Joint European Research Infrastructure network for Coastal Observatory – Novel European eXpertise for coastal observaTories - **JERICO-NEXT**	
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Lead Authors	A Novellino
Contributors	Blue Lobster
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1.1	09/05/2016	Add-ons: conclusion and Glossary	Simon Keeble
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Approvals				
	Name	**Organisation**	**Date**	**Visa**
Coordinator	Patrick Farcy	Ifremer	09/05/2016	PF
WP Leaders	Simon Keeble	Blue Lobster	09/05/2016	SK

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1. Executive Summary

The deliverable D.8.8.2 presents the second version of the JERICO-NEXT Data Portal.

It describes the new the web interface for the management and access of the JERICO NEXT as updated according the feedback from the JERICO-NEXT annual assembly and the recommendations from WP5 and WP6. The overall aim of the JERICO-NEXT data portal is:

- To provide access to near real time and delay mode data from the JERICO-NEXT platforms
- To design and make (web) accessible data and aggregated data products (re-elaboration)
- To implement the JERICO-NEXT web portal with services (data discovery, data access, data download etc)

The JERICO-NEXT data portal provides access to data and data visualization features and it is based on the data management infrastructure developed under WP5.

Data access is integrated into the JERICO-NEXT website and accessible at http://www.jerico-ri.eu/data-access/

The current version of the JERICO-NEXT data portal enables viewing and downloading of data for further analysis by users. Each dataset is providing information and metadata to let the user to understand how the data was collected, where data is stored and who was involved in the data management and data flow process. Data is collected by platforms belonging to JERICO-NEXT Virtual Infrastructures (VIs) and the JERICO-NEXT data portal is showing that relationship. The data portal provides:

- an overview (table and map) of measurement stations, with full metadata including indications as to whether they provide real-time measurements and/or delayed mode/archived measurements;
- mechanisms for downloading data and metadata including "quick look graphical representations". Users should be able to download complete sets of data for one sea-basin within a given timeframe with a few mouse clicks;
- downloadable data in different data formats (e.g. data sheets and NetCDF)
- a platform page presenting relevant metadata information about data, provider, adopted quality control procedures, relevant publication for that platform and its parameters, data viewing and downloading tools.
- added value tools for data and information checking and management (via a dedicated dashboard) and interoperability towards other systems (via WMS/WFS and web services)

2. Introduction

The specific goal of the Task 8.7 is to provide a Data Portal for access to JERICO-NEXT Data and data visualisation

The JERICO-NEXT portal is going to be an overarching portal over the main infrastructures (i.e. ROOSs and network of NODCs) and involved systems. It combines data into common inventory directory and web accessible service. It interoperates with the underlying infrastructure (see WP5) to give access to the distributed acquired data sets in real-time, delayed mode, as well as validated archived data sets provided by the JERICO-NEXT Virtual Infrastructures (see WP6).

On top of the described infrastructure, the JERICO-NEXT portal offers added value services for machine-to-machine interoperability with other running projects and programs at European Level (e.g. MyOcean, SeaDataNet, EMODnet, Obis, etc.).

This document is presenting the updated version of the JERICO-NEXT data portal and available features.

3. JERICO NEXT data portal description

This section describes the first release of the JERICO-NEXT portal that was designed to exploit and integrate the already available marine data management main infrastructures.

Currently, the portal provides users with following key services and functions:

1. **Dynamic map** facility for viewing and downloading, http://www.jerico-ri.eu/data-access/, which is the central tool for users to search, visualise and download data, metadata and products. For near real-time (NRT) data, the map allows viewing/retrieving, within a specified time (e.g. a 60-day sliding window) measurement points, values of data and quality of data. The geographical area (space window) defines the area of interest within which the measurement points, values of data and quality of data are presented. For the previous 60 days, a graph is provided with data availability within the timeframe. Information about the data originator, curator etc. is also provided. The tool also serves to visualise and retrieve data products such as time plots for specific parameters (e.g. monthly averaged temperature for data acquired during the specified time window).

2. **Dashboard**, www.emodnet-physics.eu/jerico/dashboard, which is a reporting service where users can view and export various statistics about the data portal content and usage. The EMODnet Physics dashboard represents a valuable tool to discover data availability and monitor performance of the infrastructure behind the portal. The tool also provides KPIs (Key Performance Indicators) presenting how much data and how many platforms are made available on a daily basis, and extracts statistics on page access and data downloads.

3. **Interoperability services**, the portal is providing OCG (Open Geospatial Consortium) compliant WMS and WFS layers offering information about which parameters are available (where and who is the data originator, etc.). The portal is providing API (REST/SOAP) - web services which allow linkage to external services with near real-time data stream and facilitate a machine-to-machine data fetching and assimilation.

3.1. JERICO-NEXT Dynamic Map Page

The Map page is the operational core tool for users to search, visualise and download data, metadata and products. For the near real-time (NRT) data, the map facility allows viewing/retrieving within a specified time (e.g. 60 days sliding window), measurement points, values of data and quality of data.

The geographical area (space window) will define the area of interest within which the measurement points, values of data and quality of data are presented. For the previous 60 days, a graph is provided with data availability during that time. Information about the data originator, curator etc. is also provided.

The tool is also used to visualise and retrieve data products such as time plots for specific parameters (e.g. monthly average temperature for data acquired during the specified time window).

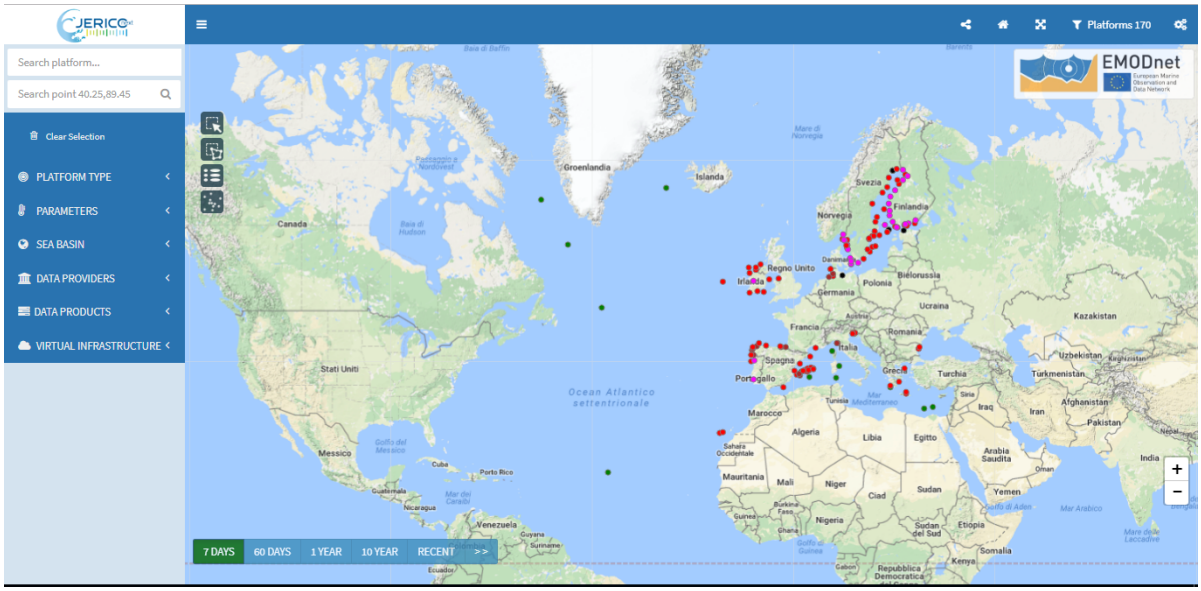


Figure 1. Map Page

Feature description:

Top left – parameters and geographical filters

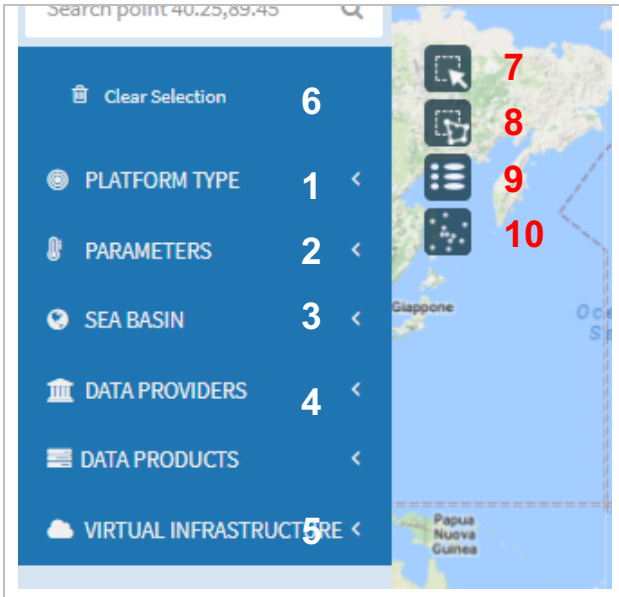


Figure 2: Filters

1 to 5 are filters and 6 removes the applied filters

7 to 10 are control buttons to select and access a single platform or a group of platforms.

7. free boxing to select platforms
8. rectangular boxing to select platforms
9. go to the selected platforms list
10. create a list/select all the platforms with the applied filters

When pointing a dialogue describes the feature

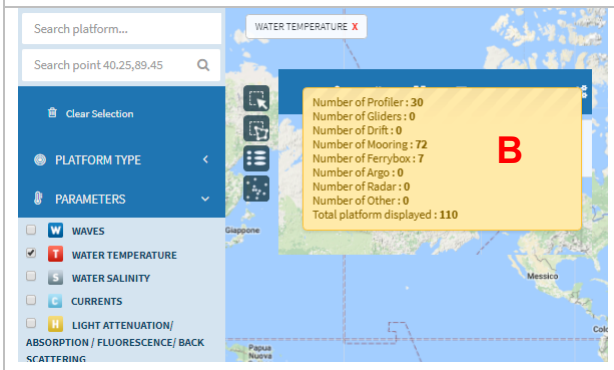


Figure 3: Parameters

Parameters are:

- Sea water temperature
- Waves and winds
- Sea level
- Sea water salinity
- Currents
- Light attenuation
- Atmospheric parameters
- Chemical parameters
- Other (e.g. biological param.)

When a filter is applied the map also shows the number of platforms matching the applied filters (shown) (B)

Bottom left – time filters

Figure 4: Time filters

Using the "time filters" the user can select platforms that are providing data for

1. (default setting) last 7 days
2. Last 60 days
3. 1 year
4. 10 years
5. Recent (last 20 years)
6. More

Applying filters 1 and 2, the map shows the platforms and data which are freely accessible and downloadable, without credentials, by all users.
Filter 3 shows platforms with data older than 60 days. These platforms are connected via the INSITU TAC of EuroGOOS ROOSs and CMEMS. As soon as the user logs in (CMEMS credentials), he can download all data.
Filter 4 opens a slider to select a time range. Most of the historical datasets are provided by the SeaDataNet network of NODCs. To download some data the user is redirected to the SDN Request Status Manager.

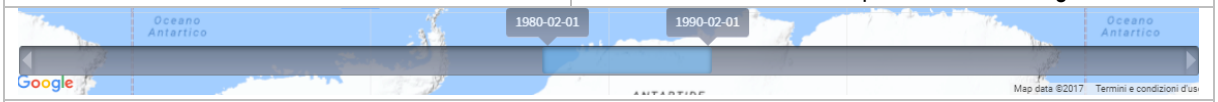


Figure 5: Time range control

Filters are grouped according to some classes, namely Platform Type, Parameters, etc. The logic of the filters is AND between classes and OR within a class. Figure 6 shows the following selection:

(Water temperature) AND (Bay of Biscay OR Bristol Channel OR Celtic Sea OR Inner Seas of west coast of Scotland OR Irish Sea and St. George's Ch OR North Atlantic) AND (last 7 Days)

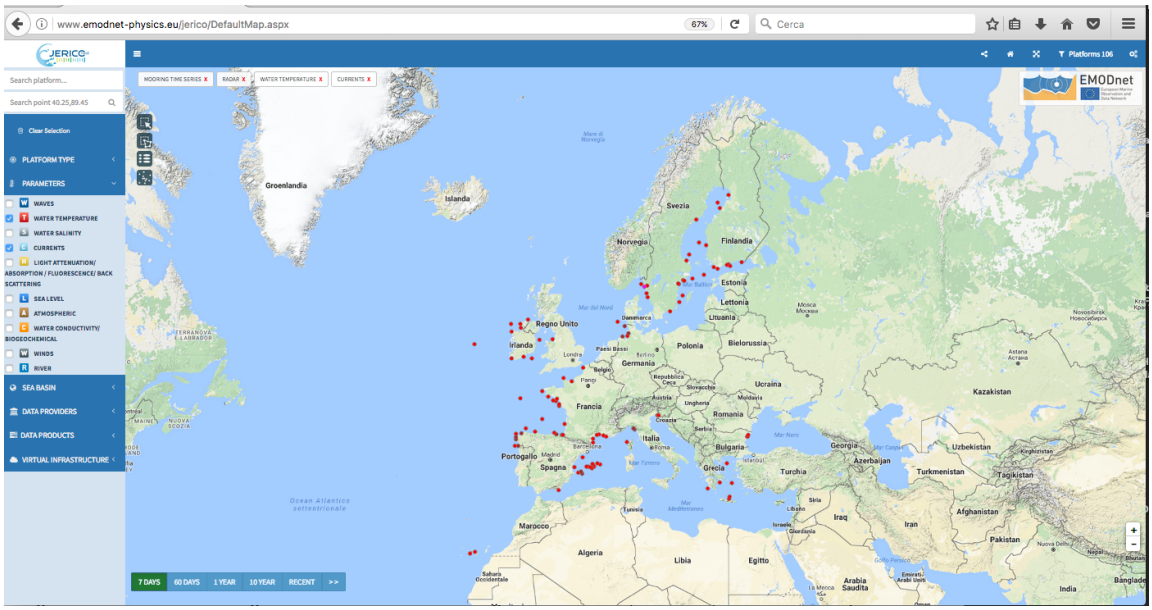


Figure 6. Example for the filters.

Figure 6 shows the following selection: dataset containing either currents, or sea temperature as recorded by either a Mooring, or a HFR, during last 7 days.

Top right – search and options

Figure 7: Search options

1. collapse
2. search by platform name
3. search by latitude and longitude

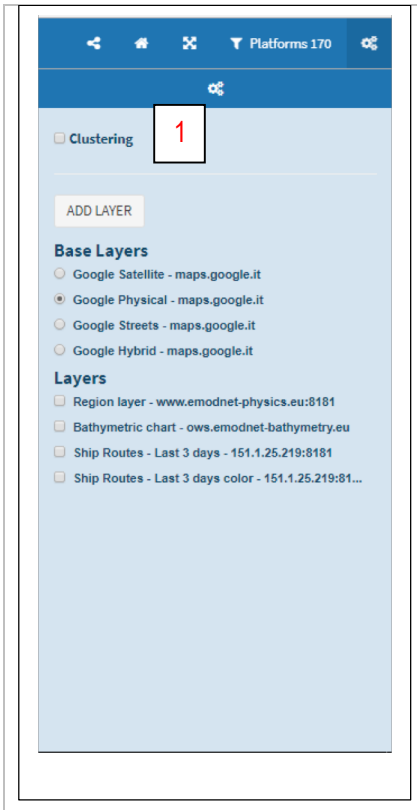


Figure 8: Clustering

If the user clicks the “option”, he can change the background map and add layers.

1-this option enable you to cluster the platform generically.

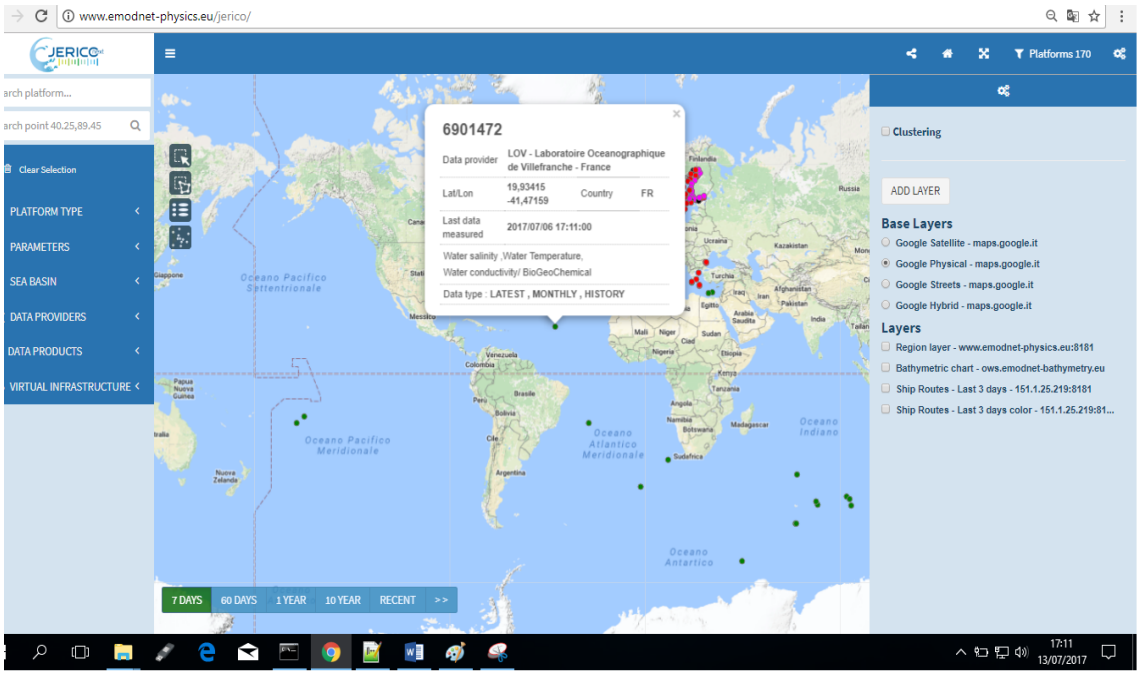


Figure 9. Example of the map page features.

3.1.1. *Evidence of the JERICO-NEXT Virtual Infrastructures*

The JERICO-NEXT Virtual Infrastructures are now evident and easily selectable in the data portal. In particular, a specific section that is listing the VIs is now available in the left menu.

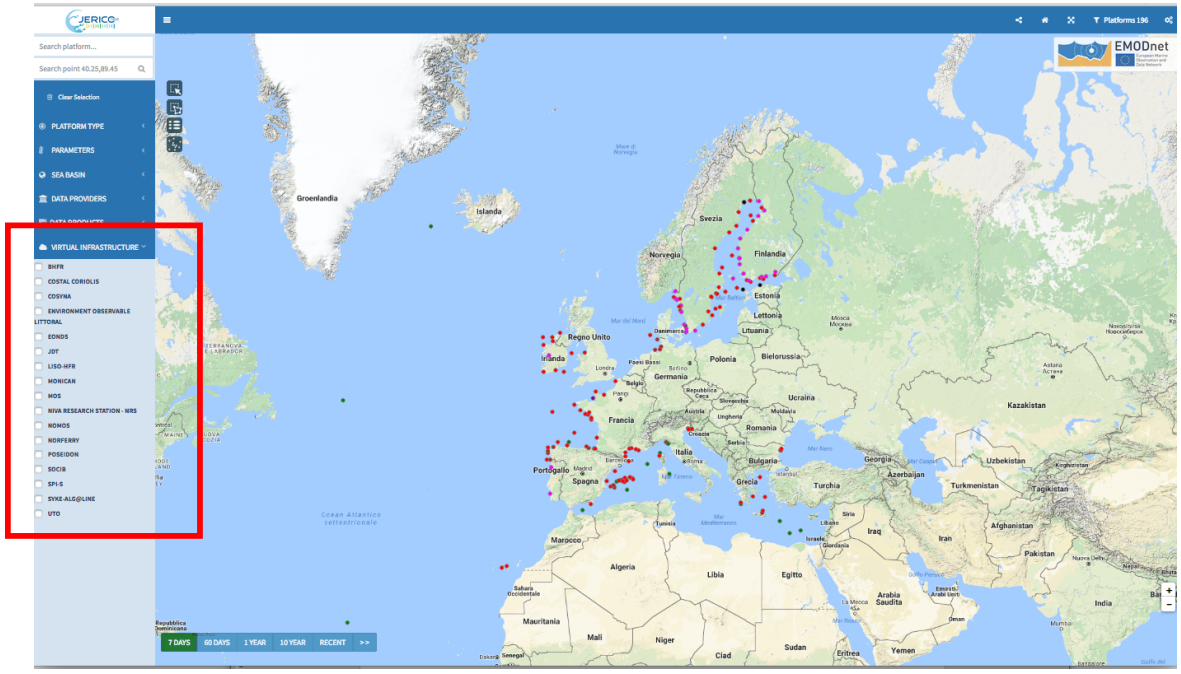


Figure 10. JERICO-NEXT data portal and the JERICO-NEXT VIs

If the user selects one of the JERICO-NEXT VIs, the system shows all the platforms belonging to that VI. The number of selected platforms is indicated in the box (top right). See Figure 11.

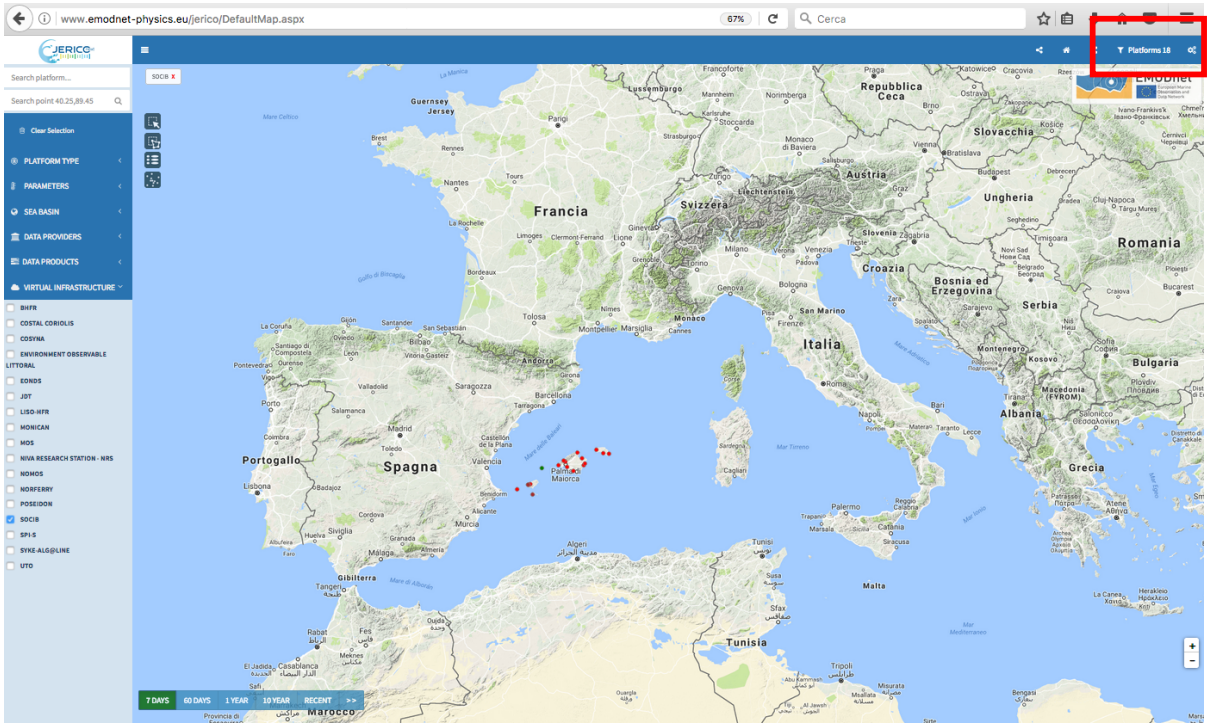


Figure 11. Example of a selection of a VI

The user can then share the selection by clicking the “share feature” that is now extended to socials.

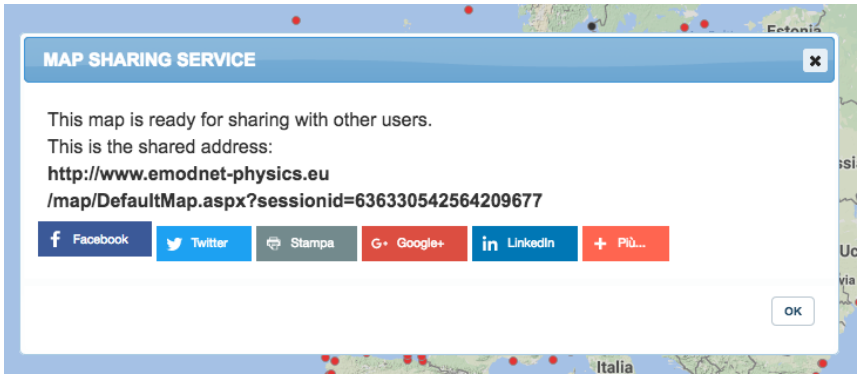


Figure 12. Share feature

3.1.2. *Interacting with a Platform*

If the user clicks on a specific platform, the system opens the platform page:

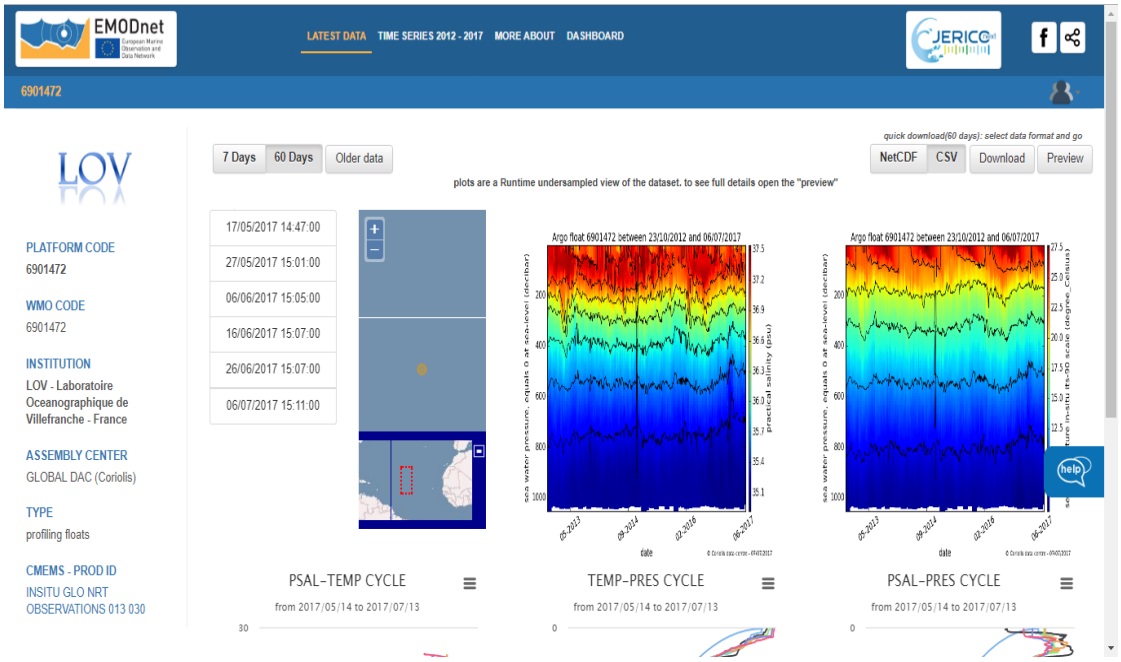


Figure 13 – Example of the ARGO platform page

Each platform has a unique internal reference id and can be used to directly access to the platform:
e.g.: http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=8427
the feature is now also supporting the the platform code (e.g. WMO):
e.g. (new): http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformcode=arkona

Service links are presented in a dedicated API hosted by EMODnet Physics:
http://www.emodnet-physics.eu/map/spi.aspx

Platform ID	Platform Code	PlatInfo	Dashboard
8	Heysham	?code=Heysham ?id=8	?code=Heysham&page=DD ?id=8&page=DD
9	Ilfracombe	?code=Ilfracombe ?id=9	?code=Ilfracombe&page=DD ?id=9&page=DD
10	Newhaven	?code=Newhaven ?id=10	?code=Newhaven&page=DD ?id=10&page=DD
11	Holyhead	?code=Holyhead ?id=11	?code=Holyhead&page=DD ?id=11&page=DD
13	Avonmouth	?code=Avonmouth ?id=13	?code=Avonmouth&page=DD ?id=13&page=DD

Figure 14. Unique URL call back service details.

The platform gives access to metadata (left side), data and products (right side), and further features:

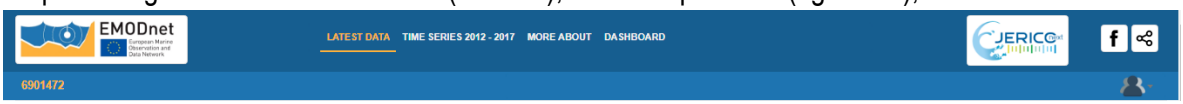


Figure 15: Platform page features

Platform page features (from left to right):
1. latest data → shows the plots for the selected period
2. averages → shows plots of parameters monthly mean, max and min
3. time series → presents the full data availability (and allows to download it)
4. (if wind data available) wind product → plots of wind products
5. more about → further information and SOS links and descriptions
6. dashboard → plots and tables about platform and data views and downloads

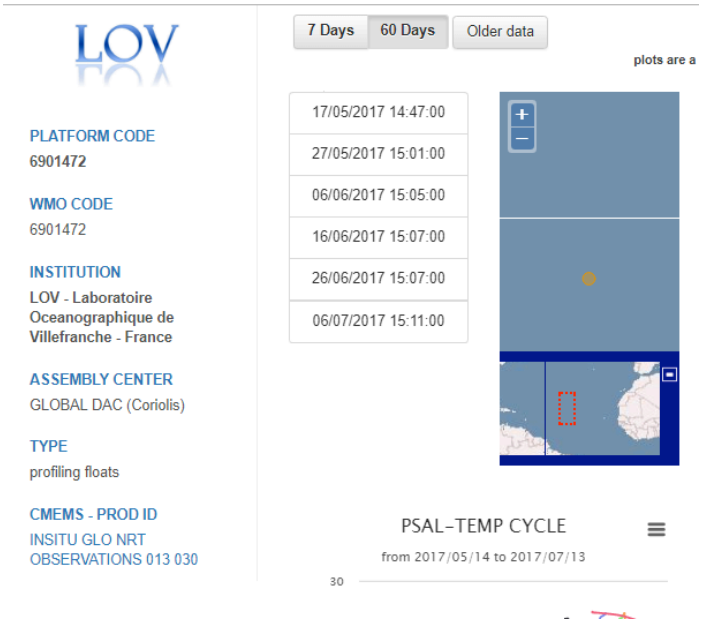


Figure 16: Platform data

Left – metadata → provider, platform name and code etc.
Inner panel - Top - Time window filter for plots → to pass from latest 7 days to latest 60 days data
Inner panel - Left – available parameters → to pass from a plot to the other

User can select the data quality in the plots (good: 0-1 and very good: 1) and the source product – if more than one are available - e.g. CMEMS GLO 013 030

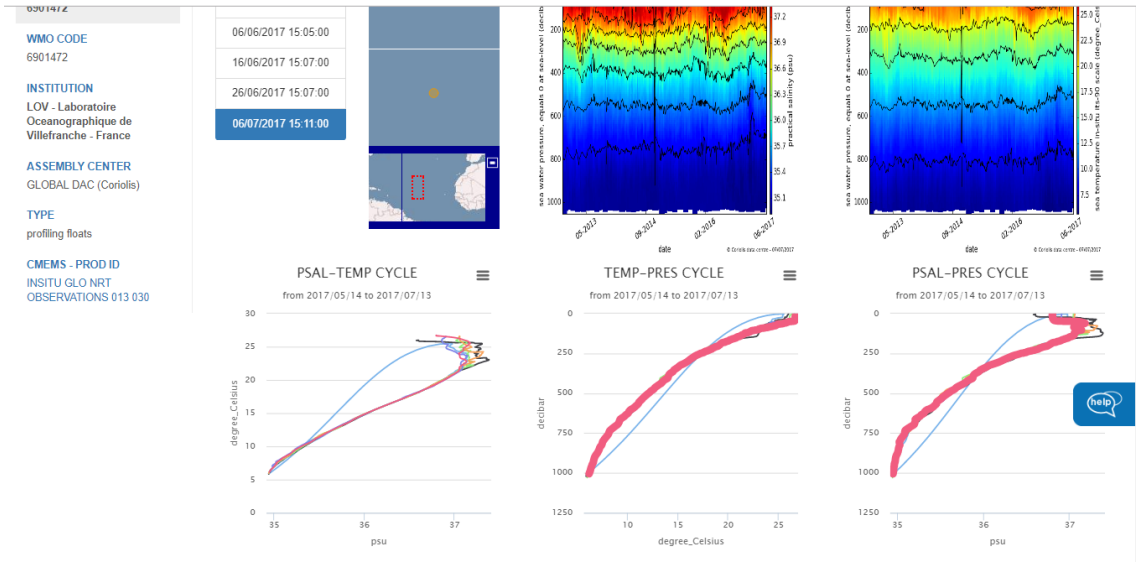


Figure 17. Example of latest data – plots for last 60 days practical salinity data (QC = 1 on the left plot)

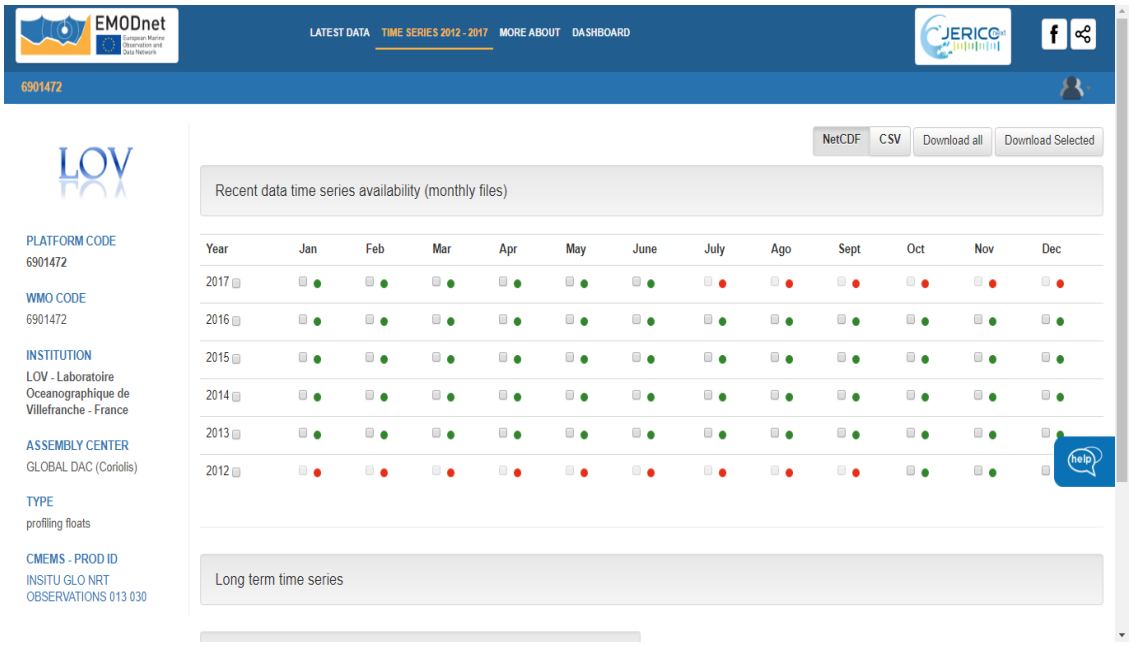


Figure 18. Example of data availability (green = data available for that month, red = no data available)

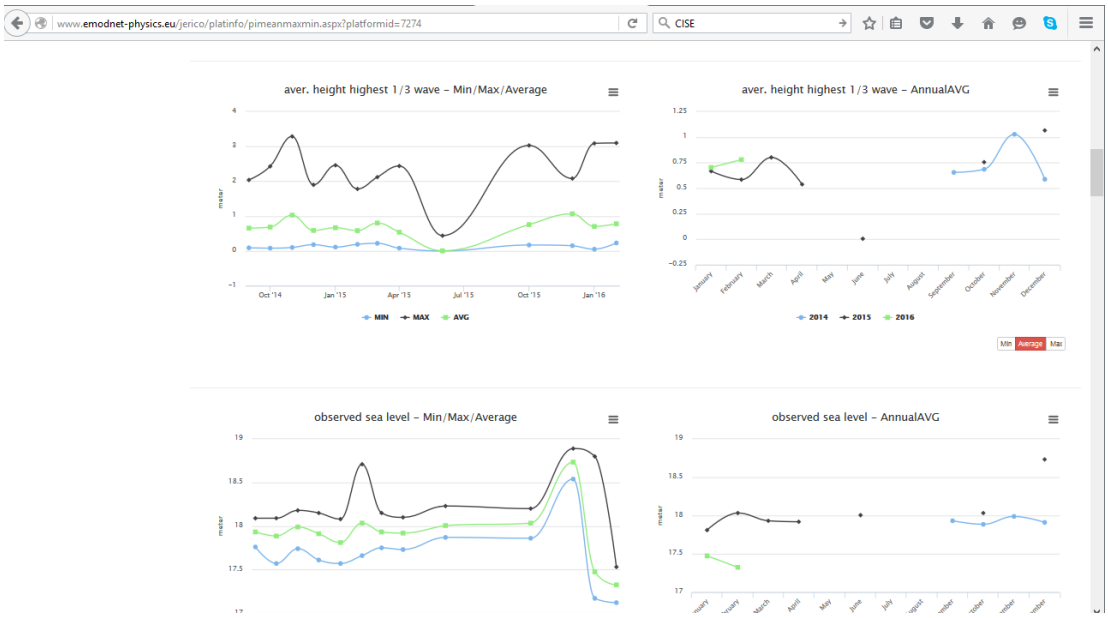


Figure 19. Example of products: monthly averages – maximum and minimum-recorded parameter values

If the platform is recording wind data, the "wind product" section is available and the user can find:

1) Plot reporting the number of hours binned by wind strength for a given period
2) Plot reporting the maximum wind speed day by day for a given period
3) Plot reporting the max wind intensity binned by wind strength for a given period
4) Average wind strength hour by hour for a given period
5) Wind rose

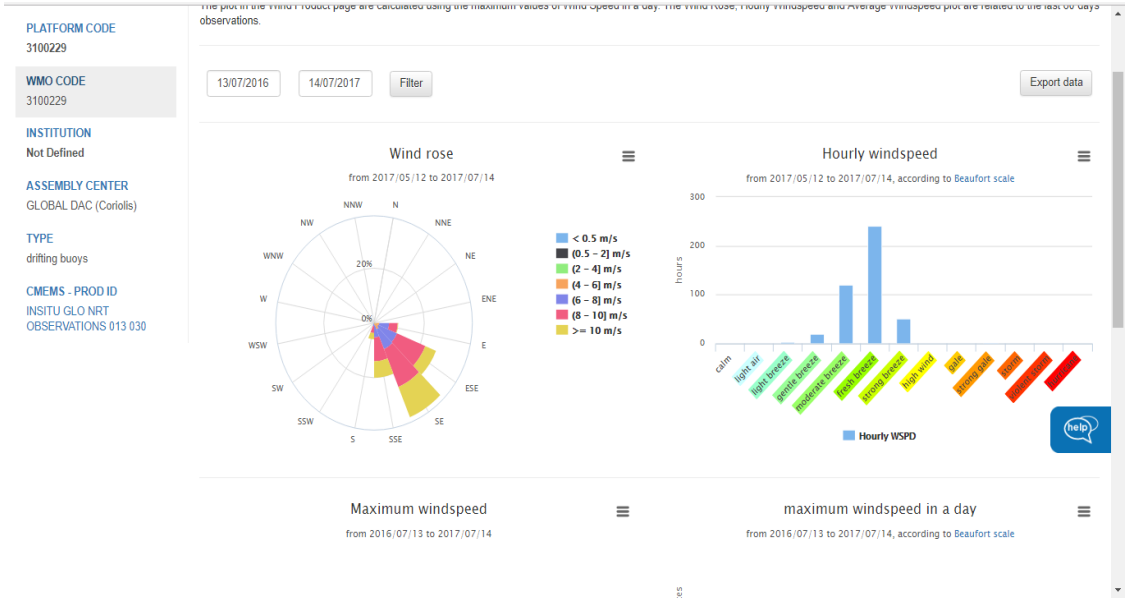


Figure 20. Example of wind products – if the user modifies the time window (from - to, top right) data are re-processed and plots are refreshed.

The section “dashboard” offers information about how much the data from the platform is viewed or downloaded. On the left data about the views (from which country), and on the right data downloads information.

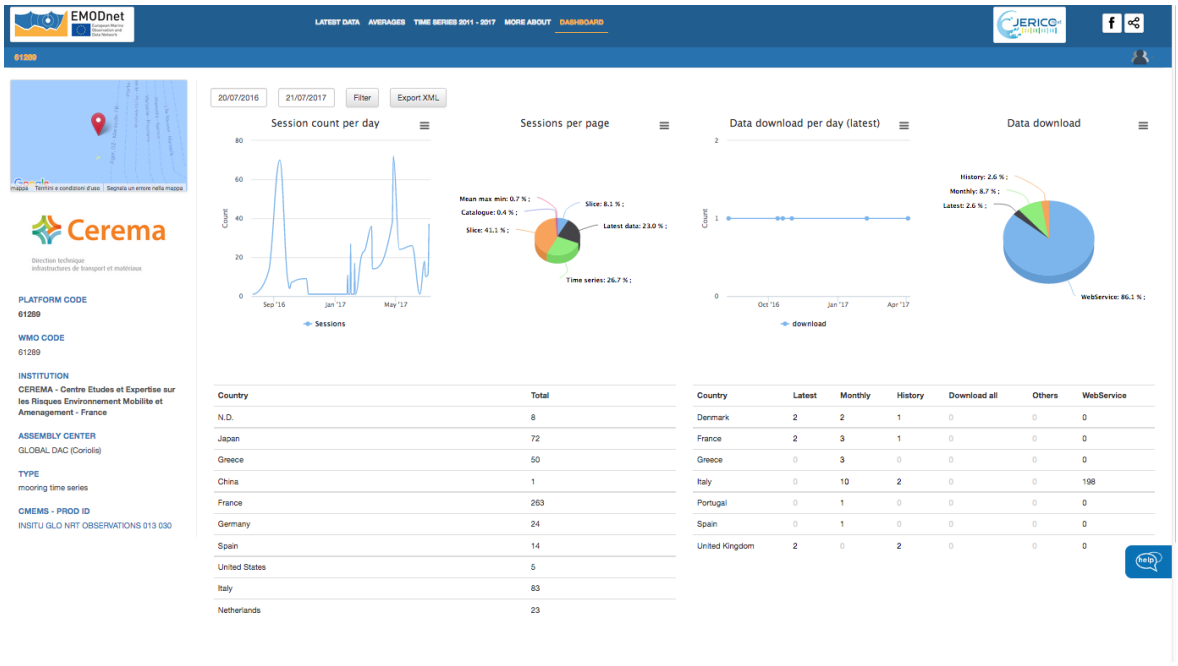


Figure 21. Dashboard

The section “more about” is presenting the list of the available machine-to-machine endpoints for that platform and instruction on how to use the services.

In case of a HF Radar, the platform page shows direction and velocity water of currents for the past 5 days (user can select a specific time or can play an animation).

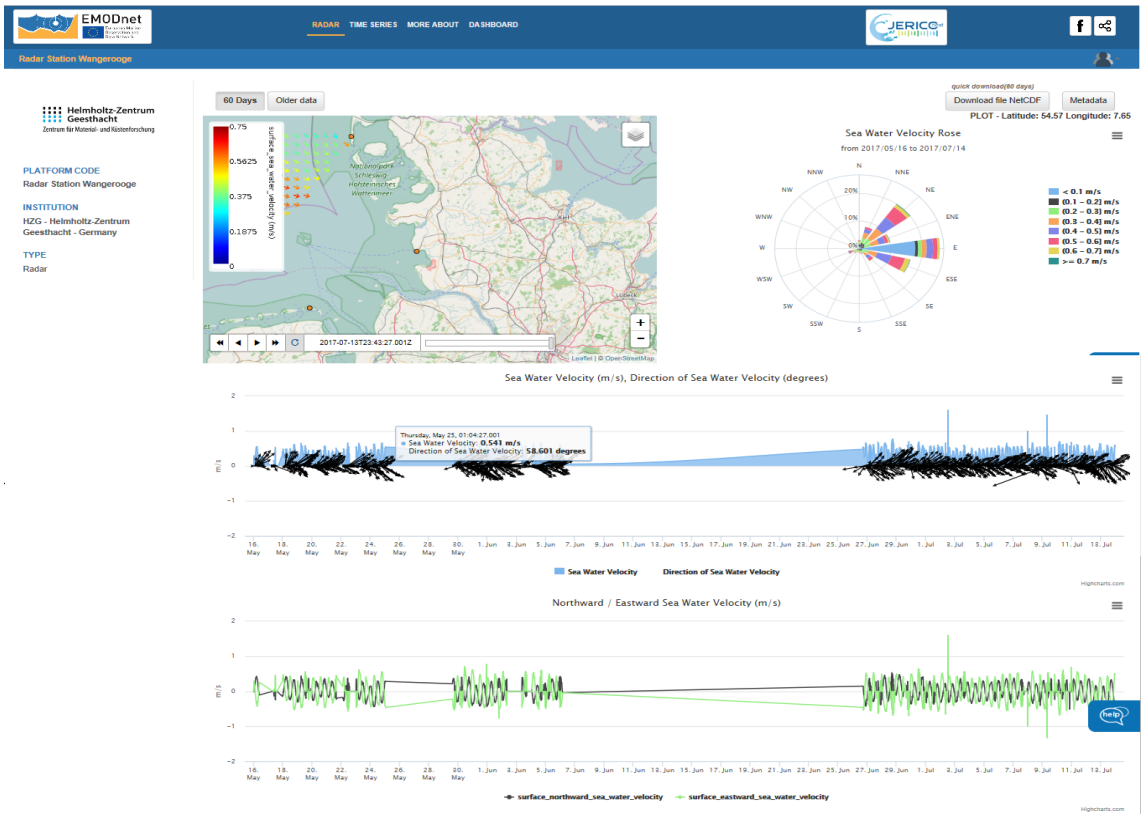


Figure 22. Example of HFR data if the user clicks on a point the system provides the temporal timeseries for that point

3.2. JERICO-NEXT Dashboard and monitoring tools

The *dashboard* is a reporting service where users can view and export various statistics about the data portal content and usage. The dashboard represents a valuable tool to discover data availability and monitor performances of the infrastructure behind the portal. The tool also provides KPI's showing how much data and how many platforms are made available on a daily basis, extracting statistics on page access and data downloads etc.

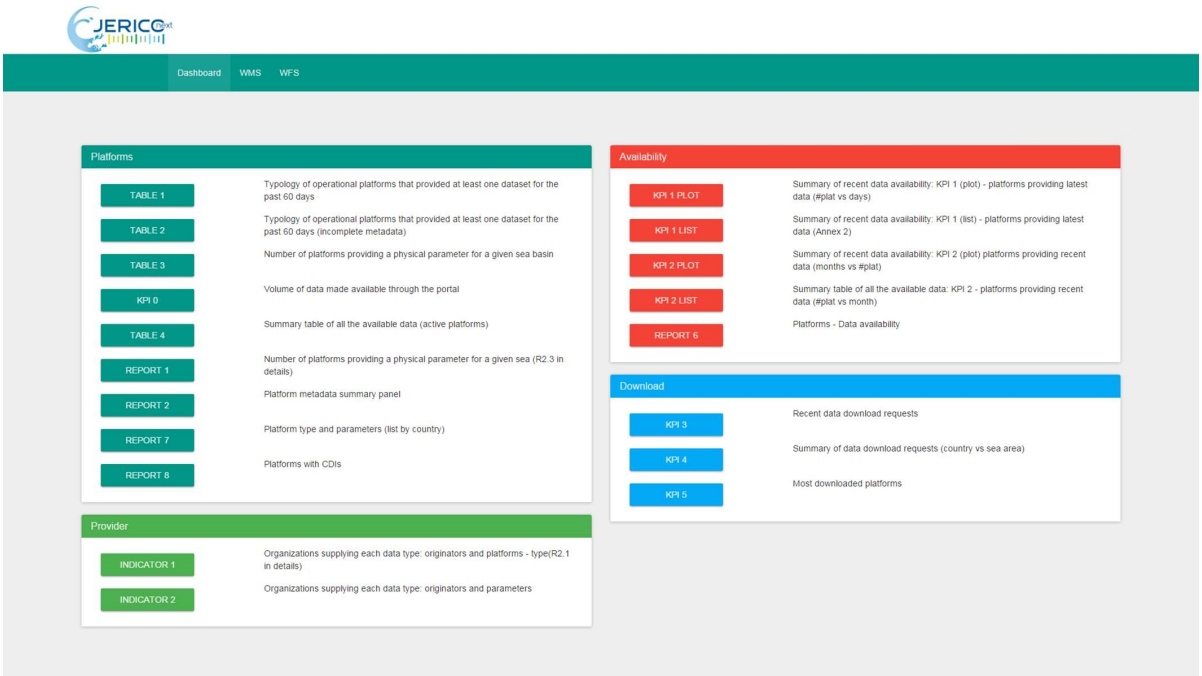
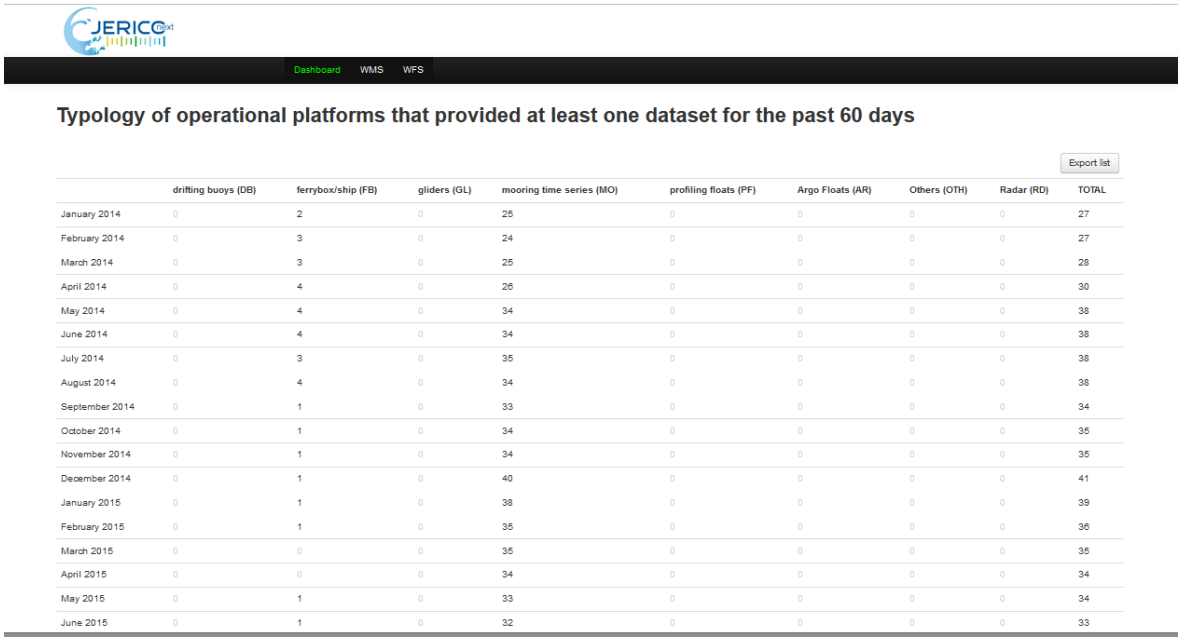


Figure 23. Dashboard main panel

The following figures are showing examples of the available reports. Legends describe the provided information.



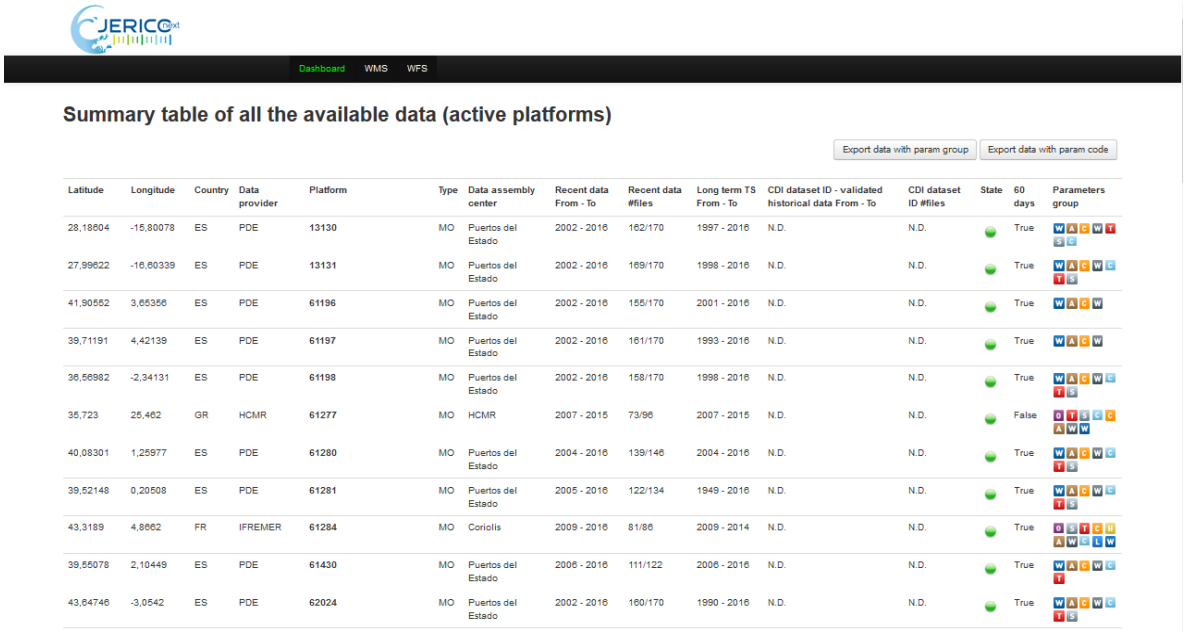
Dashboard WMS WFS

Typology of operational platforms that provided at least one dataset for the past 60 days

Export list

	drifting buoys (DB)	ferrybox/ship (FB)	gliders (GL)	mooring time series (MO)	profiling floats (PF)	Argo Floats (AR)	Others (OTH)	Radar (RD)	TOTAL
January 2014	0	2	0	25	0	0	0	0	27
February 2014	0	3	0	24	0	0	0	0	27
March 2014	0	3	0	25	0	0	0	0	28
April 2014	0	4	0	26	0	0	0	0	30
May 2014	0	4	0	34	0	0	0	0	38
June 2014	0	4	0	34	0	0	0	0	38
July 2014	0	3	0	35	0	0	0	0	38
August 2014	0	4	0	34	0	0	0	0	38
September 2014	0	1	0	33	0	0	0	0	34
October 2014	0	1	0	34	0	0	0	0	35
November 2014	0	1	0	34	0	0	0	0	35
December 2014	0	1	0	40	0	0	0	0	41
January 2015	0	1	0	38	0	0	0	0	39
February 2015	0	1	0	35	0	0	0	0	36
March 2015	0	0	0	35	0	0	0	0	35
April 2015	0	0	0	34	0	0	0	0	34
May 2015	0	1	0	33	0	0	0	0	34
June 2015	0	1	0	32	0	0	0	0	33

Figure 24. Report on available platforms, which provided data (at least one data set) for past 60 days ordered by platform type



Dashboard WMS WFS

Summary table of all the available data (active platforms)

Export data with param group | Export data with param code

Latitude	Longitude	Country	Data provider	Platform	Type	Data assembly center	Recent data From - To	Recent data #files	Long term TS From - To	CDI dataset ID - validated historical data From - To	CDI dataset ID #files	State	60 days	Parameters group
28,18604	-15,80078	ES	PDE	13130	MO	Puertos del Estado	2002 - 2016	162/170	1997 - 2016	N.D.	N.D.		True	W A C W T S C
27,99622	-16,60339	ES	PDE	13131	MO	Puertos del Estado	2002 - 2016	169/170	1998 - 2016	N.D.	N.D.		True	W A C W C T S
41,90552	3,65356	ES	PDE	61196	MO	Puertos del Estado	2002 - 2016	155/170	2001 - 2016	N.D.	N.D.		True	W A C W
39,71191	4,42139	ES	PDE	61197	MO	Puertos del Estado	2002 - 2016	161/170	1993 - 2016	N.D.	N.D.		True	W A C W
36,56982	-2,34131	ES	PDE	61198	MO	Puertos del Estado	2002 - 2016	158/170	1998 - 2016	N.D.	N.D.		True	W A C W C T S
35,723	25,462	GR	HCMR	61277	MO	HCMR	2007 - 2015	73/96	2007 - 2015	N.D.	N.D.		False	D T S C G A W W
40,08301	1,25977	ES	PDE	61280	MO	Puertos del Estado	2004 - 2016	139/146	2004 - 2016	N.D.	N.D.		True	W A C W C T S
39,52148	0,20508	ES	PDE	61281	MO	Puertos del Estado	2005 - 2016	122/134	1949 - 2016	N.D.	N.D.		True	W A C W C T S
43,3189	4,8662	FR	IFREMER	61284	MO	Coriolis	2009 - 2016	81/86	2009 - 2014	N.D.	N.D.		True	D S T C H A W C L W
39,55078	2,10449	ES	PDE	61430	MO	Puertos del Estado	2006 - 2016	111/122	2006 - 2016	N.D.	N.D.		True	W A C W C T
43,64746	-3,0542	ES	PDE	62024	MO	Puertos del Estado	2002 - 2016	160/170	1990 - 2016	N.D.	N.D.		True	W A C W C T S

Figure 25. This report is listing all the connected platforms and available data. The report can be exported in CSV format for further uses. The export is one of the most complete reports of the Jerico data portal.

3.3. JERICO-NEXT Interoperability tools

The interoperability services are based on the EMODnet Physics services and, where pertinent, they are specific to fulfil the JERICO-NEXT scope.

3.3.1. Web Map Service (WMS) and Web Feature Services (WFS)

The Web Map Services and Web Feature Services are accessible at following link:
(WMS) http://www.emodnet-physics.eu/jerico/Service/GeoServerDefaultWMS.aspx
(WFS) http://www.emodnet-physics.eu/jerico/Service/GeoServerDefaultWFS.aspx

These OGC compliant services are based on GeoServer (http://docs.geoserver.org). The JERICO-NEXT WMS provide a standard interface for requesting a geospatial map image (WMS 1.1.1).

The WMS page provides a user-friendly interface (Figure 26) to see and plug the available layers. Instructions on how to link/import into their page/service are presented when the user clicks the "i" button.

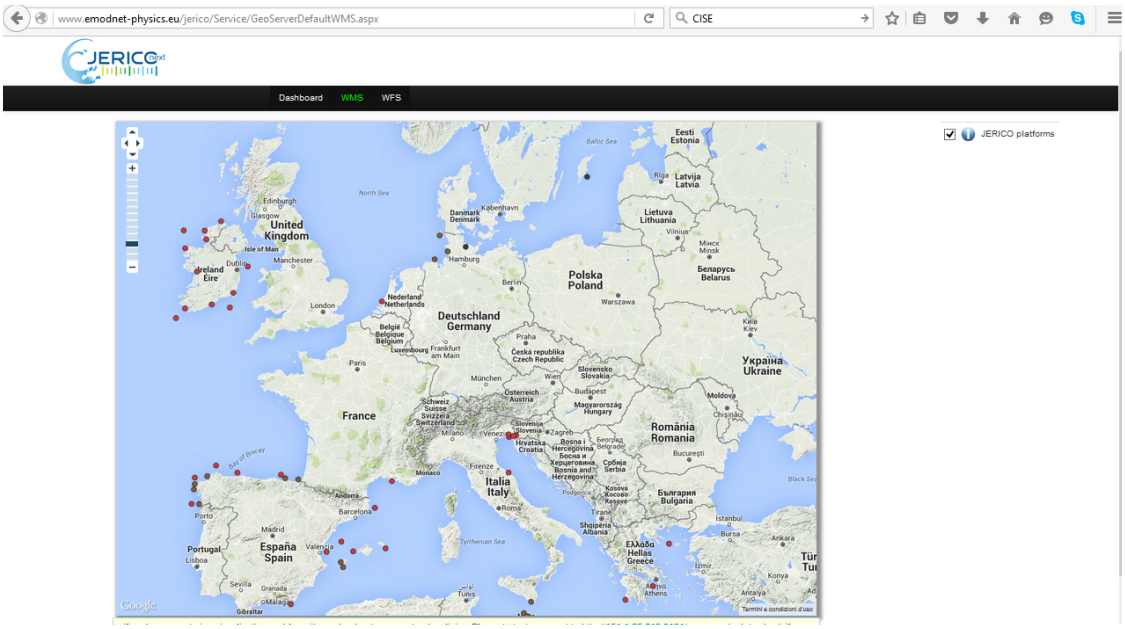


Figure 26. WMS page

http://geoserver.emodnet-physics.eu/geoserver/emodnet/ows?service=WMS&version=1.1.1&request=GetMap&format=image/png&transparent=true&SRS=EPSG%3A900913&BBOX=-2101155.3884615,5291639.887125,1655877.4252884,9048672.700875&WIDTH=768&HEIGHT=768&LAYERS=PlatformJerico

The WMS also supplies information about the available layers, server capabilities, and contact/publisher information:
http://geoserver.emodnet-physics.eu/geoserver/emodnet/ows?service=WMS&version=1.1.1&request=GetCapabilities

The WFS encodes and transfers information in Geography Mark-up Language (GML), a subset of XML.
http://www.emodnet-physics.eu/jerico/Service/provawfs/GeoServerProxy/?request=GetFeature&service=wfs&version=1.0.0&typeName=platforms_MO&bbox=-84.859375,13.1640625,76.859375,96.8359375


```
- <wfs:FeatureCollection xsi:schemaLocation="http://151.1.25.219:8181/emodnet http://151.1.25.219:8181/geoserver/emodnet/wfs?service=WFS&version=1.0.0&request=DescribeFeatureType&
  typeName=emodnet%3Aplatforms_MO http://www.opengis.net/wfs http://151.1.25.219:8181/geoserver/schemas/wfs/1.0.0/WFS-basic.xsd">
  - <gml:boundedBy>
      <gml:null>unknown</gml:null>
    </gml:boundedBy>
  - <gml:featureMember>
    - <emodnet:platforms_MO fid="platforms_MO.925">
      - <emodnet:position>
        - <gml:Point srsName="http://www.opengis.net/gml/srs/epsg.xml#4326">
            <gml:coordinates decimal="." cs="," ts=" ">12.28083,41.7135</gml:coordinates>
          </gml:Point>
        </emodnet:position>
        <emodnet:platform_code>DRAGO-OSTIA DRA10</emodnet:platform_code>
        <emodnet:sea_region>Tirreno Sea</emodnet:sea_region>
      - <emodnet:platform_info>
          http://www.emodnet-physics.eu/Map/FeedPlatformInfo.aspx?id=171
        </emodnet:platform_info>
        <emodnet:platform_id>171</emodnet:platform_id>
        <emodnet:platform_type_description>fixed buoys or mooring time series</emodnet:platform_type_description>
        <emodnet:parameters_codes>AYMD;WVST</emodnet:parameters_codes>
        <emodnet:parameters_descriptions>, </emodnet:parameters_descriptions>
        <emodnet:data_type>HistoricalCDI</emodnet:data_type>
        <emodnet:country>Italy</emodnet:country>
      - <emodnet:data_owner>
          Istituto Nazionale di Oceanografia e di Geofisica Sperimentale - Division of Oceanography - Italy
        </emodnet:data_owner>
      - <emodnet:logo>
          http://www.emodnet-physics.eu/map/includes/images/dataProviders/loghi/OGS.png
        </emodnet:logo>
        <emodnet:platform_type_code>MO</emodnet:platform_type_code>
      </emodnet:platforms_MO>
    </gml:featureMember>
```


Figure 27. Example of the XML in response to a WFS request

3.3.2. *THREDDS (HFR data only)*

The THREDDS Data Server (TDS) communicates with clients by sending them a THREDDS Catalogue that describes what datasets the server has, and how they can be accessed. THREDDS Catalogues are logical directories of on-line data resources, encoded as XML documents, which provide a place for annotations and other metadata about the data resources. JERICO-NEXT THREDDS catalogue is hosted by EMODnet Physics:

http://hfr-thredds.emodnet-physics.eu/thredds/catalog.html

4. Conclusions

The JERICO-NEXT data portal provides access to data and data visualization features and it is based on the data management infrastructure developed under WP5 and compliant to Vis needs (WP6). It provides the web interface for the management and access of the JERICO-NEXT data with a specific focus on:

- To provide access to near real time and delay mode data from the JERICO-NEXT platforms as collected by the JERICO-NEXT VIs
- To design and make (web) accessible data and aggregated data products (re-elaboration)
- To implement the JERICO-NEXT web portal with services (data discovery, data access, data download etc)

The JERICO-NEXT data portal is operational and provides:

- an overview (table and map) of measurement stations, with full metadata including indications as to whether they provide real-time measurements and/or delayed mode/archived measurements;
- mechanisms for downloading data and metadata including "quick look graphical representations". Users should be able to download complete sets of data for one sea-basin within a given timeframe with a few mouse clicks;
- downloadable data in different data formats (e.g. data sheets and NetCDF)
- a platform page presenting relevant metadata information about data, provider, adopted quality control procedures, relevant publication for that platform and its parameters, data viewing and downloading tools.
- added value tools for data and information checking and management (via a dedicated dashboard) and interoperability towards other systems (via WMS/WFS and web services)

5. Annexes and references

5.1. Glossary and abbreviations

CF	Climate Forecast (convention for NetCDF)
CMEMS	Copernicus Marine Environment Monitoring Service. CMEMS has been designed to respond to issues emerging in the environmental, business and scientific sectors.Using information from both satellite and in situ observations, it provides state-of-the-art analyses and forecasts daily, which offer an unprecedented capability to observe, understand and anticipate marine environment events.
CSV	Comma-separated values. It is a file stores tabular data (numbers and text) in plain text. Each line of the file is a data record. Each record consists of one or more fields, separated by commas. The use of the comma as a field separator is the source of the name for this file format
EC	European Commission
EMODnet	European Marine Observation and Data network (EMODnet) is a long term marine data initiative from the European Commission Directorate-General for Maritime Affairs and Fisheries (DG MARE) underpinning its Marine Knowledge 2020 strategy. EMODnet is a consortium of organizations assembling European marine data, data products and metadata from diverse sources in a uniform way. The main purpose of EMODnet is to unlock fragmented and hidden marine data resources and to make these available to individuals and organizations (public and private), and to facilitate investment in sustainable coastal and offshore activities through improved access to quality-assured, standardized and harmonized marine data which are interoperable and free of restrictions on use.
EuroGOOS	European Global Observing System. EuroGOOS is a pan-European ocean observing network operating within the context of the Global Ocean Observing System of the Intergovernmental Oceanographic Commission of UNESCO (IOC GOOS).
FP	Framework Programmes for Research and Technological Development, also called Framework Programmes or abbreviated FP1 through FP7 with "FP8" being named "Horizon 2020", are funding programmes created by the European Union/European Commission to support and foster research in the European Research Area (ERA).
FTP	Protocol to download files
GMES	EU FP7 programme for the Global Monitoring for Environment and Security
HFR	High Frequency Radar
ICES	International Council for the Exploration of the Sea
INS TAC	In Situ Thematic Assembly Center
KPI	Key Performance Indicator
My Ocean	MyOcean is a series of projects (European Commission within the FP7.GMES Program) to define and to set up a concerted and integrated pan-European capacity for ocean monitoring and forecasting
NetCDF	Network Common Data Form. NetCDF is a set of software libraries and self-describing, machine-independent data formats that support the creation, access, and sharing of array-oriented scientific data.
NODC	National Oceanographic Data Centre. The NODCs are national data centres which mission statement is to provide scientific stewardship of marine data and information
NRT	Near Real Time
Obis	Ocean Biogeographic Information System is a web-based access point to information about the distribution and abundance of living species in the ocean
OGC	Open Geospatial Consortium is an international not for profit organization committed to making quality open standards for the global geospatial community. These standards are made through a consensus process and are freely available for anyone to use to improve sharing of the world's geospatial data
ROOS	Regional Oceanographic Observing System

SDN	SeaDataNet
SeaDataNet	SeaDataNet project (FP6.GA026212 and FP7.GA283607) - Pan-European infrastructure for providing access to ocean and marine metadata
SOAP	Simple Object Access Protocol. SOAP is a protocol specification for exchanging structured information in the implementation of web services in computer networks. It uses XML Information Set for its message format, and relies on application layer protocols, most notably Hypertext Transfer Protocol (HTTP) or Simple Mail Transfer Protocol (SMTP), for message negotiation and transmission
SOS	Sensor Observation Service is a web service to query real-time sensor data and sensor data time series and is part of the Sensor Web. The offered sensor data comprises descriptions of sensors themselves, which are encoded in the Sensor Model Language (SensorML), and the measured values in the Observations and Measurements (O & M) encoding format. The web service as well as both file formats are open standards and specifications of the same name defined by the Open Geospatial Consortium (OGC).
THREDDS	Thematic Real Time Environmental Distributed Data Services is a web server that provides metadata and data access for scientific datasets, using a variety of remote data access protocols.
Web service	the We Service is a service offered by an electronic device to another electronic device, communicating with each other via the world wide web
WFS	Web Feature Service Interface Standard (WFS) provides an interface allowing requests for geographical features across the web using platform-independent calls.
WMO	World Meteorological Organization
WMS	Web Map Service is a standard protocol for serving (over the Internet) georeferenced map images which a map server generates using data from a Geographic information system (GIS) database

5.1. EuroGOOS ROOSs

Name	Region	CMEMS bigram
Arctic ROOS	Arctic Seas	AR
BOOS	Baltic Seas	BO
Black Sea GOOS	Black Sea	BS
IBI ROOS	Iberic-Biscay-Irish Seas	IR
MOON	Mediterranean Sea	MO
NOOS	North West Shelves	NO