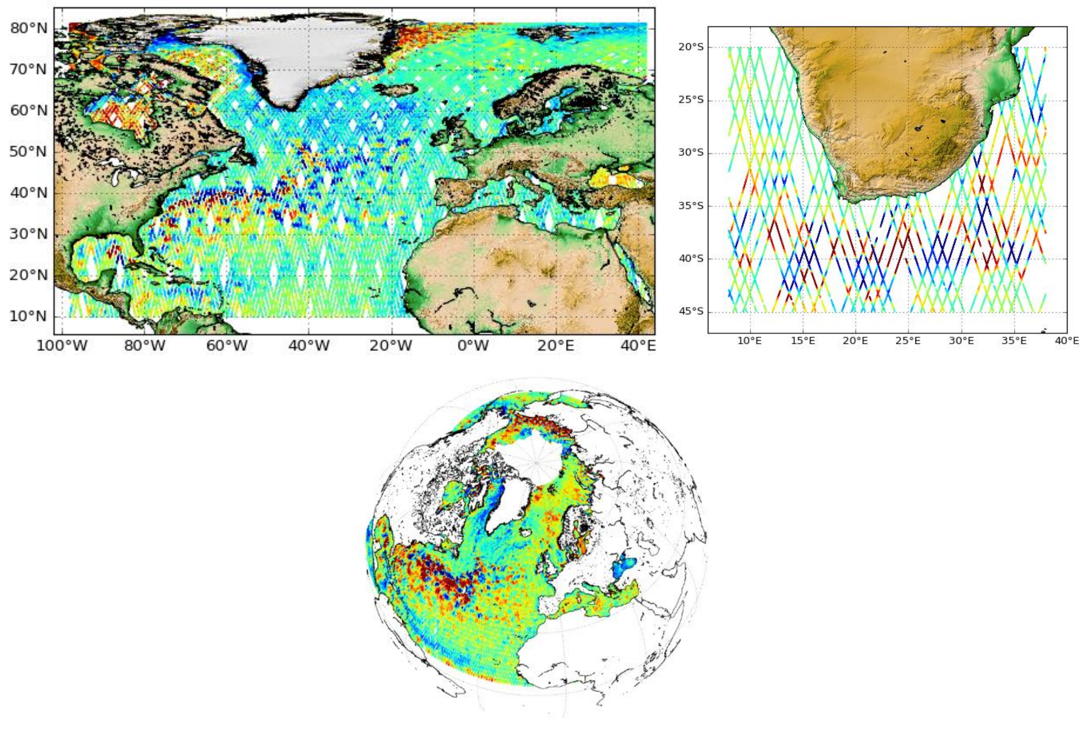

Figure 1: Geographical coverage of Along-track (level3) Sea Level Anomalies at 5 Hz for North Atlantic v01_00 (top-left) and v02_00 (bottom) and Agulhas (top-right) with 20 days of Sentinel-3A Sea Level Anomalies for v01_00 and 27 days for v02_00.

1.1 Acknowledgments

When using the experimental SSALTO/DUACS experimental products, please cite: "Those products were processed by SSALTO/DUACS and distributed by AVISO+ (https://www.aviso.altimetry.fr) with support from CNES”

1.2 User's feedback

The product is an experimental product. Therefore, each and every question, comment, example of use, and suggestion will help us improve the product. You're welcome to ask or send them to aviso@altimetry.fr .

2 Along-track Sea Level Anomalies 5Hz

Those products are distributed in version 01_00 and 02_00.

It is foreseen to deliver new versions of some products: for any new future version delivered, you will be informed via the AVISO+ user service, by email and on the website. The version number is indicated in the ftp folder and in the file ('product_version' attribute).

2.1 Processing

DUACS Experimental products system is to provide a consistent and user-friendly altimeter database using the state-of-the-art recommendations from the altimetry community. Delayed time data (more accurate) are used to create this database and the final resolution for all available altimeters is 5 Hz frequency.

The Level 3 (L3) DUACS Experimental products have been developed with the aim to provide to the users simple and homogeneous products along the tracks of the different altimeters with a resolution consistent with the physical signal observable, and different physical fields (see Table 1 and Table 2) that can be used to better fit the physical content of the altimeter field to the different applications.

The L3 along-track products are delivered with a 5Hz (i.e. nearly 1km) sampling. The Sea Level Anomaly (SLA) field has been optimally low-pass filtered (see §2.1.4.2) in order to reduce the noise measurement and in the same time keep as much as possible the physical signal at small wavelengths.

The following figure gives an overview of the system, where the main processing sequences can be divided into 6 main steps:

- acquisition
- Pre-processing homogenization
- Input data quality control
- multi-mission cross-calibration
- along-track products generation
- final quality control

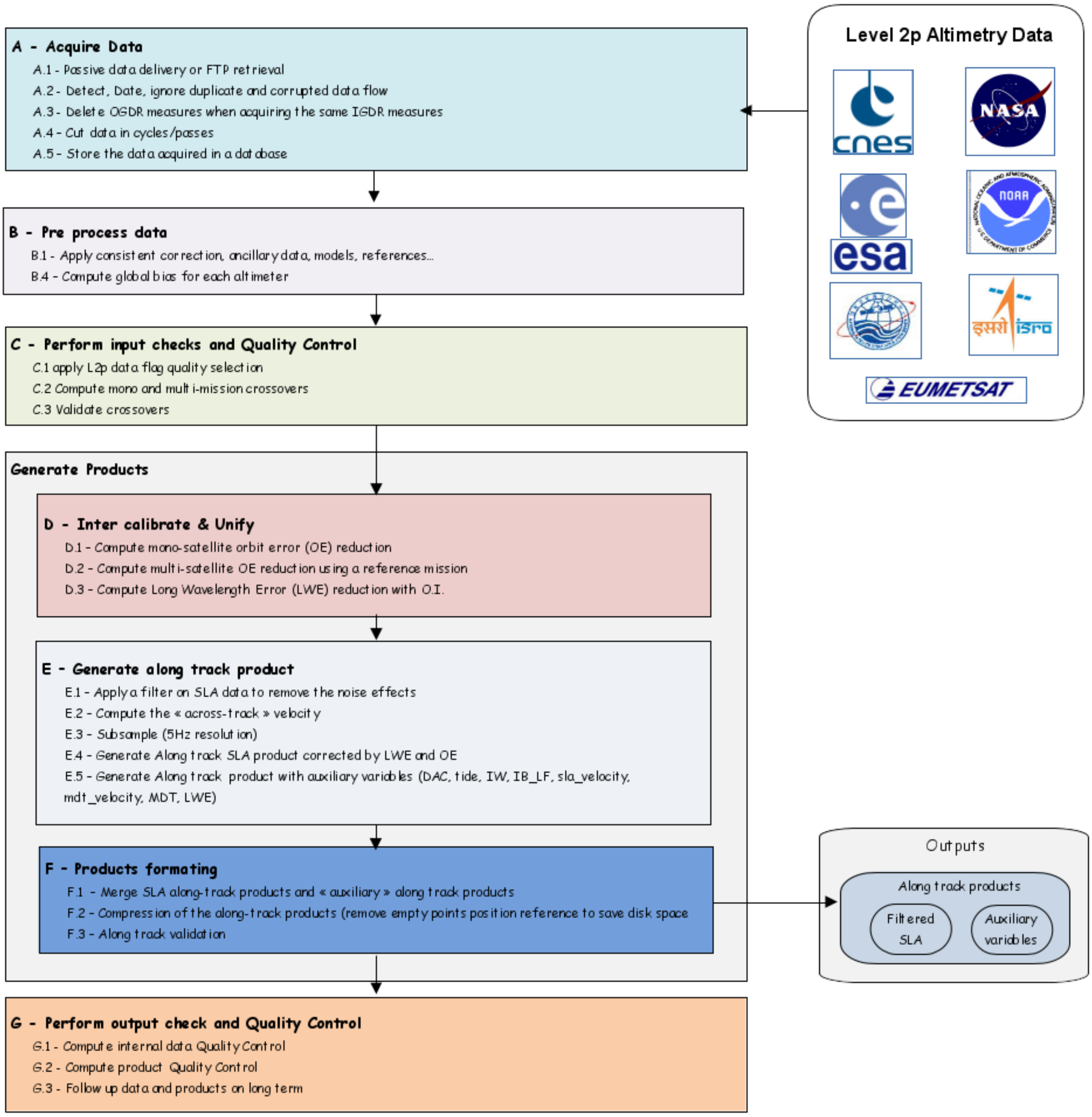

Figure 2: DUACS Experimental system processing

2.1.1 Altimeter Input data description

The altimeter measurements used in input of the DUACS Experimental products system consist in Level2p (L2P) products. They are generated from Delayed Time or Non Time Critical product (GDR or NTC) products from different missions as described in Table 1.

Altimeter mission	Type of product	Source
OSTM/Jason-2	GDR	CNES
SARAL/AltiKa	GDR	CNES
Jason-3	GDR	CNES
Cryosat-2	GDR	Derived from the CNES Processing Prototype (PP) which was developed for Cryosat-2 and Sentinel-3A (Boy et al, 2017)
Sentinel-3A	NTC	

Table 1: input data for the Along-track SLA 5Hz

2.1.2 Input data quality control

The L2 Input Data Quality Control is a critical process applied to guarantee that DUACS Experimental uses only the most accurate altimeter data. DUACS Experimental system is supplied with L2p altimeter products that include a quality flag for each measurement. The valid data selection is directly based on this quality flag. Thanks to the high quality of current missions, this process rejects a small percentage of altimeter measurements, but these erroneous data could be the cause of a significant quality loss.

Data selection on SAR areas :

v01_00: A classical Iterative editing is used.

v02_00: same editing as for LRM areas

Data selection on LRM areas :

A new iterative editing dedicated to high rate altimeter measurements (20 or 40 Hz) based on the SLA coherence between consecutive measurements was used to select valid measurements.

First, aberrant values are detected using thresholds on SLA and SWH and removed.

For v02_00, the ice contaminated measurements are detected using the waveform classification available for Sentinel-3A and SARLA-DP/ALtika missions, combined with the ice concentration provided by OSISAF. For Jason missions, the product ice_flag is used. For Cryosat-2, only a OSISAF threshold criteria is used.

For v02_00, 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 for v01_00 and 02_00, the standard deviation of the SLA around its mean on a defined windows (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.

2.1.3 Homogenization and cross-calibration

Homogenization and cross-calibration are done at different steps of the processing.

The first homogenization step consists of acquiring altimeter and ancillary data from the different altimeters that are a priori as homogeneous as possible. They include the most recent standards recommended for altimeter global products by the different agencies and expert groups such as OSTST, ESA Quality Working groups or ESA SL_cci project. Each mission is processed separately as its needs depend on the input data. The different standards applied are summarized in the Table 1 and Table 2

Input L2p products includes a first cross-calibration processing that consists in ensuring mean sea level continuity between the four altimeter reference missions (Topex/Poseidon, Jason-1, 2 and 3). This step, crucial for climate signals, is done as accurately as possible in REP/DT conditions, taking into account both the global and the regional biases, as presented in Pujol et al (2016).

We also apply global bias to reduce the impact of different standards between available missions.

Nevertheless, they are not always coherent at large regional scales due to various sources of geographically correlated errors (instrumental, processing, orbit residuals errors). Consequently, the DUACS Experimental multi-mission cross-calibration algorithm aims to reduce these errors in order to generate a global, consistent and accurate dataset for all altimeter constellations. This step processing consists of applying the Orbit Error Reduction (OER) algorithm. This process consists of reducing orbit errors through a global minimization of the crossover differences observed for the reference mission, and between the reference and other missions also identified as complementary and opportunity missions, as presented by Le Traon and Ogor (1998).

The last step consists in applying the long wavelength error (LWE) reduction algorithm based on Optimal Interpolation (see for instance; Le Traon et al, 2003; Pujol et al, 2016). This process reduces geographically-correlated errors between neighboring tracks from different sensors. This optimal-interpolation based empirical correction also contributes to reduction of the residual high frequency signal that is not fully corrected by the different corrections that are applied (mainly the Dynamic Atmospheric Correction and Ocean tides). LWE, DAC and Ocean tides corrections are provided in the final along track products. In v02_00, the methodology used to interpolate the LWE correction on each measurement was improved using OI methodology.

	OSTM/Jason-2	Jason-3	Sentinel-3A	SARAL/AltiKa	Cryosat-2
Orbit	GDR-E				
Retracking	LRM		SAR	LRM	SAR & LRM
Noise reduction	HFA [Tran 2018]		-	HFA [Tran 2018]	HFA [Tran 2018] (LRM only)
Sea State Bias	Non Parametric SSB [Tran 2012]	Non parametric SSB	Non parametric SSB [Tran 2015]	Non parametric SSB	Non parametric SSB
Ionosphere	Dual-frequency altimeter range measurement	GIM [Ijima et al., 1999]			
Wet troposphere	Neural Network correction (3 entries), [Fréry et al. in prep]	From J3-AMR radiometer	From S3A-AMR radiometer	Neural Network correction (5 entries) [Picard et al., in prep]	From ECMWF model
Dry troposphere	Model based on ECMWF Gaussian grids				
Combined atmospheric correction	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				
Ocean tide	FES2014 [Carrère et al., 2015]				
Solid Earth tide	Elastic response to tidal potential [Cartwright and Tayler, 1971], [Cartwright and Edden, 1973]				
Pole tide	[DESAI, 2015]				
MSS	CNES-CLS-2015				
MDT	CNES_CLS13 [Rio et al, 2014a]				

Table 1: Standards of the different corrections applied on altimeter measurements used in v01_00.

	OSTM/Jason-2	Jason-3	Sentinel-3A	SARAL/AltiKa	Cryosat-2
Orbit	GDR-E				
Retracking	Adaptive [Thibaut et al, 2017]		LR-RMC (with LUT correction) [Boy et al, 2017b ; Moreau et al, 2020]	LRM	SAR & LRM
Noise reduction	HFA adaptive [Tran 2019]		-	HFA [Tran 2018]	HFA [Tran 2018] (LRM only)
Sea State Bias	2D SSB [Tran 2019]		Non parametric SSB [Tran 2015]	Non parametric SSB	Non parametric SSB
Ionosphere	Dual-frequency altimeter range measurement			GIM [Ijima et al., 1999]	
Wet troposphere	From AMR radiometer Neural Network correction (3 entries), [Féry et al. in prep]		From S3A-AMR radiometer	Neural Network correction (5 entries) [Picard et al., in prep]	From ECMWF model
Dry troposphere	Model based on ECMWF Gaussian grids				
Combined atmospheric correction	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				
Ocean tide	FES2014b [Carrère et al., 2015]				
Internal tide	M2/ /K1/O1/S2 [Zaron, 2019]				
Solid Earth tide	Elastic response to tidal potential [Cartwright and Tayler, 1971], [Cartwright and Edden, 1973]				
Pole tide	[DESAI, 2017]				
MSS	CNES-CLS-2015 [Pujol et al, 2016]		HPM LR-RMC [Dibarboure et al, 2019]	CNES-CLS-2015 [Pujol et al, 2016]	
MDT	CNES_CLS18 [Rio et al., 2018, 2019] and regional SMDT_MED_2014 MDT for the Mediterranean Sea [Rio et al, 2014b]				

Table 2: Standards of the different corrections applied on altimeter measurements used in v02_00.

2.1.4 Along-track (L3) products generation

The L3 products are along-track products selected and cross-calibrated.

2.1.4.1 SLA computation

The Sea Level Anomalies (SLA) are used in oceanographic studies. They are computed from the difference of the instantaneous SSH minus a temporal reference. The temporal reference used in the DUACS Experimental production is a gridded Mean Sea Surface (MSS) (see the Table 1 and Table 2).

2.1.4.2 Along track noise filtering

The filtering processing consists in removing from along-track measurements the noise signal and short wavelength affected by this noise. This processing consists in a low-pass filtering with a cut-off wavelength defined over the regional area considered (see the following table for different altimeter cut-off). This cut-off wavelengths come from regional studies with spectral analysis in order to preserve as much as possible the short wavelength signal. In v01_00, a methodology derived from Dufau et al (2016) was used, leading to optimistic observable wavelengths. In v02_00, the methodology proposed by Vergara et al (2019), with a more precise adjustment of the spectral slope, was used. This led to more realistic observable wavelengths.

The filtered along-track products are subsampled before the delivery in order to keep every fourth point along the tracks and height for SARAL/AltiKa, leading to a nearly 1 km distance between successive points (5Hz sampling).

Version	Satellite	OSTM/ Jason-2	Jason-3	Sentinel-3A	SARAL/ ALtiKa	Cryosat-2
01_00	North Atlantic area	45	35	30	30	35
01_00	Agulhas area	55	50	45	40	50
02_00	North Atlantic area	55	55	35	40	40

Table 3: Cut-off wavelengths (unit: km) used for along-track noise filtering

2.2 Product Description

2.2.1 Area of interest

Several areas have been defined as follows:

Area	latitudes	longitudes
north_atlantic v01_00	10°N/88°N	98°W/42°E
north_atlantic v02_00	Same as in v01_00+ Arctic Ocean for latitudes>50°	
agulhas	45°S/20°S	8°E/38°E

Table 4. Geographical characteristics of along-track SLA 5Hz.

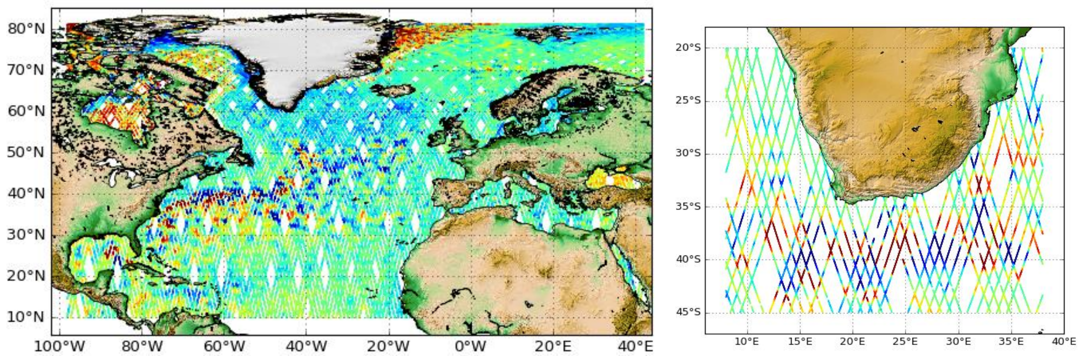

Figure 3: Geographical coverage of Along-track (level3) Sea Level Anomalies at 5 Hz for north atlantic v01_00 [10°N/88°N-98°W/42°E] (left) and agulhas [45°S/20°S-8°E/38°E] (right) with 20 days of Sentinel-3A Sea Level Anomalies

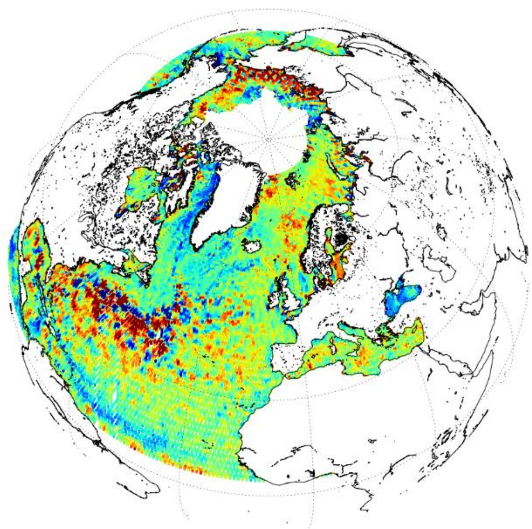

Figure 4: Geographical coverage of Along-track (level3) Sea Level Anomalies at 5 Hz for v02_00 in North Atlantic including Arctic area, with 27 days of Sentinel-3A Sea Level Anomalies in September 2017.

2.2.2 Temporal availability

One file per day is delivered.

Altimeter mission	Start dates	End dates
Jason-3	2016/03/28	2017/03/29
OSTM/Jason-2	2015/01/01	2016/02/29
Saral/AltiKa	2015/01/01	2017/02/03
Cryosat-2	2015/01/01	2015/12/31
Sentinel-3A	2016/04/06	2017/04/17

Table 5 Temporal availability of along-track SLA 5Hz products V01_00.

Altimeter mission	Start dates	End dates
Jason-3	2016/05/12	2018/12/23
OSTM/Jason-2 interleaved	2016/10/13	2017/05/17
OSTM/Jason-2 LRO	2017/07/11	2018/12/23
Saral/AltiKa	2016/07/04	2018/12/23
Cryosat-2	2016/05/23	2018/12/23
Sentinel-3A	2016/07/01	2018/12/23

Table 6: Temporal availability of along-track SLA 5Hz products V02_00.

2.2.3 Nomenclature

This is the generic model of filename :

dt_hr_<zone>_<mission>_phy_vfec_<dataset_date>_ <production_date>.nc

The products name components are:

- The type of data timeliness dt=delayed-time
- <zone>=area (north_atlantic or agulhas)
- <mission> mission taken into account:
  - s3a: Sentinel-3A
  - al or alg: Saral/AltiKa or Saral/AltiKa Drifting phase
  - j2 or j2n: OSTM/Jason-2 or OSTM/Jason-2 interleaved
  - j2g: OSTM/Jason-2 Long Repeat Orbit (LRO)
  - c2: Cryosat-2
  - j3: Jason-3
- The date of the dataset YYYYMMDD: <dataset_date>
- The date of the production YYYYMMDD: <end_date>

2.2.4 Format

All the 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.

2.2.4.1 Dimensions

The defined dimension is:

- **time:** number of measurements in current file.

2.2.4.2 Data Handling Variables

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

Name of variable	Type	Content	Unit
time	double	Time of measurements	seconds since 1950-01-01 00:00:00 UTC
latitude	int	Latitude value of measurements	degrees_north
longitude	int	Longitude value of measurements	degrees_east
cycle	short	Cycle the measurement belongs to	-
track	short	Track the measurement belongs to	-
iw	short	Internal Wave surface signature component from Ray and Zaron 2016 - M2	meters
ib_lf	short	Low Frequency component of the inverse barometer	meters
lwe	short	Long Wavelength Error	meters
dac	short	Dynamic atmospheric correction	meters
ocean_tide	short	Ocean tide height	meters
mdt	short	Mean dynamic topography	meters
mdt_velocity	short	Absolute geostrophic velocity on the across-track direction	meters/second
sla_filtered	short	Sea Level Anomaly relative to MSS	meters
sla_velocity	short	Anomaly of the geostrophic velocity on the across-track direction	meters/second

Table 7. Overview of data handling variables in Along-track 5Hz NetCDF file.

2.2.4.3 Attributes

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

3 Products accessibility

The products are available via the authenticated **Aviso+ FTP (online products)**:

- You first need to register via the Aviso+ web portal and sign the License Agreement: https://www.aviso.altimetry.fr/en/data/data-access/registration-form.html
- You have to choose the product **"Ssalto/Duacs Experimental products: along-track and gridded Sea Level Heights and velocities"** in the list of products

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

4 Contacts

For more information, please contact:

Aviso+ User Services
CLS
11 rue Hermès
Parc Technologique du canal
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.

5 Examples of files

5.1 Along-track 5Hz

```
netcdf dt_hr_AtlanticN_s3a_sla_vfec_20170418_20171113 {
dimensions:
	time = 37365 ;
variables:
	double time(time) ;
		time:units = "days since 1950-01-01 00:00:00 UTC" ;
		time:long_name = "Time of measurement" ;
		time:standard_name = "time" ;
		time:axis = "T" ;
	int longitude(time) ;
		longitude:units = "degrees_east" ;
		longitude:long_name = "Longitude of measurement" ;
		longitude:standard_name = "longitude" ;
		longitude:scale_factor = 1.e-06 ;
		longitude:add_offset = 0. ;
	int latitude(time) ;
		latitude:units = "degrees_north" ;
		latitude:long_name = "Latitude of measurement" ;
		latitude:standard_name = "latitude" ;
		latitude:scale_factor = 1.e-06 ;
		latitude:add_offset = 0. ;
	short cycle(time) ;
		cycle:units = "1" ;
		cycle:long_name = "Cycle the measurement belongs to" ;
		cycle:coordinates = "longitude latitude" ;
	short track(time) ;
		track:units = "1" ;
		track:long_name = "Track in cycle the measurement belongs to" ;
		track:coordinates = "longitude latitude" ;
	short dac(time) ;
		dac:units = "m" ;
		dac:_FillValue = 32767s ;
		dac:coordinates = "longitude latitude" ;
		dac:long_name = "Dynamic Atmospheric Correction" ;
		dac:scale_factor = 0.001 ;
		dac:add_offset = 0. ;
		dac:comment = "The sla in this file is already corrected for the dac; the uncorrected sla can be computed as
follows: [uncorrected sla]=[sla]+[dac]" ;
		dac:standard_name = "sea_surface_height_correction_due_to_air_pressure_and_wind_at_high_frequency" ;
	short iw(time) ;
		iw:units = "m" ;
		iw:_FillValue = 32767s ;
		iw:coordinates = "longitude latitude" ;
		iw:long_name = "Internal Wave surface signature component from Ray and Zaron 2016 - M2" ;
		iw:scale_factor = 0.001 ;
		iw:add_offset = 0. ;
		iw:comment = "The sla in this file is not corrected with the iw component; the corrected sla can be computed as
follows: [corrected sla]=[sla]-[iw]" ;
	short ocean_tide(time) ;
		ocean_tide:units = "m" ;
		ocean_tide:_FillValue = 32767s ;
		ocean_tide:coordinates = "longitude latitude" ;
		ocean_tide:long_name = "Ocean tide model" ;
		ocean_tide:scale_factor = 0.001 ;
```

```
		ocean_tide:add_offset = 0. ;
		ocean_tide:comment = "The sla in this file is already corrected for the ocean_tide; the uncorrected sla can be computed as follows: [uncorrected sla]=[sla]+[ocean_tide]" ;
		ocean_tide:standard_name = "sea_surface_height_amplitude_due_to_geocentric_ocean_tide" ;
	short ib_lf(time) ;
		ib_lf:units = "m" ;
		ib_lf:_FillValue = 32767s ;
		ib_lf:coordinates = "longitude latitude" ;
		ib_lf:long_name = "Low Frequency component of the inverse barometer" ;
		ib_lf:scale_factor = 0.001 ;
		ib_lf:add_offset = 0. ;
		ib_lf:comment = "The dac in this file includes the ib_lf and the hight frequency sea surface height from MOG2D model: [dac]=[MOG2D_hf]+[ib_lf]" ;
		ib_lf:standard_name = "sea_surface_height_correction_due_to_air_pressure_at_low_frequency" ;
	short sla_velocity(time) ;
		sla_velocity:units = "m/s" ;
		sla_velocity:_FillValue = 32767s ;
		sla_velocity:coordinates = "longitude latitude" ;
		sla_velocity:long_name = "Anomaly of the geostrophic velocity on the across-track direction" ;
		sla_velocity:scale_factor = 0.001 ;
		sla_velocity:add_offset = 0. ;
	short mdt_velocity(time) ;
		mdt_velocity:units = "m/s" ;
		mdt_velocity:_FillValue = 32767s ;
		mdt_velocity:coordinates = "longitude latitude" ;
		mdt_velocity:long_name = "Absolute geostrophic velocity on the across-track direction" ;
		mdt_velocity:scale_factor = 0.001 ;
		mdt_velocity:add_offset = 0. ;
	short sla_filtered(time) ;
		sla_filtered:units = "m" ;
		sla_filtered:_FillValue = 32767s ;
		sla_filtered:coordinates = "longitude latitude" ;
		sla_filtered:long_name = "Sea Level Anomaly filtered" ;
		sla_filtered:scale_factor = 0.001 ;
		sla_filtered:add_offset = 0. ;
		sla_filtered:comment = "The sea level anomaly is the sea surface height above mean sea surface height; the uncorrected sla can be computed as follows: [uncorrected sla]=[sla]+[dac]+[ocean_tide]-[lwe]" ;
		sla_filtered:standard_name = "sea_surface_height_above_sea_level" ;
	short mdt(time) ;
		mdt:units = "m" ;
		mdt:_FillValue = 32767s ;
		mdt:coordinates = "longitude latitude" ;
		mdt:long_name = "Mean Dynamic Topography" ;
		mdt:scale_factor = 0.001 ;
		mdt:add_offset = 0. ;
		mdt:comment = "The mean dynamic topography is the sea surface height above geoid; it is used to compute the absolute dynamic topography adt=sla+mdt" ;
	short lwe(time) ;
		lwe:units = "m" ;
		lwe:_FillValue = 32767s ;
		lwe:coordinates = "longitude latitude" ;
		lwe:long_name = "Long Wavelength Error" ;
		lwe:scale_factor = 0.001 ;
		lwe:add_offset = 0. ;
		lwe:comment = "The sla in this file is already corrected for the lwe; the uncorrected sla can be computed as follows: [uncorrected sla]=[sla]-[lwe]" ;

// global attributes:
		:cdm_data_type = "Swath" ;
		:title = "Ocean Along track Sea Surface Height and derived L3 product" ;
		:summary = "This dataset contains Near Real Time Level-3  sea surface height above ellipsoid and derived products from Sentinel-3A observations over Global Ocean" ;
```

: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]+[dac]+[ocean_tide]-[lwe]" ;
:time_coverage_resolution = "P1D" ;
:product_version = "1.0.0" ;
:institution = "CNES, CLS" ;
:project = "SSALTO/DUACS" ;
:references = "http://www.aviso.altimetry.fr" ;
:contact = "aviso@altimetry.fr" ;
:license = "http://www.aviso.altimetry.fr/fileadmin/documents/data/License_Aviso.pdf" ;
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:history = "13-Nov-2017 13:37:19 UTC : creation" ;
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:geospatial_vertical_max = "0" ;
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:first_meas_time = 24579.0011919781 ;
:last_meas_time = 24579.9864538634 ;

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