



EMODnet



European Marine
Observation and
Data Network

Your gateway to marine data in Europe

EMODnet Physics

EASME/2019/OP/0003 - European Marine Observation and Data Network - Physics
EASME/EMFF/2018/1.3.1.8/Lot3/SI2.810790

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Outline of the presentation

- ① Data scope
- ① Data sources
- ① Handling of data from input to products
 - ① QA-QC methods
 - ① Metadata and data formats
 - ① Vocabularies
- ① Data policies
- ① Discovery and access services
 - ① Viewing services
 - ① Web services



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Data and Scope

- ⦿ Integrate and make available Ocean Physics data
 - ⦿ Real Time, Near Real Time, Historical Reprocessed & Validated
- ⦿ Make available Products on Ocean Physics
 - ⦿ Build on available infrastructures
 - ⦿ redistribute available products
 - ⦿ develop products (collection of data and elaborations)
- ⦿ Make data, metadata and products Findable, Accessible, Interoperable, Reusable
 - ⦿ Use and promote harmonization and common standards



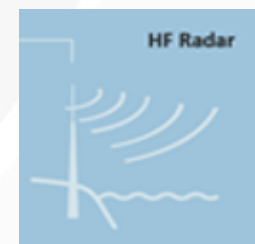
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Data and Scope

- ① Temperature in the water column
- ① Salinity in the water column
- ① Wave direction, height
- ① Wind @ Sea Level, direction, intensity
- ① Sea Currents direction, intensity
- ① Sea Level and sea level trends
- ① Optical properties
- ① Sea Ice
- ① River outflow
- ① Acoustic pollution
- ① Atmospheric - Meteorological data @ sea level

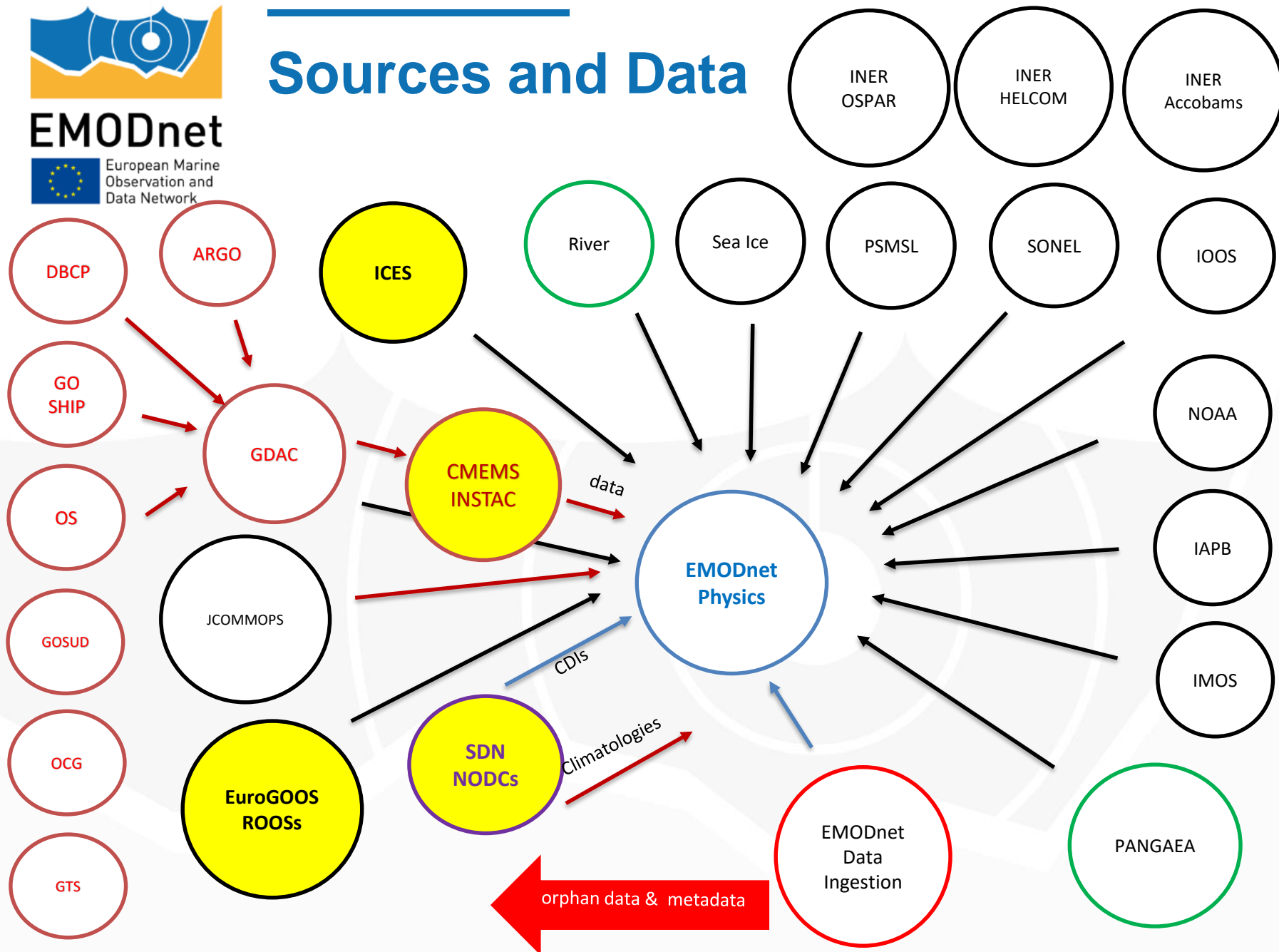




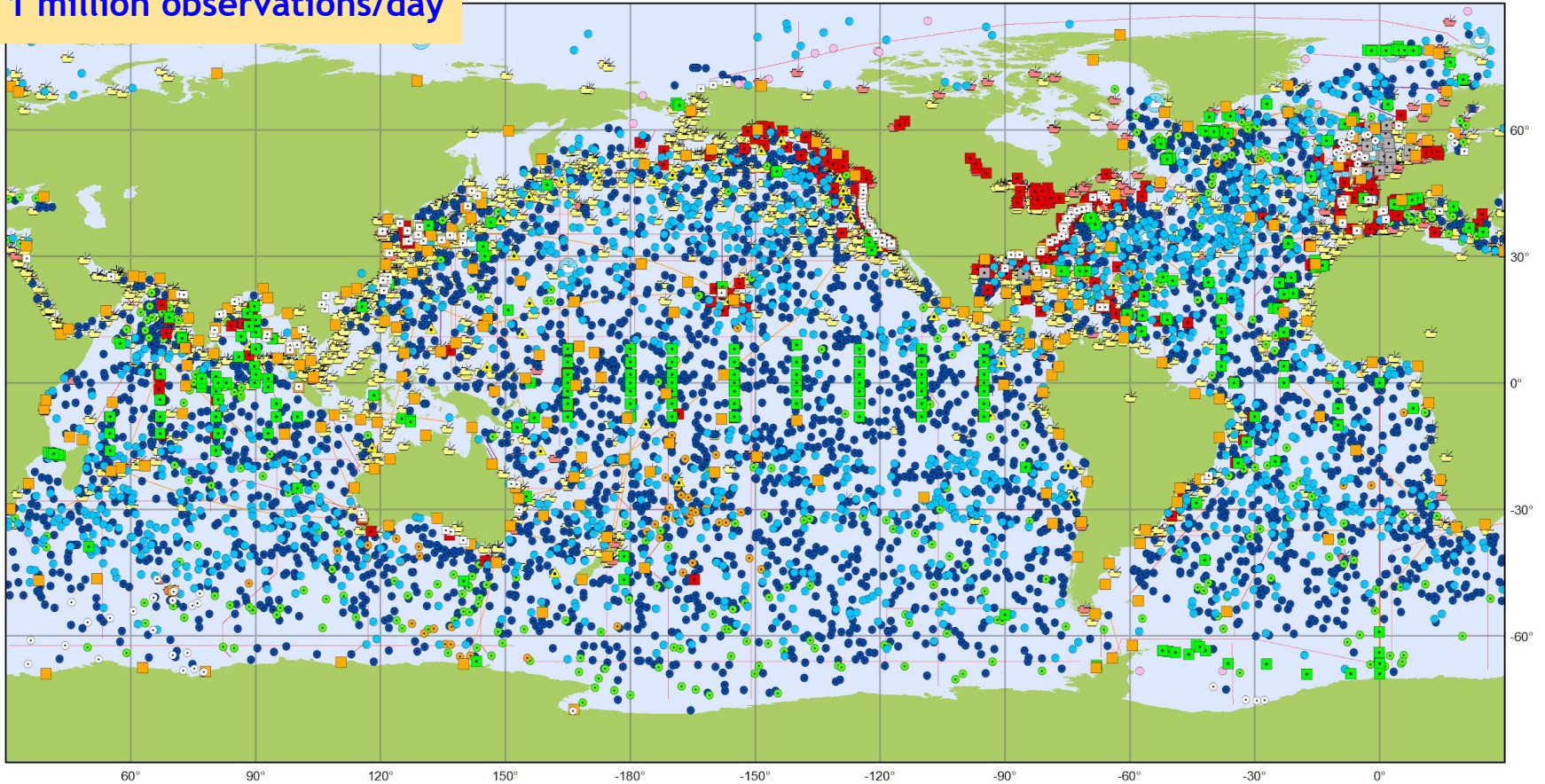
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Sources and Data



1 million observations/day



Main in situ Elements of the Global Ocean Observing System

August 2018

Profiling Floats (Argo)

- Core (3944)
- Deep (70)
- BioGeoChemical (329)

Data Buoys (DBCP)

- Surface Drifters (1383)
- Offshore Platforms (97)
- Ice Buoys (16)
- Moored Buoys (392)
- ▲ Tsunameters (36)

Timeseries (OceanSITES)

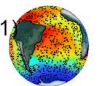
- Interdisciplinary Moorings (451)
- Repeated Hydrography (GO-SHIP)
- Research Vessel Lines (61)
- Sea Level (GLOSS)
- Tide Gauges (252)

Ship based Measurements (SOT)

- Automated Weather Stations (254)
- Manned Weather Stations (1738)
- Radiosondes (16)
- eXpendable BathyThermographs (37)

Other Networks

- HF Radars (270)
- Animal Borne Sensors (53)
- Ocean Gliders (31)



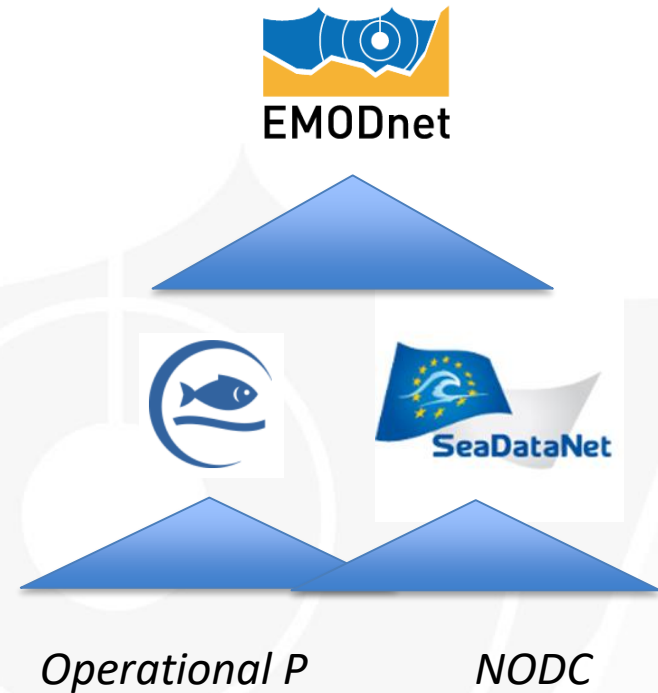


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Data Sources

- ① **SeaDataNet and NODCs**
- ① **CMEMS INSTAC**
- ① ICES
- ① PSMSL,
- ① GLOSS,
- ① SONEL,
- ① IOC SL
- ① PANGAEA
- ① GDAC (Coriolis)
 - ① OCEAN SITES, ARGO
- ① OSPAR, HELCOM, ACCOBAMS
- ① JCOMMOPS (metadata)
- ① EU HFR node, OceanGliders,
- ① SOOS, IOOS, IMOS, IAPB, DBCP,
- ① ...





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International collaboration

- WMO/IOC/GOOS/IODE
 - JCOMMOPS
 - IOOS, IMOS, MONGOOS, ODIN WESTPAC, ODIS (IOC Data and Information System)
 - GLOSS, Argo, Go-Ship, SOOP, Ocean Gliders, DBCP, Ocean Sites, VOS, ASAP, HFR
 - WMO: ET-WISC, IPET-MOIS

- SOOS (Southern Ocean Observing System)
 - DOOS (Deep Ocean Observing Strategy)
- SAON (Sustaining Arctic Observing Networks)
- NOAA (US)
- AODN (AU)
- PSMSL (Permanent Service for Mean Sea Level)
- ICES



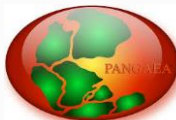
SAILDRONE



Van Oord



Nord Stream 2





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Handling of data from input to products

📍 Ocean Data

- 📍 Link sources into a single discoverable DB
- 📍 Develop smart adapter

Data flow is designed in collaboration and coordination with EU key integrators and programs (**CMEMS INSTAC**, **SDN-NODCs**, ICES) with an eye on international systems (GDAC, SOOS ...)

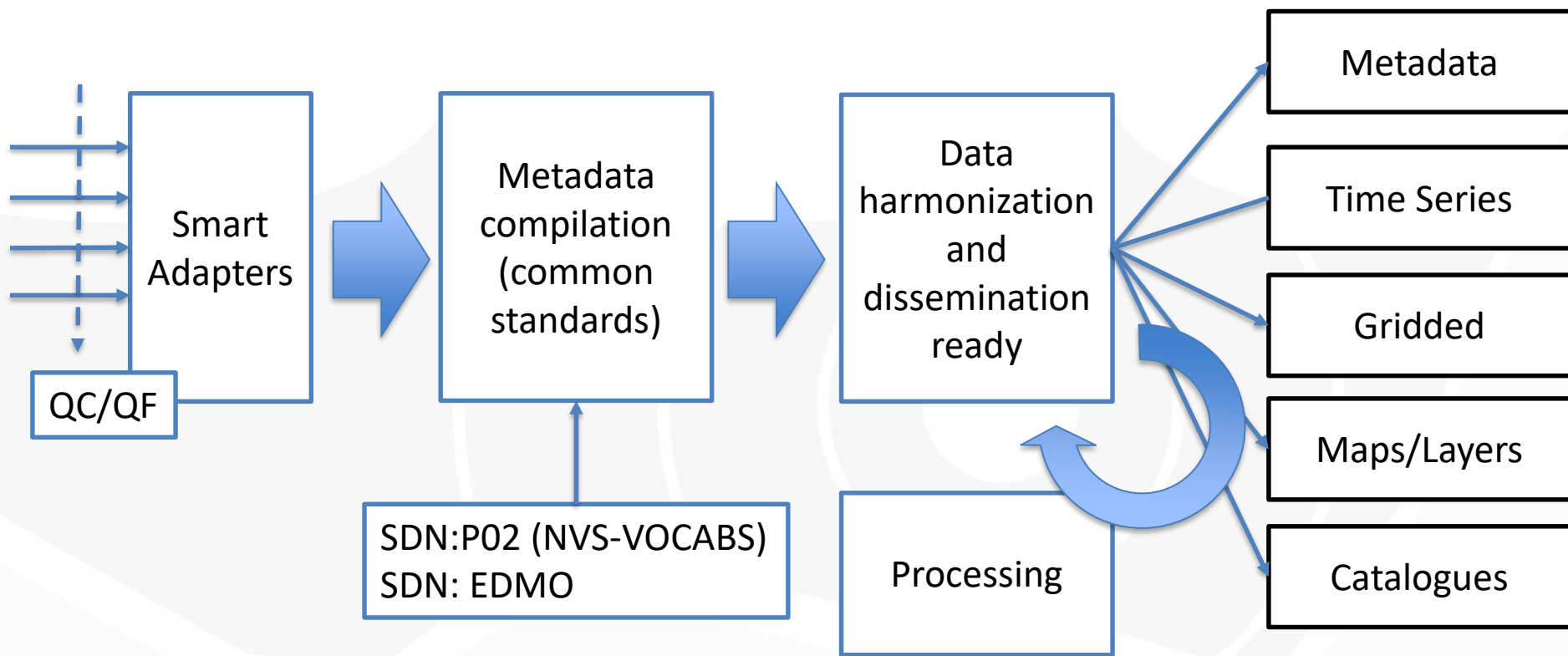
For themes not covered yet EMODnet Physics develops new data flow



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From input to products



QC/QF are semi-automatic or done by experts according the age of the data, es. NRT flow: is semi-automatic
HV: experts from SDN do apply a multi-level QC/QF



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Handling of data from input to products

Data age	technology	format
Real Time	SOS SWE	XML
Near real-time (NRT) data at in situ observatories at sea	Hourly/daily synch via ftp/thredds/erddap/APIs	CSV, netCDF (JSON, TXT)
Reprocessed NRT data (average/trends)	Internal processing/ periodic synch via APIs (REST)	CSV, netCDF, ODV4
Archived data derived from further elaboration and validation	Periodic synch via ftp/thredds	netCDF (CF, SDN)*

QC/QF are semi-automatic or done by experts according the age of the data, es.

NRT flow: is semi-automatic

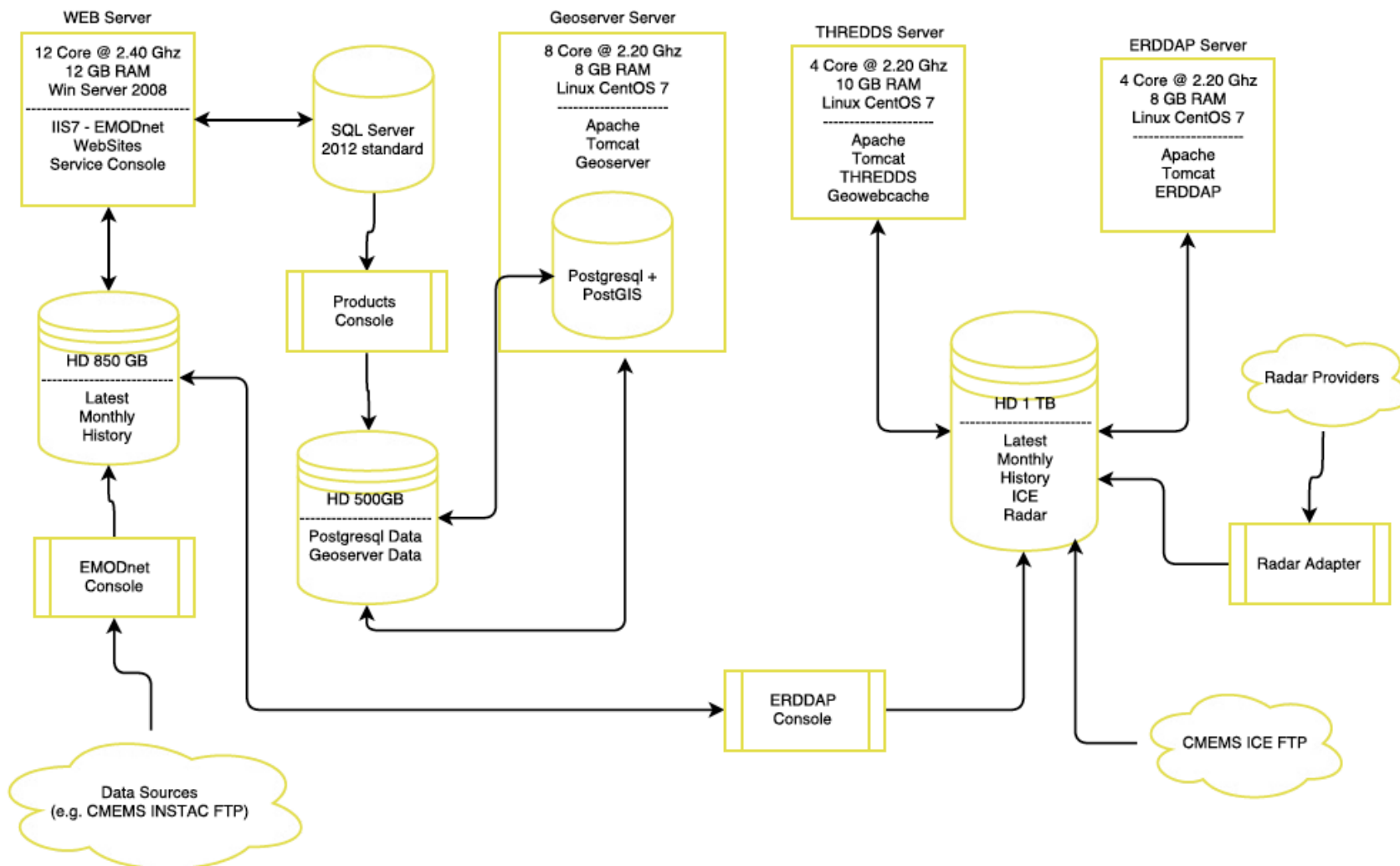
HV: experts from SDN do apply a multi-level QC/QF

* Harmonized global attributes and CF/SDN:NVS standards are key elements for data sharing with marine community (and beyond) and implement M2M services



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Overview of technical architecture/infrastructure and key features

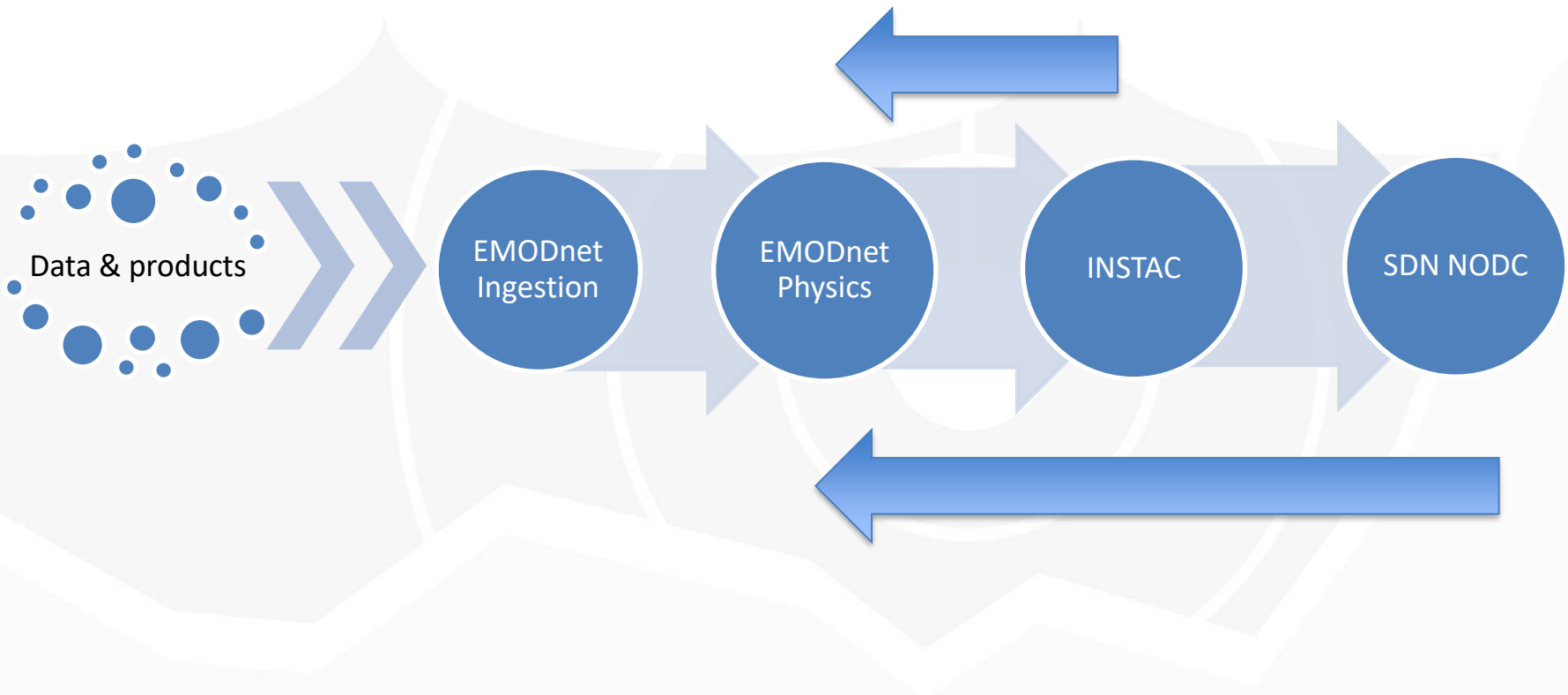




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Example for RT-NRT

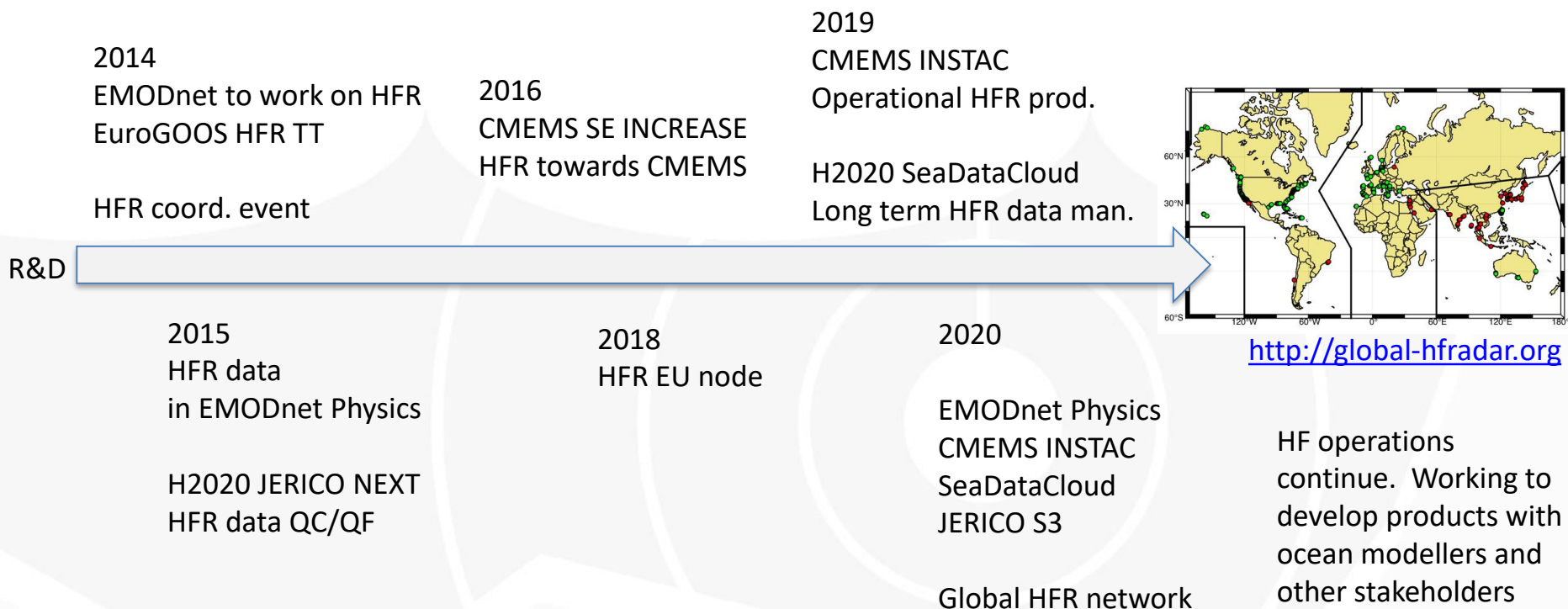




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Behind the scene e.g. HFR



*Similar activities with OceanGliders, EU river data and marine mammals,
under water acoustic pollution, ...*



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Temperature and Salinity in the water body

Input

CMEMS INSTAC

CORIORIS

MEOP

PANGAEA

IAPB

IOOS, NOAA

IMOS

...

SDN climatology

CORA – Coriolis
Ocean Dataset
for Reanalysis
v.5.2

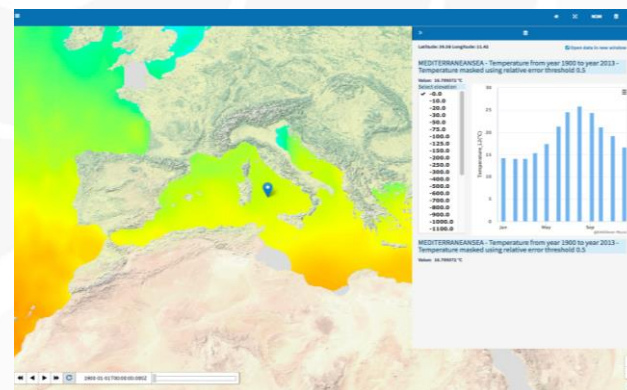
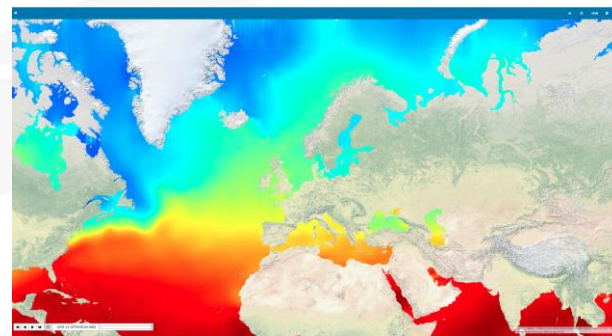
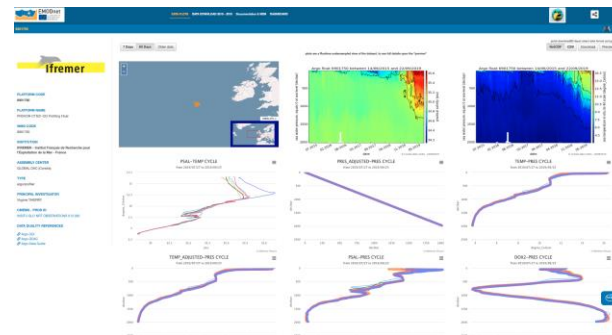
Output

Nowcast
timeseries and
profiles

Trends

Climatology

Maps (asset
mapping)





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Sea Level

Sources

EU Tide Gauge
network

PSMSL

IOC GLOSS

SONEL

UHSLC

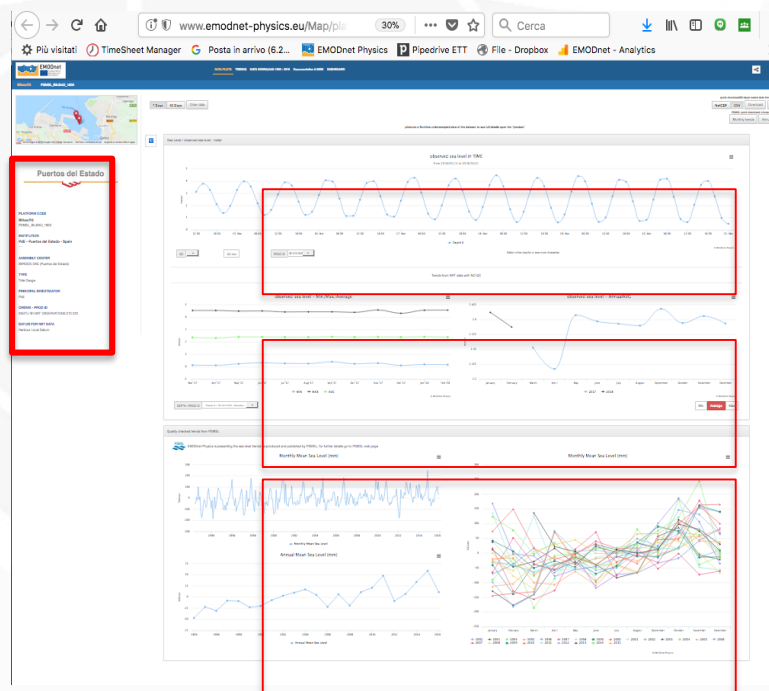
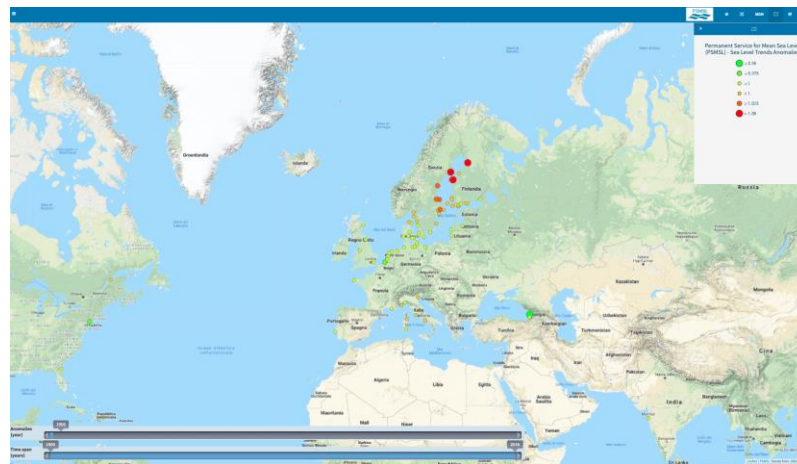
Output

Nowcast data

Rel Sea Level
trends

Abs Sea Level
trend

Sea Level
Anomalies





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Wave and Wind

Sources

CMEMS INSTAC

CORIOLIS

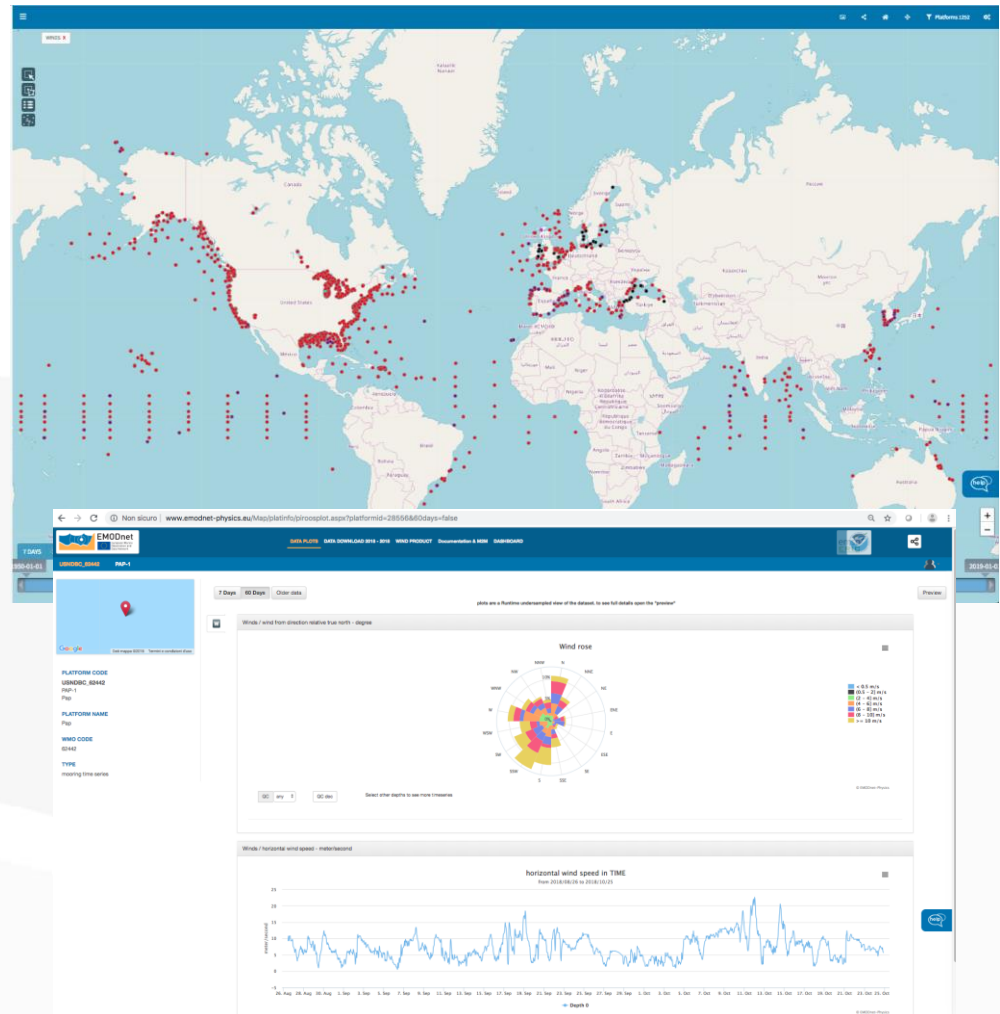
National/Regional
wave networks

Output

Nowcast
timeseries

Max/Min

Maps





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Observation and
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Sea Surface Currents

Sources

EU HFR NODE

IOOS

IMOS

Regional HFR
data providers

COROLIS

CMEMS INSTAC

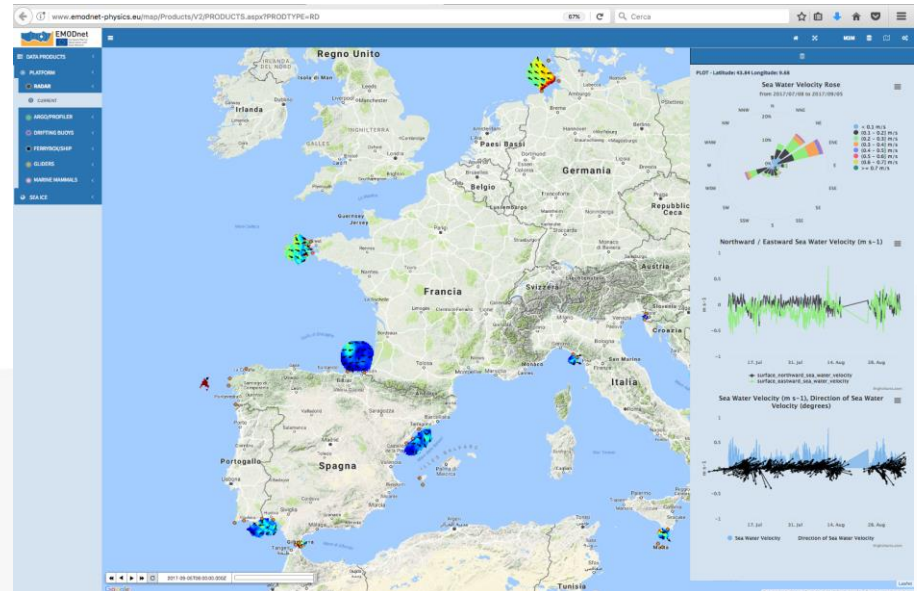
DBCP

Output

Nowcast data

Currents fields

Currents rose





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Sea Ice contour & tickness

Sources

CMEMS-
SEAICE_GLO_SEAICE_L4_NRT

IAPB

CORIOLIS

Output

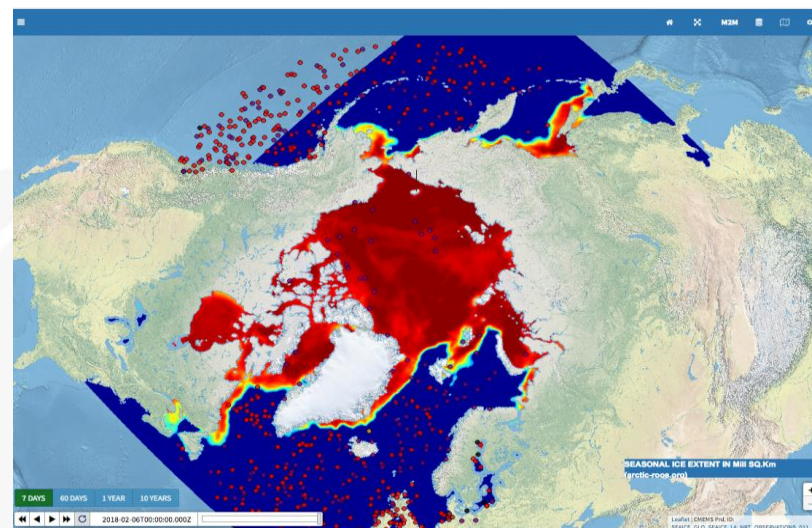
Ice
edge/coverage

Ice tickness

Ice type

Timeseries

Profiles



10km resolution in a polar stereographic projection



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River Runoff and Total Suspended Matter

Sources

GRDC

RIVER NODE

CMEMS

LAMBDA

...

OCEAN COLOR

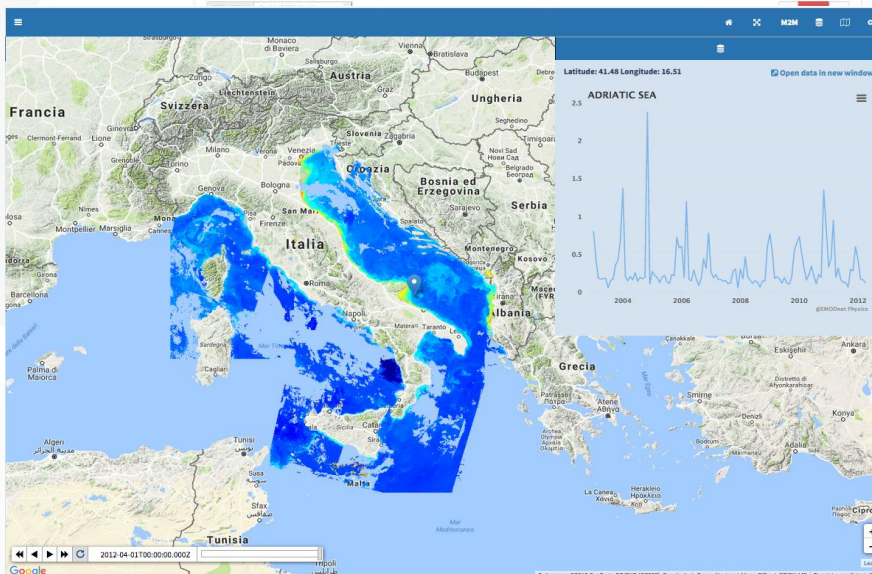
Output

Nowcast data

Climatology

Runoff timeseries

Maps of TSM



300 m full resolution



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Impulsive Noise

Input

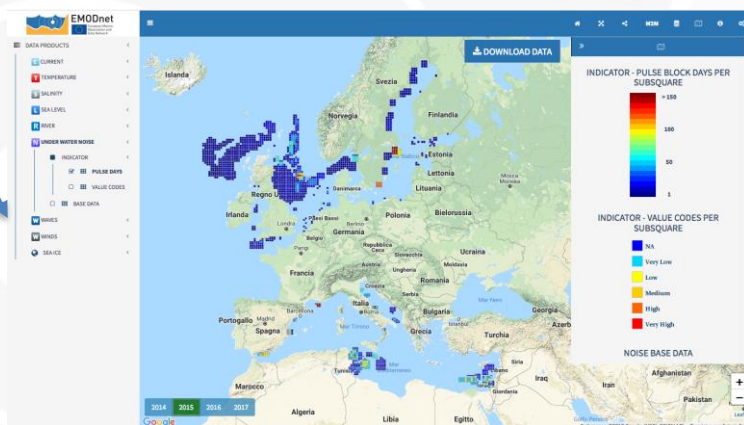
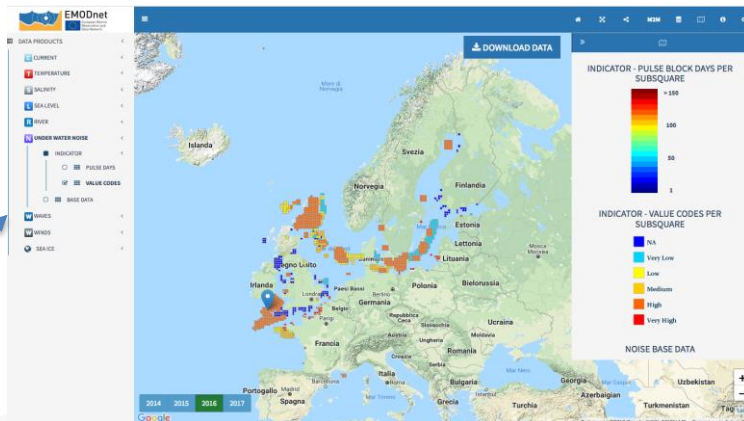
OSPAR – ODIMS

HELCOM - ICES

ACCOBAMS -
QuiteMED

Pulse per day
per block
count

Grid = ICES statistical subrectangles
(10' lat*20' lon) down to MED



Unit: pulse event days per block; period: 2015
– 2018; value code

Cooperation with ICES and QuietMED
(new statistical grid, updates, etc.)
TGNOISE, JOMOPANS, BIAS

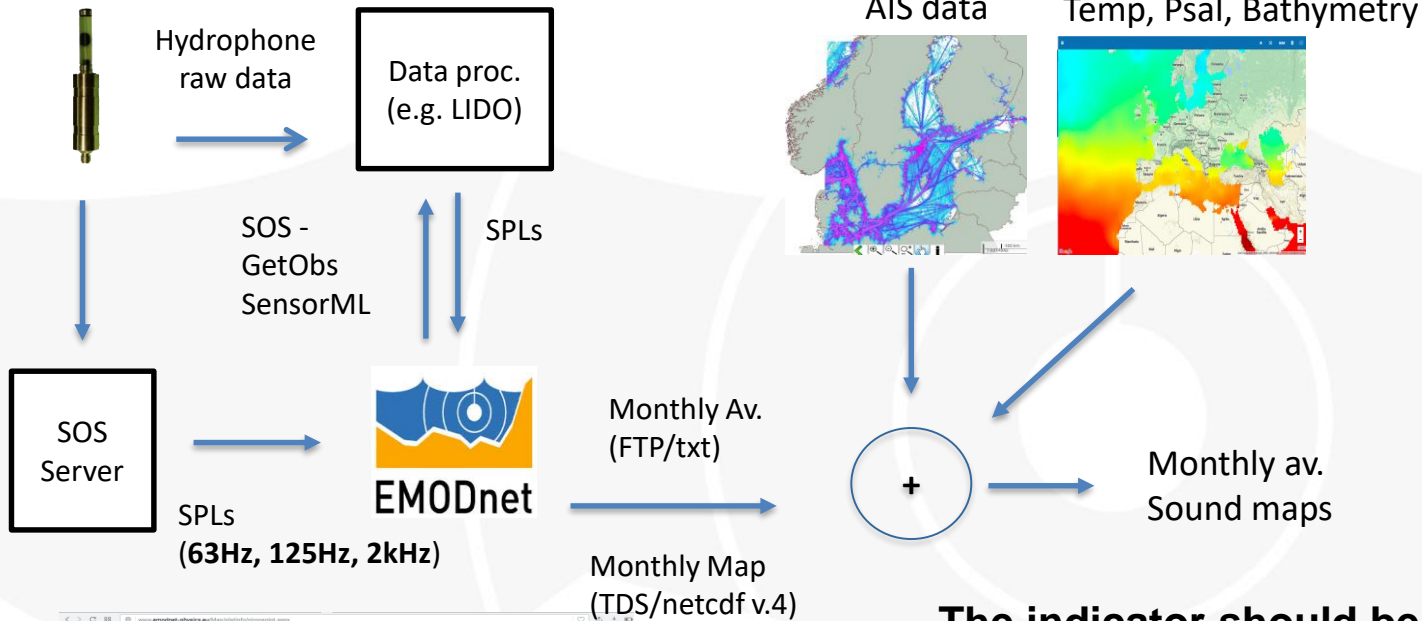


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Continuous Noise

Offshore/underwater



The indicator should be evaluated using a combination of monitoring of sound and soundscape maps

<https://portal.helcom.fi/meetings/PRESSURE%205-2016-386/MeetingDocuments/4-4-Rev.1%20HELCOM%20pre-core%20indicator%20on%20Continuous%20low%20frequency%20anthropogenic%20sound.pdf>



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Data Policy

Download without authentication:

- Latest 60 days of any operational data
- Operational data from platforms contributing to international programs (e.g. ARGO, DP)
- Data already available free and open/explicit request form the provider (e.g. SOCIB)

Download with authentication (CMEMS Service Level Agreement):

- Data older than 60 days (European Coastal platforms)
- Reprocessed/delay mode data

Download with authentication (SDN Service Level Agreement):

- CDI – delay mode and historical data hosted by NODCs
some data may require negotiation/specific agreements

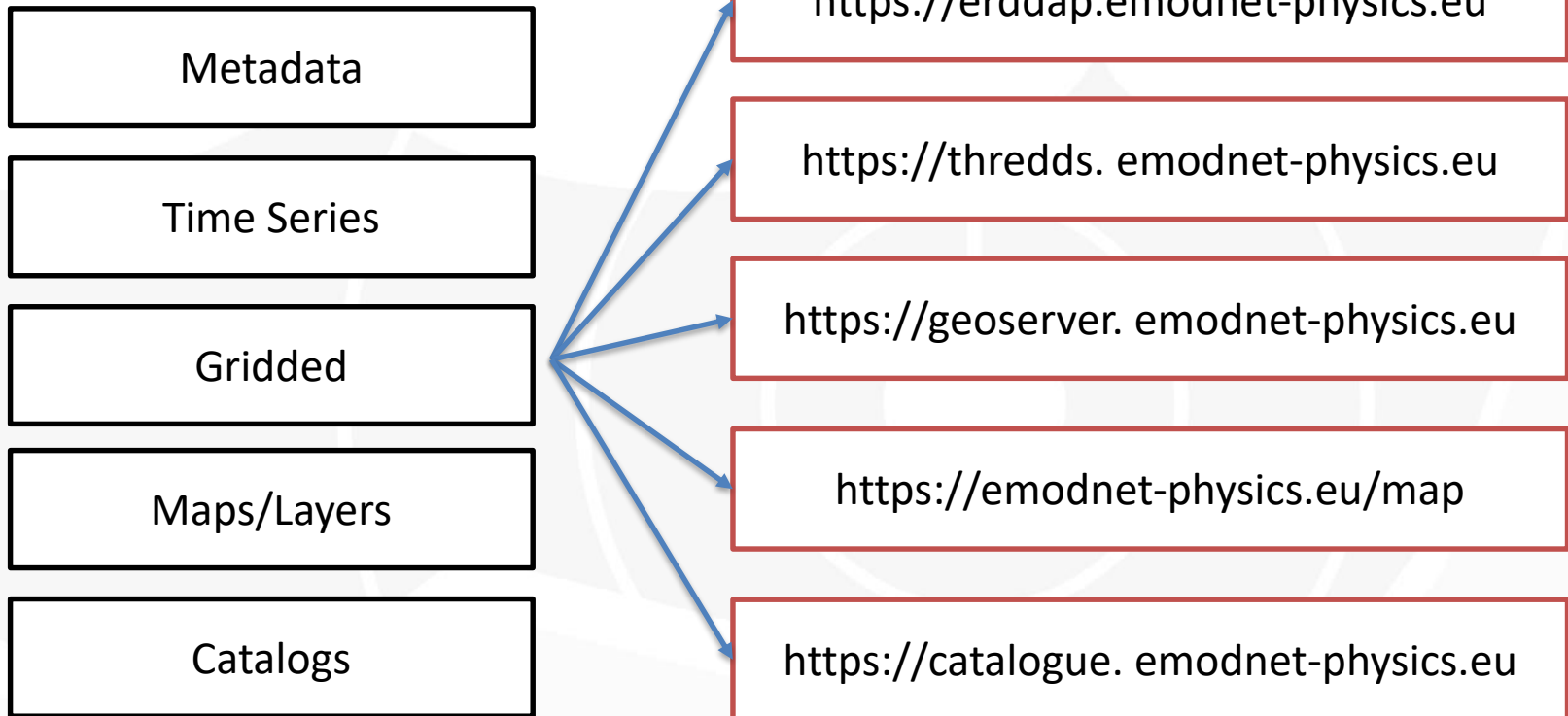
~2% of the available data



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Discovery and access services



Dissemination Channels



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Discovery and access services

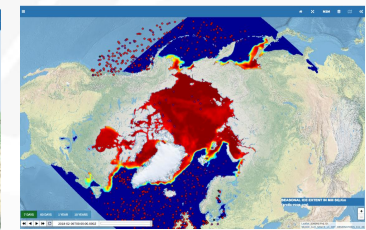
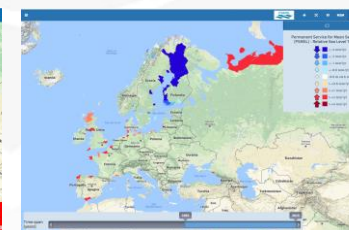
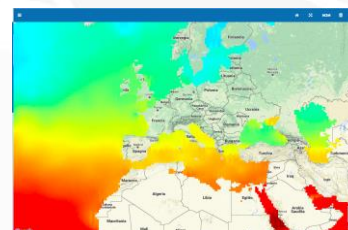
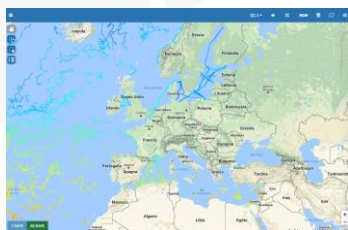
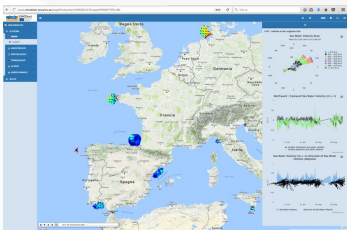
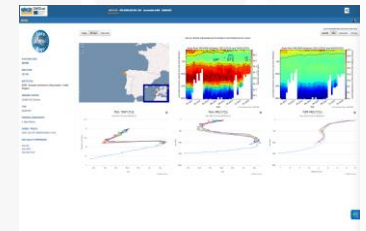
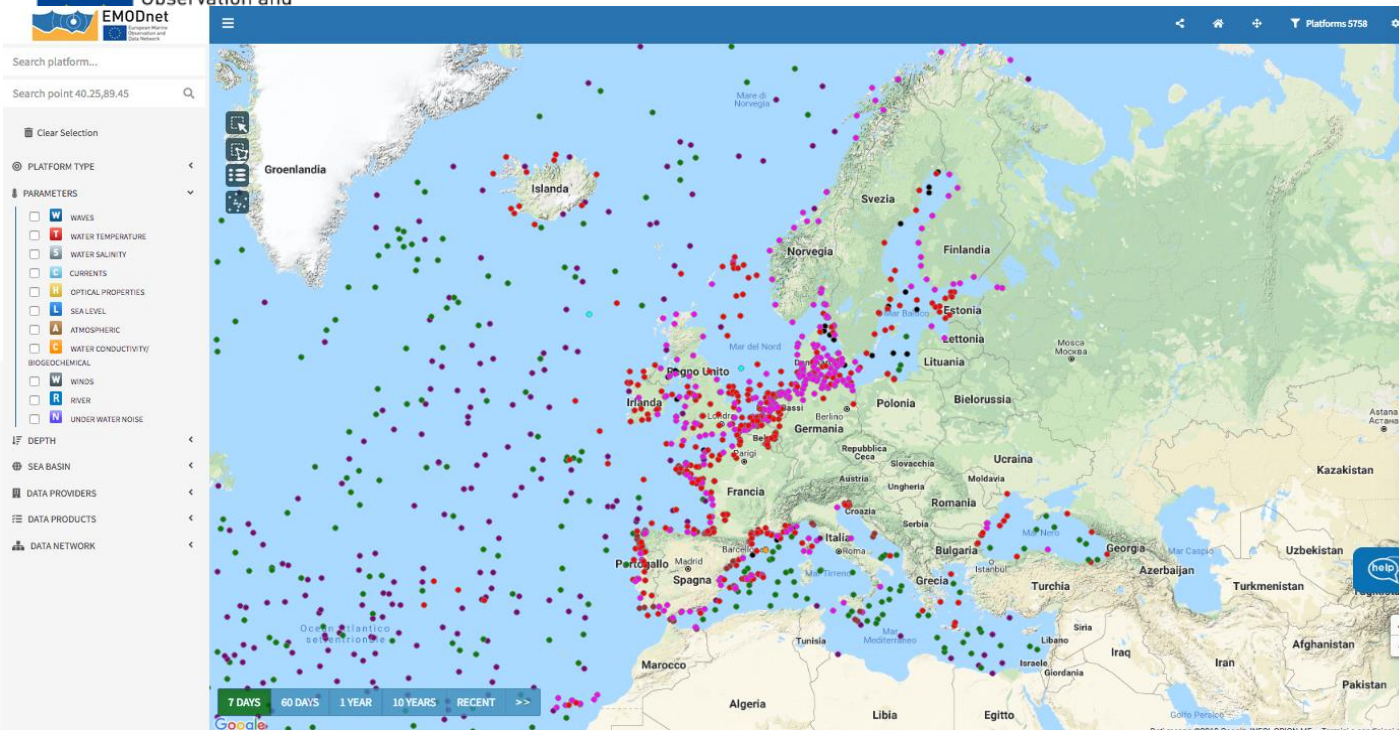
The screenshot displays the EMODnet Physics portal interface. At the top left is the EMODnet logo and the text "PHYSICS Oceans Physics at your fingertips". To the right is a search bar and links for "CONTACT US" and "SUBMIT DATA". Below this is a dark blue navigation bar with links: HOME, MAP VIEWER, CATALOGUE, TERMS OF USE, ABOUT, HELPDESK, and CENTRAL PORTAL. A "SUBMIT DATA" link is also present. On the left side, there is a vertical menu with the following categories: WAVES, WATER TEMPERATURE, WATER SALINITY, CURRENTS, OPTICAL PROPERTIES, SEA LEVEL, ATMOSPHERIC, WATER CONDUCTIVITY, WINDS, RIVER, and UNDER WATER NOISE. The main area features a map of Europe and the Mediterranean region, overlaid with numerous colored dots representing data points. At the bottom, there is a row of ten icons representing different services: DATA INGESTION, PRODUCTS, THREDDS, ERDDAP, GEOSERVER, API REST SOAP, WMS WFS, DASHBOARD, GITHUB, and VIDEOS.



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Map viewer





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Discovery and access services

Moring buoy – data presentation

The screenshot displays the EMODnet data portal interface. On the left, a red-bordered box highlights the metadata section for the 'Puertos del Estado' mooring buoy. The metadata includes:

- PLATFORM CODE: 62084
- WMO CODE: 62084
- INSTITUTION: Pde - Puertos del Estado - Spain
- ASSEMBLY CENTER: IBIROOS DAC (Puertos del Estado)
- TYPE: mooring time series
- PRINCIPAL INVESTIGATOR: Pde
- CIEMS - PROD ID: INSTTU IBI INT OBSERVATIONS 013 033

The main content area shows a 'Near real time data charts' for 'sea temperature in TIME' from 2017/12/14 to 2018/02/12. Below this, there are two additional charts: 'sea temperature - Min/Max/Average' showing monthly trends from 2002 to 2018, and 'sea temperature - AnnualAVG' showing annual average trends from 2002 to 2018. The interface also includes navigation options like '7 Days', '60 Days', and 'Older data', and download options like 'NetCDF', 'CSV', 'Download', and 'Preview'.

metadata

Monthly average or trends

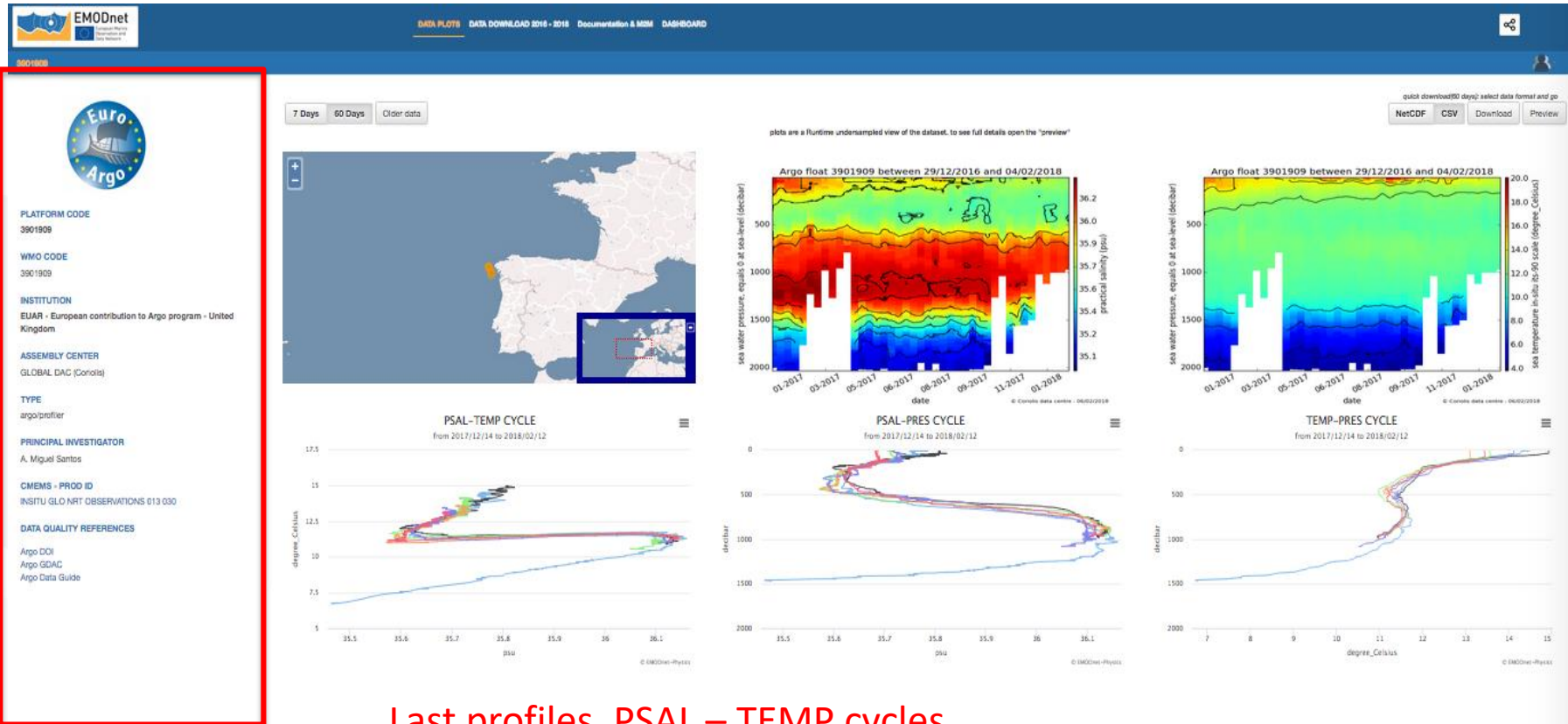


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Discovery and access services

ARGO – data presentation



metadata

Last profiles, PSAL – TEMP cycles ...



Discovery and access services

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EMODnet Physics ERDDAP
Easier access to scientific data

ERDDAP > List of All Datasets

128 matching datasets, listed in alphabetical order.

Grid DAP Data	Sub-set	Table DAP Data	Make A Graph	W M S	Source Data Files	Access-ible	Title	Sum-mary	FGDC, ISO, Metadata	Back-ground Info	RSS	E mail	Ins
set	data	graph			public		* The List of All Active Datasets in this ERDDAP *			M	background		ETT S p.
set	data	graph			public		ASPeCt-Bio: Chlorophyll a in Antarctic sea ice from historical ice core dataset		F I M	background	#		Virginia b
set	data	graph			public		CMEMS-LAMBDA data from a local source.			M	background	#	CMEMS-
set	data	graph			public		EMODnet Physics - Collection of absolute salinity (AMON) Profiles - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of air temperature in dry bulb (DRYT) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of air temperature in wet bulb (WETT) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of atmospheric pressure at altitude (ATMP) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of atmospheric pressure at sea level (ATMS) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of atmospheric pressure hourly tendency (ATPT) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of Average height highest 1/10 wave (H1/10) (VH110) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of Average height highest 1/3 wave (H1/3) (VAH3) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of Average period highest 1/10 wave (T1/10) (VT110) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne
set	data	graph			public		EMODnet Physics - Collection of Average period highest 1/3 wave (T1/3) (VAVT) TimeSeries - MultiPointTimeSeriesObservation		F I M	background	#		EMODne

erddap.emodnet-physics.eu

thredds.emodnet-physics.eu

EMODnet Catalog <http://thredds.emodnet-physics.eu/thredds/catalog.html>

Dataset	Size	Last Modified
EMODnetPhysics_TDS_HER/HR_Radar_data/		
EMODnetPhysics_TDS_HER/HR_Radar_data/EU_NODE_OC/		
EMODnetPhysics_TDS_SEAICE/CMEMS_Prod_ID_SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS_011_001V		
EMODnetPhysics_TDS_SEALEVEL/based on LHSL/C_data/		
EMODnetPhysics_TDS_SEASURFACETEMPERATURE/CMEMS_Prod_ID_SST_GLO_SST_L4_NRT_OBSERVATIONS_010_005V		
EMODnetPhysics_TDS_SEADATANET_CLIMATOLOGY/		
EMODnetPhysics_TDS_Duynosop/		
EMODnetPhysics_TDS_TSM/Total Suspended Matter/		
COBOLUS-GLOBAL-CORADS-2-OBS/		
EMODnet_Physics - NRT Sea Surface Currents from HR - GridSeriesObservation/		
EMODnet_Physics - NRT Sea Surface Currents from HR European Seas - GridSeriesObservation/		
EMODnet_Physics - NRT Sea Ice Extend - GridSeriesObservation - based on CMEMS-SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS_011_001 - Arctic and Antarctic - Ocean/		
EMODnet_Physics - NRT Satellite Sea Surface Temperature - GridSeriesObservation - based on CMEMS-SEAICE_GLO_SEAICE_L4_NRT_OBSERVATIONS_011_001 - Global Ocean/		
EMODnet_Physics - NRT Sea Level - MultiPointSeriesObservation - based on the LHSL/		
EMODnet_Physics - Sea Surface Temperature Climatology (1900-2013) - GridSeriesObservation - based on the SeaDataNet aggregated dataset/		
EMODnet_Physics - European Insulative Noise Events Registry - GridSeriesObservation/		
EMODnet_Physics - Total Suspended Matter - GridSeriesObservation - Concentration of total suspended matter/		
EMODnet_Physics - Temperature in the Water column - GridSeriesObservation - based on INSITU_GLO_TS_OA_REP_OBSERVATIONS_013_002_b/		
EMODnet_Physics - Salinity in the Water column - GridSeriesObservation - based on INSITU_GLO_TS_OA_REP_OBSERVATIONS_013_002_b/		

geoserver.emodnet-physics.eu

Service	Description	Examples
platformURL	All platforms	http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273 http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273 Service description @ http://www.emodnet-physics.eu/map/spi.aspx
widgets	All plots	www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=8427&timerange=7



EMODnet



Services

Services

https & permaURLs

Widgets

Monitoring tools

Reports (mail)

Newsletter & digest



Analytics

Provider :
IFREMER - Institut Français de Recherche pour l'Exploitation de la Mer - France

Report Period : 01/08/2017 - 31/08/2017

Total views 224

Total download long term rep. file 2

Total download NRT latest file 0

Total download CDI file 0

Total download NRT monthly file 4

Total request web service 46

Top 5 most viewed/downloaded platform

Platform	Viewed	Download	Web service	Total
61284	123	4	26	153
6900642	19	1	0	20
6200310	17	1	0	18
6101650	10	0	0	10
6101654	9	0	0	9

Views per Country

Country	Tot
Germany	49
China	38
Belgium	37
United Kingdom	36
Italy	29
France	11
United States	9
N.D.	5
Slovak Republic	4
Canada	2
Netherlands	2
Portugal	2

Downloads per Country (data usage)

Country	NRT Latest	NRT Monthly	Long term rep.	CDI	Web service	Tot
Germany	0	0	0	0	46	46
United Kingdom	0	1	1	0	0	2
United States	0	1	1	0	0	2
Belgium	0	2	0	0	0	2

[Link to platform dashboard page \(detailed statistics for the platform\)](#)

Platform	Link

Ocean physics at your fingertips

contacts@emodnet-physics.eu



www.emodnet.eu

Your gateway to marine data in Europe



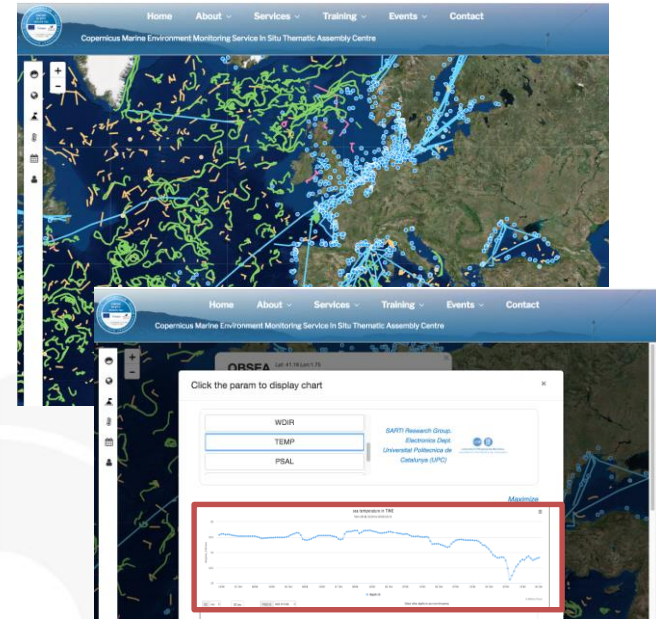
EMODnet



Use case of available services

CMEMS INSTAC uses the EMODnet Physics widgets to improve the viewing service developed for outreach and promotion activities

The Copernicus Marine Environment Monitoring Service (CMEMS) In Situ Thematic Assembly Centre (In Situ TAC) is the component of the Copernicus Marine Service which ensures a consistent and reliable access to a range of *in situ* data for the purpose of service production and validation.



Service: WIDGET

<http://www.emodnet-physics.eu/MapTest/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=8805&plattype=MO&timerange=7>

Paramcode: **TEMP, PSAL, SLEV, WDIR, ...**

Plattype: **MO, FB, AP, GL ...**

timerange: **7, 60,**

<http://www.emodnet.eu/emodnet-physics-enhances-services-cmems-situ-thematic-assembly-centre>



EMODnet



European Marine
Observation and
Data Network



PM_TEN s.r.l.

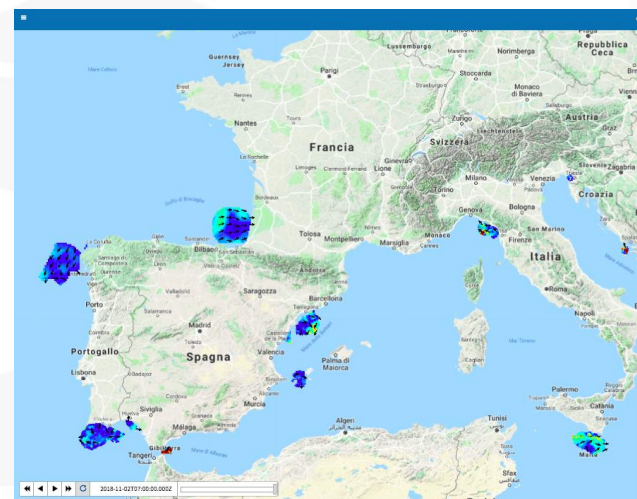
Use case of available services

Water-pollutants-dispersion studies are usually performed with numerical codes, which require both meteorological and marine **surface current inputs**. The inputs are usually provided by circulation models and/or by radar data analysis, **such as those available in the EMODnet Physics database.**

PM_TEN (Physical Methods and Technologies for Environmental Needs) is an Italian supporting assessment on the analysis of air pollution, atmospheric impact and the effects of harbours and ships on urban air quality.

Service: THREDDS SERVER

- <http://thredds.emodnet-physics.eu/thredds/catalog.html>
- <http://thredds.emodnet-physics.eu/thredds/HFRADARCatalog.html>





EMODnet



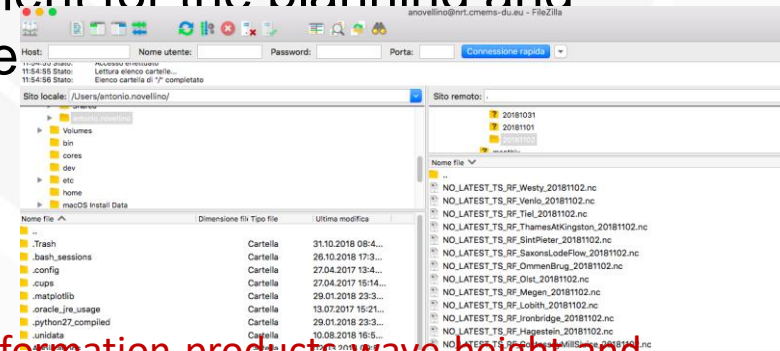
Use case of available services



DLR's German Remote Sensing Data Center (DFD) implemented a validation chain of SAR (Synthetic Aperture Radar) satellite based products (wind and wave) on the in situ station data distributed by EMODnet Physics

The German Aerospace Center (DLR) DLR has been given responsibility by the federal government for the planning and implementation of the German space

**Service:
ad-hoc FTP-distribution-server**



<http://www.emodnet.eu/validation-sar-satellite-based-information-products-wave-height-and-combination-emodnet-station-data>



EMODnet



Use case of available services

SOOSmap builds on the data aggregation and sharing **infrastructure of EMODnet** to bring circumpolar datasets into a single web-based discovery portal.

Through SOOSmap, users can discover, plot, explore, and download datasets of relevance to biologists, ecologists, ice scientists, and physical oceanographers.

The use of EMODnet allows SOOS to develop the data-sharing tools it needs **without duplicating existing infrastructure** and without placing undue burden on its member organisations

Service: spin-off portal

<http://www.soos.aq>

SOOSmap brings circumpolar Southern Ocean data to a computer near you
Pip Bricher¹, Antonio Novellino², Patrick Gorringer¹, Marco Alba³, Jie Zhang⁴, and Roger Proctor⁵

¹Southern Ocean Observing System, University of Tasmania, Private Bag 110, Sandy Bay Tasmania, 7001 Australia, email: pip@soos.aq
²INMOS-Das Physics, Genova, Italy; ³EuroSOOS, Sweden; ⁴Polar Research Institute of China, China; ⁵PHOSGADON, Australia

The Southern Ocean Observing System (SOOS) is an international initiative with the mission to facilitate the collection and delivery of essential observations on dynamics and change of Southern Ocean systems to all international stakeholders (researchers, governments, industries) through design, advocacy and implementation of cost-effective observing and data delivery systems. As part of this, SOOS has a mandate to provide tools to make it easier to share and discover existing data from the Southern Ocean.

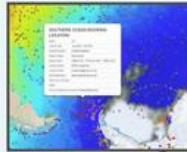


Figure 2. An example of the metadata that pops up when you hover over a feature on SOOSmap.

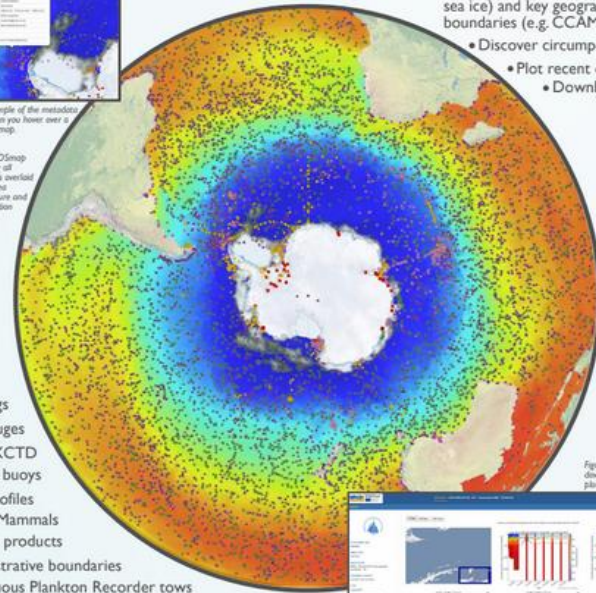


Figure 1. The SOOSmap interface, showing all observation points overlaid on an interpolated sea surface temperature and sea-ice concentration layers.

- Explore spatial, temporal and multi-disciplinary ocean observation data
- Overlaid on data products (e.g. SST, sea ice) and key geographic boundaries (e.g. CCAMLR)
- Discover circumpolar datasets
- Plot recent observations
- Download datasets

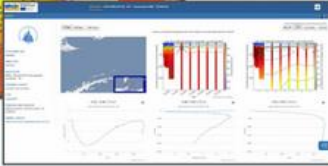


Figure 3. SOOSmap data download page showing plot of key variables

- Argo
- Moorings
- Tide gauges
- XBT / XCTD
- Drifting buoys
- CTD Profiles
- Marine Mammals
- Satellite products
- Administrative boundaries
- Continuous Plankton Recorder tows
- NECKLACE Ice Shelf Melt Observations
- **More layers coming all the time**

The European Marine Observation and Data Network (EMODnet) is a network of organisations supported by the EU's integrated maritime policy. These organisations work together to observe the sea, process the data according to international standards and make that information freely available as interoperable data layers and data products.

SOOSmap is a collaboration between SOOS and the European Marine Observation and Data Network (EMODnet) Physics group

www.soos.aq/camr/soosmap



EMODnet

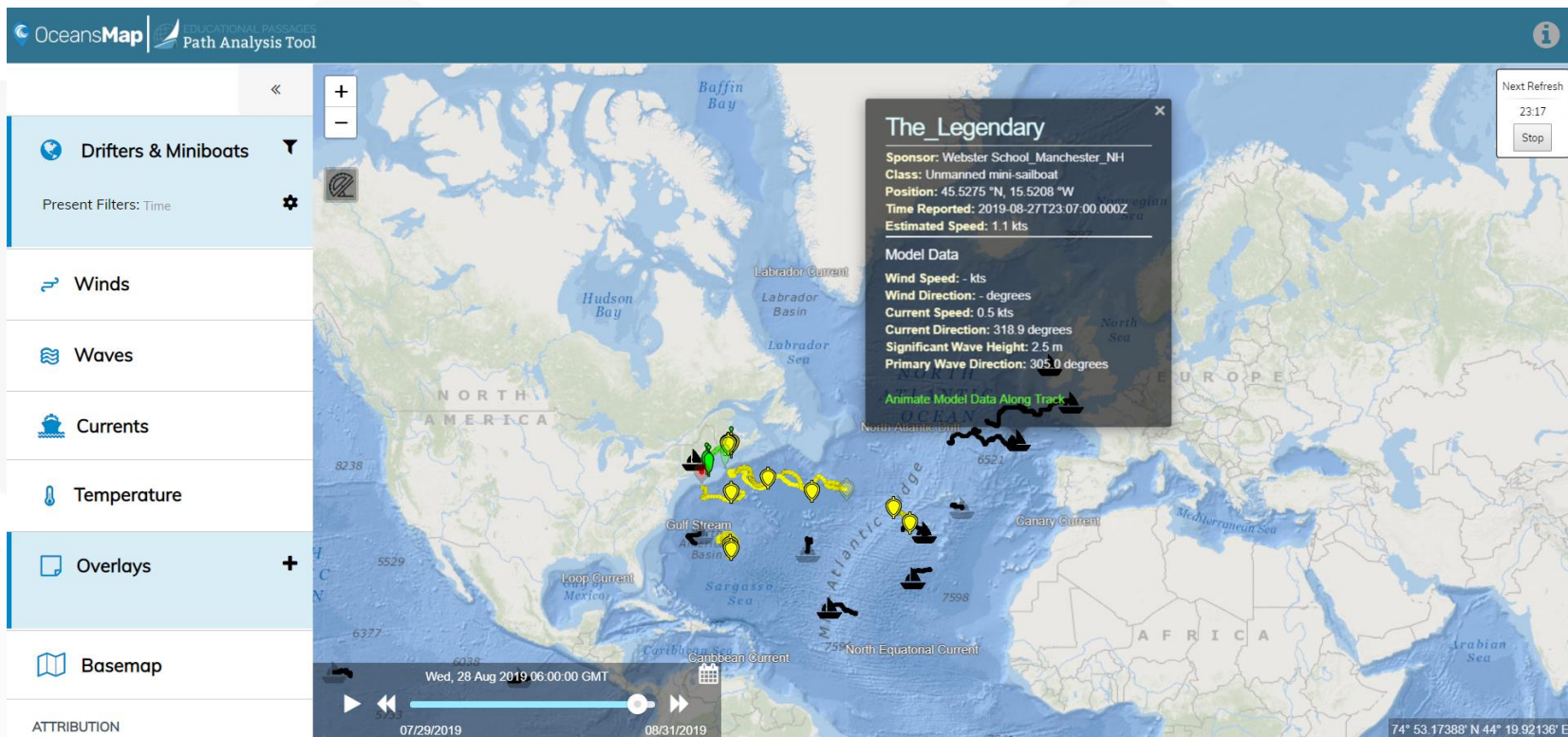


EDUCATIONAL PASSAGES

Expanding the data coverage



Students around the world prepare, deploy, and track their very own miniboat while learning about ocean currents, weather, technology, and more.





EMODnet



Expanding the data coverage

Real-time CTD profiles in data poor shelf seas and coastal waters

Collecting data in the North Sea, Skagerrak, and the Kattegat. In the USA they are collecting samples in the Bering Sea, Alaska and the Gulf of Maine.



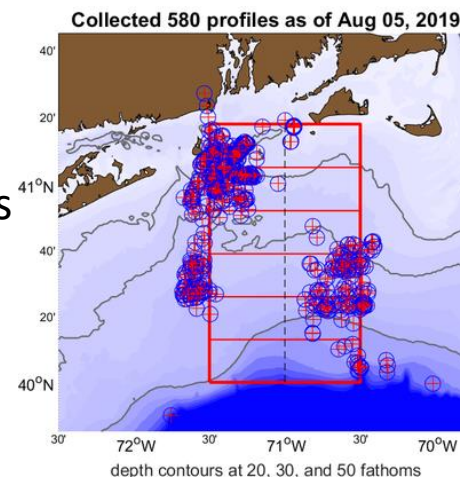
Berring Data Collective

Ocean data from fishing gear:
Connecting and benefiting fishermen, science, and maritime industries.



Partnership between commercial fishermen and scientists

CFRF - WHOI Shelf Research Fleet





EMODnet



Expanding the data coverage

T-MEDNet is devoted to develop an **observation network** on climate change effects in marine coastal ecosystems by spreading the acquisition of standard monitoring protocols on **seawater temperature and biological indicators** over large-scale and long-term.

T-MEDNet members are Public Research Institutions, Marine Protected Areas and NGOs working in near-shore and coastal zone around the Mediterranean Sea.

T-MONITORING SITES

Network of micro T-loggers
IN SITU at High-Frequency

Marine Protected Areas
Near-coast Mainland and islands

Multiyear time series
Some 20 years long

Vertical profiles 0 to 40 m
Also single depth in habitats

Monitoring effort
70 sites - 180 dataloggers

Collaborative network

Marine scientists

MPA managers

