PRODUCT USER MANUAL

IBI_ANALYSIS_FORECAST_WAV_005_005

Issue: 5.0

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RECORD TABLE

Issue	Date	§	Description of Change	Author	Validated By
1.0	23/12/2016	All	**[EIS April 2017: IBI-V3 version]** Generation of the document for the V3 Copernicus Marine Service operational release.	M. G. Sotillo A. Amo L. Aouf C. Toledano.	E. Álvarez Fanjul
2.0	23/12/2017	All	**[EIS Mar 2018: IBI-V4 version]** Update of the document with the changes required for the WAV-V4 release.	M. G. Sotillo A. Amo L. Aouf C. Toledano	E. Álvarez Fanjul
3.0	17/04/2019		**[EIS Jul 2019: IBI-V5 version]** Changes related to the increase of the spatial resolution. New dataset for static files.	A. Amo	M.G. Sotillo
3.1	04/09/2019		**[EIS Dec 2019: IBI-V5 version]** Update of atmospheric forcing. Increase of temporal resolution (from 3-hour to hourly winds).	A. Amo C. Toledano	M.G. Sotillo
4.0	03/04/2020	All	**[EIS Jul 2020: IBI-V6 version]** Update of the MFWAM model code. Implementation of current forcing and SWH altimeter data assimilation.	A. Amo L. Aouf C. Toledano	M.G. Sotillo
4.1	10/09/2020	All	**[EIS Dec 2020: IBI-V6 version]** Forecast extension to 10-days for the second cycle of the day (12H).	A. Amo L. Aouf C. Toledano	M.G. Sotillo
4.2	08/08/2022	All	**[EIS Nov 2022: IBI-V6 version]** WAV data Assimilation system upgrade to include directional wave spectra form CFOSAT and Sentinel-1A. Adaptation of the document to the new template.	A. Amo C. Toledano L. Aouf R. Aznar	M.G. Sotillo

4.3	16/06/2023	All	**[EIS Nov 2023: IBI-V7 version]** Model system update: same new code and model set-up used for the IBI_MULTIYEAR_WAV_005_006 product, but keeping the same resolution (1/20º). New highest wave variables. Update of static files.	A. Amo C. Toledano L. Aouf	S. Cailleau M. G. Sotillo
5.0	31/05/2024	All	**[EIS Nov 2024: IBI-V8 version]** Model system update: Resolution increased from 1/20º to 1/36º. Assimilation system upgrade: inclusion of SWOT-NADIR and HY2B altimetric data.	L. Castrillo B. Gómez L. Aouf	S. Cailleau M. G. Sotillo

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GLOSSARY AND ABBREVIATIONS

CF	Climate Forecast (convention for NetCDF)
CMEMS	Copernicus Marine Environment Monitoring Service now referred as Copernicus Marine Service
ECMWF	European Centre for Medium Range Weather forecast
GLO	Global
IBI	Iberian Biscay Irish
Meridional Velocity	West to East component of the horizontal velocity vector
MFC	Monitoring and Forecasting Centre
MFWAM	Meteo France WAve Model
MY	Multi Year
NRT	Near Real Time
NetCDF	Network Common Data Form
PUM	Product User Manual
QUID	Quality Information Document
SLA	Sea Level Anomalies
SSH	Sea surface height
Zonal Velocity	South to North component of the horizontal velocity vector

DATA ACCESS

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.

I INTRODUCTION

I.1 Summary

This document is the Product User Manual (PUM) for the IBI analysis and forecast product **IBI_ANALYSISFORECAST_WAV_005_005** of the Copernicus Marine Service (also referred to as the CMS). It provides aggregated analyses updated daily with 5-day forecast in the first cycle of the day, and 10-day forecast in the second cycle. An archive of analysis covering two years up to real-time is available on the server of the Copernicus Marine Service.

This product is defined on a standard grid at **0.027 degree**, extending from 19°W to 5°E and 26°N to 56°N.

The product is organized in 2 datasets:

1. **cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i:** containing hourly instantaneous fields, including wave Height, Period and Direction for total spectrum and fields of Wind Wave (or wind sea), Primary Swell Wave and Secondary Swell for partitioned wave spectra, together with the highest wave variables, such as maximum crest height and maximum crest-to-trough height.
- **cmems_mod_ibi_wav_anfc_0.027deg_static:** containing the coordinates, bathymetry and mask files used to generate this IBI product.

The forecast product is generated twice a day:

- the time series (analysis for the previous day and 5-day/10-day forecast in the first/second cycle of the day) is updated at the end of the operational production process.
- old obsolete forecasts are deleted from the server.

The IBI-MFC Production Unit (run by Nologin with the support of CESGA, in terms of supercomputing resources) is responsible of the generation and delivery of the product.

The product is available on-line and disseminated through the Marine Data Store of the Copernicus Marine Service after automatic and human quality controls. Files downloaded are in **NetCDF-4** format and follow **CF-1.8** convention.

The analysis and forecast system are described and evaluated in the Quality Information Document (QUID – see link in References).

I.2 History of changes

System Version (Project/Service)	Operational launch	End of operations	Novelties
IBI-V3 EIS Apr 2017 (Copernicus-1 Phase-I)	19/04/2017	22/03/2018	First release of the IBI MFC Wave operational System. The IBI wave product (historic data from year 2015) generated by means of this system.
IBI-V4 EIS Mar 2018 (Copernicus-1 Phase-I)	22/03/2018	09/07/2019	Minor update of the model to improve surface stress characterization (i.e. new setting on wave dissipation term, sheltering parameter and use of Phillips spectrum tail for high frequency part of the wave spectrum). Update of the historic best estimates on the catalogue.
IBI-V5 EIS Jul 2019 (Copernicus-1 Phase-II)	09/07/2019	03/12/2019	Major update of the model to increase the spatial resolution (from 0.10º to 0.05º). New dataset for static files. Update of the historic best estimates on the catalogue.
IBI-V5 EIS Dec 2019 (Copernicus-1 Phase-II)	03/12/2019	07/07/2020	Temporal frequency of the ECMWF wind forcing enhanced (from the previous 3 hour data to the present hourly winds).
IBI-V6 EIS Jul 2020 (Copernicus-1 Phase-II)	07/07/2020	15/12/2020	Implementation of SWH altimeter data assimilation using optimal interpolation algorithm and current forcing. Update of the historic best estimates on the catalogue.
IBI-V6 EIS Dec 2020 (Copernicus-1 Phase-II)	15/12/2020	29/11/2022	Forecast extension to 10-days for the second cycle of the day (12H).
IBI-V6 EIS Nov 2022 (Copernicus-2 Phase-I)	29/11/2022	30/11/2023	Upgraded of assimilation system to include directional wave spectra from CFOSAT and Sentinel-1A.

IBI-V7 **EIS Nov 2023** **(Copernicus-2 Phase-I)**	30/11/2023	26/11/2024	Model system update: same new code and model set-up used for the IBI_MULTIYEAR_WAV_005_006 product, but keeping the same resolution (1/20º). New highest wave variables: maximum crest height and maximum crest-to-trough height. Update fo static files. Renaming of product and datasets.
IBI-V8 **EIS Nov 2024** **(Copernicus-2 Phase-I)**	26/11/2024	…	Model system update: Resolution increased from 1/20º to 1/36º as performed in IBI_MULTIYEAR_WAV_005_006 product. Assimilation system upgrade: inclusion of SWOT-NADIR and HY2B altimetric data.

Table 1. Historical evolution of the IBI MFC NRT wave operational analysis and forecast system along the Copernicus Marine Service. Time period in operation, as well as its main novelties with respect to the previous release, is provided for each system version.

II DESCRIPTION OF THE PRODUCT SPECIFICATION

II.1 General Information

Product Lines	**IBI_ANALYSISFORECAST_WAV_005_005**	
Geographical coverage	IBI longitude: [-19, 5] deg latitude: [26, 56] deg	
Variables	cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i Spectral significant wave height (Hm0) Spectral moments (0,2) wave period (Tm02) Spectral moments (-1,0) wave period (Tm-10) Mean wave direction from (Mdir) Wave principal direction at spectral peak Wave period at spectral peak /peak period (Tp) Maximum crest trough wave height (Hc,max) Height of the highest crest Spectral significant wind wave height Spectral significant primary swell wave height Spectral significant secondary swell wave height Mean wind wave direction from Mean primary swell wave direction from Mean secondary swell wave direction from Spectral moments (0,1) wind wave period Spectral moments (0,1) primary swell wave period Spectral moments (0,1) secondary swell wave period Stokes drift U Stokes drift V cmems_mod_ibi_wav_anfc_0.027deg_static Bathymetry Mask Coordinates (e1t, e2t)	
Product Type	Analyse and Forecast	
Analysis / **Update frequency**	yes	daily (in first cycle)
	Assimilation of wave height (SWH) altimeter data and wave spectral data (CFOSAT).	
Forecast /	yes	Daily (in both cycles)

Update frequency		
Available time series	2Y + 10-days forecast Historical catalogue covering the last 2 years of analysis. Two forecast bulletins per day. - IBI-WAV-00H cycle: 1-day analysis + 5-days forecast - IBI-WAV-12H cycle: 10-days forecast	
Horizontal resolution	1/36º	
Number of vertical levels	Surface product	
Target delivery time	Two forecast bulletins per day. - IBI-WAV-00H cycle: daily at 13:30UTC. - IBI-WAV-12H cycle: daily at 02:00UTC next day.	
Format	NetCDF CF1.8	
Delivery mechanism	Copernicus Marine Toolbox	

Table 2. General Information of the IBI_ANALYSISFORECAST_WAV_005_005 product.

II.2 Details of datasets

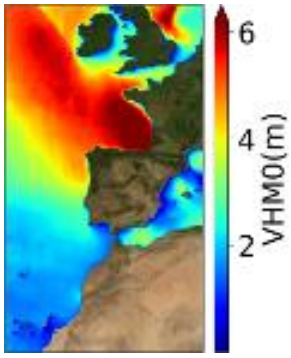
IBI_ANALYSISFORECAST_WAV_005_005
Dataset: **cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i: contains hourly instantaneous fields.** **cmems_mod_ibi_wav_anfc_0.027deg_static: contains coordinates, mask and bathymetry files.** The **hourly instantaneous dataset** is composed of post-processed data into a regular 1/36º lat/lon grid that goes from 26°N to 56°N in latitude and 19°W to 5°E in longitude, called IBI service domain. Latitude and longitude step is 0.027°, and the resulting horizontal grid extends to 1081 x 865 grid points. Information from all variables contained in these datasets is provided at the same grid points. The static dataset contains the static files used for the generation of this IBI product. **Variables name in the NetCDF file and Unit: Long_name & Standard_name**
cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i
VHM0 [m] Spectral significant wave height (Hm0) sea_surface_wave_significant_height

VTM02 [s] Spectral moments (0,2) wave period (Tm02) sea_surface_wave_mean_period_from_variance_spectral_density_second_frequency_moment
VTM10 [s] Spectral moments (-1,0) wave period (Tm-10) sea_surface_wave_mean_period_from_variance_spectral_density_inverse_frequency_moment
VMDR [degree] Mean wave direction from (Mdir) sea_surface_wave_from_direction
VPED [degree] Wave principal direction at spectral peak sea_surface_wave_from_direction_at_variance_spectral_density_maximum
VTPK [s] Wave period at spectral peak / peak period (Tp) sea_surface_wave_period_at_variance_spectral_density_maximum
VCMX [m] Maximum crest trough wave height (Hc,max) sea_surface_wave_maximum_height
VMXL [m] Height of the highest crest sea_surface_wave_maximum_crest_height
VHM0_WW [m] Spectral significant wind wave height sea_surface_wind_wave_significant_height
VHM0_SW1 [m] Spectral significant primary swell wave height sea_surface_primary_swell_wave_significant_height
VHM0_SW2 [m] Spectral significant secondary swell wave height sea_surface_secondary_swell_wave_significant_height
VMDR_WW [degree] Mean wind wave direction from sea_surface_wind_wave_from_direction

VMDR_SW1 [degree] Mean primary swell wave direction from sea_surface_primary_swell_wave_from_direction
VMDR_SW2 [degree] Mean secondary swell wave direction from sea_surface_secondary_swell_wave_from_direction
VTM01_WW [s] Spectral moments (0,1) wind wave period sea_surface_wind_wave_mean_period
VTM01_SW1 [s] Spectral moments (0,1) primary swell wave period sea_surface_primary_swell_wave_mean_period
VTM01_SW2 [s] Spectral moments (0,1) secondary swell wave period **sea_surface_secondary_swell_wave_mean_period**
VSDX [m s-1] Stokes drift U sea_surface_wave_stokes_drift_x_velocit y
VSDY [m s-1] Stokes drift V sea_surface_wave_stokes_drift_y_velocity
cmems_mod_ibi_wav_anfc_0.027deg_static
IBI-MFC_005_005_mask_bathy.nc **deptho [m]** Bathymetry sea_floor_depth_below_geoid **mask** [] Land-sea mask: 1 = sea; 0 = land sea_binary_mask
IBI-MFC_005_005_coordinates.nc **e1t [m]** Cell dimension along X axis **e2t [m]** Cell dimension along Y axis

Table 3. List of the datasets and variable names and unit for the IBI_ANALYSISFORECAST_WAV_005_005 product.

II.3 Production System Description

Domain	IBI (19°W-5°E; 26°N – 56°N)
Resolution and grid	1/36º ; regular grid; 1081 x 865
Geographic coverage	This product is regional. It is defined on a regular grid at 1/36 degree that goes from 26°N to 56°N in latitude and 19°W to 5°E in longitude. Latitude and longitude step is 0.027°. The resulting horizontal grid extends to 1081x865 grid points. Interpolated from native grid (20°W-17°E; 25°N-64.6°N). 
Model version	MFWAM Based on ECWAM-IFS47R1 computing code with two different dissipation source terms (ST4) developed (**Ardhuin et al., 2010)**.
Horizontal resolution	1/36°
Vertical coord.	Surface product
Spectral resolution	24 directions and 30 frequencies (start at 0.035Hz).
Atmospheric forcings	Hourly ECMWF winds
Currents forcings	Surface currents forcing taken from the IBI ocean circulation model (**IBI_ANALYSISFORECAST_PHY_005_001**)
Bounday Conditions	Wave spectra at OBC from Copernicus Marine GLOBAL WAV System
Initial conditions	No
Bathymetry	ETOPO1

Assimilation scheme	Optimal interpolation of SWH (**Lionello et al., 1992**) and directional wave spectra from CFOSAT and Sentinel 1-A
Assimilated observations	Significant wave height (SWH) altimeter data from Copernicus Marine L3 product and wave spectral data (CFOSAT, Sentinel1-A).

Table 4. Summary of the system characteristics.

Short description.

The IBI-MFC provides a high-resolution wave analysis and forecast product (run twice a day by Nologin with the support of CESGA in terms of supercomputing resources), covering the European waters, and more specifically the Iberia–Biscay–Ireland (IBI) area. The last 2 years before now (historic best estimates) as well as hourly instantaneous forecasts with a horizon of up to 10 days (updated on a daily basis) are available on the catalogue.

The IBI wave model system is based on the MFWAM model and runs on a grid of 0,027 degrees of horizontal resolution forced with the ECMWF hourly wind data. The system assimilates significant wave height (SWH) altimeter data from various sensors and CFOSAT wave spectral data (supplied by Météo-France), and it is forced by currents provided by the IBI ocean circulation system.

The product offers hourly instantaneous fields of different wave parameters, including Wave Height, Period and Direction for total spectrum and fields of Wind Wave (or wind sea), Primary Swell Wave and Secondary Swell for partitioned wave spectra; and the highest wave variables, such as maximum crest height and maximum crest-to-trough height. Additionally, the IBI wave system is set up to provide internally some key parameters adequate to be used as forcing in the IBI NEMO ocean model forecast run.

Detailed description.

The IBI MFC wave system is based on an operational suite, run by Nologin in the CESGA Supercomputing facilities, with the objective to produce a near-real-time short-term (10-days) forecast of wave parameters. Other key variables are also generated to be later used internally as forcing by the daily IBI ocean circulation model run.

The wave **model** code used as a basis of the IBI-WAV application is the **MFWAM**, which is the operational wave model of Météo-France. The MFWAM model has been upgraded with IFS-ECWAM-47R1 code from the ECMWF. We recall that the MFWAM model uses the ST4 wave physics as developed by **Ardhuin et al. (2010)** to model the dissipation by wave breaking and the swell damping source terms. The model physics has been updated with major improvements thanks to the FP7 European Research project MyWave (see **Janssen et al. 2014).** During phase 1 of the Copernicus Marine Service, the ST4 wave physics of the MFWAM model has been adjusted by including a Philipps spectrum for the high frequency tail of the wave spectrum.

The MFWAM model is implemented on the IBI domain (see **Figure 2**) with a grid size of 1/36º and the **bathymetry** used in the IBI-wave model has been generated smoothing the ocean bathymetry of ETOPO1 (https://sos.noaa.gov/datasets/etopo1-topography-and-bathymetry/), with 1 arc-minute of spatial resolution (1/60 of degree). The wave spectrum is discretized in 24 directions and 30 frequencies ranging from 0.035 Hz and 0.56 Hz.

The IBI-wave model performs a **partitioning technique** on wave spectra over all ocean grid points of the IBI domain. The partitioning technique is based on the watershedding method developed for image processing (**Gerling, 1992**). This process effectively treats the wave spectrum as a topographic map from which individual peaks in wave energy can be identified in order to define the separate wave components. First the wave spectrum is split in wind sea and swell wave spectra. Then the partitioning is applied for the swell wave spectrum where, the peaks are isolated and the two most energetic ones are identified as primary and secondary swells.

In the Copernicus Marine **July 2020 release**, the **assimilation** of significant wave height from altimeters was implemented. The assimilation scheme is based on optimal interpolation as described by **Lionello et al. (1992)** and it is the same scheme used in the Copernicus Marine GLOBAL wave system. For the IBI ocean domain we set the correlation length and the distance of influence of the observations to 170 km and 650 km, respectively. In this release the ratio of background and observation errors are kept constant over the IBI domain. In other respects, by using empirical wave growth laws (**Lionello et al. 1992**) the analysed SWH after the assimilation induces a correction on the wave spectra mostly on the wind sea part in the frequency scale (**Aouf and Lefevre 2015**). The assimilation scheme has been adjusted with the ST4 physics used in the IBI-wave model. This release also included the use of **surface currents forcing** obtained from the IBI ocean circulation model. The upgraded IBI wave system includes improved computations of some key parameters such as the surface stress, and wave-breaking induced turbulence in the ocean mixed layer (see **Toledano et al, 2022**), that are internally generated to be later used as forcing by the daily IBI ocean circulation model run.

In the **November 2022** Copernicus Marine release, in addition to the SWH data assimilation using an optimal interpolation algorithm with constant model and observation errors from Jason-3, Saral, Cryosat2, Sentinel-3A and 3B, and Sentinel-6A altimeters, the assimilation system is upgraded to include directional wave spectra from CFOSAT and Sentinel-1A. The spectral assimilation uses optimal interpolation on mean wavenumbers components of each wave partition describing a dominant wave train.

In the **November 2024** Copernicus Marine release, the model resolution is increased from 1/20° to 1/36°, which roughly corresponds to 5km and 2.7km in mid-latitudes respectively. In addition, two new altimeters are ingested in the data assimilation scheme: SWOT-NADIR and HY2B.

Catalogue generation.

The **IBI_ANALYSISFORECAST_WAV_005_005** product is updated twice a day, being the data produced in the first run of the day (the 00H cycle) substituted by the data provided by the second run of the day (the 12H cycle).

- The **00H** IBI Forecast Cycle produces, at day D, 6 days of ocean information: 5 days of forecast (from D to D+4d) plus an extra day of analysis (going back till D-1d).
- The **12H** IBI Forecast Cycle produces, at day D, 10 days of ocean information: 10 days of forecast (from D to D+9d). The data generated in this second cycle replace the first 5-days forecast of the first cycle and extend up to 10 days the forecast horizon.

The analysis data (corresponding to the D-1d) produced in the first run of the day is kept as final IBI best estimates. It is important to notice that only **the last 2 years** of long time series of historical best estimates **are available on the catalogue**, i.e., minus 2 years up to present time.

In **Figure 1** it can be seen the conceptual scheme of the NRT WAV analysis and forecast system.

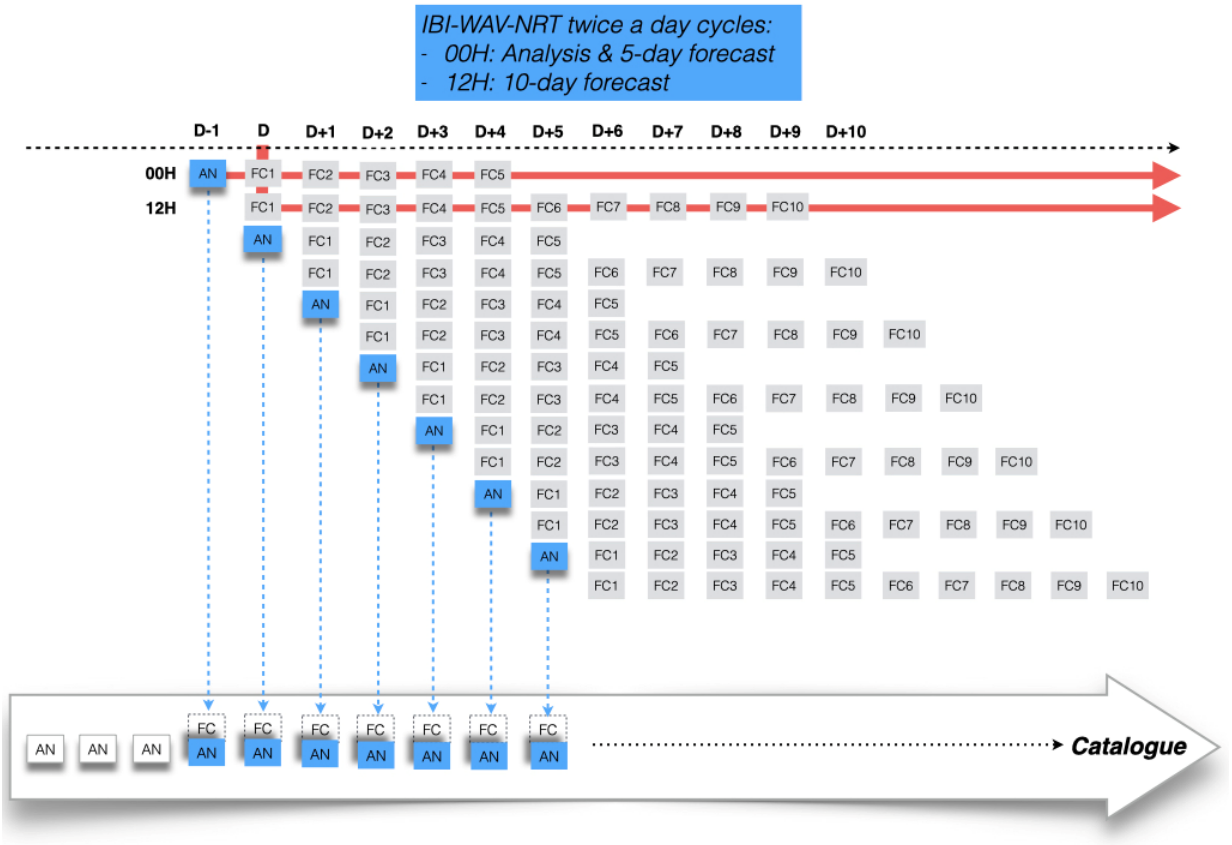


Figure 1. Conceptual scheme for generation of the IBI MFC WAV analysis and forecast product catalogue. Two forecast cycles are run at 00 and 12 UTC. The historical time series of IBI best estimates will be updated therefore once a day with IBI wave D-1 analysis generated in the 00 UTC run.

II.4 Grid

Grid characteristics and geographical Projection.

The MFWAM model is run in a larger native lon/lat reduced grid with a 1/36º resolution. The IBI wave model outputs are then post-processed to be delivered to end-users in a regular lon/lat standard grid.

The regular standard grid presents the same resolution (1/36º) and covers from 26.0ºN to 56.0ºN in latitude and 19.0ºW to 5.0ºE in longitude. The latitude and longitude step is 0.027º and the resulting horizontal grid extends to 1081 x 865 grid points. Information from all surface variables contained in the dataset is provided at same grid points.

Domain coverage.

Figure 2 represents the spatial coverage of the **IBI_ANALYSISFORECAST_WAV_005_005** product.

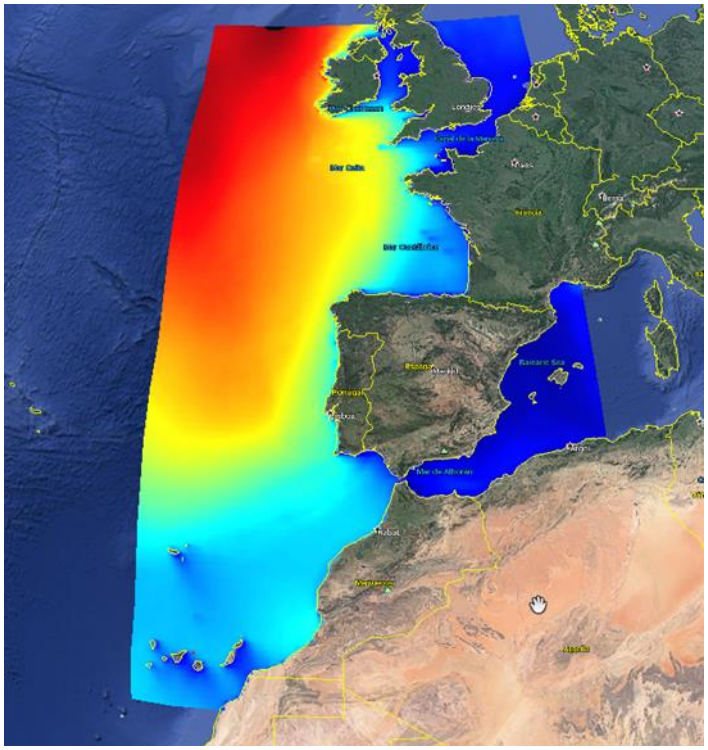


Figure 2. Spatial domain where IBI_ANALYSISFORECAST_WAV_005_005 Product is delivered

II.5 Vertical Levels

This is a surface product.

II.6 Processing information

II.6.1 Update Time

The product presents two daily wave forecast bulletins, which are updated at the following times:

- IBI-WAV-00H cycle (1-day analysis + 5-days forecast): daily at 13:30UTC.
- IBI-WAV-12H cycle (10-days forecast): daily at 02:00UTC next day.

II.6.2 Temporal extent of analysis and forecast stored on delivery mechanism.

The **IBI_ANALYSISFORECAST_WAV_005_**005 product is updated twice a day, being the data produced in the first run of the day (the 00H cycle) substituted by the data provided by the second run of the day (the 12H cycle).

- The **00H IBI Forecast Cycle** produces, at day D, 6 days of ocean information: 5 days of forecast (from D to D+4d) plus an extra day of analysis (going back till D-1d).
- The **12H IBI Forecast Cycle** produces, at day D, 10 days of ocean information: 10 days of forecast (from D to D+9d). The data generated in this second cycle replace the first 5-days forecast of the first cycle and extend up to 10 days the forecast horizon.

The analysis data (corresponding to the D-1d) produced in the first run of the day is kept as final IBI best estimates, making up the historic IBI time series that extend back to 2 years ago.

In summary, the last forecast bulletin (twice a day updated) is available together with the historic best estimates corresponding to **2 years up to the present time**. That is, the historic catalogue is available in a time window of 2 years.

II.6.3 Time averaging

- **cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i :** the fields are hourly instantaneous values centered on the hour, from 00:00:00 to 23:00:00 per file.

III FILE FORMAT

The products are stored using the NetCDF format. To know more about the NetCDF format, please follow this link:

What is the format of Copernicus Marine products ? NetCDF

To understand the differences between netCDF and Zarr, please consult this article:

how-to-choose-between-netcdf-and-zarr-format-using-the-toolbox

IV FILES NOMENCLATURE

Information about nomenclature of files when downloaded can be found in this articles " **How is defined the nomenclature of Copernicus Marine data? | Copernicus Marine Help Center***"*

IV.1 Nomenclature of the original file format (producer format)

File nomenclature when downloaded through the Get function of the Copernicus Marine Toolbox or the File browser system. Based on production and field date:

CMEMS_{fileVersion}_{region}_WAV_NRT_NL_{freqFlag}_{validDate}_{validDate}_R{bulletinDate}_{productType}.nc

Where:

- **region:** a three-letter code for the region, IBI in this case.
- **fileVersion:** vxry, where x, y are the version and release number, respectively
- **freqFlag:** the frequency of data values in the file (01hsn = hourly snapshots, i.e.: hourly instantaneous fields).
- **validate:** YYYYMMDD is the valid date of the fields contained in the file.
- **bulletinDate:** RYYYYMMDD is the bulletin date, i.e.: data production date
- **productType:** is a two-letter code for the product type (AN01 for analysis, FC01 for forecast).

Examples:

CMEMS_v8r1_IBI_WAV_NRT_NL_01hsn_20200101_20200101_R20200102_AN01.nc

IV.2 Other information: land mask value, missing value

The NetCDF-4 format is used with short integer coding for better compression, using an offset and scale factor as follows:

$$Real\_value = (Display\_value * scale\_factor) + add\_offset$$

The **missing value** for this product is: **-32767s**

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

Land values are treated as missing value.

IV.3 File size

DATASET NAME FILE NAME	DIMENSION (no fixed size)
cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i **CMEMS_v8r1_IBI_WAV_NRT_NL_01hsn_20200826_20200826_R20200827_AN01.nc**	200Mb
IBI-MFC_005_005_coordinates.nc IBI-MFC_005_005_mask_bathy.nc	1Mb 1Mb

Table 5. Name and size of files in each dataset (compressed values).

IV.4 Structure of files

Examples of the header of output NetCDF files are inserted in VI

V REFERENCES

Quality Information Document (QUID) :
https://catalogue.marine.copernicus.eu/documents/QUID/CMEMS-IBI-QUID-005-005.pdf.

Ardhuin, F., et al. (2010). Semi-empirical dissipation source functions for wind-wave models: Part I, Definition, calibration and validation, J. Phys. Oceanogr., 40(9), 1917–1941.

Gerling (1992). Partitioning sequences and arrays of directional ocean wave spectra intocomponents wave systems. J. Atmos. Oceanic Tech.

Lionello, P., Günther, H., & Janssen, P. A. (1992). Assimilation of altimeter data in a global third-generation wave model. Journal of Geophysical Research: Oceans, 97(C9), 14453-14474.

Janssen et al. (2014). Final report of Work Package I of the FP7 research project “My wave”.

Toledano, C., Ghantous, M., Lorente, P., Dalphinet, A., Aouf, L., & Sotillo, M. G. (2022). Impacts of an Altimetric Wave Data Assimilation Scheme and Currents-Wave Coupling in an Operational Wave System: The New Copernicus Marine IBI Wave Forecast Service. Journal of Marine Science and Engineering, 10(4), 457. https://doi.org/10.3390/jmse10040457

VI ANNEX

Examples of structure and header of **IBI_ANALYSISFORECAST_WAV_005_005** original files.

cmems_mod_ibi_wav_anfc_0.027deg_PT1H-i

```
netcdf CMEMS_v8r1_IBI_WAV_NRT_NL_01hsn_20221204_20221204_R20221130_FC05 {
dimensions:
        time = 24 ;
        longitude = 865 ;
        latitude = 1081 ;
variables:
        float time(time) ;
                time:standard_name = "time" ;
                time:long_name = "time" ;
                time:units = "hours since 1950-01-01 00:00:00" ;
                time:calendar = "gregorian" ;
                time:axis = "T" ;
        float longitude(longitude) ;
                longitude:standard_name = "longitude" ;
                longitude:long_name = "Longitude" ;
                longitude:units = "degrees_east" ;
                longitude:unit_long = "Degrees East" ;
                longitude:step = "0.02777863f" ;
                longitude:axis = "X" ;
        float latitude(latitude) ;
                latitude:standard_name = "latitude" ;
                latitude:long_name = "Latitude" ;
                latitude:units = "degrees_north" ;
                latitude:unit_long = "Degrees North" ;
                latitude:step = "0.02777863f" ;
                latitude:axis = "Y" ;
        short VHM0(time, latitude, longitude) ;
                VHM0:add_offset = 0.f ;
                VHM0:scale_factor = 0.01f ;
                VHM0:standard_name = "sea_surface_wave_significant_height" ;
                VHM0:long_name = "Spectral significant wave height (Hm0)" ;
                VHM0:units = "m" ;
                VHM0:unit_long = "Meters" ;
                VHM0:valid_min = 0s ;
                VHM0:valid_max = 3000s ;
                VHM0:easting = "longitude" ;
                VHM0:northing = "latitude" ;
                VHM0:longitude_min = "-19.f" ;
                VHM0:longitude_max = "5.f" ;
                VHM0:latitude_min = "26.f" ;
                VHM0:latitude_max = "56.f" ;
                VHM0:_FillValue = -32767s ;
```

```
            VHM0:WMO_code = 100 ;
            VHM0:type_of_analysis = "spectral analysis" ;
      short VTM02(time, latitude, longitude) ;
            VTM02:add_offset = 0.f ;
            VTM02:scale_factor = 0.01f ;
            VTM02:standard_name                                                    =
"sea_surface_wave_mean_period_from_variance_spectral_density_second_frequency_moment" ;
            VTM02:long_name = "Spectral moments(0,2)wave period(Tm02)" ;
            VTM02:units = "s" ;
            VTM02:unit_long = "Second" ;
            VTM02:valid_min = 0s ;
            VTM02:valid_max = 3000s ;
            VTM02:easting = "longitude" ;
            VTM02:northing = "latitude" ;
            VTM02:longitude_min = "-19.f" ;
            VTM02:longitude_max = "5.f" ;
            VTM02:latitude_min = "26.f" ;
            VTM02:latitude_max = "56.f" ;
            VTM02:_FillValue = -32767s ;
            VTM02:WMO_code = 221 ;
            VTM02:type_of_analysis = "spectral analysis" ;
      short VTM10(time, latitude, longitude) ;
            VTM10:add_offset = 0.f ;
            VTM10:scale_factor = 0.01f ;
            VTM10:standard_name                                                    =
"sea_surface_wave_mean_period_from_variance_spectral_density_inverse_frequency_moment" ;
            VTM10:long_name = "Spectral moments(-1,0)wave period(Tm-10)" ;
            VTM10:units = "s" ;
            VTM10:unit_long = "Second" ;
            VTM10:valid_min = 0s ;
            VTM10:valid_max = 3000s ;
            VTM10:easting = "longitude" ;
            VTM10:northing = "latitude" ;
            VTM10:longitude_min = "-19.f" ;
            VTM10:longitude_max = "5.f" ;
            VTM10:latitude_min = "26.f" ;
            VTM10:latitude_max = "56.f" ;
            VTM10:_FillValue = -32767s ;
            VTM10:WMO_code = 201 ;
            VTM10:type_of_analysis = "spectral analysis" ;
      short VMDR(time, latitude, longitude) ;
            VMDR:add_offset = 180.f ;
            VMDR:scale_factor = 0.01f ;
            VMDR:standard_name = "sea_surface_wave_from_direction" ;
            VMDR:long_name = "Mean wave direction from(Mdir)" ;
            VMDR:units = "degree" ;
            VMDR:unit_long = "Degree" ;
            VMDR:valid_min = -18000s ;
            VMDR:valid_max = 18000s ;
```

```
            VMDR:easting = "longitude" ;
            VMDR:northing = "latitude" ;
            VMDR:longitude_min = "-19.f" ;
            VMDR:longitude_max = "5.f" ;
            VMDR:latitude_min = "26.f" ;
            VMDR:latitude_max = "56.f" ;
            VMDR:_FillValue = -32767s ;
            VMDR:WMO_code = 200 ;
            VMDR:type_of_analysis = "spectral analysis" ;
      short VPED(time, latitude, longitude) ;
            VPED:add_offset = 180.f ;
            VPED:scale_factor = 0.01f ;
            VPED:standard_name                                                    =
"sea_surface_wave_from_direction_at_variance_spectral_density_maximum" ;
            VPED:long_name = "Wave principal direction at spectral peak" ;
            VPED:units = "degree" ;
            VPED:unit_long = "Degree" ;
            VPED:valid_min = -18000s ;
            VPED:valid_max = 18000s ;
            VPED:easting = "longitude" ;
            VPED:northing = "latitude" ;
            VPED:longitude_min = "-19.f" ;
            VPED:longitude_max = "5.f" ;
            VPED:latitude_min = "26.f" ;
            VPED:latitude_max = "56.f" ;
            VPED:_FillValue = -32767s ;
            VPED:WMO_code = 999 ;
            VPED:type_of_analysis = "spectral analysis" ;
      short VTPK(time, latitude, longitude) ;
            VTPK:add_offset = 0.f ;
            VTPK:scale_factor = 0.01f ;
            VTPK:standard_name                                                    =
"sea_surface_wave_period_at_variance_spectral_density_maximum" ;
            VTPK:long_name = "Wave period at spectral peak/peak period(Tp)" ;
            VTPK:units = "s" ;
            VTPK:unit_long = "Second" ;
            VTPK:valid_min = 0s ;
            VTPK:valid_max = 3000s ;
            VTPK:easting = "longitude" ;
            VTPK:northing = "latitude" ;
            VTPK:longitude_min = "-19.f" ;
            VTPK:longitude_max = "5.f" ;
            VTPK:latitude_min = "26.f" ;
            VTPK:latitude_max = "56.f" ;
            VTPK:_FillValue = -32767s ;
            VTPK:WMO_code = 204 ;
            VTPK:type_of_analysis = "spectral analysis" ;
      short VCMX(time, latitude, longitude) ;
            VCMX:add_offset = 0.f ;
```

```
        VCMX:scale_factor = 0.01f ;
        VCMX:standard_name = "sea_surface_wave_maximum_height" ;
        VCMX:long_name = "Maximum crest trough wave height(Hc,max)" ;
        VCMX:units = "m" ;
        VCMX:unit_long = "Meters" ;
        VCMX:valid_min = 0s ;
        VCMX:valid_max = 3000s ;
        VCMX:easting = "longitude" ;
        VCMX:northing = "latitude" ;
        VCMX:longitude_min = "-19.f" ;
        VCMX:longitude_max = "5.f" ;
        VCMX:latitude_min = "26.f" ;
        VCMX:latitude_max = "56.f" ;
        VCMX:_FillValue = -32767s ;
        VCMX:WMO_code = 999 ;
        VCMX:type_of_analysis = "crest" ;
    short VMXL(time, latitude, longitude) ;
        VMXL:add_offset = 0.f ;
        VMXL:scale_factor = 0.01f ;
        VMXL:standard_name = "sea_surface_wave_maximum_crest_height" ;
        VMXL:long_name = "Height of the highest crest" ;
        VMXL:units = "m" ;
        VMXL:unit_long = "Meters" ;
        VMXL:valid_min = 0s ;
        VMXL:valid_max = 3000s ;
        VMXL:easting = "longitude" ;
        VMXL:northing = "latitude" ;
        VMXL:longitude_min = "-19.f" ;
        VMXL:longitude_max = "5.f" ;
        VMXL:latitude_min = "26.f" ;
        VMXL:latitude_max = "56.f" ;
        VMXL:_FillValue = -32767s ;
        VMXL:WMO_code = 999 ;
        VMXL:type_of_analysis = "crest" ;
    short VHM0_WW(time, latitude, longitude) ;
        VHM0_WW:add_offset = 0.f ;
        VHM0_WW:scale_factor = 0.01f ;
        VHM0_WW:standard_name = "sea_surface_wind_wave_significant_height" ;
        VHM0_WW:long_name = "Spectral significant wind wave height" ;
        VHM0_WW:units = "m" ;
        VHM0_WW:unit_long = "Meters" ;
        VHM0_WW:valid_min = 0s ;
        VHM0_WW:valid_max = 3000s ;
        VHM0_WW:easting = "longitude" ;
        VHM0_WW:northing = "latitude" ;
        VHM0_WW:longitude_min = "-19.f" ;
        VHM0_WW:longitude_max = "5.f" ;
        VHM0_WW:latitude_min = "26.f" ;
        VHM0_WW:latitude_max = "56.f" ;
```

```
        VHM0_WW:_FillValue = -32767s ;
        VHM0_WW:WMO_code = 102 ;
        VHM0_WW:type_of_analysis = "spectral analysis" ;
    short VHM0_SW1(time, latitude, longitude) ;
        VHM0_SW1:add_offset = 0.f ;
        VHM0_SW1:scale_factor = 0.01f ;
        VHM0_SW1:standard_name = "sea_surface_primary_swell_wave_significant_height" ;
        VHM0_SW1:long_name = "Spectral significant primary swell wave height" ;
        VHM0_SW1:units = "m" ;
        VHM0_SW1:unit_long = "Meters" ;
        VHM0_SW1:valid_min = 0s ;
        VHM0_SW1:valid_max = 3000s ;
        VHM0_SW1:easting = "longitude" ;
        VHM0_SW1:northing = "latitude" ;
        VHM0_SW1:longitude_min = "-19.f" ;
        VHM0_SW1:longitude_max = "5.f" ;
        VHM0_SW1:latitude_min = "26.f" ;
        VHM0_SW1:latitude_max = "56.f" ;
        VHM0_SW1:_FillValue = -32767s ;
        VHM0_SW1:WMO_code = 202 ;
        VHM0_SW1:type_of_analysis = "spectral analysis" ;
    short VHM0_SW2(time, latitude, longitude) ;
        VHM0_SW2:add_offset = 0.f ;
        VHM0_SW2:scale_factor = 0.01f ;
        VHM0_SW2:standard_name = "sea_surface_secondary_swell_wave_significant_height" ;
        VHM0_SW2:long_name = "Spectral significant secondary swell wave height" ;
        VHM0_SW2:units = "m" ;
        VHM0_SW2:unit_long = "Meters" ;
        VHM0_SW2:valid_min = 0s ;
        VHM0_SW2:valid_max = 3000s ;
        VHM0_SW2:easting = "longitude" ;
        VHM0_SW2:northing = "latitude" ;
        VHM0_SW2:longitude_min = "-19.f" ;
        VHM0_SW2:longitude_max = "5.f" ;
        VHM0_SW2:latitude_min = "26.f" ;
        VHM0_SW2:latitude_max = "56.f" ;
        VHM0_SW2:_FillValue = -32767s ;
        VHM0_SW2:WMO_code = 203 ;
        VHM0_SW2:type_of_analysis = "spectral analysis" ;
    short VMDR_WW(time, latitude, longitude) ;
        VMDR_WW:add_offset = 180.f ;
        VMDR_WW:scale_factor = 0.01f ;
        VMDR_WW:standard_name = "sea_surface_wind_wave_from_direction" ;
        VMDR_WW:long_name = "Mean wind wave direction from" ;
        VMDR_WW:units = "degree" ;
        VMDR_WW:unit_long = "Degree" ;
        VMDR_WW:valid_min = -18000s ;
        VMDR_WW:valid_max = 18000s ;
        VMDR_WW:easting = "longitude" ;
```

```
        VMDR_WW:northing = "latitude" ;
        VMDR_WW:longitude_min = "-19.f" ;
        VMDR_WW:longitude_max = "5.f" ;
        VMDR_WW:latitude_min = "26.f" ;
        VMDR_WW:latitude_max = "56.f" ;
        VMDR_WW:_FillValue = -32767s ;
        VMDR_WW:WMO_code = 101 ;
        VMDR_WW:type_of_analysis = "spectral analysis" ;
    short VMDR_SW1(time, latitude, longitude) ;
        VMDR_SW1:add_offset = 180.f ;
        VMDR_SW1:scale_factor = 0.01f ;
        VMDR_SW1:standard_name = "sea_surface_primary_swell_wave_from_direction" ;
        VMDR_SW1:long_name = "Mean primary swell wave direction from" ;
        VMDR_SW1:units = "degree" ;
        VMDR_SW1:unit_long = "Degree" ;
        VMDR_SW1:valid_min = -18000s ;
        VMDR_SW1:valid_max = 18000s ;
        VMDR_SW1:easting = "longitude" ;
        VMDR_SW1:northing = "latitude" ;
        VMDR_SW1:longitude_min = "-19.f" ;
        VMDR_SW1:longitude_max = "5.f" ;
        VMDR_SW1:latitude_min = "26.f" ;
        VMDR_SW1:latitude_max = "56.f" ;
        VMDR_SW1:_FillValue = -32767s ;
        VMDR_SW1:WMO_code = 107 ;
        VMDR_SW1:type_of_analysis = "spectral analysis" ;
    short VMDR_SW2(time, latitude, longitude) ;
        VMDR_SW2:add_offset = 180.f ;
        VMDR_SW2:scale_factor = 0.01f ;
        VMDR_SW2:standard_name = "sea_surface_secondary_swell_wave_from_direction" ;
        VMDR_SW2:long_name = "Mean secondary swell wave direction from" ;
        VMDR_SW2:units = "degree" ;
        VMDR_SW2:unit_long = "Degree" ;
        VMDR_SW2:valid_min = -18000s ;
        VMDR_SW2:valid_max = 18000s ;
        VMDR_SW2:easting = "longitude" ;
        VMDR_SW2:northing = "latitude" ;
        VMDR_SW2:longitude_min = "-19.f" ;
        VMDR_SW2:longitude_max = "5.f" ;
        VMDR_SW2:latitude_min = "26.f" ;
        VMDR_SW2:latitude_max = "56.f" ;
        VMDR_SW2:_FillValue = -32767s ;
        VMDR_SW2:WMO_code = 109 ;
        VMDR_SW2:type_of_analysis = "spectral analysis" ;
    short VTM01_WW(time, latitude, longitude) ;
        VTM01_WW:add_offset = 0.f ;
        VTM01_WW:scale_factor = 0.01f ;
        VTM01_WW:standard_name = "sea_surface_wind_wave_mean_period" ;
        VTM01_WW:long_name = "Spectral moments(0,1)wind wave period" ;
```

```
        VTM01_WW:units = "s" ;
        VTM01_WW:unit_long = "Second" ;
        VTM01_WW:valid_min = 0s ;
        VTM01_WW:valid_max = 3000s ;
        VTM01_WW:easting = "longitude" ;
        VTM01_WW:northing = "latitude" ;
        VTM01_WW:longitude_min = "-19.f" ;
        VTM01_WW:longitude_max = "5.f" ;
        VTM01_WW:latitude_min = "26.f" ;
        VTM01_WW:latitude_max = "56.f" ;
        VTM01_WW:_FillValue = -32767s ;
        VTM01_WW:WMO_code = 223 ;
        VTM01_WW:type_of_analysis = "spectral analysis" ;
    short VTM01_SW1(time, latitude, longitude) ;
        VTM01_SW1:add_offset = 0.f ;
        VTM01_SW1:scale_factor = 0.01f ;
        VTM01_SW1:standard_name = "sea_surface_primary_swell_wave_mean_period" ;
        VTM01_SW1:long_name = "Spectral moments(0,1)primary swell wave period" ;
        VTM01_SW1:units = "s" ;
        VTM01_SW1:unit_long = "Second" ;
        VTM01_SW1:valid_min = 0s ;
        VTM01_SW1:valid_max = 3000s ;
        VTM01_SW1:easting = "longitude" ;
        VTM01_SW1:northing = "latitude" ;
        VTM01_SW1:longitude_min = "-19.f" ;
        VTM01_SW1:longitude_max = "5.f" ;
        VTM01_SW1:latitude_min = "26.f" ;
        VTM01_SW1:latitude_max = "56.f" ;
        VTM01_SW1:_FillValue = -32767s ;
        VTM01_SW1:WMO_code = 226 ;
        VTM01_SW1:type_of_analysis = "spectral analysis" ;
    short VTM01_SW2(time, latitude, longitude) ;
        VTM01_SW2:add_offset = 0.f ;
        VTM01_SW2:scale_factor = 0.01f ;
        VTM01_SW2:standard_name = "sea_surface_secondary_swell_wave_mean_period" ;
        VTM01_SW2:long_name = "Spectral moments(0,1)secondary swell wave period" ;
        VTM01_SW2:units = "s" ;
        VTM01_SW2:unit_long = "Second" ;
        VTM01_SW2:valid_min = 0s ;
        VTM01_SW2:valid_max = 3000s ;
        VTM01_SW2:easting = "longitude" ;
        VTM01_SW2:northing = "latitude" ;
        VTM01_SW2:longitude_min = "-19.f" ;
        VTM01_SW2:longitude_max = "5.f" ;
        VTM01_SW2:latitude_min = "26.f" ;
        VTM01_SW2:latitude_max = "56.f" ;
        VTM01_SW2:_FillValue = -32767s ;
        VTM01_SW2:WMO_code = 227 ;
        VTM01_SW2:type_of_analysis = "spectral analysis" ;
```

```
        short VSDX(time, latitude, longitude) ;
                VSDX:add_offset = 0.f ;
                VSDX:scale_factor = 0.01f ;
                VSDX:standard_name = "sea_surface_wave_stokes_drift_x_velocity" ;
                VSDX:long_name = "Stokes drift U" ;
                VSDX:units = "m s-1" ;
                VSDX:unit_long = "Meters per second" ;
                VSDX:valid_min = -500s ;
                VSDX:valid_max = 500s ;
                VSDX:easting = "longitude" ;
                VSDX:northing = "latitude" ;
                VSDX:longitude_min = "-19.f" ;
                VSDX:longitude_max = "5.f" ;
                VSDX:latitude_min = "26.f" ;
                VSDX:latitude_max = "56.f" ;
                VSDX:_FillValue = -32767s ;
                VSDX:WMO_code = 215 ;
                VSDX:type_of_analysis = "spectral analysis" ;
        short VSDY(time, latitude, longitude) ;
                VSDY:add_offset = 0.f ;
                VSDY:scale_factor = 0.01f ;
                VSDY:standard_name = "sea_surface_wave_stokes_drift_y_velocity" ;
                VSDY:long_name = "Stokes drift V" ;
                VSDY:units = "m s-1" ;
                VSDY:unit_long = "Meters per second" ;
                VSDY:valid_min = -500s ;
                VSDY:valid_max = 500s ;
                VSDY:easting = "longitude" ;
                VSDY:northing = "latitude" ;
                VSDY:longitude_min = "-19.f" ;
                VSDY:longitude_max = "5.f" ;
                VSDY:latitude_min = "26.f" ;
                VSDY:latitude_max = "56.f" ;
                VSDY:_FillValue = -32767s ;
                VSDY:WMO_code = 216 ;
                VSDY:type_of_analysis = "spectral analysis" ;

// global attributes:
                :Conventions = "CF-1.8" ;
                :title = " Wave hourly instantaneous fields for the Iberia-Biscay-Ireland (IBI) region " ;
                :source = "MFWAM-CY47R1" ;
                :domain_name = "IBI36" ;
                :field_type = "instantaneous" ;
                :field_date = "20211220" ;
                :institution = "Nologin-MeteoFrance" ;
                :references = "http://marine.copernicus.eu/" ;
                :contact = "https://marine.copernicus.eu/contact" ;
                :licence = "https://marine.copernicus.eu/user-corner/service-commitments-and-licence" ;
                :comment = "" ;
```

}

cmems_mod_ibi_wav_anfc_0.027deg_static This dataset only contains 2 files:
IBI-MFC_005_005_mask_bathy.nc
IBI-MFC_005_005_coordinates.nc

```
netcdf IBI-MFC_005_005_mask_bathy {
dimensions:
        latitude = 1081 ;
        longitude = 865 ;
variables:
        float latitude(latitude) ;
                latitude:standard_name = "latitude" ;
                latitude:units = "degrees_north" ;
                latitude:axis = "Y" ;
                latitude:step = "0.027f" ;
        float longitude(longitude) ;
                longitude:standard_name = "longitude" ;
                longitude:units = "degrees_east" ;
                longitude:axis = "X" ;
                longitude:step = "0.027f" ;
        float mask(latitude, longitude) ;
                mask:standard_name = "sea_binary_mask" ;
                mask:long_name = "Land-sea mask: 1 = sea ; 0 = land" ;
                mask:units = "1" ;
        float deptho(latitude, longitude) ;
                deptho:standard_name = "sea_floor_depth_below_geoid" ;
                deptho:long_name = "Bathymetry" ;
                deptho:units = "m" ;
                deptho:_FillValue = -32767.f ;

// global attributes:
                :Conventions = "CF-1.8" ;
                :title = "Static files for product IBI_ANALYSISFORECAST_WAV_005_005" ;
                :domain_name = "IBI36" ;
                :institution = "Nologin-MeteoFrance" ;
                :references = "http://marine.copernicus.eu" ;
                :contact = "https://marine.copernicus.eu/contact" ;
                :licence = "http://marine.copernicus.eu/services-portfolio/service-commitments-and-
licence" ;
                :credit = "E.U. Copernicus Marine Service Information" ;
                :comment = "" ;
}

netcdf IBI-MFC_005_005_coordinates {
dimensions:
        latitude = 1081 ;
        longitude = 865 ;
variables:
```

```
        float latitude(latitude) ;
                latitude:standard_name = "latitude" ;
                latitude:units = "degrees_north" ;
                latitude:axis = "Y" ;
                latitude:step = "0.027" ;
        float longitude(longitude) ;
                longitude:standard_name = "longitude" ;
                longitude:units = "degrees_east" ;
                longitude:axis = "X" ;
                longitude:step = "0.027" ;
        float e1t(latitude, longitude) ;
                e1t:long_name = "Cell dimension along X axis" ;
                e1t:units = "m" ;
                e1t:_FillValue = -32767.f ;
        float e2t(latitude, longitude) ;
                e2t:long_name = "Cell dimension along Y axis" ;
                e2t:units = "m" ;
                e2t:_FillValue = -32767.f ;

    // global attributes:
                :Conventions = "CF-1.8" ;
                :title = "Static files for product IBI_ANALYSISFORECAST_WAV_005_005" ;
                :domain_name = "IBI36" ;
                :institution = "Nologin-MeteoFrance" ;
                :references = "http://marine.copernicus.eu" ;
                :contact = "https://marine.copernicus.eu/contact" ;
                :licence = "http://marine.copernicus.eu/services-portfolio/service-commitments-and-
licence/" ;
                :credit = "E.U. Copernicus Marine Service Information" ;
                :comment = "" ;
    }
```