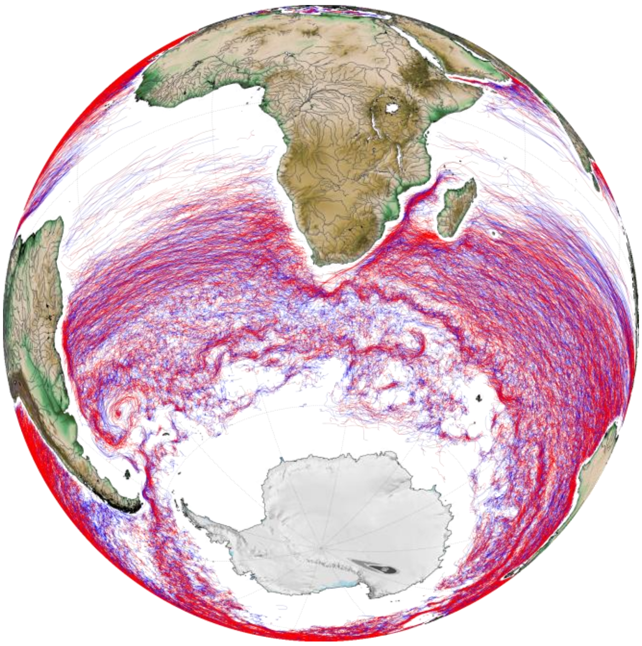
Mesoscale Eddy Trajectory Atlas Product HandbookEvolution

META3.2exp Near Real Time



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Chronology Issues:		
Issue:	Date:	Reason for change:
1.0	2022/01/13	1st issue from former User Manual
1.1	2022/03/21	Update citation, typos

List of Acronyms:

ADT	Absolute Dynamic Topography (=SLA+MDT)
AVISO+	Archivage, Validation et Interprétation des données des Satellites Océanographiques
C3S	Copernicus Climate Change Service http://climate.copernicus.eu/
CLS	Collecte Localisation Satellites
CMEMS	Copernicus Marine Environment Monitoring Service
CNES	Centre National d'Etudes Spatiales
DUACS	Data Unification and Altimeter Combination System
FTP	File Transfer Protocol
MDT	Mean Dynamic Topography (difference between Mean Sea Surface (MSS) and Geoid)
NetCDF	Network Common Data Format
OSU	Oregon State University
SLA	Sea Level Anomaly (a.k.a. sea surface height with respect to a mean sea surface)

List of figures

Reference documents

Mason, E., Pascual, A., McWilliams, J.C., 2014. A New Sea Surface Height–Based Code for Oceanic Mesoscale Eddy Tracking. J. Atmospheric Ocean. Technol. 31, 1181–1188. https://doi.org/10.1175/JTECH-D-14-00019.1

Pegliasco, C., Delepoulle, A., Mason, E., Morrow, R., Faugère, Y., Dibarboure, G., 2022. META3.1exp: a new global mesoscale eddy trajectory atlas derived from altimetry. Earth Syst. Sci. Data 14, 1087–1107. https://doi.org/10.5194/essd-14-1087-2022

Visvalingam, M., Whyatt, J.D., 1992. Line generalisation by repeated elimination of the smallest area. Cartogr. Inf. Syst. Res. Group University of Hull.

Contents

1. Overview of this document

This document is the user manual for the Mesoscale Eddy Trajectory Atlas NRT (**META3.2exp NRT**) product, processed by CNES/CLS in the DUACS system.

2.1.2These versions are generated and quality-controlled following the methodology developed by E. Mason at the Instituto Mediterráneo de Estudios Avanzados (IMEDEA, Spain). The algorithm benefits from upgrades added through this collaboration, and the datasets are distributed by AVISO+.

This document describes the **Near Real Time 3.2 Experimental version (NRT META3.2exp)** product, released since January 13th 2022.

The document is organized as follows:

- Chapter 2; presentation
- Chapter 3; processing: input data and method applied
- Chapter 4; the product description, with the different files provided, the nomenclature & the file format
- Chapter 5; how to download the products.

2. The Mesoscale Eddy Trajectory Atlas

2.1.1. Rationale

The mesoscale circulation is defined as a class of energetic phenomena of spatial dimensions ranging from tens to hundreds of kilometers and spanning days to years. The mesoscale structures are mainly generated by currents instabilities, from the ocean large-scale circulation instabilities due to wind or topographic obstacles, creating variability around the ocean's mean state.

Altimetry enables observations of such phenomena by measuring the sea surface height, where currents swirl around local highs and lows through the geostrophic balance between the pressure gradient force and the Coriolis acceleration. The best resolution is obtained with several satellites to study and understand eddies, whose diameters range from 100 to 300 km, when the ground track separation at the Equator is about 315 km for Jason. The existence of at least two satellites operating simultaneously is therefore necessary for research on mesoscale features.

The analysis of Sea Surface Height (starting with Sea Level Anomalies, now more with Absolute Dynamic Topography) from merged satellite data reveals the areas of high eddy activity, the number of eddies per year, their horizontal scale and amplitude. Such a census helps understand ocean dynamics due to eddies, and to discriminate eddies' effect from other processes (like the Rossby waves). This reveals that most of the mesoscale features are "non-linear", i.e. that these features are coherent structures (as opposed to planetary waves that would be linear). Moreover, eddies can transport heat, salts and nutrients trapped within them if they rotate faster than they move-- also as opposed to planetary waves that would not transport water parcels. Some regions see more anticyclonic eddies (highs in the Sea Surface Height), like the Tehuantepec and Papagayo eddy area, others more cyclonic eddies, such as seen in the Humboldt Current.

2.1.2. Versioning of the AVISO+ Mesoscale Eddy Trajectory Atlas

The versioning of the different Mesoscale Eddy Trajectories Atlas is detailed on the AVISO+ website:

https://www.aviso.altimetry.fr/en/data/products/value-added-products/global-mesoscale-eddy-trajectory-product.html

2.2. Acknowledgments

When using the products, please cite:

Mesoscale Eddy Trajectory Atlas product in near-real-time 3.2exp: "The altimetric Mesoscale Eddy Trajectory Atlas (META3.2exp NRT) product is produced by SSALTO/DUACS and distributed by AVISO+ (https://www.aviso.altimetry.fr/) with support from CNES, in collaboration with IMEDEA."

We recommend specifying the date you access the dataset and the period covered.

2.3. User's feedback

This 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.

3. Processing

3.1. Input data

The data used are described in Table 1: Input product used .

Eddy product	Input data	Variable	Origin
Near Real Time 3.2exp version	**"all-satellite"** daily **Near Real Time** DUACS (DT2021 version since 2021/12/08)	Gridded Global **Absolute Dynamic Topographies** (ADT)	Copernicus Marine Service (CMEMS) http://marine.copernicus.eu/

Table 1: Input product used

The NRT product is based on "all-satellite" input products, that allows a better sampling of the ocean at a given time. Indeed the focus on short period of time with a best sampling is in the interest of using a NRT product.

For the NRT product, the eddy detection is made on ADT maps to avoid a) misinterpreting eddies with a permanent signature and b) that the displacement of large currents creates anomalies similar to eddies.

3.2. Algorithm

The algorithm used for this product is derived from the one described in Mason et al. (2014) and further described in Pegliasco et al. (2022).

This section highlights the improvements used for this version with respect to the previous one.

3.2.1. Filtering

The Sea Surface Height field includes a wide range of features, ranging from small to large-scale ones. Eddies are identified as features with diameters of 100-300 km, so the first step is to remove larger scale variability using a low pass filter. Large-scale variability was computed by smoothing the ADT field with a first order Lanczos filter with a half-power cutoff wavelength of 700 km. The result was subtracted from the original ADT data to produce a high-pass filtered grid which contains only mesoscale variability (Figure 1).

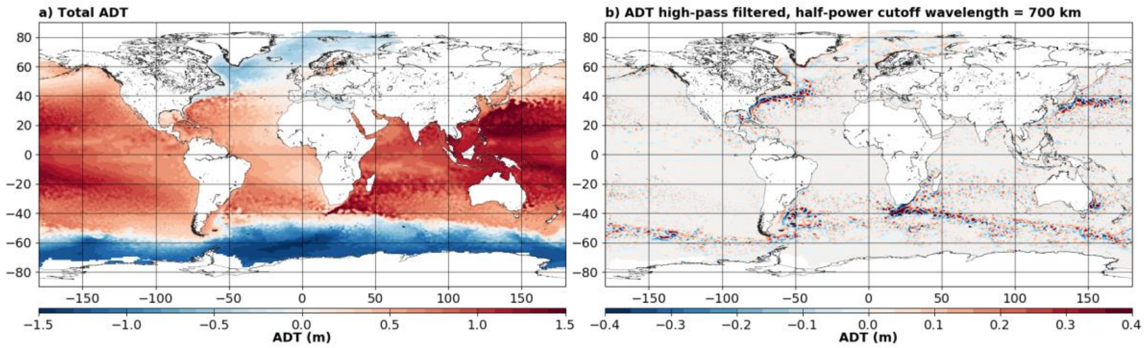

Figure 1 : Filter applied on the Absolute Dynamic Topography for the NRT 30 March 2021 map. a) initial ADT map. b) resulting high pass filtered ADT used for the DT 3.2exp eddy detection.

3.2.2. Detection

The detection is made in two steps:

1/ Closed contours of the ADT are scanned between -100/100 cm with a 0.2 cm interval. Closed contours in agreement with the defined criteria (shape error ≤ 70%, amplitude ≤ 0.4cm, only one extremum, 5 ≤ Npixel ≤ 1000, no masked pixels within a contour, only pixels with SSH values under (below) the interval for cyclones (anticyclones) are selected and registered as Cyclones or Anticyclones, the other contours are rejected (Figure 2).

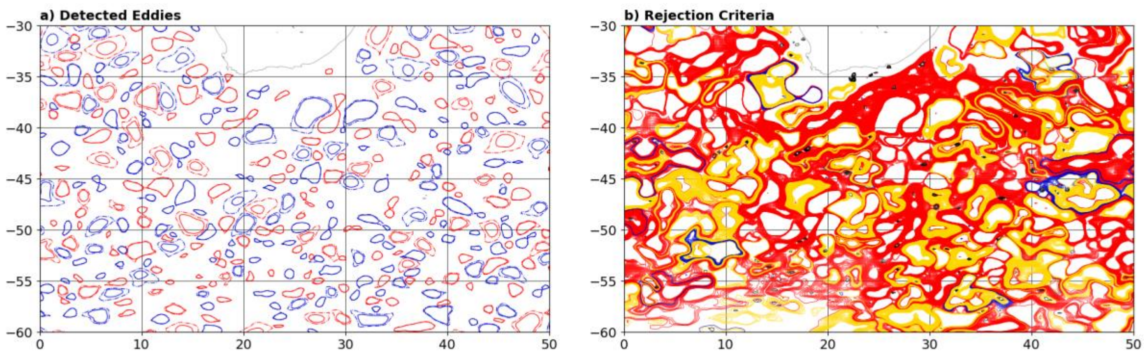

Figure 2 : Eddy detection. a) Selected contours for Anticyclones (red) and Cyclones (blue). b) rejected contours colored with their rejection criteria (red : shape error, yellow : amplitude related criteria, blue : masked value in the contour, black : outside the pixel number limits).

The full explanation can be found in Pegliasco et al. (2022).

2/ For each retained effective contour, we searched towards the local extremum the contour associated with the maximum circum-averaged speed. These two contours are over sampled uniformly by multiplying by 10 the number of points constituting the contours, before fitting circles on the contours. Then, the center of the eddy is defined as the center of the circle which fits best with the contour of the maximum averaged speed (Figure 3). The corresponding radius is then calculated as the radius of this best fit circle for both the effective and the speed contours.

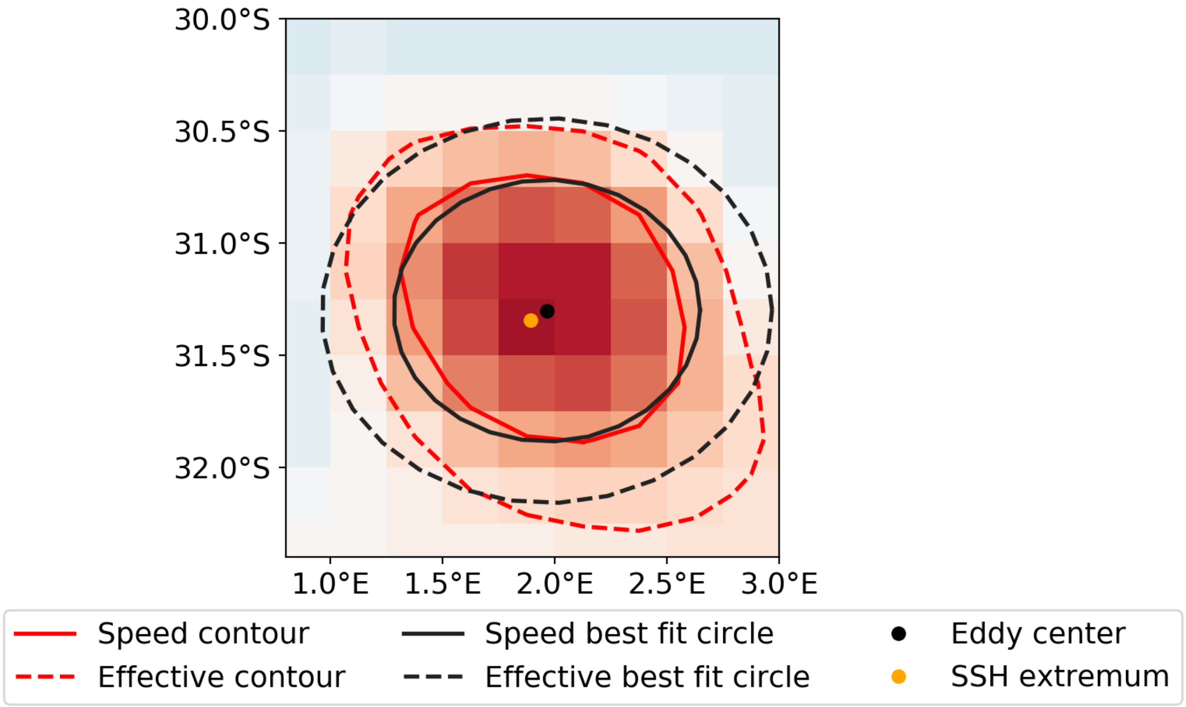

Figure 3 : Contours and associated circles for an Anticyclones. The SSH extremum corresponds to the center of the smallest SSH contour

3/ The contours are then sampled using the Visvalingam & Whyatt algorithm to obtain 20 points preserving the shape of the original contour (Visvalingam and Whyatt, 1992).

3.2.3. Estimation of eddy characteristics

After the detection, we compute an estimate of different eddy characteristics, provided as variables within the dataset:

Characteristic	Value
Center position	Longitude and latitude of the center of the best fit circle with the contour of maximum circum-average geostrophic speed
Amplitude	|SSH(local_extremum) – SSH(outermost_contour)|
Speed radius	Radius of the best fit circle with the contour of maximum circum-average geostrophic speed
Speed average	Average geostrophic speed of the contour defining the speed radius
Speed profile	Profile speed average values from effective contour inwards to smallest inner contour
Effective contour	Largest contour of the detected eddy
Speed contour	Speed contour of the detected eddy

Table 2: Characteristics of eddies for META3.2exp NRT (the full variables are detailed in section 4)

To save space, the contours are recorded on 20 points using the Visvalingam algorithm, which reduces the number of points describing a curve by preserving its original shape.

3.2.4. Tracking

After performing detection on several consecutive days, we apply a procedure to build the trajectories over time of the detected eddies.

<u>Tracking procedure :</u>

The tracking scheme is described in details in Pegliasco et al. (2022) and differs from the Mason et al. (2014) tracking. Between two maps, we search for candidates to associate to the trajectories as eddies whose effective contours are overlapping (Figure 4). Here the eddy candidate is retained if the overlap ratio, defined as the ratio between the overlapping area and the union of the two eddies' area, is more than 5%.

$$Overlap\ Ratio = 100 \times \frac{Area\ (Eddy_t)\ \cap Area\ (Eddy_{t+dt})}{Area\ (Eddy_t)\ \cup Area\ (Eddy_{t+dt})}$$

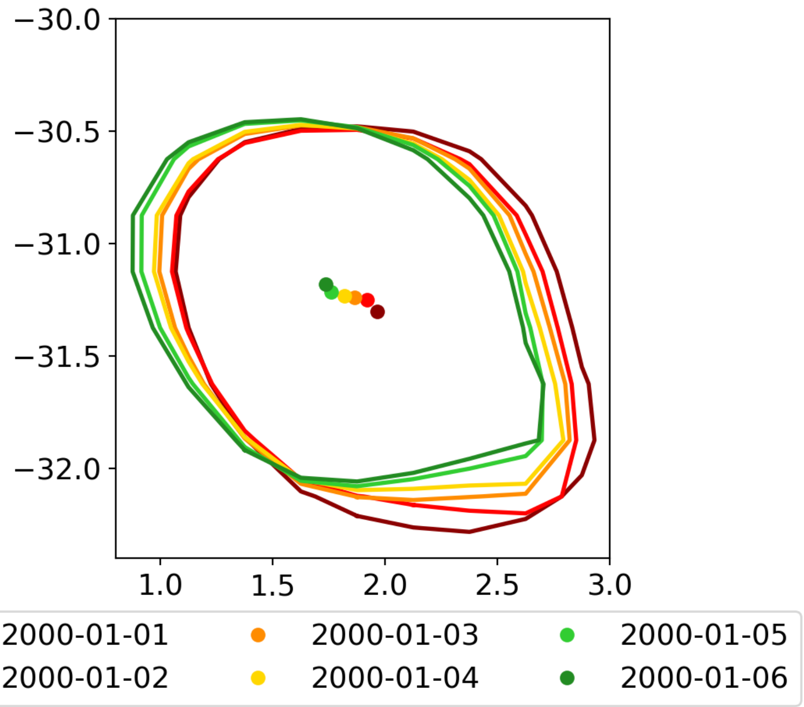

Figure 4 : Successive eddy contours and centers associated in a trajectory.

Loss of the eddy position on one or several maps:

The tracking procedure allows the loss of one to four consecutive observations as illustrated in Figure 5. This can happen sometimes due to identification thresholds criteria and/or map quality. Then, the lost eddy is reconstructed using interpolation. This information is given is the file in the variable 'observation_flag'.

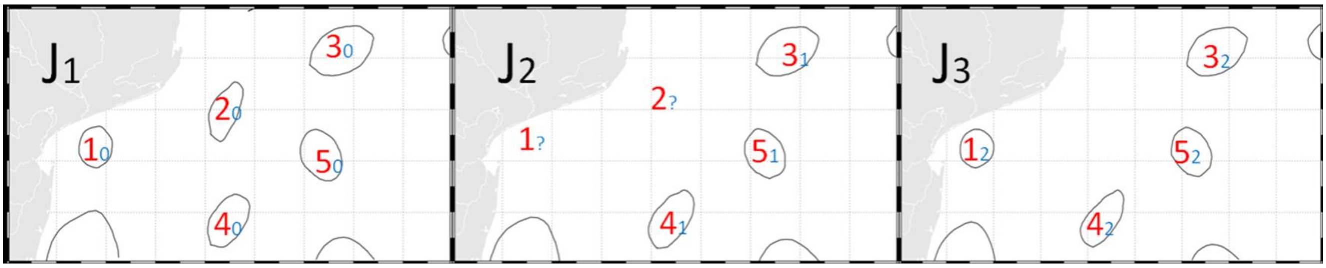

Figure 5: Tracking procedure : the eddy number 1 is kept because an association is found on map J3, contrary to the eddy number 2 where no association is found on the last map.

Lifetime selection

The trajectories lasting at least 10 days are delivered in two separated files, one for Cyclonic Eddies and one for Anticyclonic Eddies.

4. Description of the product

4.1. Product general content and specifications

Eddy product	Covered period	Spatial coverage	Delivery format	Update
Near Real Time 3.2exp version	01/01/2018 – ongoing with 15 days of latency	-180 to 540°E* 90°S to 90°N	2 NetCDF files , 1 for Anticyclones, 1 for Cyclones, of the trajectories lasting at least 10 days.	Daily

Table 3: Characteristics of the META3.1exp NRT product

*The negative longitudes maintain continuity in longitude for the trajectories crossing the Prime Meridian to the West, the longitudes above 360°E are for the trajectories crossing the Prime Meridian to the East.

Note that the numbering of the eddies may differ from one day to another one so this variable should not be taken as the basis for comparison between files.

4.2. Nomenclature of files

NRT META3.2exp

Eddy_trajectory_nrt_3.2exp_Anticyclonic_%Y%m%d_%Y%m%d.nc
Eddy_trajectory_nrt_3.2exp_Cyclonic_%Y%m%d_%Y%m%d.nc
include the whole time series of the data processed for the version META3.2exp. Each day, the second date increments to update the period of coverage.

4.3. NetCDF

The products are stored using the NetCDF CF 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 on the NetCDF software package: http://www.unidata.ucar.edu/packages/netcdf/

NetCDF data is:

- Self-Describing. A NetCDF file includes information about the data it contains.
- Architecture-independent. A NetCDF file is represented in a form that can be accessed by computers with different ways of storing integers, characters, and floating-point numbers.
- Direct-access. A small subset of a large dataset may be accessed efficiently, without first reading through all of the preceding data.

- Appendable. Data can be appended to a NetCDF dataset along one dimension without copying the dataset or redefining its structure. The structure of a NetCDF dataset can be changed, though this sometimes causes the dataset to be copied.
- Sharable. One writer and multiple readers may simultaneously access the same NetCDF file.

The NetCDF version provided here is version 4 “classic”.

4.4. Structure and semantic of NetCDF files

NRT META3.2exp

All the eddies detected are stored in two files: cyclonic and anticyclonic.

Variable name	Description	Standard_name	Dimensions	Units
META3.2exp_NRT_ Anticyclonic_%Y%m%d_%Y%m%d.nc **META3.2exp_NRT_ Cyclonic_%Y%m%d_%Y%m%d.nc**				
NetCDF-CF **Dimensions:** **Obs : Each detected track is stored end-to-end on one dimension "obs" (an index). The "track" variable numbers the eddy trajectories, and thus allows to separate trajectories.** **Nbsamples : 20** It is the number of points to store information. If there are more or less than 20 points constituting the uavg_profile, the information is interpolated to be stored in the file. For contours, the original number of points is first multiplied by 10 with a linear spacing, and then resampled with the Visvaligam & Whyatt algorithm.				
latitude	observation latitude	latitude	(Obs)	Degrees_north
longitude	observation longitude	longitude	(Obs)	Degrees_east
time	days since 1950-01-01 00:00:00 UTC (float)	time	(Obs)	Days
track	trajectory identification number		(Obs)	ordinal
observation_number	observation sequence number, days from eddy first detection		(Obs)	ordinal
observation_flag	flag indicating if the value is interpolated between two observations or not (0: observed, 1: interpolated)		(Obs)	boolean
amplitude	magnitude of the height difference between the extremum of ADT within the eddy and the ADT around the contour defining the eddy perimeter		(Obs)	meters
num_contours	number of contours selected for this eddy		(Obs)	ordinal
effective_contour_latitude	Latitudes of effective contour		(Obs, Nbsamples)	Degrees_north

effective_contour_ longitude	Longitudes of effective contour	(Obs, Nbsamples)	Degrees _east
effective_contour_ height	ADT filtered height for effective contour	(Obs)	meters
effective_contour_ shape_error	Error criterion of fit on effective contour	(Obs)	%
effective_radius	radius of a circle whose area is equal to that enclosed by the effective contour	(Obs)	meters
speed_contour_ latitude	Latitudes of speed contour	(Obs, Nbsamples)	Degrees _north
speed_contour_ longitude	Longitudes of speed contour	(Obs, Nbsamples)	Degrees _north
speed_contour_ height	ADT filtered height for speed contour	(Obs)	meters
speed_average	average speed of the contour defining the radius scale “speed_radius”	(Obs)	m/s
speed_radius	radius of a circle whose area is equal to that enclosed by the contour of maximum circum-average speed	(Obs)	km
speed_contour_ shape_error	Error criterion of fit on speed contour	(Obs)	%
inner_contour_height	ADT filtered height for inner contour	(Obs)	meters
uavg_profile	speed average values from effective contour inwards to smallest inner contour	(Obs, Nbsamples)	m/s
latitude_max	latitude of SSH extremum	(Obs)	
longitude_max	longitude of SSH extremum	(Obs)	

5. How to download a product

5.1. Registration

To access data, registration is required. During the registration process, the user shall accept using licenses for the use of AVISO+ products and services.

Register at:

http://www.aviso.altimetry.fr/en/data/data-access/registration-form.html

or, if already registered on AVISO+, request the addition of this product on your personal account on https://www.aviso.altimetry.fr/no_cache/en/my-aviso-plus.html

and select the product:

"**Mesoscale Eddy Trajectories Atlas product**"

5.2. Access Services

Note that once your registration is processed (see above), AVISO+ will validate your registration by e-mail as soon as possible (within 5 working days during working hours, Central European Time). The access information will be available in your personal account on https://www.aviso.altimetry.fr/no_cache/en/my-aviso-plus.html .

Appendix A - Product header

NRT META3.2exp

```
netcdf Eddy_trajectory_nrt_3.2exp_anticyclonic_20180101_20211123 {
dimensions:
	obs = 4713364 ;
	NbSample = 20 ;
variables:
	ushort amplitude(obs) ;
		amplitude:comment = "Magnitude of the height difference between the extremum of SSH within the eddy and the SSH around the effective contour defining the eddy edge" ;
		amplitude:long_name = "Amplitude" ;
		amplitude:units = "m" ;
		amplitude:scale_factor = 0.0001 ;
		amplitude:add_offset = 0LL ;
		amplitude:min = 0.004 ;
		amplitude:max = 1.1294 ;
	float effective_area(obs) ;
		effective_area:comment = "Area enclosed by the effective contour in m^2" ;
		effective_area:long_name = "Effective area" ;
		effective_area:units = "m^2" ;
		effective_area:min = 1.409617e+08f ;
		effective_area:max = 3.263873e+11f ;
	float effective_contour_height(obs) ;
		effective_contour_height:comment = "SSH filtered height for effective contour" ;
		effective_contour_height:long_name = "Effective Contour Height" ;
		effective_contour_height:units = "m" ;
		effective_contour_height:min = -0.342f ;
		effective_contour_height:max = 0.938f ;
	short effective_contour_latitude(obs, NbSample) ;
		effective_contour_latitude:axis = "X" ;
		effective_contour_latitude:comment = "Latitudes of effective contour" ;
		effective_contour_latitude:long_name = "Effective Contour Latitudes" ;
		effective_contour_latitude:units = "degrees_east" ;
		effective_contour_latitude:scale_factor = 0.01 ;
		effective_contour_latitude:add_offset = 0LL ;
	short effective_contour_longitude(obs, NbSample) ;
		effective_contour_longitude:axis = "X" ;
		effective_contour_longitude:comment = "Longitudes of the effective contour" ;
		effective_contour_longitude:long_name = "Effective Contour Longitudes" ;
		effective_contour_longitude:units = "degrees_east" ;
		effective_contour_longitude:scale_factor = 0.01 ;
		effective_contour_longitude:add_offset = 180. ;
	ubyte effective_contour_shape_error(obs) ;
		effective_contour_shape_error:comment = "Error criterion between the effective contour and its best fit circle" ;
		effective_contour_shape_error:long_name = "Effective Contour Shape Error" ;
		effective_contour_shape_error:units = "%" ;
		effective_contour_shape_error:scale_factor = 0.5 ;
		effective_contour_shape_error:add_offset = 0LL ;
		effective_contour_shape_error:min = 2. ;
```

```
        effective_contour_shape_error:max = 74. ;
    ushort effective_radius(obs) ;
        effective_radius:comment = "Radius of the best fit circle corresponding to the effective contour" ;
        effective_radius:long_name = "Effective Radius" ;
        effective_radius:units = "m" ;
        effective_radius:scale_factor = 50. ;
        effective_radius:add_offset = 0LL ;
        effective_radius:min = 7400. ;
        effective_radius:max = 373650. ;
    float inner_contour_height(obs) ;
        inner_contour_height:comment = "SSH filtered height for the smallest detected contour" ;
        inner_contour_height:long_name = "Inner Contour Height" ;
        inner_contour_height:units = "m" ;
        inner_contour_height:min = -0.31f ;
        inner_contour_height:max = 1.114f ;
    float latitude(obs) ;
        latitude:axis = "Y" ;
        latitude:comment = "Latitude center of the best fit circle" ;
        latitude:long_name = "Eddy Center Latitude" ;
        latitude:standard_name = "latitude" ;
        latitude:units = "degrees_north" ;
        latitude:min = -77.85374f ;
        latitude:max = 83.9397f ;
    float latitude_max(obs) ;
        latitude_max:axis = "Y" ;
        latitude_max:comment = "Latitude of the inner contour" ;
        latitude_max:long_name = "Latitude of the SSH maximum" ;
        latitude_max:standard_name = "latitude" ;
        latitude_max:units = "degrees_north" ;
        latitude_max:min = -90.f ;
        latitude_max:max = 83.87755f ;
    float longitude(obs) ;
        longitude:axis = "X" ;
        longitude:comment = "Longitude center of the best fit circle" ;
        longitude:long_name = "Eddy Center Longitude" ;
        longitude:standard_name = "longitude" ;
        longitude:units = "degrees_east" ;
        longitude:min = -37.35703f ;
        longitude:max = 364.7928f ;
    float longitude_max(obs) ;
        longitude_max:axis = "X" ;
        longitude_max:comment = "Longitude of the inner contour" ;
        longitude_max:long_name = "Longitude of the SSH maximum" ;
        longitude_max:standard_name = "longitude" ;
        longitude_max:units = "degrees_east" ;
        longitude_max:min = -37.37921f ;
        longitude_max:max = 364.3947f ;
    ushort num_contours(obs) ;
        num_contours:comment = "Number of contours selected for this eddy" ;
        num_contours:long_name = "Number of contours" ;
        num_contours:min = 1US ;
```

```
        num_contours:max = 565US ;
    ushort num_point_e(obs) ;
        num_point_e:description = "Number of points for effective contour before resampling" ;
        num_point_e:long_name = "number of points for effective contour" ;
        num_point_e:units = "ordinal" ;
        num_point_e:min = 10US ;
        num_point_e:max = 209US ;
    ushort num_point_s(obs) ;
        num_point_s:description = "Number of points for speed contour before resampling" ;
        num_point_s:long_name = "number of points for speed contour" ;
        num_point_s:units = "ordinal" ;
        num_point_s:min = 10US ;
        num_point_s:max = 171US ;
    byte observation_flag(obs) ;
        observation_flag:comment = "Flag indicating if the value is interpolated between two observations or not
(0: observed eddy, 1: interpolated eddy)" ;
        observation_flag:long_name = "Virtual Eddy Position" ;
        observation_flag:min = 0b ;
        observation_flag:max = 1b ;
    ushort observation_number(obs) ;
        observation_number:comment = "Observation sequence number, days starting at the eddy first detection"
;
        observation_number:long_name = "Eddy temporal index in a trajectory" ;
        observation_number:min = 0US ;
        observation_number:max = 1422US ;
    float speed_area(obs) ;
        speed_area:comment = "Area enclosed by the speed contour in m^2" ;
        speed_area:long_name = "Speed area" ;
        speed_area:units = "m^2" ;
        speed_area:min = 1.044128e+08f ;
        speed_area:max = 3.129622e+11f ;
    ushort speed_average(obs) ;
        string speed_average:comment = "Average speed of the contour defining the radius scale “speed_radius”" ;
        speed_average:long_name = "Maximum circum-averaged Speed" ;
        speed_average:units = "m/s" ;
        speed_average:scale_factor = 0.0001 ;
        speed_average:add_offset = 0LL ;
        speed_average:min = 0.007 ;
        speed_average:max = 5.5859 ;
    float speed_contour_height(obs) ;
        speed_contour_height:comment = "SSH filtered height for speed contour" ;
        speed_contour_height:long_name = "Speed Contour Height" ;
        speed_contour_height:units = "m" ;
        speed_contour_height:min = -0.342f ;
        speed_contour_height:max = 0.938f ;
    short speed_contour_latitude(obs, NbSample) ;
        speed_contour_latitude:axis = "X" ;
        speed_contour_latitude:comment = "Latitudes of speed contour" ;
        speed_contour_latitude:long_name = "Speed Contour Latitudes" ;
        speed_contour_latitude:units = "degrees_east" ;
        speed_contour_latitude:scale_factor = 0.01 ;
```

```
		speed_contour_latitude:add_offset = 0LL ;
	short speed_contour_longitude(obs, NbSample) ;
		speed_contour_longitude:axis = "X" ;
		speed_contour_longitude:comment = "Longitudes of speed contour" ;
		speed_contour_longitude:long_name = "Speed Contour Longitudes" ;
		speed_contour_longitude:units = "degrees_east" ;
		speed_contour_longitude:scale_factor = 0.01 ;
		speed_contour_longitude:add_offset = 180. ;
	ubyte speed_contour_shape_error(obs) ;
		speed_contour_shape_error:comment = "Error criterion between the speed contour and its best fit circle" ;
		speed_contour_shape_error:long_name = "Speed Contour Shape Error" ;
		speed_contour_shape_error:units = "%" ;
		speed_contour_shape_error:scale_factor = 0.5 ;
		speed_contour_shape_error:add_offset = 0LL ;
		speed_contour_shape_error:min = 1.5 ;
		speed_contour_shape_error:max = 93.5 ;
	ushort speed_radius(obs) ;
		speed_radius:comment = "Radius of the best fit circle corresponding to the contour of maximum circum-
average speed" ;
		speed_radius:long_name = "Speed Radius" ;
		speed_radius:units = "m" ;
		speed_radius:scale_factor = 50. ;
		speed_radius:add_offset = 0LL ;
		speed_radius:min = 7400. ;
		speed_radius:max = 373250. ;
	uint time(obs) ;
		time:axis = "T" ;
		time:calendar = "proleptic_gregorian" ;
		time:comment = "Date of this observation" ;
		time:long_name = "Time" ;
		time:standard_name = "time" ;
		time:units = "days since 1950-01-01 00:00:00" ;
		time:scale_factor = 1.15740740740741e-05 ;
		time:add_offset = 0LL ;
		time:min = 24837. ;
		time:max = 26259. ;
	uint track(obs) ;
		track:comment = "Trajectory identification number" ;
		track:long_name = "Trajectory number" ;
		track:min = 0U ;
		track:max = 108097U ;
	ushort uavg_profile(obs, NbSample) ;
		uavg_profile:comment = "Speed averaged values from the effective contour inwards to the smallest
contour, evenly spaced points" ;
		uavg_profile:long_name = "Radial Speed Profile" ;
		uavg_profile:units = "m/s" ;
		uavg_profile:scale_factor = 0.0001 ;
		uavg_profile:add_offset = 0LL ;

// global attributes:
		:Metadata_Conventions = "Unidata Dataset Discovery v1.0" ;
```

:comment = "Surface product; mesoscale eddies" ;
:creator_email = "aviso@altimetry.fr" ;
:creator_url = "https://www.aviso.altimetry.fr" ;
:date_created = "2021-12-08T12:28:03Z" ;
:framework_used = "https://github.com/AntSimi/py-eddy-tracker" ;
:framework_version = "v3.5.0+25.gf6e8633" ;
:input_product_reference = "https://www.aviso.altimetry.fr/en/data/products/value-added-products/global-mesoscale-eddy-trajectory-product.html" ;
:institution = "CLS/CNES in collaboration with IMEDEA" ;
:license = "https://www.aviso.altimetry.fr/fileadmin/documents/data/License_Aviso.pdf" ;
:product_version = "3.2exp" ;
:project = "SSALTO/DUACS" ;
:standard_name_vocabulary = "NetCDF Climate and Forecast (CF) Metadata Convention Standard Name Table" ;
:summary = "This dataset contains eddy atlas from all-satellite NRT CMEMS maps over global ocean (SEALEVEL_GLO_PHY_L4_NRT_OBSERVATIONS*)" ;
:time_coverage_duration = "P1423D" ;
:time_coverage_end = "2021-11-23T00:00:00Z" ;
:time_coverage_start = "2018-01-01T00:00:00Z" ;
:title = "Mesoscale Anticyclonic Eddies in Altimeter Observations of ADT" ;

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