PRODUCT USER MANUAL

For Mediterranean Sea Physical Analysis and Forecasting Product

MEDSEA_ANALYSISFORECAST_PHY_006_013

Issue: 2.1.1

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Approval Date:

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RECORD TABLE

Issue	Date	§	Description of Change	Author	Validated By
1.0	25/09/2017	all	Initial version	R. Lecci, M. Drudi, A. Grandi, C. Fratianni, D. Padeletti	
1.1	25/01/2018	all	Changes for product upgrade	R. Lecci, A. Grandi, C. Fratianni, E. Clementi, M. Drudi	
1.2	21/01/2019	all	New template and new datasets	R. Lecci, A. Grandi, E. Clementi, M. Drudi	
1.3	06/12/2019	all	Release of daily-mean products centred at 12:00Z instead of 00:00Z	R. Lecci, A. Grandi, M. Drudi, E. Clementi	
1.4	10/09/2020	all	Revision of timeseries temporal coverage and new atmospheric forcing	R. Lecci, A. Grandi, E. Clementi	C. Derval
2.0	15/01/2021	all	New product and new datasets	R. Lecci, A. Grandi, E. Clementi	
2.1	10/09/2021	all	Upgrade of forcing	R. Lecci, A. Grandi	
2.1.1	23/09/2022	II.4	Change of upstream data (added Sentinel-6A)	R. Lecci, E. Clementi	

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GLOSSARY AND ABBREVIATIONS

Analysis (Numerical)	A representation of the state of the ocean based on numerical modeling ingesting available observations in Near Real Time. The operational production centre produces 4D time-space analysis data.
CF	Climate Forecast (convention for NetCDF)
CMCC	Centro Euro-Mediterraneo sui Cambiamenti Climatici
CMEMS	Copernicus Marine Environment Monitoring Service
CTD	Conductivity Temperature Depth
DGF	DirectGetFile
DirectGetFile	CMEMS service tool (FTP like) to download a NetCDF file
ECMWF	European Centre for Medium-Range Weather Forecasts
FAQ	Frequently Asked Question
Forecast (Numerical)	A numerical forecast or prediction is based on equations governing the motions and the forces affecting motion of fluids. The equations are based, or initialized, on specified ocean conditions at a certain place and time (NOAA Glossary).
FTP	File Transfer Protocol
MDT	Mean Dynamic Topography
Med/MED	Mediterranean
Meridional Velocity	South to North component of the horizontal velocity vector
MFC	Monitoring and Forecasting Centre
MFS	Mediterranean Forecasting System
NEMO	Nucleous for European Modelling of the Ocean
NetCDF	Network Common Data Form

NOAA	National Oceanic and Atmospheric Administration
OA	Objective Analyses
OCEANVAR	Oceanographic variational data assimilation scheme developed at CMCC
OpenDAP	Open-Source Project for a Network Data Access Protocol. Protocol to download subset of data from a n-dimensional gridded dataset (ie: 4 dimensions: lon-lat, depth, time)
PU	Production Unit
SL	Sea Level
SLA	Sea Level Anomaly
SSH	Sea Surface Height
SST	Sea Surface Temperature
Subsetter	Copernicus Marine Service tool to download a NetCDF file of a selected geographical box using values of longitude, latitude and time range
XBT	eXpandable BathyThermograph
WW3	WaveWatch-III
Zonal Velocity	West to East component of the horizontal velocity vector
3DVAR	Three-Dimensional Variational

I INTRODUCTION

I.1 Summary

This document is the user manual for the CMEMS analysis and forecast product **MEDSEA_ANALYSISFORECAST_PHY_006_013**. A rolling archive of analysis over the last two years up to real-time is available on the CMEMS server.

It contains 3D, monthly mean fields, 24 hours mean fields and hourly mean fields of Potential Temperature, Bottom Temperature, Salinity, Zonal and Meridional Velocity, and by 2D, monthly mean fields, 24 hours mean fields and hourly mean fields of Sea Surface Height, Mixed Layer Depth and Bottom Potential Temperature.

MEDSEA_ANALYSISFORECAST_PHY_006_013 product is organized in 21 datasets:

- 5 datasets contain monthly mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface height, bottom potential temperature, mixed layer thickness information.
  - **med-cmcc-tem-an-fc-m**
  - **med-cmcc-cur-an-fc-m**
  - **med-cmcc-ssh-an-fc-m**
  - **med-cmcc-mld-an-fc-m**
  - **med-cmcc-sal-an-fc-m**
- 5 datasets contain daily mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D sea surface height, bottom potential temperature, mixed layer thickness information.
  - **med-cmcc-tem-an-fc-d**
  - **med-cmcc-cur-an-fc-d**
  - **med-cmcc-ssh-an-fc-d**
  - **med-cmcc-mld-an-fc-d**
  - **med-cmcc-sal-an-fc-d**
- 3 datasets contain hourly mean fields: 3D potential temperature, salinity and currents information from top to bottom and 2D bottom potential temperature.
  - **med-cmcc-tem-an-fc-h**
  - **med-cmcc-sal-an-fc-h**
  - **med-cmcc-cur-an-fc-h**

- 2 datasets contain 15minutes instantaneous fields: 2D sea surface currents and sea surface height information.
    - **med-cmcc-cur-an-fc-qm**
    - **med-cmcc-ssh-an-fc-qm**
- 5 datasets contain hourly mean fields: 3D potential temperature, salinity and currents information from top to 400 m and 2D sea surface height, bottom potential temperature, mixed layer thickness information.
    - **med-cmcc-tem-an-fc-hts**
    - **med-cmcc-sal-an-fc-hts**
    - **med-cmcc-cur-an-fc-hts**
    - **med-cmcc-ssh-an-fc-hts**
    - **med-cmcc-mld-an-fc-hts**
- **1** dataset contains the static fields for the system: coordinates, mean sea surface level, mask and bathymetry: **MEDSEA_ANALYSISFORECAST_PHY_006_013-statics**

The product is published on the CMEMS dissemination server after automatic and human quality controls. Product is available on-line and disseminated through the CMEMS Information System. Files downloaded are in NetCDF format.

The analysis and forecasting system is described in the Quality Information Document (QUID) CMEMS-MED-QUID-006-013 (http://marine.copernicus.eu/documents/QUID/CMEMS-MED-QUID-006-013.pdf).

More detailed information can be obtained from the CMEMS Service Desk (servicedesk.cmems@mercator-ocean.eu).

Disclaimer: The quality of the product may vary during the proposed time series depending on the possible update of the system.

Information on operational issues on products and services can be found on our User Notification Service. If you have any questions, please contact us.

I.2 History of changes

Date	Description
21.01.2019	New template and inclusion of new datasets
06.12.2019	Release of daily-mean products centered at 12:00Z instead of 00:00Z
10.09.2020	New timeseries temporal coverage and new atmospheric forcing
15.01.2021	New product with the addition of 15 minutes frequency dataset for sea surface currents and sea level Addition of the variable zos_detided in the datasets for sea level.
10.09.2021	Upgrade of forcing with Po daily observations

II DESCRIPTION OF THE PRODUCT SPECIFICATION

II.1 General Information

Product name	MEDSEA_ANALYSISFORECAST_PHY_006_013	
Geographical coverage	17.29°W → 36.30°E; 30.18°N → 45.98°N	
Variables	Temperature Salinity Sea Surface Height Sea Surface Height Detided Horizontal velocity (eastward and northward components) Ocean mixed layer thickness Sea floor potential temperature	
	Analysis	**Forecast**
Update frequency	Weekly	Daily
Available time series	last two years up to real-time	10-days forecast
Target delivery time	On Tuesday at 16:00 UTC	Daily at 16:00 UTC
Temporal resolution	med-cmcc-cur-an-fc-qm, med-cmcc-ssh-an-fc-qm: 15 minutes instantaneous med-cmcc-tem-an-fc-hts, med-cmcc-sal-an-fc-hts, med-cmcc-cur-an-fc-hts, med-cmcc-ssh-an-fc-hts, med-cmcc-mld-an-fc-hts, med-cmcc-tem-an-fc-h, med-cmcc-sal-an-fc-h, med-cmcc-cur-an-fc-h: hourly mean med-cmcc-tem-an-fc-d, med-cmcc-sal-an-fc-d, med-cmcc-cur-an-fc-d, med-cmcc-ssh-an-fc-d, med-cmcc-mld-an-fc-d: daily mean med-cmcc-tem-an-fc-m, med-cmcc-sal-an-fc-m, med-cmcc-cur-an-fc-m, med-cmcc-ssh-an-fc-m, med-cmcc-mld-an-fc-m: monthly mean	
Horizontal resolution	1/24 °	

Number of vertical levels	141		
Format	NetCDF CF1.0		
Delivery mechanisms	Subsetter	DGF	FTP

Table 1: MED-MFC Real Time products

The runtime schedule:

MEDSEA_ANALYSISFORECAST_PHY_006_013

The processing is based on two cycles: a daily cycle to produce forecast data, starting each day at 8:00UTC, and a weekly cycle to produce analysis data starting each Monday at 12:00UTC

II.2 Details of datasets

MEDSEA_ANALYSISFORECAST_PHY_006_013

Datasets:

- **med-cmcc-tem-an-fc-m**
- **med-cmcc-sal-an-fc-m**
- **med-cmcc-cur-an-fc-m**
- **med-cmcc-ssh-an-fc-m**
- **med-cmcc-mld-an-fc-m**

contain monthly mean fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface height, bottom potential temperature, mixed layer thickness

- **med-cmcc-tem-an-fc-d**
- **med-cmcc-sal-an-fc-d**
- **med-cmcc-cur-an-fc-d**
- **med-cmcc-ssh-an-fc-d**
- **med-cmcc-mld-an-fc-d**

contain daily mean fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D sea surface height, bottom potential temperature, mixed layer thickness

- **med-cmcc-tem-an-fc-h**
- **med-cmcc-sal-an-fc-h**

- **med-cmcc-cur-an-fc-h**

contain hourly mean fields: 3D potential temperature, salinity, and currents information from top to bottom and 2D bottom potential temperature

- **med-cmcc-tem-an-fc-hts**
- **med-cmcc-sal-an-fc-hts**
- **med-cmcc-cur-an-fc-hts**
- **med-cmcc-ssh-an-fc-hts**
- **med-cmcc-mld-an-fc-hts**

contain hourly mean fields: 3D potential temperature, salinity, and currents information from top to 400 m and 2D sea surface height, bottom potential temperature, mixed layer thickness

- **med-cmcc-ssh-an-fc-qm**
- **med-cmcc-cur-an-fc-qm**

contain 15minutes instantaneous fields: 2D sea surface currents and sea surface height

- **MEDSEA_ANALYSISFORECAST_PHY_006_013_statics**

contains the static fields for the system: coordinates, mean sea surface level, mask and bathymetry

Variables name in the NetCDF file and Unit: Long_name & Standard_name
zos [m] Sea surface height sea_surface_height_above_geoid
zos_detided [m] Sea surface height detided sea_surface_height_above_geoid_detided
uo [m/s] eastward ocean current velocity eastward_sea_water_velocity
vo [m/s] northward ocean current velocity northward_sea_water_velocity
so [psu] Salinity sea_water_salinity
thetao [°C] Sea Temperature sea_water_potential_temperature
bottomT [°C] Sea floor potential temperature sea_water_potential_temperature_at_sea_floor
mlotst [m]

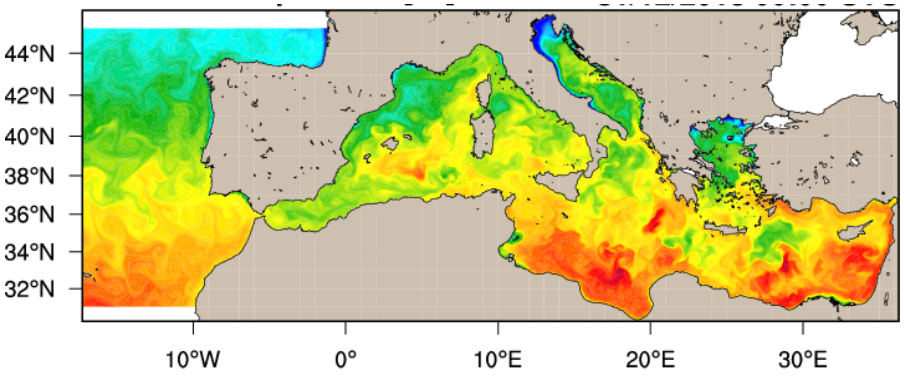
Ocean mixed layer thickness defined by density (as in de Boyer Montegut,2004) ocean_mixed_layer_thickness_defined_by_sigma_theta
e1t [m] Cell dimension along X axis
e2t [m] Cell dimension along Y axis
e3t [m] Cell dimension along Z axis cell_thickness
mask [1] Land-sea mask: 1 = sea ; 0 = land sea_binary_mask
deptho [m] Bathymetry sea_floor_depth_below_geoid
deptho_lev [1] Model level number at sea floor model_level_number_at_sea_floor
mdt [m] Mean dynamic topography sea_surface_height_above_geoid

Table 2: list of the datasets and variable names and unit for the MEDSEA_ANALYSISFORECAST_PHY_006_013 product

II.3 Additional Information on parameters

mlotst [m]	ocean_mixed_layer_thickness_defined_by_sigma_theta. It is the depth where the density increases of 0.01 kg.m-3 compared to density at 10 m depth
*-hts datasets	Hourly 3D variables are available at 15 surface and subsurface levels: 1: (L1) 1.02m, 2: (L2) 3.17m, 3: (L3) 5.46m, 4:(L4) 7.92m, 5: (L5) 10.54m, 6:(L8) 19.40m, 7: (L11) 29.89m, 8: (L16) 51.38m, 9: (L20) 72.62m, 10: (L24) 97.93m, 11: (L31) 153.43m, 12: (L36) 203.17m, 13: (L40) 249.92m, 14: (L44) 303.56m, 15: (L50) 398.54m

II.4 Production System Description

Domain Resolution and grid Geographic coverage	MEDSEA (17.29°W-36.29°E; 30.19°N – 45.98°N) 1/24º; regular grid; 1287 x 380 x 141 This is a regional product covering the Mediterranean Sea and a box in the adjacent Atlantic Ocean. It is defined on a regular grid at 1/24 degree (approx. 4km) and 141 vertical levels. 
Model Version Production unit Period of validation	▪ NEMO-WW3 ▪ CMCC, Italy ▪ 01.01.2019–31.12.2019 and 01.04.2022-31.06.2022
Vertical grid	The product is delivered at the model's native grid, with up to 141 vertical levels: **levels [m]:** 1.02 3.17 5.46 7.92 10.54 13.32 16.27 19.40 22.71 26.20 29.89 33.77 37.85 42.15 46.65 51.38 56.33 61.52 66.95 72.62 78.55 84.74 91.20 97.93 104.94 112.25 119.86 127.77 136 144.55 153.43 162.66 172.24 182.18 192.48 203.17 214.25 225.72 237.61 249.92 262.65 275.83 289.46 303.56 318.13 333.19 348.75 364.82 381.42 398.54 416.22 434.46 453.27 472.67 492.67 513.29 534.53 556.41 578.94 602.15 626.03 650.62 675.91 701.93 728.69 756.2 784.47 813.53 843.39 874.06 905.55 937.89 971.08 1005.14 1040.08 1075.91 1112.66 1150.34 1188.95 1228.52 1269.05 1310.56 1353.07 1396.58 1441.11 1486.67 1533.27 1580.93 1629.65 1679.45 1730.33 1782.31 1835.41 1889.61 1944.95 2001.42 2059.03 2117.79 2177.71 2238.8 2301.06 2364.49 2429.11 2494.91 2561.9 2630.09 2699.47 2770.06 2841.84 2914.83 2989.02 3064.41 3141 3218.8 3297.79 3377.98 3459.37 3541.94 3625.7 3710.65 3796.77 3884.06 3972.52 4062.13 4152.9 4244.8 4337.85 4432.02 4527.3 4623.7 4721.19 4819.77 4919.43 5020.15 5121.93 5224.75 5328.59 5433.46 5539.33 5646.2 5754
Tides	8 components : M2, S2, N2, K2, K1, O1, P1, Q1

Atmospheric forcing	ECMWF atmospheric forcing at 1/10 degrees: 6-hourly analysis; 1 hour for the first 3 days of forecast, 3 hours for the following 3 days of forecast and 6 hours for the last 4 days of forecast
Boundary forcing	The Mediterranean modeling system is forced in the Atlantic side by the Global analysis and forecast product (GLOBAL_ANALYSIS_FORECAST_PHY_001_024), while in the Dardanelles Strait it is force by a combination of daily climatological fields from a Marmara Sea model and the Global analysis and forecast product (GLOBAL_ANALYSIS_FORECAST_PHY_001_024)
Assimilation scheme	OceanVar (3DVAR)
Assimilated observations	In-situ vertical profiles of Temperature and Salinity from ARGO and XBT; Sea Level Anomaly (SLA) from available satellites Jason 2 & 3, Saral-Altika, Cryosat; Sentinel-3A/3B, Sentinel-6A. Objective Analyses-Sea Surface Temperature (SST) fields are used to correct surface heat fluxes.
Initial conditions (spin-up process)	World Ocean Atlas (WOA) 2013 V2, winter climatology at 01/01/2015
Bathymetry	GEBCO 30sec interpolated on the model grid
River run-off	Data from monthly climatologies and Po River observations

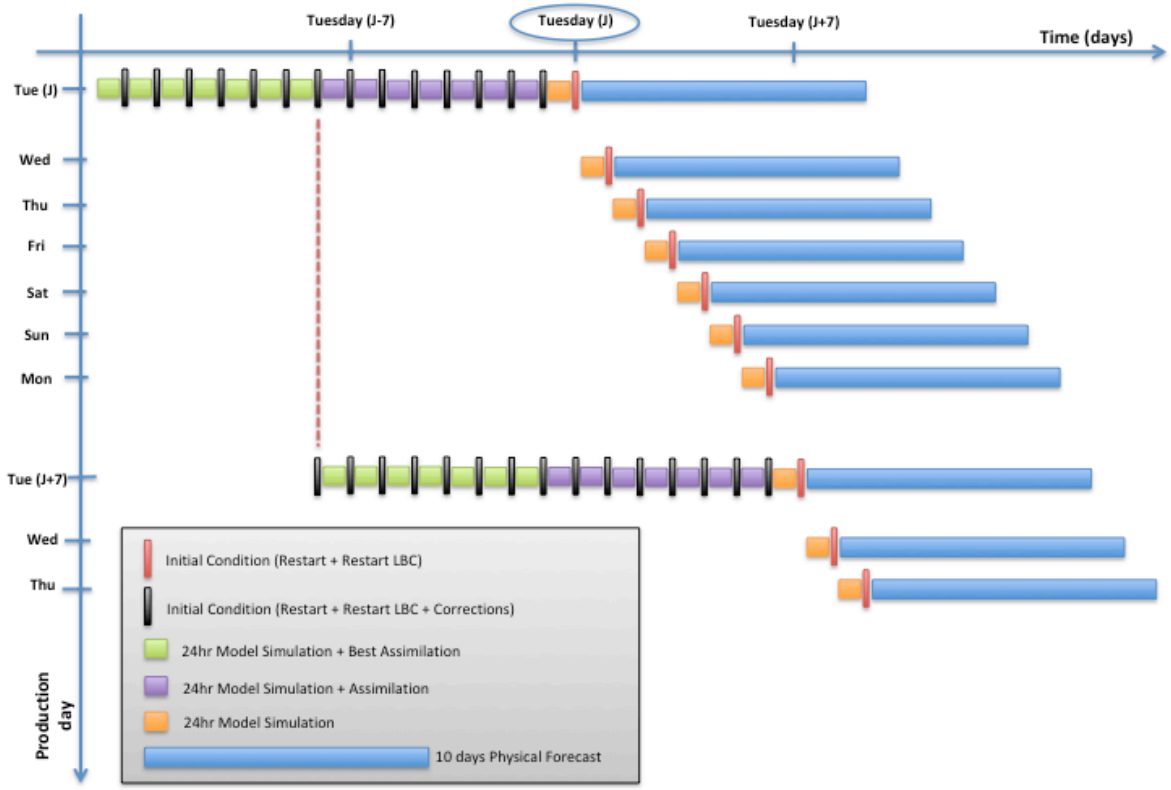
The physical component of the Mediterranean Forecasting System (Med-Currents) is a coupled hydrodynamic-wave modeling system implemented over the whole Mediterranean Basin including tides. The model horizontal grid resolution is 1/24˚ (ca. 4 km) and has 141 unevenly spaced vertical levels.
The hydrodynamics are supplied by the Nucleus for European Modelling of the Ocean (NEMO v3.6) while the wave component is provided by WaveWatch-III; the model solutions are corrected by a variational data assimilation scheme (3DVAR) of temperature and salinity vertical profiles and along track satellite Sea Level Anomaly observations. Objective Analyses-Sea Surface Temperature fields are used for the correction of surface heat fluxes with the relaxation constant of 110 W m-2 K-1 applied close to midnight.

II.4.1.1 Processing information

The processing is based on two cycles: a daily cycle for the production of forecast data, and a weekly cycle for the production of analysis data.

The daily cycle is delivered each day (J), for the next 10 days. The forecast is initialized by a hindcast every day. Every day the product is updated with a hindcast for day J-1 and 10-day forecast.

The weekly cycle is delivered on Tuesday, for the previous 14 days. The assimilation cycle is daily (24hr) and is produced in filter mode. Every Tuesday the product is updated with the analyses from day J-15 to day J-2, a hindcast for day J-1 and 10-day forecast.



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II.4.1.2 Observations

Observational data are assimilated into the OceanVar data assimilation scheme in the weekly analysis cycle. Presently the following data are assimilated:

- Altimetric sea level anomaly (SLA) observations from the Altika, Cryosat, Jason3, Jason2, HY-2A, HY-2B, Sentinel3A, Sentinel3B and Sentinel6A satellites from the products:
  1. SEALEVEL_EUR_PHY_L3_MY_008_061
  2. SEALEVEL_EUR_PHY_L3_NRT_OBSERVATIONS_008_059
- SST satellite L4 data from product SST_MED_SST_L4_NRT_ OBSERVATIONS_010_004.
- *In situ* observations of temperature and salinity profiles from Argo floats and temeperature profiles from XBTs from the products:
  1. INSITU_MED_NRT_ OBSERVATIONS_013_035
  2. INSITU_GLO_NRT_ OBSERVATIONS_013_030

II.5 Grid

NEMO model is discretized on a staggered grid (Arakawa C grid) with masking of land areas. All variables are delivered at the center of the tracer grid cell after interpolation.

II.6 Vertical Levels

All MEDSEA ocean variables are computed on a z* (time varying thickness) vertical coordinate system and delivered along a fixed z-level vertical grid. Moreover, the vertical grid is defined by means of partial cells, thus the last ocean level thickness varies to better represent the model topography.

II.7 Processing information

II.7.1 Update Time

The product is updated daily at 16:00 UTC for the daily and hourly datasets.

The monthly dataset is updated monthly on the 20th (addition of the monthly mean of the previous month).

II.7.2 Temporal extent of analysis and forecast stored on delivery mechanism

A rolling archive of analysis over the last two years up to real-time is available on CMEMS portal. The table below shows the time coverage in detail for the time-series of each dataset.

Dataset	Time-series available from	Time-series available up to
monthly mean: med-cmcc-tem-an-fc-m, med-cmcc-sal-an-fc-m, med-cmcc-cur-an-fc-m, med-cmcc-ssh-an-fc-m, med-cmcc-mld-an-fc-m	last two years	Previous Month Update the 20th of current month
daily mean: med-cmcc-tem-an-fc-d, med-cmcc-sal-an-fc-d, med-cmcc-cur-an-fc-d, med-cmcc-ssh-an-fc-d, med-cmcc-mld-an-fc-d		J+9 Updated by processing of day J

hourly mean – 2D fields and 3D fields from top to 400m in depth: med-cmcc-tem-an-fc-hts, med-cmcc-sal-an-fc-hts, med-cmcc-cur-an-fc-hts, med-cmcc-ssh-an-fc-hts, med-cmcc-mld-an-fc-hts		J+4 Updated by processing of day J
15 minutes instantaneous – 2D fields: med-cmcc-ssh-an-fc-qm, med-cmcc-cur-an-fc-qm		
hourly mean – 3D fields from top to bottom: med-cmcc-tem-an-fc-h, med-cmcc-sal-an-fc-h, med-cmcc-cur-an-fc-h	19/04/2021	

II.7.3 Time averaging

For the monthly dataset, the fields are monthly means over the calendar month (first to last day of the month). For the daily dataset, the fields are daily means over a day (midnight to midnight, centered at midday). For the hourly dataset, the fields are hourly means (centered every half-hour). For the 15 minutes frequency datasets, the fields are instantaneous at minutes 00, 15, 30 and 45 of every hour.

III DOWNLOAD A PRODUCT

After registration, you will be able to download our data. To assist you, our HelpCenter is available, and more specifically its section about download.

Information on operational issues on products and services can be found on our User Notification Service. If you have any questions, please contact us.

IV FILES NOMENCLATURE

IV.1 Nomenclature of files when downloaded through the CMEMS Web Portal Subsetter Service

Files nomenclature when downloaded through the CMEMS Web Portal Subsetter is based on product dataset name and a numerical reference related to the request date on the MIS.

The scheme is: : **datasetname_nnnnnnnnnnnn.nc**

where:

- **datasetname**: as described previously
- **nnnnnnnnnnnn**: 13-digit integer corresponding to the current time (download time) in milliseconds since January 1, 1970 midnight UTC.
- **.nc**: standard NetCDF filename extension.

Example: med-cmcc-sal-an-fc-d_1303461772348.nc

IV.2 Nomenclature of files when downloaded through the CMEMS Web Portal DirectGetFile or CMEMS FTP Service

MEDSEA_ANALYSISFORECAST_PHY_006_013 files nomenclature when downloaded through the CMEMS Web Portal DGF or FTP service is based as follows:

{valid date}_{freq flag}-{producer}--{parameter}-{config}-{region}-{bul date}_{product type}-sv{file version}.nc

where

- **valid date** YYYYMMDD is the validity day of the data in the file
- **freq flag** is the frequency of data values in the file (h = hourly, hts = hourly time series, d = daily, m=monthly)
- **producer** is a short version of the CMEMS production unit
- **config** identifies the producing system and configuration
- **region** is a six-letter code for the region
- **parameter** is a four-letter code for the parameter or parameter set from Standard BODC.
- **bul date** bYYYYMMDD is the bulletin date the product was produced
- **product type** is a two-letter code for the product type, for example fc for forecast, an for analysis and sm for hindcast.

- **file version** is xx.yy where xx is the CMEMS version (03, 04, 05, 06 or 07) and yy is an incremental version number

Table 1 shows the nomenclature for the MEDSEA_ANALYSISFORECAST_PHY_006_013 products.

Table 1 Description of the nomenclature for MEDSEA_ANALYSISFORECAST_PHY_006_013

valid date	YYYYMMDD
freq flag	m (monthly) d (daily) h (hourly) hts (hourly time series) qm (15 minutes)
producer	CMCC
config	MFSeas6
region	MEDATL
parameter	TEMP PSAL ASLV RFVL AMXL
bul date	bYYYYYMMDD
product type	fc (forecast) an (analysis) sm (hindcast)
file version	07.00

Example for a file of Salinity:

20190309_d-CMCC--PSAL-MFSeas6-MEDATL-b20190306_fc-sv07.00.nc

This is the mean field of salinity centered at 00:00 UTC of the 9thMarch 2019, and the time coverage is from midnight (00:00 UTC) of the 9thMarch 2019 to midnight (24:00 UTC) of the 9thMarch 2019 (see section IV.8).

20190309_h-CMCC--PSAL-MFSeas6-MEDATL-b20190306_fc-sv07.00.nc

This file contains the 24-hourly mean fields of salinity, each one centered at 30' of every hour from midnight (00:00 UTC) of the 9thMarch 2019 to midnight (24:00 UTC) of the 9thMarch 2019 (see section IV.9).

20190309_hts-CMCC--PSAL-MFSeas6-MEDATL-b20190306_fc-sv07.00.nc

This file contains the 24-hourly mean fields of salinity, each one centered at 30' of every hour from midnight (00:00 UTC) of the 9thMarch 2019 to midnight (24:00 UTC) of the 9thMarch 2019 (see section IV.9).

20190309_qm-CMCC--RFVL-MFSeas6-MEDATL-b20190306_fc-sv07.00.nc

This file contains the instantaneous fields of sea surface currents at minutes 00, 15, 30 and 45 of every hour from midnight (00:00 UTC) of the 9thMarch 2019 to midnight (24:00 UTC) of the 9thMarch 2019 (see section IV.9).

20190301_m-CMCC--PSAL-MFSeas6-MEDATL-b20190306_an-sv07.00.nc

This is the monthly mean field of salinity for the month of March 2019. The mean is computed from midnight (00:00 UTC) of the 1st March 2019 to midnight (24:00 UTC) of the 31th March 2019 (see section IV.9).

IV.3 Other information: mean centre of Products, land mask value, missing value

The missing value for this product is: 1.e+20

Land mask is equal to "_FillValue" (see variable attribute on NetCDF file).

Real_Value = (Display_Value X scale_factor) + add_offset

The PHY forecasts are using the NetCDF4 format without offset nor scale factors.

In the CMEMS online system data from the latest 2 years (running window) are available via these download interfaces: Subsetter and FTP download

IV.4 File size

DATASET NAME	FILE NAME	DIMENSION [MB]
med-cmcc-ssh-an-fc-d	{date1}_d-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_d-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_d-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	1.2
med-cmcc-sal-an-fc-d	{date1}_d-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_d-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_d-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	36
med-cmcc-tem-an-fc-d	{date1}_d-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_d-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_d-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	47
med-cmcc-cur-an-fc-d	{date1}_d-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_fc-sv07.nc {date1}_d-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_d-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	131

med-cmcc-mld-an-fc-d	{date1}_d-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_d-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_d-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	0.73
med-cmcc-sal-an-fc-h	{date1}_h-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_h-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_h-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	820
med-cmcc-tem-an-fc-h	{date1}_h-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_h-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_h-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	1100
med-cmcc-cur-an-fc-h	{date1}_h-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_h-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_h-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	3150
med-cmcc-ssh-an-fc-hts	{date1}_hts-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_hts-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_hts-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	28

med-cmcc-sal-an-fc-hts	{date1}_hts-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_hts-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_hts-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	160
med-cmcc-tem-an-fc-hts	{date1}_hts-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_hts-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_hts-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	200
med-cmcc-cur-an-fc-hts	{date1}_hts-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_hts-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_hts-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	510
med-cmcc-mld-an-fc-hts	{date1}_hts-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_hts-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_hts-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	14
med-cmcc-cur-an-fc-qm	{date1}_qm-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_qm-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_qm-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	139

med-cmcc-ssh-an-fc-qm	{date1}_qm-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_fc-sv07.00.nc {date1}_qm-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_sm-sv07.00.nc {date1}_qm-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	117
med-cmcc-ssh-an-fc-m	{date1}_m-CMCC--ASLV-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	0.6
med-cmcc-sal-an-fc-m	{date1}_m-CMCC--PSAL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	36
med-cmcc-tem-an-fc-m	{date1}_m-CMCC--TEMP-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	47
med-cmcc-cur-an-fc-m	{date1}_m-CMCC--RFVL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	131
med-cmcc-mld-an-fc-m	{date1}_m-CMCC--AMXL-MFSeas6-MEDATL-b{date2}_an-sv07.00.nc	0.73
MEDSEA_ANALYSISFORECAST_PHY_006_013-statics	MED-MFC_006_013_${field}.nc	5.7

V FILE FORMAT

V.1 NetCDF

The products are stored using the NetCDF 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 (http://www.unidata.ucar.edu/software/netcdf/) for more information, and to retrieve netCDF software package.

NetCDF data format 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 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 products are compliant with the NetCDF Climate and Forecast Convention CF-1.4 (see http://cf-pcmdi.llnl.gov/).

The MEDSEA_ANALYSISFORECAST_PHY_006_013 product is distributed in netCDF4 format.

V.2 Reader Software

NetCDF data can be browsed and used through a number of software packages, including:

- ✓ ncBrowse: http://www.epic.noaa.gov/java/ncBrowse/,
- ✓ NetCDF Operator (NCO): http://nco.sourceforge.net/
- ✓ IDL, Matlab, Panoply, GMT…

V.3 Structure and semantic of netCDF maps files

The model output files contain some additional fields in addition to the variables mentioned earlier. An example output NetCDF file header for med-cmcc-tem-an-fc-d is inserted below, with the additional fields in italic fonts.

netcdf \20191205_d-CMCC--TEMP-MFSeas6-MEDATL-b20210101_an-sv07.00.nc {

dimensions:

depth = 141 ;

lat = 380 ;

lon = 1287 ;

time = UNLIMITED ; // (1 currently)

variables:

VI REFERENCES

Clementi, E., Aydogdu, A., Goglio, A. C., Pistoia, J., Escudier, R., Drudi, M., Grandi, A., Mariani, A., Lyubartsev, V., Lecci, R., Cretí, S., Coppini, G., Masina, S., & Pinardi, N. (2021). Mediterranean Sea Analysis and Forecast (CMEMS MED-Currents, EAS6 system) (Version 1) [Data set]. Copernicus Monitoring Environment Marine Service (CMEMS). https://doi.org/10.25423/CMCC/MEDSEA_ANALYSISFORECAST_PHY_006_013_EAS6