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Product User Guide

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Issue:	Date:	Reason for change:	Author
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1.1	18/11/19	ESA review comments	JF Legeais (CLS)
1.2	5/01/20	Extension with Jason-3	F. Léger (LEGOS)
1.3	25/05/20	SLA and trends product at selected sites (sec. 4)	Y. Gouzenes (LEGOS)
1.4	11/03/21	Temporal J3 extension + new zones	F. Léger (LEGOS)
1.5	15/04/21	Addition of Envisat and SARAL/AltiKa	F. Léger (LEGOS)
1.6	24/01/22	New coastal product v2.1: Update of along-track coastal sea level time series and trends with temporal extension up to Dec. 2019 and addition of American coasts, plus some new regions around Africa; New data selection and creation of a new set of virtual coastal stations (section 5).	Y. Gouzènes, A. Cazenave, F. Léger (LEGOS)
1.7	03/01/2023	New coastal product v2.2: Update of the V2.1 product based on a few minor improvements brought to the data.	Y. Gouzenes, A. Cazenave (LEGOS)

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Figure 4: Sea level trends against distance to coast from the version 2.2. Upper panel: Mississippi delta. Lower panel: Irrawaddy delta.

List of Acronyms

ALES	Adaptive Leading Edge Subwaveform
ESA	European Space Agency
CCI	Climate Change Initiative
CTOH	Centre of Topography of the Oceans and Hydrosphere
GDR	Geophysical Data Record
GPD	GNSS Path Delay we troposphere correction
GSHHS	Global Self-consistent, Hierarchical, High-resolution Geography database
Level 2P	Level 2 Plus altimeter data (after editing and validation)
RADS	Radar Altimeter Database System
SLA	Sea Level Anomaly
SSH	Sea Surface Height
X-TRACK	Altimeter production system developed by CTOH

1. Introduction

In the context of the ESA's climate change initiative sea-level project, the Centre of Topography of the Oceans and the Hydrosphere (CTOH, http://ctoh.legos.obs-mip.fr) produces a Level 2P multi-mission altimeter along-track sea level product in some coastal regions. The product benefits from the spatial resolution provided by high-rate data, the Adaptive Leading Edge Subwaveform Retracker (ALES, *Passaro et al.*; 2014, 2015, 2017) and the post-processing strategy of the X-TRACK algorithm (*Birol et al.*, 2017, adapted to 20 Hz data as in *Birol and Delebecque*, 2014) both developed for the processing of coastal altimetry data, as well as the best possible set of geophysical corrections.

The main objective of this product is to provide accurate altimeter Sea Level Anomalies (SLA) time series as close to the coast as possible.

By merging X-TRACK and ALES altimetry processing tools, we compute 20-Hz along-track sea surface height (SSH) time series for Envisat, Jason-1, Jason-2 and Jason-3 missions and 40-Hz along-track SSH time series for SARAL/AltiKa mission. The X-TRACK software reprocesses corrections and parameters from delayed-time geophysical data records provided by space agencies (GDR products) and combines them with the ALES retracker product (range, sigma0 and sea state bias) to compute the SSH, after a robust editing of the measurements and corrections (described in Birol et al., 2017). The full data processing is explained in Birol et al. (2021) and Benveniste et al. (2020).

This document describes the information required to use the different coastal sea level products. Two recent updates (versions v2.1 and v2.2) of the initial version v1.1 of along-track coastal sea level time series and associated trends are presented below. They differ from the v1.1 product by: (1) a temporal extension up to 31 December 2019 and addition of American coasts, plus some new regions around Africa; and (2) new data selection and creation of a new set of virtual coastal stations. The v2.2 product is an updated version of v2.1, based on an optimization of the intermission bias calculation and improvement of some geophysical corrections. We strongly recommend to the users to use the v2.2 product.

Section 2 describes the altimeter standards used for the SLA computation; section 3 describes the regional along-track coastal sea level product valid for the two versions v2.1 and v2.2; section 4 presents the updates brought to the v2.2 product (compared to v2.1). Section 5 shows two examples of coastal sea level trends against distance to coast (version 2.2). These products provide a set of 756 altimetry-based virtual coastal stations and associated sea level data which can be used for studying long-term coastal sea level trends (Cazenave et al., 2022).

2. Altimeter standards used for v2.1 and v2.2

The Jason-1, Jason-2 and Jason-3 data used by the X-TRACK software are based, respectively, on the GDR-E and GDR-D products. The Envisat data used are the reprocessed GDR v2.1 and the SARAL/AltiKa data are from GDR-T. The range and sea state bias are provided by the ALES retracker product. The ocean tide and DAC corrections come from the RADS database. The wet tropospheric correction used is GPD+ (*Fernandes and Lazaro,* 2016), provided by the University of Porto. The list of the parameters used in the computation of the SSH data is provided in the table below. Note that the mean sea surface used to compute the sea level anomalies is an area-averaged mean SSH and is thus not considered as an input dataset.

Parameter	**Source**	**Jason-1**	**Jason-2**	**Jason-3**	**Envisat**	**SARAL**
L2 standards	GDR	GDR-E	GDR-E	GDR-D	GDR V2.1	GDR-T
Altitude	GDR	Altitude of satellite				
Range	ALES	20 Hz ku band ALES corrected altimeter range (*Passaro et al.*, 2014)				
Ionosphere	GDR	From dual-frequency altimeter range measurements, further filtered by X-TRACK			From GIM model (Iijima et al. 1999)	
Dry troposphere	GDR	From ECMWF model				
Wet troposphere	GPD+	GPD+ radiometer correction (*Fernandes and Lazaro*, 2016)				
Sea state bias	ALES	Sea state bias correction in ku band, ALES retracking (*Passaro et al.*, 2018)				
Solid tide	RADS	From tide potential model (*Cartwright and Taylor*, 1971, *Cartwright and Eden*, 1973)				
Pole tide	GDR	From *Wahr*, 1985				
Loading effect	RADS	From FES 2014 (*Carrere et al.*, 2012)				
Atmospheric correction	RADS	From MOG2D-G high frequencies (*Carrere and Lyard,* 2003) + inverse barometer				
Ocean tide	RADS	From FES 2014 (*Carrere et al.*, 2012) including ocean tide, long period equilibrium tide, S1 tide				

3. Along-track coastal sea level anomalies and trends: Jan. 2002-Dec. 2019; v2.1 product

The coastal sea level trend product is product is a 18-year-long, high-resolution (20 Hz), along-track sea level dataset in coastal zones of thirteen regions shown in Figure 1: Northeast Atlantic, Mediterranean Sea, West Africa, Benguela, Southeast Africa, North Indian Ocean, Southeast Asia, Australia, Northwest America, Gulfstream, Caribbean, Atlantic South America and Humboldt. The present reprocessing has consisted of recomputing altimeter ranges of high-resolution (20 Hz, i.e., 300 m resolution) along-track altimetry data of the successive missions Jason-1, 2 and 3 over the **January 2002-December 2019 time span**, using the Adaptive Leading-Edge Subwaveform (ALES) retracking method. The ALES retracking also retrieves one of the geophysical corrections applied to the range measurements, the so-called sea state bias, that depends on the significant wave height, also derived from the radar echoes. Additional post-processing consists of applying adapted geophysical corrections for the coastal zones, dedicated inter-bias missions, editing, etc. This new data set, validated against tide gauges where possible, provides coastal sea level anomalies and sea level trends against distance to the coast, every 300 m along track, over January 2002 to December 2019. With this reprocessing, it is possible to provide reliable sea level time series around global coastlines. Hereinafter, we define as **'virtual' coastal stations** the sites where the Jason tracks cross the coastline. The data validation step used same criteria as for product v1.1. Note that for product v2.1, we have updated the virtual stations located within 6 km from the coast. This has led to the production of 756 virtual stations (Cazenave et al., 2022). Figure 2 shows the closest distance to the coast reached by the first valid point along the satellite tracks in the study regions.

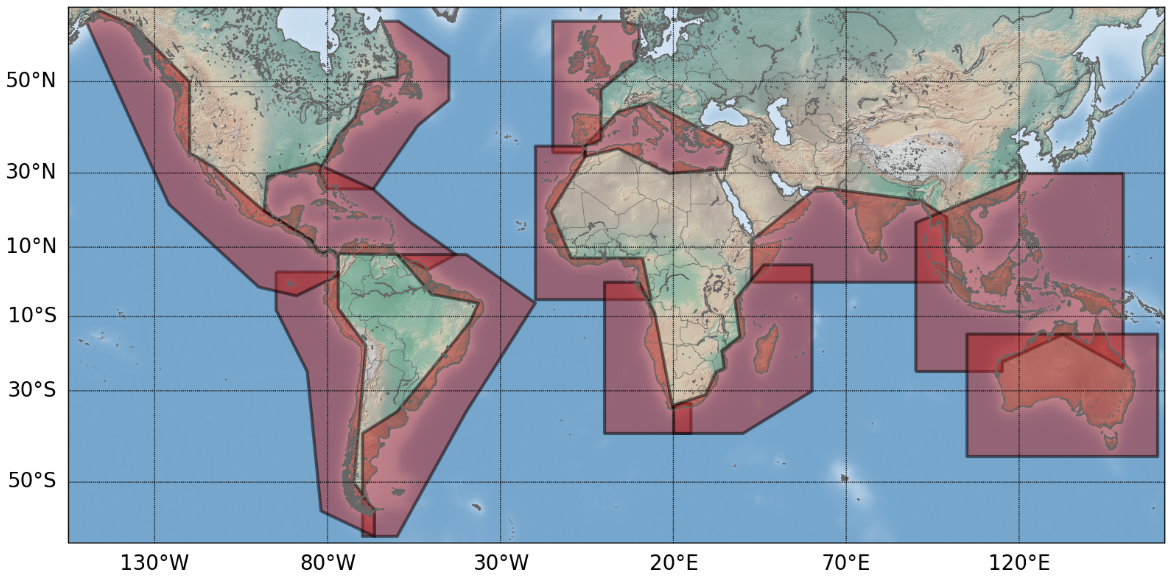

Figure 1: The regions covered by the along-track coastal sea level product.

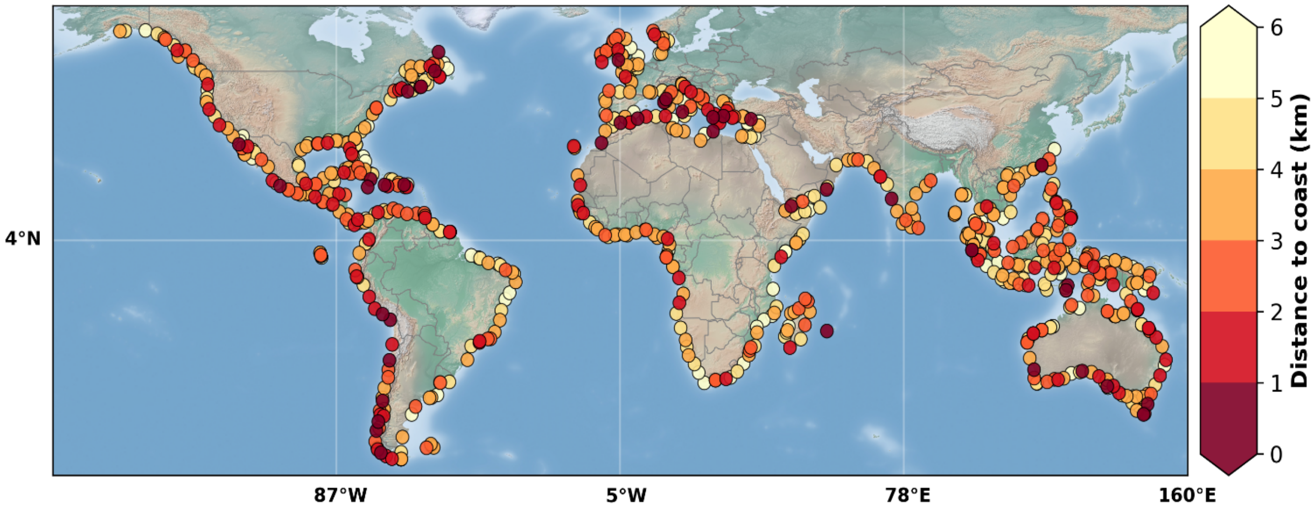

Figure 2: Closest distance (km) to coast reached by the first valid point along the Jason tracks for the 756 selected virtual stations.

3.1. Nomenclature update

The nomenclature used for this version **2.1 product** is:
ESACCI-SEALEVEL-IND-MSLTR-MERGED-<ZONE>_JA_<PassNumber>_<StationNumber>-<ProductionDateYYYYMMDD>-fv02.1.nc

Where <ZONE> is one of:

MED_SEA, for the Mediterranean Sea, 30°N/46°N, -6°E/37°E

NE_ATL, for the North East Atlantic Ocean, 35°N/60°N, -15°E/10°E

N_INDIAN, North Indian Ocean, 0°N/26,5°N, 42,5°E/99°E

S_AUSTRALIA, South Australia, -45°N/-15°N, 105°E/160°E

SE_ASIA, Southeast Asia, -25°N/30°N, 90°E/150°E

WAFRICA for West Africa, -5°N /36.6°N, -20°E /13.5°E

BENGUELA for Southwest Africa, -40°N/0°N, 0°E/25°E

SE_AFRICA for Southeast Africa, -40°N /5°N, 20°E /60°E

NW_AMERICA for Northwest America, -3.9°N /61.5°N, -150°E /-77°E

GULFSTREAM for Northeast America, 26°N /60°N, -82.5°E /-45°E

CARIBBEAN for Caribbean region including Gulf of Mexico, 3.6°N /32.5°N, -98.45°E /-43°E

ASA for Southeast America, -59°N /8°N, -70°E /-20°E

HUMBOLDT for Southwest America, -59°N /3°N, -95°E /66.5°E

<PassNumber> is the Jason track number

<StationNumber> is the site number on the track numbered from north to south

For example, the time series data associated with track 222 station number 2 in the North East Atlantic Ocean, produced on 2022/01/24 is found in a file whose name is:

ESACCI-SEALEVEL-IND-MSLTR-MERGED-**NE_ATL**_JA_**222_02**-20220124-fv02.1.nc

3.2. Format

NetCDF (network Common Data Form) is an interface for array-oriented data access and a library that provides an implementation of the interface. The NetCDF library also defines a machine-independent format for representing scientific data.

Together, the interface, library, and format support the creation, access, and sharing of scientific data. The NetCDF software was developed at the Unidata Program Center in Boulder, Colorado. The NetCDF libraries define a machine-independent format for representing scientific data. Please see Unidata NetCDF pages for more information, and to retrieve NetCDF software on: https://www.unidata.ucar.edu/software/netcdf/

3.3. Data handling variable

Variables	**Description**
lat	Latitude of each 20 Hz point
lon	Longitude of each 20 Hz point
distance_to_coast	Distance to a reference point at the coast of each 20 Hz point. This reference point is the point of the track closest to the coastline.
time	Time of measurements (days since 1950-01-01)
sla	Monthly sea level anomaly (SLA) time series over 1 January 2002 to 31 December 2019 derived from the original 10-day X-TRACK/ALES SLA after post-processing at each 20 Hz point along-track (from 20 km offshore to the coast). Annual and inter-annual signals have been removed.
local_sla_trend	Sea level trends computed from the monthly SLAs time series at each 20 Hz point in the along-track direction (from 20 km offshore to the coast).
local_sla_trend_error	Sea level trend error at each 20 Hz point in the along-track direction, based on the standard error of the slope regression coefficient (computed as the root square of the diagonal of the covariance matrix of the regression coefficients).

3.4. NetCDF Header update; v2.1 product

3.4.1. Global attributes; v2.1 product

Product name = ESACCI-SEALEVEL-IND-MSLTR-MERGED-NE_ATL_JA_035_01-20220124-fv02.1.nc

// global attributes:

:title = "SL_cci+ L3 X-TRACK/ALES Altimeter Sea Level Trends in the region " ;

:institution = "ESA, CTOH/LEGOS, Toulouse Univ., CNRS, IRD, CNES, UPS, France" ;

:source = "Jason-1 GDR-E, Jason-2 GDR-D, Jason-3 GDR-D, RADS 4.0, ALES" ;

:history = "2022-01-18 generated by X-TRACK v.1.06" ;

:references = https://climate.esa.int/en/projects/sea-level/data/"" ;

:tracking_id = "bb6907ce-1906-42c2-8df1-acf89b190b23" ;

:Conventions = "CF-1.7" ;

:version = "X-TRACK/ALES" ;

:pass_number = "035" ;

:site_number = "01" ;

:product_version = "2.1" ;

:summary = "This dataset contains 20 Hz regional sea level trends computed from monthly sea level anomalies combining ALES retracker and post-processing strategy of X-TRACK from 20 km offshore to the coast" ;

:keywords = "satellite, ocean, coastal altimetry" ;

:id = "ESACCI-SEALEVEL-IND-MSLTR-MERGED-NE_ATL_JA_035_01-20220124-fv02.1.nc" ;

:naming_authority = "ESA CCI+" ;

:keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard Names" ;

:cdm_data_type = "Trajectory" ;

:comment = "These data were produced at LEGOS as part of the ESA SL_CCI+ project." ;

:date_created = "2022-01-24" ;

:creator_name = "CTOH/LEGOS, Toulouse Univ., CNRS, IRD, CNES, UPS, France" ;

:creator_url = “https://climate.esa.int/en/projects/sea-level/data/” ;

:creator_email = "info-sealevel@esa-sealevel-cci.org" ;

:project = "Sea Level Climate Change Initiative – European Space Agency" ;

:geospatial_lat_min = "36.1577 " ;

:geospatial_lat_max = "36.2846 " ;

:geospatial_lon_min = "-6.26852 " ;

:geospatial_lon_max = "-6.18904 " ;

:geospatial_vertical_min = "0" ;

:geospatial_vertical_max = "0" ;

:time_coverage_start = "2002-01-01" ;

:time_coverage_end = "2019-12-31" ;

:time_coverage_duration = "P18Y" ;

:time_coverage_resolution = "P1M" ;

:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table v67" ;

:license = "ESA CCI Data Policy: free and open access" ;

:platform = "Jason-1, Jason-2 and Jason-3" ;

:sensor = "Poseidon-2, Poseidon-3 and Poseidon-3B" ;

:spatial_resolution = "350 m" ;

:geospatial_lat_units = "degrees_north" ;

:geospatial_lon_units = "degrees_east" ;

:key_variables = "local_sla_trend" ;

}

3.5.

3.5.1. Variables attributes

variables:

float distance_to_coast(nbpoints) ;

distance_to_coast:_FillValue = 1.844674e+19f ;

distance_to_coast:long_name = "Distance to GSHHS 1.3 coastline" ;

distance_to_coast:units = "m" ;

distance_to_coast:distance_to_coast_min = 4053.74f ;

distance_to_coast:distance_to_coast_max = 19888.5f ;

distance_to_coast:comment = "Distance along track to a reference point at the coast " ;

float lat(nbpoints) ;

lat:long_name = "Latitude" ;

lat:standard_name = "latitude" ;

lat:units = "degrees_north" ;

lat:lat_min = 36.1577f ;

lat:lat_max = 36.2846f ;

float lon(nbpoints) ;

lon:long_name = "Longitude" ;

lon:standard_name = "longitude" ;

lon:units = "degrees_east" ;

lon:lon_min = -6.26852f ;

lon:lon_max = -6.18904f ;

double time(nbmonth) ;

time:_FillValue = 99.9999 ;

time:units = "days since 1950-1-1" ;

time:calendar = "julian" ;

time:long_name = "Time" ;

time:standard_name = "time" ;

float local_sla_trend(nbpoints) ;

local_sla_trend:_FillValue = 1.844674e+19f ;

local_sla_trend:long_name = "Geographical distribution of sea level trends" ;

local_sla_trend:standard_name = "tendency_of_sea_surface_height_above_sea_level" ;

local_sla_trend:units = "mm/year" ;

local_sla_trend:comment = "Sea level trends computed from X-TRACK/ALES monthly sea level anomalies between 2002-01-01 and 2019-12-31" ;

float local_sla_trend_error(nbpoints) ;

local_sla_trend_error:_FillValue = 1.844674e+19f ;

local_sla_trend_error:long_name = "Geographical distribution of sea level trends errors" ;

local_sla_trend_error:units = "mm/year" ;

local_sla_trend_error:add_offset = 0.f ;

local_sla_trend_error:scale_factor = 1.f ;

float sla(nbpoints, nbmonth) ;

sla:_FillValue = 1.844674e+19f ;

sla:units = "m" ;

sla:standard_name = "sea_surface_height_above_mean_sea_level" ;

sla:comment = "The sla are monthly averaged and annual and semi-annual cycles are removed. sla = altitude of satellite - 20 Hz Ku band ALES corrected altimeter range (Passaro et al. 2014) - altimeter ionospheric correction on Ku band (From dual-frequency altimeter range measurements) - model dry tropospheric correction (From ECMWF model) - GPD+ wet tropospheric correction (Fernandes et al. 2015) - sea state bias correction in Ku band (ALES retracking, Passaro et al. 2014) - solid earth tide height (From RADS, tide potential model, Cartwright and Taylor 1971, Cartwright and Edden 1973) - geocentric ocean tide (FES 2014 from RADS, Carrere et al. 2012) - geocentric pole tide height (Wahr 1985) - Atmospheric correction (From RADS, Carrere and Lyard 2003) - X-TRACK mean sea surface (Birol et al. 2017). Each corrective term is edited following Birol et al. 2017."

4. V2.2 product: Updated along-track coastal sea level anomalies and trends; Improvement of the intermission bias calculation and improvement of the corrections applied in the SSH calculation

In this update, we optimized the calculation method of the intermission bias.
The bias Jason-1/Jason-2 and Jason-2/Jason-3 are now directly calculated on the SLAs of the individual missions. We filter and edit the SLAs before calculating the bias on the SSH. In addition, the smoothing parameters are also increased, via 4°x4° boxes and smoothed on 3 neighbouring boxes in all directions.
The v2.2 update also corrects a problem detected in the interpolation of the corrections applied to the SSH calculation very close to the coast. This problem has mainly affected the dry tropospheric correction at the few closest points to the coast where significant coastal relief is observed. This has impacted trend estimates when the satellite approaches the coast (about 73 coastal sites among the 756 sites). Figure 3 compares the coastal trend behaviour before and after the correction (i.e., between v2.1 and v2.2). However, on average, the impact on trends values is small.

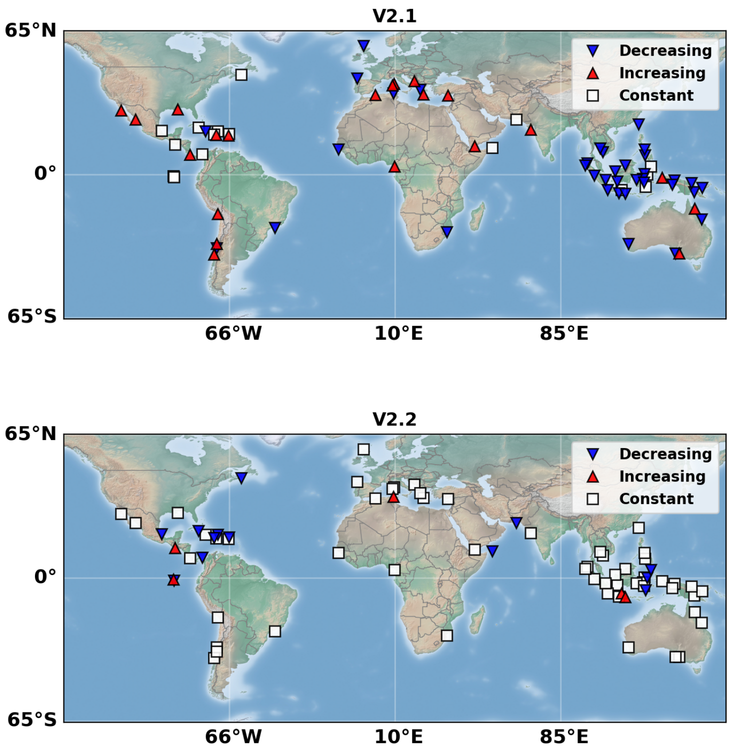

Fig 3. Behaviour of the trends approaching the coast where the trends behaviour has changed between V2.1 (top panel) and V2.2 (bottom panel). Red triangle upward means the trend along-track increases from open ocean to the coast. Blue triangle downward means the trend along-track decreases close to the coast. White squares correspond to constant trends all along the track.

4.1 Global Attributes; v2.2 product

Product name = ESACCI-SEALEVEL-IND-MSLTR-MERGED-NE_ATL_JA_035_01-20221220-fv02.2.nc

```
// global attributes:
        :title = "SL_cci+ L3 X-TRACK/ALES Altimeter Sea Level Trends in the region NE_ATL" ;
        :institution = "ESA, CTOH/LEGOS, Toulouse Univ., CNRS, IRD, CNES, UPS, France" ;
        :source = "Jason-1 GDR-E, Jason-2 GDR-D, Jason-3 GDR-D, RADS 4.0, ALES" ;
        :history = "2022-12-20 generated by X-TRACK v.1.06" ;
        :references = "https://climate.esa.int/en/projects/sea-level/data/" ;
        :tracking_id = "076f9cb0-8d05-4bd8-9081-33ee0b978224" ;
        :Conventions = "CF-1.7" ;
        :version = "X-TRACK/ALES" ;
        :pass_number = "035" ;
        :site_number = "01" ;
        :product_version = "2.2" ;
        :summary = "This dataset contains 20 Hz regional sea level trends computed  from monthly sea level anomalies combining ALES retracker and  post-processing strategy of X-TRACK from 20 km offshore to the coast" ;
        :keywords = "satellite, ocean, coastal altimetry" ;
        :id = "ESACCI-SEALEVEL-IND-MSLTR-MERGED-NE_ATL_JA_035_01-20221220-fv02.2.nc" ;
        :naming_authority = "ESA CCI+" ;
        :keywords_vocabulary = "NetCDF COARDS Climate and Forecast Standard Names" ;
        :cdm_data_type = "Trajectory" ;
        :comment = "These data were produced at LEGOS as part of the ESA SL_CCI+ project." ;
        :date_created = "2022-12-20" ;
        :creator_name = "CTOH/LEGOS, Toulouse Univ., CNRS, IRD, CNES, UPS, France" ;
        :creator_url = "https://climate.esa.int/en/projects/sea-level/data/" ;
        :creator_email = "info-sealevel@esa-sealevel-cci.org" ;
        :project = "Sea Level Climate Change Initiative – European Space Agency" ;
        :geospatial_lat_min = "36.1577 " ;
        :geospatial_lat_max = "36.2846 " ;
        :geospatial_lon_min = "-6.26852 " ;
        :geospatial_lon_max = "-6.18904 " ;
        :geospatial_vertical_min = "0" ;
        :geospatial_vertical_max = "0" ;
        :time_coverage_start = "2002-01-01" ;
        :time_coverage_end = "2019-12-31" ;
        :time_coverage_duration = "P18Y" ;
        :time_coverage_resolution = "P1M" ;
```

:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table v67" ;
:license = "ESA CCI Data Policy: free and open access" ;
:platform = "Jason-1, Jason-2 and Jason-3" ;
:sensor = "Poseidon-2, Poseidon-3 and Poseidon-3B" ;
:spatial_resolution = "350 m" ;
:geospatial_lat_units = "degrees_north" ;
:geospatial_lon_units = "degrees_east" ;
:key_variables = "local_sla_trend" ;
}

4.2 Variables attributes; v2.2 product

variables:
float distance_to_coast(nbpoints) ;
distance_to_coast:_FillValue = 1.844674e+19f ;
distance_to_coast:long_name = "Distance to GSHHS 1.3 coastline" ;
distance_to_coast:units = "m" ;
distance_to_coast:distance_to_coast_min = 4053.74f ;
distance_to_coast:distance_to_coast_max = 19888.5f ;
distance_to_coast:comment = "Distance along track to a reference point at the coast " ;
float lat(nbpoints) ;
lat:long_name = "Latitude" ;
lat:standard_name = "latitude" ;
lat:units = "degrees_north" ;
lat:lat_min = 36.1577f ;
lat:lat_max = 36.2846f ;
float lon(nbpoints) ;
lon:long_name = "Longitude" ;
lon:standard_name = "longitude" ;
lon:units = "degrees_east" ;
lon:lon_min = -6.26852f ;
lon:lon_max = -6.18904f ;
double time(nbmonth) ;
time:_FillValue = 99.9999 ;
time:units = "days since 1950-1-1" ;
time:calendar = "julian" ;
time:long_name = "Time" ;
time:standard_name = "time" ;
float local_sla_trend(nbpoints) ;
local_sla_trend:_FillValue = 1.844674e+19f ;
local_sla_trend:long_name = "Geographical distribution of sea level trends" ;
local_sla_trend:standard_name = "tendency_of_sea_surface_height_above_sea_level" ;
local_sla_trend:units = "mm/year" ;

local_sla_trend:comment = "Sea level trends computed from X-TRACK/ALES monthly sea level anomalies between 2002-01-01 and 2019-12-31" ;
float local_sla_trend_error(nbpoints) ;
local_sla_trend_error:_FillValue = 1.844674e+19f ;
local_sla_trend_error:long_name = "Geographical distribution of sea level trends errors" ;
local_sla_trend_error:units = "mm/year" ;
float sla (nbpoints, nbmonth) ;
sla:FillValue = 1.844674e+19f ;
sla:units = "m" ;
sla:standard_name = "sea_surface_height_above_mean_sea_level" ;
sla:comment = "The sla are monthly averaged and annual and semi-annual cycles are removed. sla = altitude of satellite - 20 Hz Ku band ALES corrected altimeter range (Passaro et al. 2014) - altimeter ionospheric correction on Ku band (From dual-frequency altimeter range measurements) - model dry tropospheric correction (From ECMWF model) - GPD+ wet tropospheric correction (Fernandes et al. 2016) - sea state bias correction in Ku band (ALES retracking, Passaro et al. 2014) - solid earth tide height (From RADS, tide potential model, Cartwright and Taylor 1971, Cartwright and Eden 1973) - geocentric ocean tide (FES 2014 from RADS, Carrere et al. 2012) - geocentric pole tide height (Wahr 1985) - Atmospheric correction (From RADS, Carrere and Lyard 2003) - X-TRACK mean sea surface (Birol et al. 2017). Each corrective term is edited following Birol et al. 2017."

5. Examples of sea level trends against distance to coast

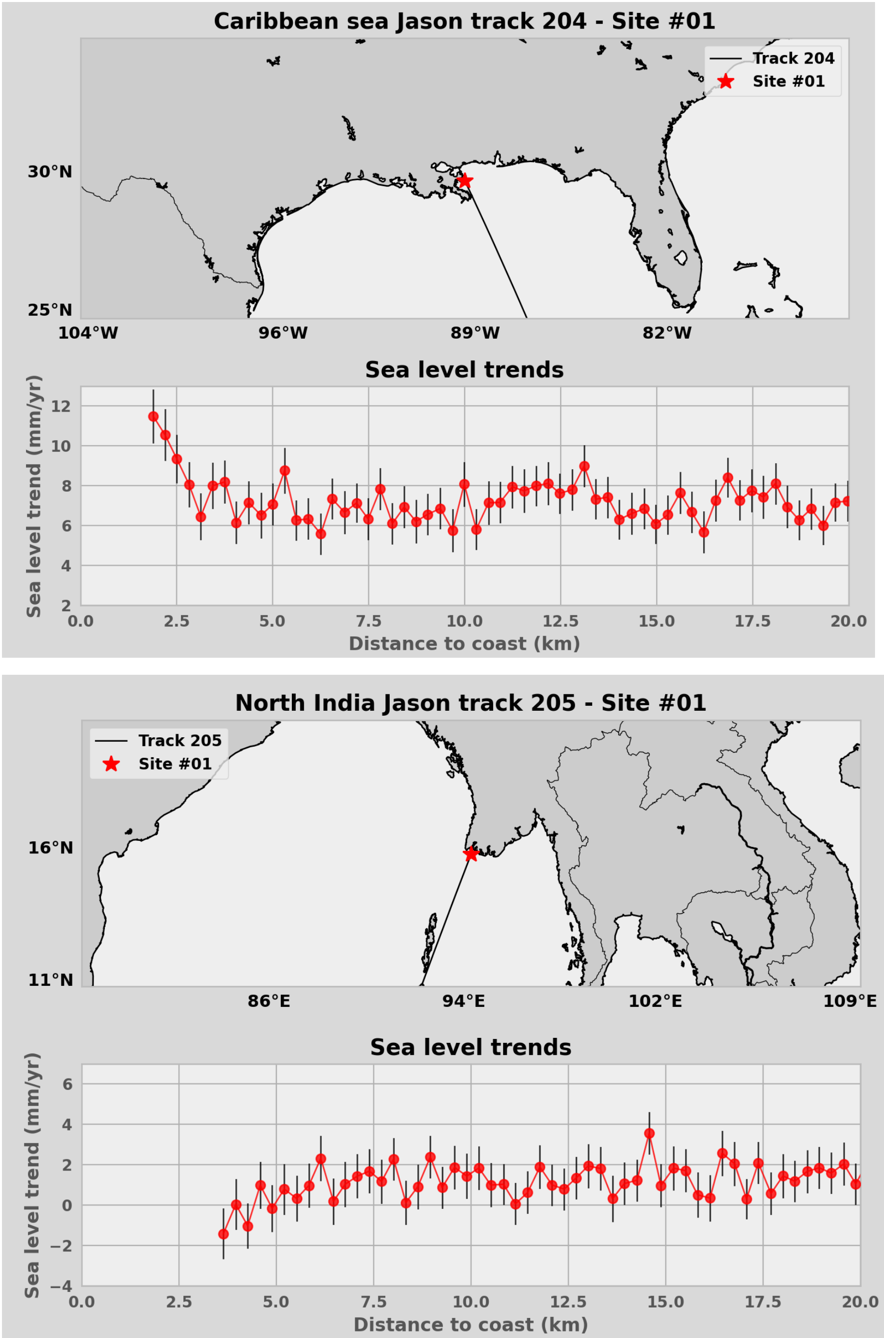

Fig 4. Sea level trends against distance to coast from the version 2.2. Upper panel: Mississippi delta. Lower panel: Irrawaddy delta.

6. Additional information and known issues

- The reference to Fernandes et al., 2015 mentioned in the “comment” attribute of the “sla” variable in the NetCDF data files v2.1 has been changed to Fernandes et al., 2016.

- Clarification: the “spatial_resolution” global attribute available in the NetCDF data files corresponds to the posting rate (separation between two consecutive estimates in the along-track direction), which is on average around 350m.

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