



ESA Sea Level CCI

D1.2 Product Specification Document

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Applicable documents

AD 1 Sea level CCI project Management Plan
CLS-DOS-NT-10-013

Reference documents

RD 1 Manuel du processus Documentation
CLS-DOC



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1. Introduction

The Product Specification Document (PSD) contains the specification for the products which will be produced in the Sea Level CCI project as part of WP3200 of SLCCI phase I and WP WP4000 of SLCCI phase II.

With regards to the applied altimetry standards, it is important to recall the different versions of these products:

- **Version 0 (V0):** The sea level product generated using the existing standard algorithms. This product corresponds to the state of the art at the beginning of the project.
- **Version 1 (V1.0):** The sea level product generated using the algorithms selected in the first phase of the project. It has been delivered for users in September 2012.
- **Version 1.1 (V1.1):** An updated version of the V1.0 products generated at the end of the SLCCI phase I in December 2013. It includes new wet troposphere correction for all altimeter missions and reprocessed level 2 products concerning Jason-2 (GDR-D) and Envisat (V2.1) missions.

The Version 1.1 of the products is the current version to be used. The time series has been extended in December 2014 with the data of years 2011-2013 and in December 2015 with the data of year 2014. The period covered by v1.1 (January 1993 to December 2014) is derived from the periods associated with the main altimeter missions:

- ERS-1
- ERS-2
- Envisat
- TOPEX/Poseidon
- Jason-1
- Jason-2
- Geosat-Follow-On.

V1.1 benefits from yearly extension during phase II of the SLCCI project and a full reprocessed v2.0 ECV is planned to be released in 2016 within this phase II (see Figure 1), including the data from new altimeter missions.

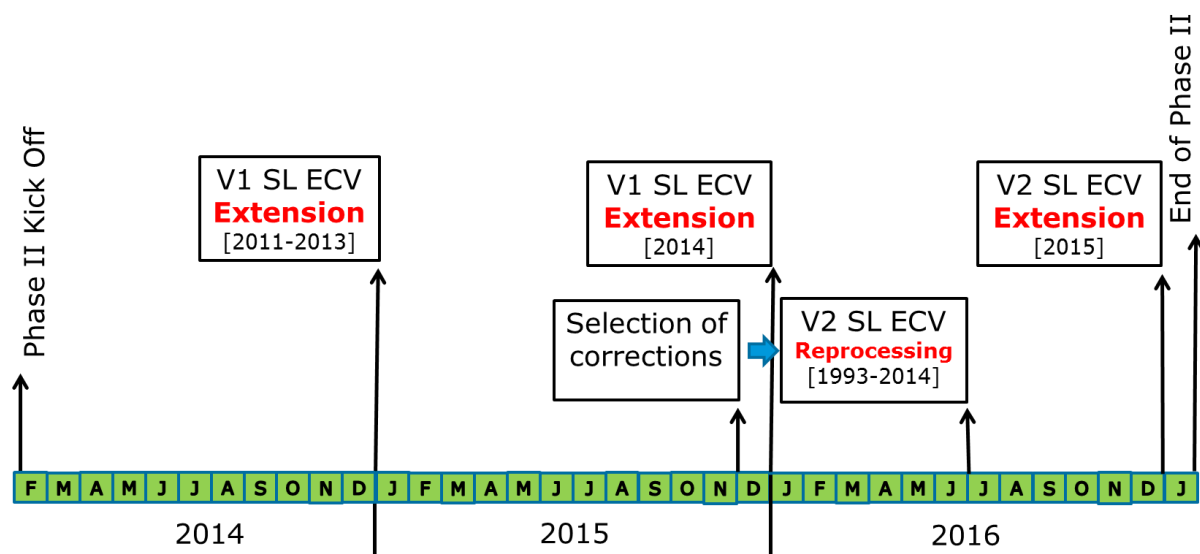


Figure 1: ECV Production Planning



2. Fundamental Climate Data Record (FCDR)

2.1. Definition

The FCDR (SL_FCDR) is a **mono-mission** product generated from the altimeter level-2 product (as geophysical data records (GDR) product for instance). It contains the **along-track** sea level height (SSH) estimates over ocean with a quality control indicator to remove spurious measurements. It contains also the altimeter standards applied in the SSH calculation as the geophysical corrections, the mean sea surface, etc... In addition, information derived from the cross-calibration of the SSH between all the missions is provided in order to remove the global/regional SSH bias and to homogenize long spatial scale errors (due to orbit calculation for instance).

Data are produced along the tracks of the different altimeters, with a resolution of 1Hz corresponding to a ground distance close to 6km. There are separated dataset products for each altimeter mission, divided into files by altimetric cycle corresponding to the repetivity of the mission.

Mission	ERS 1 & 2	Envisat	Topex	Jason-1	Jason-2	Geosat Follow-on
Repetitivity	35 days	35 days	9.9 days	9.9 days	9.9 days	17 days

Table 1: Repetitivity of the altimeter missions

2.2. Nomenclature

The nomenclature used for the along-track FCDR is:

VariableProject_Data_Mission_Cycle_Version.nc

Example: SLCCI_ALTDB_J2_Cycle094_V1.nc

<i>VariableProject</i>	SLCCI	Sea Level Climate Change Initiative
<i>Data</i>	ALTDB	Altimeter Database
<i>Mission</i>	E1	ERS-1
	E2	ERS-2
	EN	Envisat
	TP	Topex/Poseidon
	J1	Jason-1
	J2	Jason-2
	G2	Geosat Follow On
<i>Cycle</i>	xxx	Cycle number of the given altimeter mission
<i>Version</i>	Vx	version number

Table 2: Nomenclature of the FCDR product

2.3. Format

The FCDR products are stored using the NetCDF (Network Common Data Form) using CF (Climate and Forecast) Metadata convention.

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2.4. Data Handling Variables

One dimension is defined:

- time: number of data per parameter in current file

Type	Name	Content	Unit	Scale Factor
double	time(time)	Time of measurement	days since 1950-01-01 00:00:00 UTC	none
int	latitude(time)	Latitude of measurement	degrees_north	10 ⁻⁶
int	longitude(time)	Longitude of measurement	degrees_east	10 ⁻⁶
short	cycle(time)	Cycle the measurement belongs to	1	none
short	track(time)	Track in cycle the measurement belongs to	1	none
short	TimeDay(time)	Number of days from reference date	days since 1950-01-01 00:00:00 UTC	none
short	TimeSec(time)	Number of seconds within the day	sec	none
short	TimeMicroSec(time)	Microseconds	1e-6 sec	none
int	corssh(time)	Corrected sea surface height above the reference	meters	10 ⁻⁴
int	alt(time)	1 Hz altitude of satellite	meters	10 ⁻⁴
int	range(time)	1 Hz Ku band corrected altimeter range	meters	10 ⁻⁴
short	dry_tropo_corr(time)	Model dry tropospheric correction	meters	10 ⁻⁴
short	sea_state_bias(time)	Non parametric sea state bias	meters	10 ⁻⁴
short	iono_corr(time)	Ionospheric correction	meters	10 ⁻⁴
short	rad_wet_tropo_corr(time)	Radiometer wet tropospheric correction	meters	10 ⁻⁴
short	model_wet_tropo_corr(time)	ECMWF model wet tropospheric correction	meters	10 ⁻⁴
short	comp_wet_tropo_corr(time)	Wet tropospheric correction based on the GPD algorithm	meters	10 ⁻⁴
short	dyn_atmosph_corr(time)	Combined atmospheric correction ¹	meters	10 ⁻⁴

¹ Combined atmospheric correction : high frequency fluctuations of the sea surface topography and inverted barometer height correction computed from rectangular grids



short	off_nadir_angle(time)	Square of the off nadir angle computed from Ku waveforms	degrees ²	10 ⁻⁴
short	wind_speed_alt(time)	Altimeter wind speed	meters/seconde	10 ⁻³
byte	alt_flag_oper(time)	Altimeter state flag	none	1
byte	rad_qual_interp_flag(time)	Radiometer quality interpolation flag	none	1
int	bathymetry(time)	Bathymetry	meters	10 ⁻³
int	mean_sea_surface(time)	Mean sea surface height	meters	10 ⁻⁴
int	ocean_tide(time)	Geocentric ocean tide height, including the corresponding loading tide, long period equilibrium tide and S1 tide	meters	10 ⁻⁴
short	pole_tide(time)	Pole tide height	meters	10 ⁻⁴
short	sigma0(time)	Backscatter coefficient	db	10 ⁻³
short	solid_earth_tide(time)	Solid earth tide height	meters	10 ⁻⁴
short	swh(time)	Significant wave height	meters	10 ⁻⁴
byte	range_numval(time)	Number of valid points for Ku band range	count	1
short	range_rms(time)	RMS of the Ku band range	meters	10 ⁻⁴
byte	sigma0_numval(time)	Number of valid points for Ku band range	count	1
short	sigma0_rms(time)	RMS of the Ku band backscattering coefficient	dB	10 ⁻⁴
byte	validation_flag(time)	Validity flag (0=valid, 1=non valid)	1	none
byte	rad_surf_type(time)	Radiometer surface type	none	1
byte	alt_surf_type(time)	Altimeter surface type (0 for Ocean, 1 for Land)	none	1
byte	ice_flag(time)	Ice flag	none	1
short	global_bias	Global relative SSH Bias between all the missions	meters	10 ⁻⁴
short	regional_bias	Regional relative SSH Bias between all the missions	meters	10 ⁻⁴



2.4.1. Empty Fields

It should also be noted that only the fields which are useful for the computation of the sea level anomalies are filled with defined values. Other fields are empty. The following table describes if the fields are defined or empty:

Name	Content	Field
time(time)	Time of measurement	Defined
latitude(time)	Latitude of measurement	Defined
longitude(time)	Longitude of measurement	Defined
cycle(time)	Cycle the measurement belongs to	Defined
track(time)	Track in cycle the measurement belongs to	Defined
TimeDay(time)	Number of days from reference date	Defined
TimeSec(time)	Number of seconds within the day	Defined
TimeMicroSec(time)	Microseconds	Defined
corssh(time)	Corrected see surface height above the reference	Defined
alt(time)	1 Hz altitude of satellite	Defined
range(time)	1 Hz Ku band corrected altimeter range	Defined
dry_tropo_corr(time)	Model dry tropospheric correction	Defined
sea_state_bias(time)	Non parametric sea state bias	Defined
iono_corr(time)	Ionospheric correction	Defined
rad_wet_tropo_corr(time)	Radiometer wet tropospheric correction	Empty
model_wet_tropo_corr(time)	ECMWF model wet tropospheric correction	Empty
comp_wet_tropo_corr(time)	Wet tropospheric correction based on the GPD algorithm	Defined
dyn_atmosph_corr(time)	Combined atmospheric correction ²	Defined
off_nadir_angle(time)	Square of the off nadir angle computed from Ku waveforms	Empty
wind_speed_alt(time)	Altimeter wind speed	Empty

² Combined atmospheric correction : high frequency fluctuations of the sea surface topography and inverted barometer height correction computed from rectangular grids



alt_flag_oper(time)	Altimeter state flag	Empty
rad_qual_interp_flag(time)	Radiometer quality interpolation flag	Empty
bathymetry(time)	Bathymetry	Defined
mean_sea_surface(time)	Mean sea surface height	Defined
ocean_tide(time)	Geocentric ocean tide height, including the corresponding loading tide, long period equilibrium tide and S1 tide	Defined
pole_tide(time)	Pole tide height	Defined
sigma0(time)	Backscatter coefficient	Empty
solid_earth_tide(time)	Solid earth tide height	Defined
swh(time)	Significant wave height	Empty
range_numval(time)	Number of valid points for Ku band range	Empty
range_rms(time)	RMS of the Ku band range	Empty
sigma0_numval(time)	Number of valid points for Ku band range	Empty
sigma0_rms(time)	RMS of the Ku band backscattering coefficient	Empty
validation_flag(time)	Validity flag (0=valid, 1=non valid)	Defined
rad_surf_type(time)	Radiometer surface type	Empty
alt_surf_type(time)	Altimeter surface type (0=ocean, 1=land)	Defined
ice_flag(time)	Ice flag	Empty
global_bias	Global relative SSH Bias between all the missions	Defined
regional_bias	Regional relative SSH Bias between all the missions	Defined

2.4.2. Surface type flag

Finally, the *alt_surf_type* field specifies the altimeter surface type with the value 0 for ocean and 1 for land. Note that for Jason-2, *alt_surf_type* values may equal to 0, 1, 2 or 3 and all non-zero values are equivalent to *alt_surf_type* equals 1 in the other missions' products.

However, FCDR products are designed to study Sea Level. Therefore, only measurements over ocean are kept. Hence, the *alt_surf_type* field contains only zeros.



2.5. NetCDF Header

2.5.1. Global attributes

Additional global attributes are available. They are providing information about the type of product or the processing and parameters used.

Attribute	Format	Description
title	string	A succinct description of what is in the dataset.
OriginalName	string	Name of the file.
CreatedBy	string	Creator name.
CreatedOn	string	Date of file creation.
Mission	string	Name (abbreviation) of the altimeter mission the data come from.
MeanProfile	string	Cycle number.
Version	string	
Conventions	string	Convention used for format of the file.
history	string	Provides an audit trail for modifications to the original data.

2.5.2. Variable attributes

The different variables can be described with different attributes as listed in the following table:

Attribute	Description
_FillValue	A value used to represent missing or undefined data
add_offset	If present, this number is to be added to the date after it is read by an application. If both <i>scale_factor</i> and <i>add_offset</i> attributes are present, the date are first scaled before the offset is added.
coordinates	Identified auxiliary coordinates variables.
long_name	A descriptive name that indicates a variable's content. This name is not standardized.
scale_factor	If present, the data are to be multiplied by this factor after the data are read by an application. See also <i>add_offset</i> attribute.
units	Unit of a variable's content. The value of this attribute must be a string that can be recognized by the UNIDATA's Udunits package.
Valid_range	Smallest and largest theoretical valid value of a variable



2.6. Computation of the Corrected Sea Surface Height

Besides altimeter parameters, geophysical corrections, as well as flags, corrected sea surface height is also provided in altimetric database.

The variables used to compute the *corssh* are detailed below. For Envisat:

$$\text{corssh} = \text{alt} - \text{range} - \text{dyn_atmosph_corr} - \text{sea_state_bias} - \text{ocean_tide} - \text{pole_tide} - \text{solid_earth_tide} \\ - \text{dry_tropo_corr} - \text{comp_wet_tropo_corr} - \text{iono_corr}$$

If required, users can easily replace one correction by another one (e.g. *comp_wet_tropo_corr* by *rad_wet_tropo_corr*, or a correction of their own).

It is advised to use the validation flag (*validation_flag*), but users may apply their own validation criteria.

2.7. Changes in FCDR v1.1 versus v1.0

Users should be aware that in the FCDR v1.0, the validation flag was already applied in the *corssh* field. This has been modified in the v1.1 release and the *corssh* field includes all valid and invalid measurements. The *corssh* field includes the same values as the difference "*alt - range - geophysical corrections*". Users can now use their own validation flag directly from the *corssh* field.

In the FCDR v1.1 release, standards have been upgraded for a better quality of the products. These standards have been selected in order to provide the best long-term stability for climate applications and not necessarily the best data coverage. The counterpart is the change of the time dimension and of the validation flag. According to the altimeter mission, some v1.0 valid measurements may be invalid in v1.1 or the opposite.

For more details about the change of processing standards for Envisat please check the following link:

http://www.aviso.oceanobs.com/fileadmin/documents/calval/validation_report/EN/EnvisatReprocessingReport.pdf



3. Sea Level ECV products

3.1. Definition

Sea Level ECV products are composed of the following categories:

- **Monthly averaged Sea Level Anomalies (SLA):** This corresponds to the SLA grids computed after merging all the altimetric mission measurements together into monthly grids.
- **Mean Sea Level changes indicators:** This corresponds to static files over the whole altimeter period describing the evolution of the SLA grids just previously described. Several indicators are provided such as:
 - o the temporal evolution of the global mean sea level (MSL),
 - o the regional MSL trends,
 - o the amplitude and phase of the main periodic signals (annual, semi-annual)

3.2. Nomenclature

- **Monthly averaged sea level anomalies (SLA) files** are indicated by:
PROJECT-ECV-LEVEL-VARIABLE-MISSION-DATE-VERSION.nc

With the following meaning:

PROJECT	ESACCI	Project name
ECV	SEALEVEL	Essential Climate Variable name
LEVEL	L4	Level of the product
VARIABLE	MSLA	Variable maps of sea level anomalies
MISSION	MERGED	Combined data
DATE	YYYYMMDDHHMMSS	Averaged month date
VERSION	fvxx	Version number

Example: ESACCI-SEALEVEL-L4-MSLA-MERGED-19930115000000-fv01.nc

- **Mean Sea Level temporal variations files** are indicated by:
PROJECT-ECV-INDICATOR-VARIABLE-MISSION-DATE-VERSION.nc

With the following meaning:

PROJECT	ESACCI	Project name
ECV	SEALEVEL	Essential Climate Variable name
INDICATOR	IND	Type of the product
VARIABLE	MSL	Global Mean Sea Level temporal evolution
MISSION	MERGED	Combined data
DATE	YYYYMMDDHHMMSS	Production date of the file
VERSION	fvxx	Version number

Example: ESACCI-SEALEVEL-IND-MSL-MERGED-20141014000000-fv01.nc

- **Mean Sea Level changes geographic distribution files** are indicated by:
PROJECT-ECV-INDICATOR-VARIABLE-MISSION-DATE-VERSION.nc

With the following meaning:

PROJECT	ESACCI	Project name
ECV	SEALEVEL	Essential Climate Variable name
INDICATOR	IND	Type of the product
VARIABLE	MSLTR	Map of the Mean Sea Level trends
MISSION	MERGED	Combined data
DATE	YYYYMMDDHHMMSS	Production date of the file
VERSION	fvxx	Version number

Example: ESACCI-SEALEVEL-IND-MSLTR-MERGED-20141014000000-fv01.nc

- **Files of the Amplitude and phase of the annual signal of the Sea Level** are indicated by:

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PROJECT-ECV-INDICATOR-VARIABLE-MISSION-DATE-VERSION.nc

With the following meaning:

PROJECT	ESACCI	Project name
ECV	SEALEVEL	Essential Climate Variable name
INDICATOR	IND	Type of the product
VARIABLE	MSLAMPH	Map of the amplitude and phase of the Mean Sea Level
MISSION	MERGED	Combined data
DATE	YYYYMMDDHHMMSS	Production date of the file
VERSION	fvxx	Version number

Example: ESACCI-SEALEVEL-IND-MSLAMPH-MERGED-20141014000000-fv01.nc

3.3. Format

ECV products are stored using the NetCDF (Network Common Data Form) format and CF (Climate and Forecast) metadata conventions. The way CF conventions are applied to ECV products with specific CCI additional vocabularies is defined in the frame of CCI Data Standards Working Group (DSWG).

3.4. Maps projection

All ECV products are provided on Cartesian grids at a spatial resolution of 1/4°.

3.5. Data Handling Variables

For Sea level ECV monthly SLA products, 3 dimensions are defined:

- lat : number of latitude boxes between -90° and 90°
- lon : number of longitudes boxes between 0° and 360°
- n: bounds associated to the time period

For Sea level ECV indicator products, up to 4 dimensions are defined:

- time
- lat : number of latitude boxes between -90° and 90°
- lon : number of longitudes boxes between 0° and 360°
- period: period of the signal (eg one year or half a year)

3.6. NetCDF header

3.6.1. Monthly averaged sea level anomalies

3.6.1.1. Global attributes

Attribute	Value
title	"Monthly averaged sea level anomalies"
institution	"CNES, CLS, ESA"

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references	http://www.esa-sealevel-cci.org/webfm_send/108
tracking_id	UUID
source	ERS-1 Phase C OPR V6, ERS-1 Phase E OPR V3, ERS-1 Phase F OPR V3, ERS-1 Phase G OPR V6, ERS-2 OPR V6, Envisat GDR-1, Topex/Poseidon MGDR, Jason-1 GDR-C, Jason-2 GDR-C, GFO GDR NOAA
platform	"ERS-1, ERS-2, ENVISAT, Topex/Poseidon, Jason-1, Jason-2, GFO"
sensor	"RA, RA2, Poseidon-1, Poseidon-2, Poseidon-3, GFO"
Conventions	CF-1.6
product_version	"1."
summary	"This dataset contains Level-4 monthly global sea surface height products from satellite observations."
keywords	"altimetry"
id	DT-MSLA-MERGED-MONTH
naming_authority	AVISO
keywords_vocabulary	"MyOcean"
standard_name_vocabulary	" http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/12/cf-standard-name-table.html "
cdm_data_type	"Grid"
comment	"These data were produced at CNES as part of the ESA Sea Level CCI project."
license	"ESA CCI Data Policy: free and open access."
date_created	" YYYY-MM-DD HH:MM:SS "
history	" YYYY-MM-DD HH:MM:SS: creation"
contact	info-sealevel@esa-sealevel-cci.org
project	"Climate Change Initiative - European Space Agency"
time_coverage_start	"YYYY-MM-DD HH:MM:SS"
time_coverage_end	"YYYY-MM-DD HH:MM:SS"
time_coverage_duration	P1M
time_coverage_resolution	P1M
geospatial_lat_min	"-90"
geospatial_lat_max	"90"
geospatial_lon_min	"0"
geospatial_lon_max	"360"
geospatial_vertical_min	0.0
geospatial_vertical_max	0.0
geospatial_lat_units	"degrees_north"
geospatial_lon_units	"degrees_east"



geospatial_lat_resolution	"0,25"
geospatial_lon_resolution	"0,25"
creator_name	"CNES,CLS"
creator_url	http://www.aviso.oceanobs.com/en/
creator_email	aviso@oceanobs.com

3.6.1.2. Variable attributes

Name	Attribute	Value
lon(lon)	long_name	"Longitude"
	standard_name	"longitude"
	units	"degrees_east"
	axis	"X"
	valid_min	0.
	valid_max	360.
lat(lat)	long_name	"Latitude"
	standard_name	"latitude"
	units	"degrees_north"
	axis	"Y"
	valid_min	-90
	valid_max	90
time	long_name	"Time"
	standard_name	"time"
	units	"days since 1950-01-01"
	calendar	"julian"
	month	"December 2010"
	axis	"T"
date_bounds(n)	bounds	"date_bounds"
sla(lat,lon)	_FillValue	1.844674e+19f
	long_name	"Monthly sea level anomalies"
	standard_name	"sea_surface_height_above_sea_level"
	units	"m"
	coordinates	"lon lat"



3.6.2. Mean Sea Level temporal variations

3.6.2.1. Global attributes

Attribute	Value
title	"Mean Sea Level temporal variations"
institution	"CNES, CLS, ESA"
references	http://www.esa-sealevel-cci.org/webfm_send/108
tracking_id	UUID
source	ERS-1 Phase C OPR V6, ERS-1 Phase E OPR V3, ERS-1 Phase F OPR V3, ERS-1 Phase G OPR V6, ERS-2 OPR V6, Envisat GDR-1, Topex/Poseidon MGDR, Jason-1 GDR-C, Jason-2 GDR-C, GFO GDR NOAA
platform	"ERS-1, ERS-2, ENVISAT, Topex/Poseidon, Jason-1, Jason-2, GFO"
sensor	"RA, RA2, Poseidon-1, Poseidon-2, Poseidon-3, GFO"
Conventions	CF-1.6
product_version	"1."
summary	"This dataset contains global mean sea level variations from satellite observations."
keywords	"altimetry"
id	GLO-MSL-MERGED
naming_authority	AVISO
keywords_vocabulary	"MyOcean"
standard_name_vocabulary	" http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/12/cf-standard-name-table.html "
cdm_data_type	"Station"
comment	"These data were produced at CNES as part of the ESA Sea Level CCI project."
license	"ESA CCI Data Policy: free and open access."
date_created	"YYYY-MM-DD HH:MM:SS"
history	"YYYY-MM-DD HH:MM:SS: creation"
contact	info-sealevel@esa-sealevel-cci.org
project	"Climate Change Initiative - European Space Agency"
time_coverage_start	"YYYY-MM-DD HH:MM:SS "
time_coverage_end	"YYYY-MM-DD HH:MM:SS "
time_coverage_duration	P22Y



time_coverage_resolution	P1M
geospatial_lat_min	"-90"
geospatial_lat_max	"-90"
geospatial_lon_min	"0"
geospatial_lon_max	"360"
geospatial_vertical_min	0.0
geospatial_vertical_max	0.0
creator_name	"CNES,CLS"
creator_url	http://www.aviso.oceanobs.com/en/
creator_email	aviso@oceanobs.com

3.6.2.2. Variable attributes

Name	Attribute	Value
lon(lon)	long_name	"Longitude"
	standard_name	"longitude"
	units	"degrees_east"
	axis	"X"
	valid_min	0.
	valid_max	360.
lat(lat)	long_name	"Latitude"
	standard_name	"latitude"
	units	"degrees_north"
	axis	"Y"
	valid_min	-90
	valid_max	90
time(time)	long_name	"Time"
	standard_name	"time"
	units	"days since 1950-01-01"
	calendar	"julian"
	month	"December 2010"
	axis	"T"
	bounds	"date_bounds"
global_msl(time)	_FillValue	1.844674e+19f
	long_name	""Global mean sea level variations"



	standard_name	"global_average_sea_level_change"
	units	"m"
global_msl_trend	long_name	"Tendency of global mean sea level variations"
	standard_name	"tendency_of_global_average_sea_level_change"
	units	"mm/year"
global_msl_trend_error	long_name	"Standard error on global mean sea level variations tendency"
	units	"mm/year"

3.6.3. Mean Sea Level changes geographic distribution

3.6.3.1. Global attributes

title	"Geographical distribution of mean sea level trends"
institution	"CNES, CLS, ESA"
references	http://www.esa-sealevel-cci.org/webfm_send/108
tracking_id	UUID
source	ERS-1 Phase C OPR V6, ERS-1 Phase E OPR V3, ERS-1 Phase F OPR V3, ERS-1 Phase G OPR V6, ERS-2 OPR V6, Envisat GDR-1, Topex/Poseidon MGDR, Jason-1 GDR-C, Jason-2 GDR-C, GFO GDR NOAA
platform	"ERS-1, ERS-2, ENVISAT, Topex/Poseidon, Jason-1, Jason-2, GFO"
sensor	"RA, RA2, Poseidon-1, Poseidon-2, Poseidon-3, GFO"
Conventions	CF-1.6
product_version	"1."
summary	"This dataset contains global maps of mean sea level variations from satellite observations."
keywords	"altimetry"
id	GLO-MSLTR-MERGED
naming_authority	AVISO
keywords_vocabulary	"MyOcean"
standard_name_vocabulary	" http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/12/cf-standard-name-table.html "



cdm_data_type	"Grid"
comment	"These data were produced at CNES as part of the ESA Sea Level CCI project."
license	"ESA CCI Data Policy: free and open access."
date_created	" YYYY-MM-DD HH:MM:SS "
history	" YYYY-MM-DD HH:MM:SS : creation"
contact	info-sealevel@esa-sealevel-cci.org
project	"Climate Change Initiative - European Space Agency"
time_coverage_start	" YYYY-MM-DD HH:MM:SS"
time_coverage_end	" YYYY-MM-DD HH:MM:SS"
time_coverage_duration	P22Y
time_coverage_resolution	P1M
geospatial_lat_min	"-90"
geospatial_lat_max	"-90"
geospatial_lon_min	"0"
geospatial_lon_max	"360"
geospatial_vertical_min	0.0
geospatial_vertical_max	0.0
geospatial_lat_units	"degrees_north"
geospatial_lon_units	"degrees_east"
geospatial_lat_resolution	"0,25"
geospatial_lon_resolution	"0,25"
creator_name	"CNES,CLS"
creator_url	http://www.aviso.oceanobs.com/en/
creator_email	aviso@oceanobs.com

3.6.3.2. Variable attributes

Name	Attribute	Value
lon(lon)	long_name	"Longitude"
	standard_name	"longitude"
	units	"degrees_east"
	axis	"X"
	valid_min	0.
	valid_max	360.



lat(lat)	long_name	"Latitude"
	standard_name	"latitude"
	units	"degrees_north"
	axis	"Y"
	valid_min	-90
	valid_max	90
time(time)	long_name	"Time"
	standard_name	"time"
	units	"days since 1950-01-01"
	calendar	"julian"
	month	"December 2010"
	axis	"T"
	bounds	"date_bounds"
local_msl_trend(lat,lon)	_FillValue	1.844674e+19f
	long_name	"Geographical distribution of mean sea level trends"
	standard_name	"tendency_of_sea_surface_height_above_sea_level"
	units	"mm/year"
local_msl_trend_error(lat,lon)	long_name	"Geographical distribution of mean sea level trends errors"
	units	"mm/year"

3.6.4. Mean Sea Level changes amplitude and phases

3.6.4.1. Global attributes

Attribute	Value
title	"Mean Sea Level changes amplitude and phases"
institution	"CNES, CLS, ESA"
references	http://www.esa-sealevel-cci.org/webfm_send/108
tracking_id	UUID



source	ERS-1 Phase C OPR V6, ERS-1 Phase E OPR V3, ERS-1 Phase F OPR V3, ERS-1 Phase G OPR V6, ERS-2 OPR V6, Envisat GDR-1, Topex/Poseidon MGDR, Jason-1 GDR-C, Jason-2 GDR-C, GFO GDR NOAA
platform	"ERS-1, ERS-2, ENVISAT, Topex/Poseidon, Jason-1, Jason-2, GFO"
sensor	"RA, RA2, Poseidon-1, Poseidon-2, Poseidon-3, GFO"
Conventions	CF-1.6
product_version	"1."
summary	"This dataset contains global maps of mean sea level variations amplitude and phases from satellite observations."
keywords	"altimetry"
id	GLO-MSL-AMPH-MERGED
naming_authority	AVISO
keywords_vocabulary	"MyOcean"
standard_name_vocabulary	" http://cf-pcmdi.llnl.gov/documents/cf-standard-names/standard-name-table/12/cf-standard-name-table.html "
cdm_data_type	"Grid"
comment	"These data were produced at CNES as part of the ESA Sea Level CCI project."
license	"ESA CCI Data Policy: free and open access."
date_created	"2012-09-10 00:00:00"
history	"2012-09-10 00:00:00 : creation"
contact	info-sealevel@esa-sealevel-cci.org
project	"Climate Change Initiative - European Space Agency"
time_coverage_start	" YYYY-MM-DD HH:MM:SS"
time_coverage_end	" YYYY-MM-DD HH:MM:SS"
time_coverage_duration	P22Y
time_coverage_resolution	P1M
geospatial_lat_min	"-90"
geospatial_lat_max	"-90"
geospatial_lon_min	"0"
geospatial_lon_max	"360"
geospatial_vertical_min	0.0
geospatial_vertical_max	0.0
geospatial_lat_units	"degrees_north"
geospatial_lon_units	"degrees_east"
geospatial_lat_resolution	"0,25"



geospatial_lon_resolution	"0,25"
creator_name	"CNES,CLS"
creator_url	http://www.aviso.oceanobs.com/en/
creator_email	aviso@oceanobs.com

3.6.4.2. Variable attributes

Name	Attribute	Value
lon(lon)	long_name	"Longitude"
	standard_name	"longitude"
	units	"degrees_east"
	axis	"X"
	valid_min	0.
	valid_max	360.
lat(lat)	long_name	"Latitude"
	standard_name	"latitude"
	units	"degrees_north"
	axis	"Y"
	valid_min	-90
	valid_max	90
time(time)	long_name	"Time"
	standard_name	"time"
	units	"days since 1950-01-01"
	calendar	"julian"
	month	"December 2010"
	axis	"T"
	bounds	"date_bounds"
ampl(lat,lon,period)	_FillValue	1.844674e+19f
	long_name	"Geographical distribution of mean sea level amplitude"
	standard_name	"amplitude_of_global_average_sea_level_change"
	units	"m"
phase(lat,lon,period)	_FillValue	1.844674e+19f
	long_name	"Geographical distribution of mean sea level phase" (referenced to the 15 th January 1993)



	standard_name	"phase_of_global_average_sea_level_change"
	units	"degrees"
period(period)	long_name	"Period of signal" (annual, semi-annual)
	standard_name	"harmonic_period"
	units	"year"



Appendix A - List of acronyms

AD	Applicable Document
CORSSH	CORrected Sea Surface Height
DT	Delayed-time
ECV	Essential Climate Variable
FCDR	Fundamental Climate Data Record
GDR	Geophysical Data Record
GPD	GNSS-derived Path Delay
MSLA	Map of Sea Level Anomaly
MSS	Mean Sea Surface
POE	Precise Orbit Ephemeris
RD	Reference Document
SSH	Sea Surface Height
TBC	To be confirmed
TBD	To be defined
T/P	Topex/Poséidon