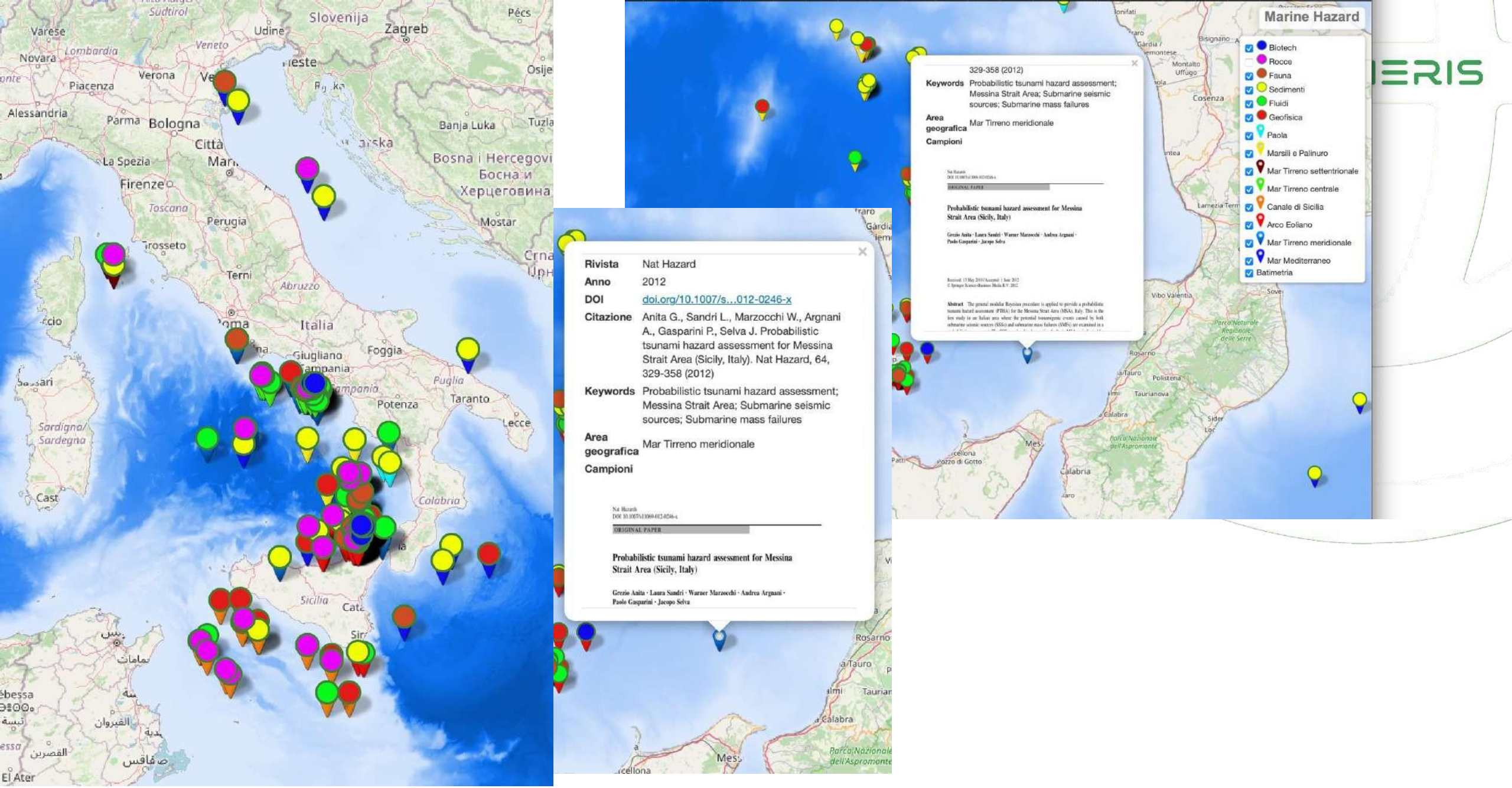
IT-IOOS

Mauro Caccavale

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-Mission 4 “Education and Research” - Component 2: “From research to business” - Investment 3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani


Marine Hazard
Biotech
Rocce
Fauna
Sedimenti
Fluidi
Geofisica
Paola
Marsili e Palinuro
Mar Tirreno settentrionale
Mar Tirreno centrale
Canale di Sicilia
Arco Eoliano
Mar Tirreno meridionale
Mar Mediterraneo
Batimetria
329-358 (2012)
Keywords Probabilistic tsunami hazard assessment; Messina Strait Area; Submarine seismic sources; Submarine mass failures
Area geografica Mar Tirreno meridionale
Campioni
Probabilistic tsunami hazard assessment for Messina Strait Area (Sicily, Italy)
Rivista Nat Hazard
Anno 2012
DOI doi.org/10.1007/s...012-0246-x
Citazione Anita G., Sandri L., Marzocchi W., Argnani A., Gasparini P., Selva J. Probabilistic tsunami hazard assessment for Messina Strait Area (Sicily, Italy). Nat Hazard, 64, 329-358 (2012)
Keywords Probabilistic tsunami hazard assessment; Messina Strait Area; Submarine seismic sources; Submarine mass failures
Area geografica Mar Tirreno meridionale
Campioni
ORIGINAL PAPER
Probabilistic tsunami hazard assessment for Messina Strait Area (Sicily, Italy)
Grezio Anita · Laura Sandri · Warner Marzocchi · Andrea Argnani · Paolo Gasparini · Jacopo Selva

CNR ISMAR

ERDDAP
Easier access to scientific data

ERDDAP > tabledap » Data Access Form •

Dalaset Title: EMSO BB 584 SBE 56 '!€Z2I
Institution: CNR—ISP (Dataset ID: ISP)
Informadon: Summary | License @ | FGDC] ISO 19115 i Metsdela | Background @] Files | Make 8 graph

Variable	Optional Constraint II @	Optional Constralnt 82 @	Minimum	Maximum
@ time (time of measurement, UTC) @	>= @ 2012•06•14T00:00:OOZ	<= @ 2012•06-21T11:30:OOZ	2012—0608TO8:50:0€IZ	2012-08-21T11:30:0OZ
O latitude (degrees_north) @	>=	<=	41.34125	41.34125
O longitude (degrees_east) @	>=	<=	17.19375	17.19375
g depth (m) @	>=	• e	584.0	584.0
@ TEMP (Degrees Celsius) @	>=	<=	12.5288	13.4886
@ TEIVIP_QC @	>=	<=	1	1
@ station_id @	>=	<=		

Server•side Factions e
distinct() @
@@ (" s' w w

File type: (more information)
.htmiTable • View a UTF•8 .html web page with the daia in a table. Times are ISO 8601 stringe.
Just generate che URL:
(Documentation / Bypass this lorm @)

Submit (Pleaae be patient. It may take e wrthe to get the data.)

The Dataset Attribute Structure (.das) for this Dataset

```
Atcributes
 s f
  cime I
    9t.r ng _ ocrelina<leAni s"ype " 1me"
    :loat64 actual_range 1.3311966ev9, 1.3402182e+9:
    String axis 'T";
    String ioos ca:egory 'Time":
    String long'name "time of measurement';
    String sdn parameter name "Elapsed time relative to 1950-01-
01T00:Q0:OOZ";
    String sdn arameter_uri
"ntcps://vocab.nerc.ao.uk/eolleotion/P0I/eurrent/ELTJLD01/";
    String sdn a-ameter_urn "SDN:P0l::ELTOLDOl';
    String sdn_uom_naoe "days";
    String sdn_uom_url
'https://vocab.nerc.ac.uk/collection/P0%/current/U?AA/";
    String sdn_uom_urn 'SDN:?06::UTAA";
    String standard_name 'time";
    String time origin "01-JR-:970 00:00:00";
    String units 'seconds since 1970-01-01T00:00:OOZ";
```

/ Datasets

sgt Filter try location Cua

Esri, Garnjn, GEBCO, NOAA NGOC. arld othaf contributors

Date/Time Selection @

Start Time: M
ISO 8b0 date or " for all dates

End Time: M
ISO 860 date or " for all dates

@ Depth Selection

Minimum depth (meters):

h§ayimum depth (meters):

Apply Clear

Y Organizations

GCOOS-

SECOORA -

AOOS-

GeNCOOS- :

Glider DAC -

PacIOOS —

MARACOOS -

NERACOOS -

NANOOS -

GLOS -

Searcn datasets...

51,725 datasets found

Order I

Elfin Cove, Elfin Cove Seaplane Basa, AK (PAEL)
Tlmeseries data from 'Elfin Cove, Elfin Cove Seaplane Base, AK (PAEL)' ‹gov_noaa_awc_paei)
BE@'^@

Security Cove, AK
Timeseries data from 'Security Cove. AK' (noaa_nos_co_ops_9450055)
OPeNDAP ERDDAP ERDDAP-TableDAP

BULLPOUND CREEK NEAR WATTS
Tlmeseries data from 'BULLPOUND CREEK NEAR WATTS' (ca_hydro_05CG004)

Akutan Harbor, Akutan Island, AK
Timeseries data from 'Akutan Harbor AkUtan Island, AK' (noaa_nos_co_ops_9462691)
OPeNDAP ERDDAP ERDDAP-TableDAP

Sheep Camp
Timeseries data from 'Sheep Camp' (raws_akashp)
OPeNDAP ERDDAP ERDDAP-TableDAP

Kuparuk
Tlmeseries data from 'KuparUk' (boem_ahmd_kuparUk)
OPeNDAP ERDDAP ERDDAP-TableDAP

Mt. Noak
Tlmeseries data from 'Mt. Noak' (raws_akamtn)
OPeNDAP ERDDAP ERDDAP-TableDAP

Inian Cove, North Inian Pass, AK
Timeseries data from 'Inian Cove, North Inian Pass, AK' (noaa_nos_co_ops_9452629)

CNR ISMAR ISTITUTO DI SCIENZE MARINE

ERDDAP
Easier access to scientific data

ERDDAP > tabledap » Data Access Form •

Dataset Title: **EMSO BB 584 SBE56**
Institution: CNR-ISP (Dataset ID: ISP)
Information: Summary | License | FGDC |

Variable Check All Uncheck All

- time (time of measurement, UTC) >=
- latitude (degrees_north) >=
- longitude (degrees_east) >=
- depth (m) >=
- TEMP (Degrees Celsius) >=
- TEMP_QC >=
- station_id >=

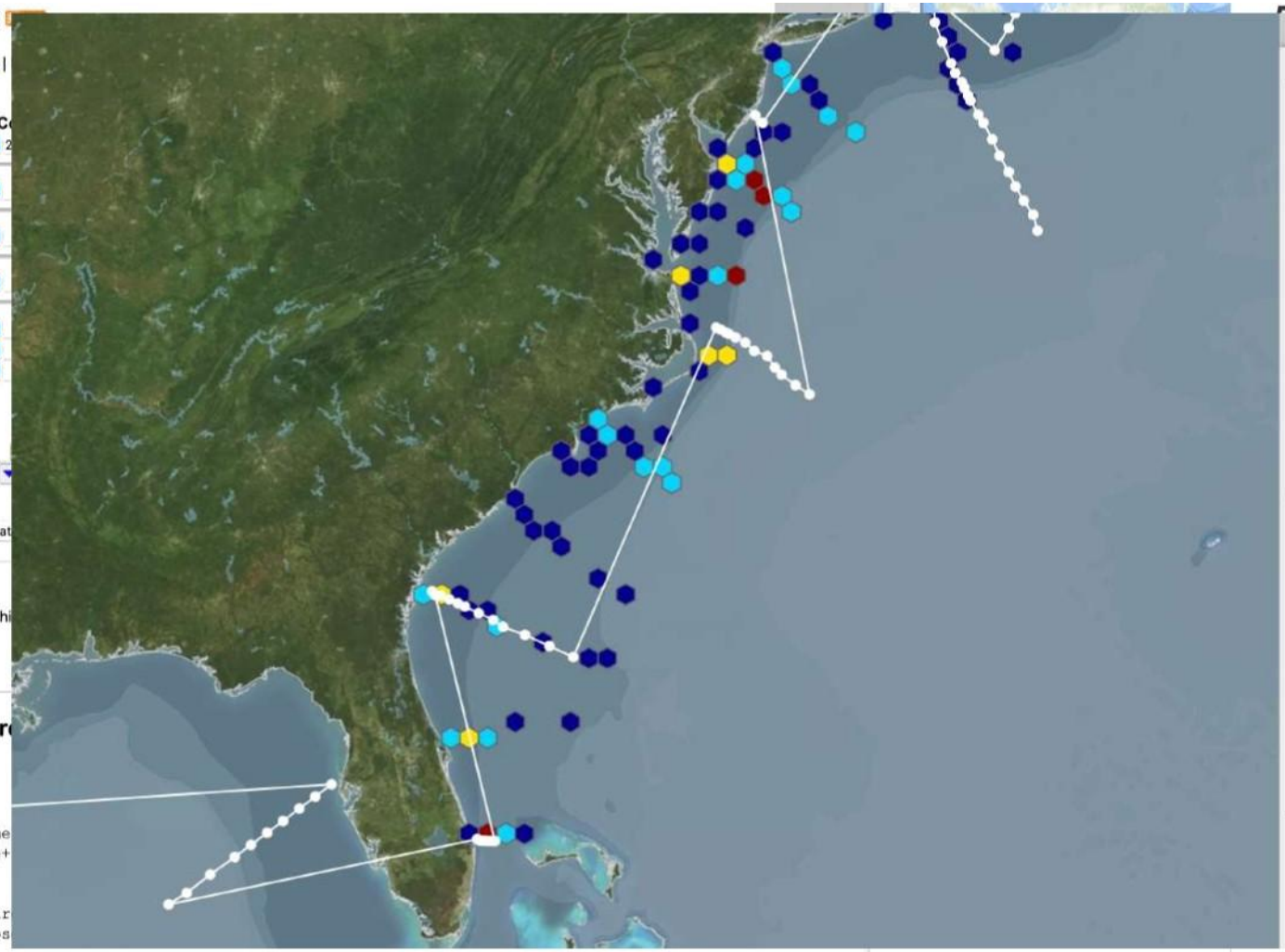
Server-side Functions
- distinct()

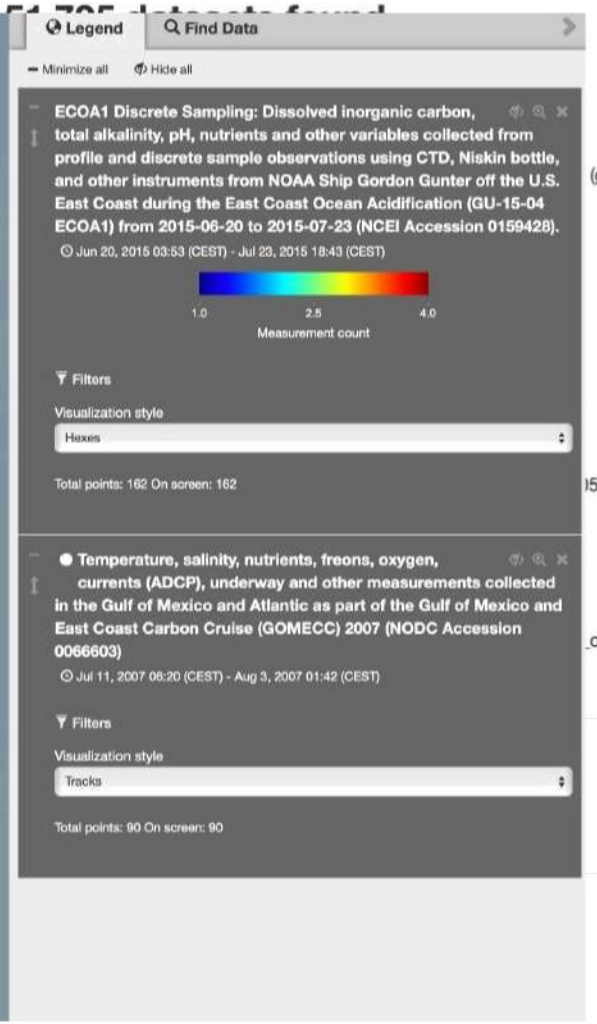
File type: (more information)
.htmlTable - View a UTF-8 .html web page with the dat
Just generate the URL:
(Documentation / Bypass this form)

Submit (Please be patient. It may take a whi

The Dataset Attribute Structur

```
Attributes {
 s {
  time {
    String _CoordinateAxisType "Time
    Float64 actual_range 1.3311966e+
    String axis "T";
    String ioos_category "Time";
    String long_name "time of measur
    String sdn_parameter_name "Elaps
01T00:00:00Z";
    String sdn_parameter_uri
"https://vocab.nerc.ac.uk/collection/P01/current/ELTJLD01/";
    String sdn  a-ameter_urn "SDN:P01::EL?OLD0I';
    String sdn_uom_naoe "days";
    String sdn_uom_url
'https://vocab.nerc.ac.uk/collection/P0%/current/U?AA/";
    String sdn_uom_urn 'SDN:?06::UTAA";
    String scandard_name 'time";
    String time origin "01-JR-:970 00:00:00";
    String units 'seconds since 1970-01-01T00:00:00Z";
```





/ Datasets

sgt Filter try location Cua

Search datasets.

(gov_noaa_awc_pael)

)5CG004)

_ops_9462691)

PacIOOS - 953

MARACOOS -

NERACOOS -

NANOOS -

GLOS -

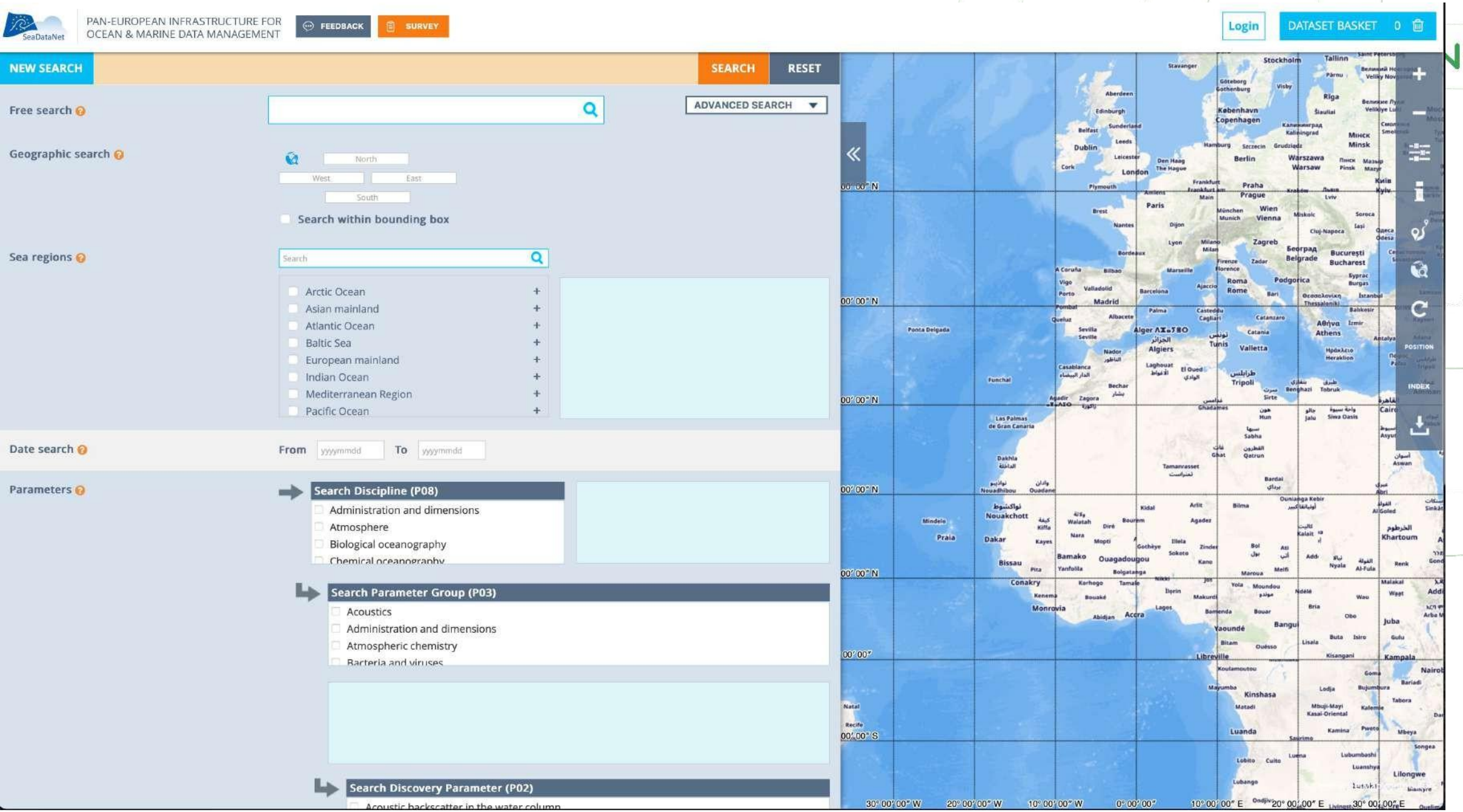
Mt. Noak

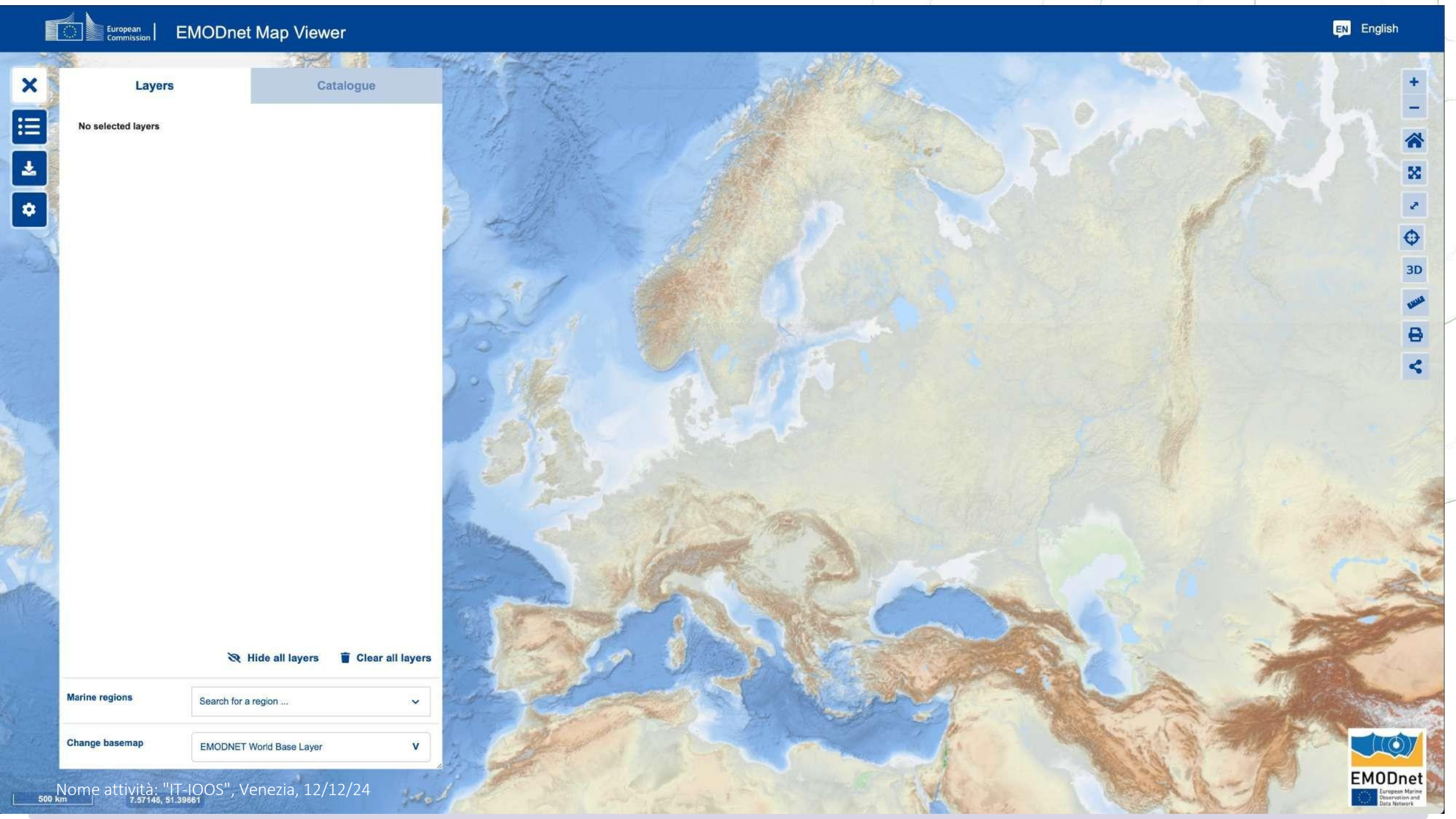
Tlmeseries data from 'Mt. Noak' (raws_akamtn)

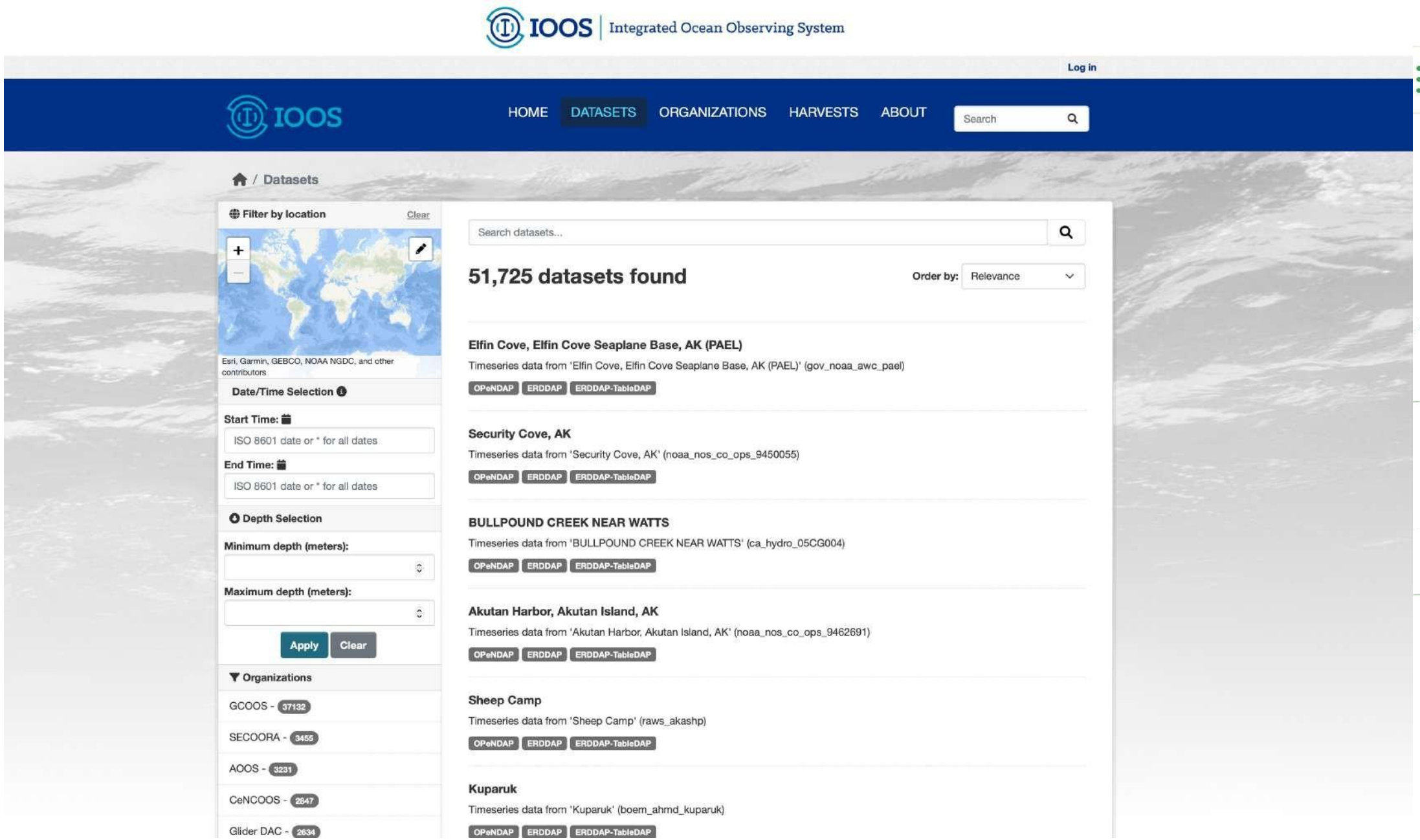
OPeNDAP ERDDAP ERDDAP-TableDAP

Inian Cove, North lnian Pass, AK

Timeseries data from 'lnian Cove, North lnian Pass, AK' (noaa_nos_co_ops_9452629)


SeaDataNet
PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN & MARINE DATA MANAGEMENT
FEEDBACK
SURVEY
Login
DATASET BASKET 0
NEW SEARCH
SEARCH
RESET
ADVANCED SEARCH
Free search
Geographic search
North
West
East
South
Search within bounding box
Sea regions
Search
Arctic Ocean
Asian mainland
Atlantic Ocean
Baltic Sea
European mainland
Indian Ocean
Mediterranean Region
Pacific Ocean
Date search
From
yyyymmdd
To
yyyymmdd
Parameters
Search Discipline (P08)
Administration and dimensions
Atmosphere
Biological oceanography
Search Parameter Group (P03)
Acoustics
Administration and dimensions
Atmospheric chemistry
Search Discovery Parameter (P02)
POSITION
INDEX


European Commission
EMODnet Map Viewer
EN English
Layers
Catalogue
No selected layers
Hide all layers
Clear all layers
Marine regions
Search for a region ...
Change basemap
EMODNET World Base Layer
3D
500 km
7.57146, 51.39661
EMODnet
European Marine Observation and Data Network


IOOS | Integrated Ocean Observing System
Log in
IOOS
HOME
DATASETS
ORGANIZATIONS
HARVESTS
ABOUT
Search
/ Datasets
Filter by location
Clear
Esri, Garmin, GEBCO, NOAA NGDC, and other contributors
Date/Time Selection
Start Time:
ISO 8601 date or * for all dates
End Time:
ISO 8601 date or * for all dates
Depth Selection
Minimum depth (meters):
Maximum depth (meters):
Apply
Clear
Organizations
GCOOS - 37132
SECOORA - 3455
AOOS - 3231
CeNCOOS - 2847
Glider DAC - 2634
Search datasets...
51,725 datasets found
Order by: Relevance
Elfin Cove, Elfin Cove Seaplane Base, AK (PAEL)
Timeseries data from 'Elfin Cove, Elfin Cove Seaplane Base, AK (PAEL)' (gov_noaa_awc_pael)
OPeNDAP ERDDAP ERDDAP-TableDAP
Security Cove, AK
Timeseries data from 'Security Cove, AK' (noaa_nos_co_ops_9450055)
OPeNDAP ERDDAP ERDDAP-TableDAP
BULLPOUND CREEK NEAR WATTS
Timeseries data from 'BULLPOUND CREEK NEAR WATTS' (ca_hydro_05CG004)
OPeNDAP ERDDAP ERDDAP-TableDAP
Akutan Harbor, Akutan Island, AK
Timeseries data from 'Akutan Harbor, Akutan Island, AK' (noaa_nos_co_ops_9462691)
OPeNDAP ERDDAP ERDDAP-TableDAP
Sheep Camp
Timeseries data from 'Sheep Camp' (raws_akashp)
OPeNDAP ERDDAP ERDDAP-TableDAP
Kuparuk
Timeseries data from 'Kuparuk' (boem_ahmd_kuparuk)
OPeNDAP ERDDAP ERDDAP-TableDAP

IOOS By The Numbers

NERIS

Data Categories

As datasets are published, they are tagged with categories so you can quickly access the data you need. Explore popular categories below.

Physical Oceanography

Models and Forecasts

Real Time Observations

Gliders

Surface Current

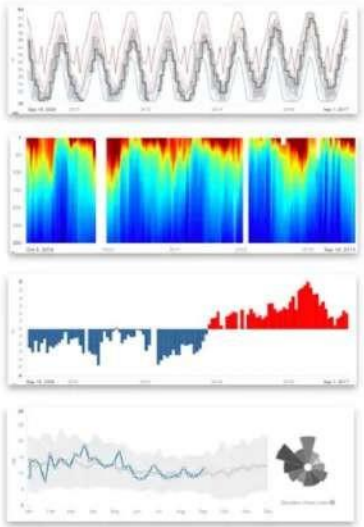
SECOORA Data Portal

Go to version 1.0 portal »

Welcome to the new SECOORA Data Portal! Use the portal to:

- Search and download real-time data
- Search historical data
- Compare datasets from different stations
- Generate and share custom data views (how to coming soon!)
- Access metadata for SECOORA stations
- Access to regional and sub-regional models, including coastal circulation, water quality and fisheries habitat models.

Coming soon the portal will provide access to regional and sub-regional models, including coastal circulation, water quality and fisheries habitat models.



Explore map | Catalog | Glider deployments

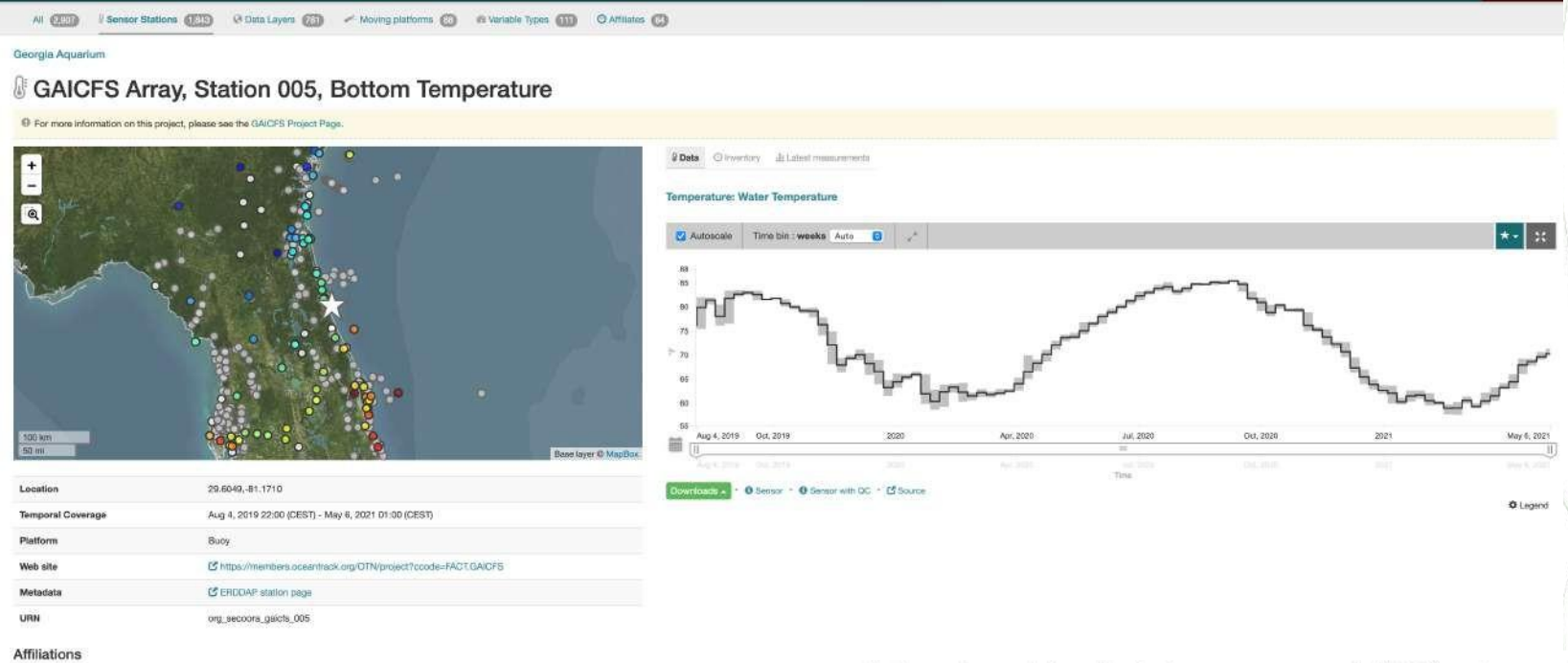
Release notes | Documentation

For best results, use the latest version of these browsers.

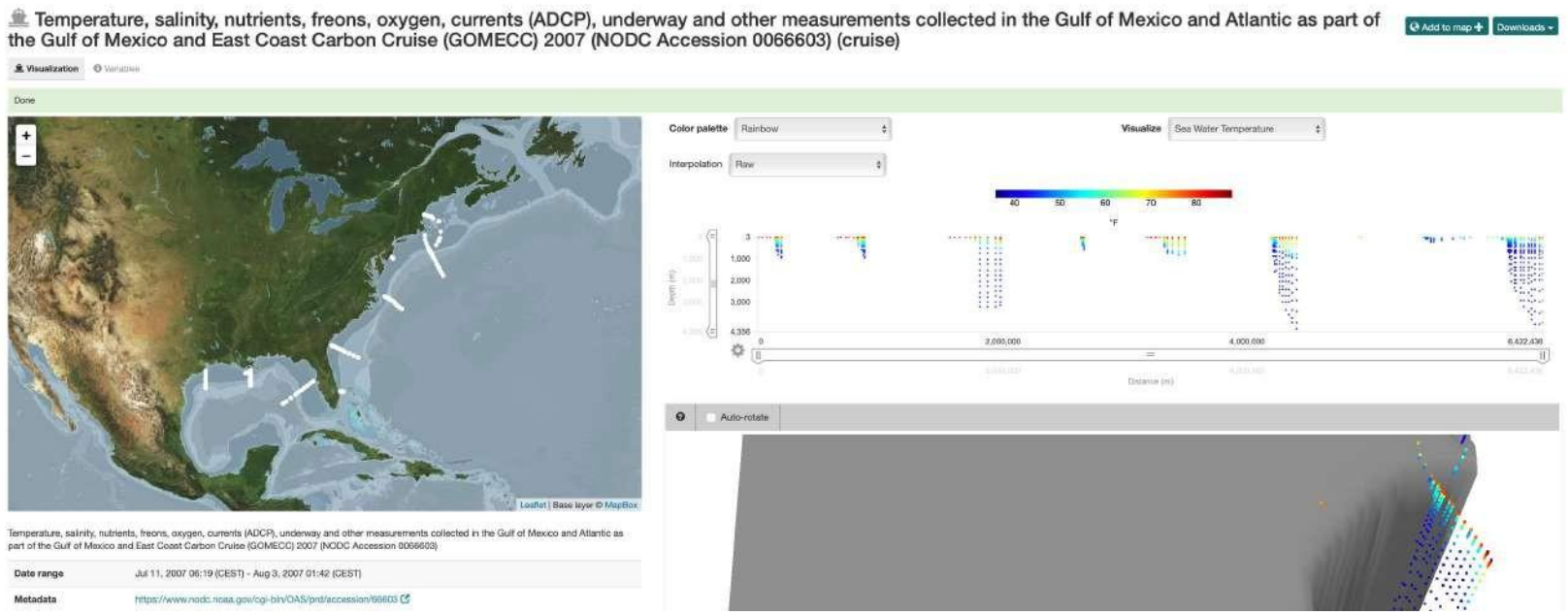
Chrome Firefox

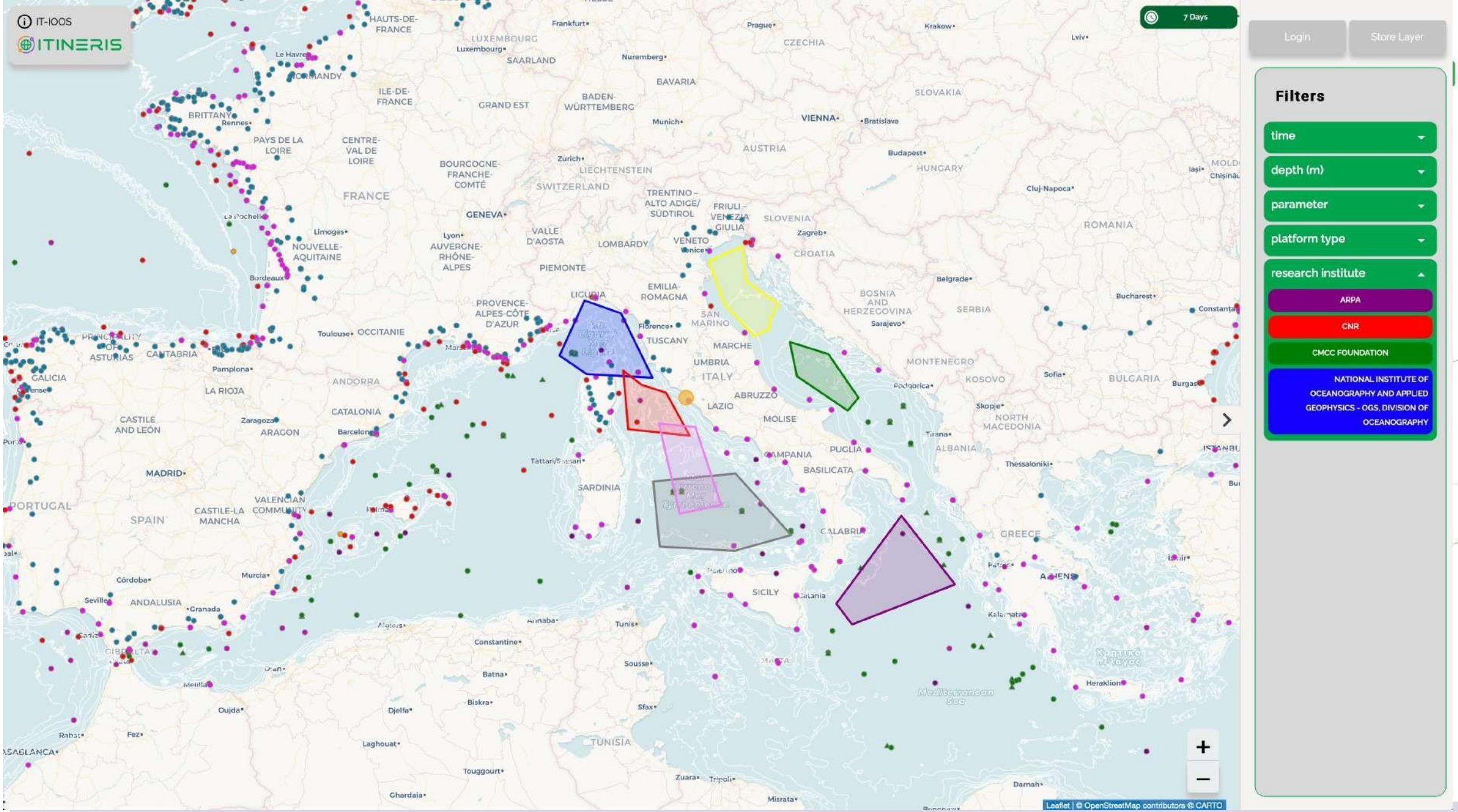
Data Views

Explore highlighted views below. Or, create, save, and share your own custom views.

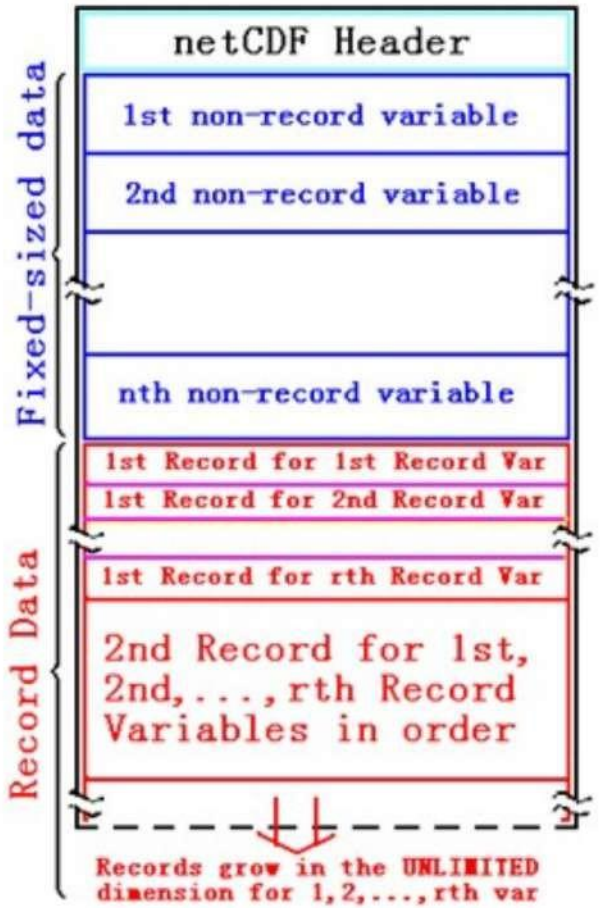

All 2,907
Sensor Stations 1,843
Data Layers 781
Moving platforms 86
Variable Types 111
Affiliates 64
Georgia Aquarium
GAICFS Array, Station 005, Bottom Temperature
For more information on this project, please see the GAICFS Project Page.
Data
Inventory
Latest measurements
Temperature: Water Temperature
Autoscale
Time bin : weeks Auto
Aug 4, 2019
Oct, 2019
2020
Apr, 2020
Jul, 2020
Oct, 2020
2021
May 6, 2021
Time
Downloads
Sensor
Sensor with QC
Source
Legend
100 km
50 mi
Base layer © MapBox
Location 29.6049,-81.1710
Temporal Coverage Aug 4, 2019 22:00 (CEST) - May 6, 2021 01:00 (CEST)
Platform Buoy
Web site https://members.oceantrack.org/OTN/project?ccode=FACT.GAICFS
Metadata ERDDAP station page
URN org_secoora_gaicfs_005
Affiliations
Georgia Aquarium | Station site | Web site Owner, Operator
Southeast Coastal Ocean Observing Regional Association (SECOORA) | Station site | Web site Supporter, Publisher
FACT Network (FACT) | Station site | Web site Supporter
For best results, use the latest version of these browsers.
Chrome
Firefox


ITINERIS


Temperature, salinity, nutrients, freons, oxygen, currents (ADCP), underway and other measurements collected in the Gulf of Mexico and Atlantic as part of the Gulf of Mexico and East Coast Carbon Cruise (GOMECC) 2007 (NODC Accession 0066603) (cruise)
Add to map
Downloads
Visualization
Variables
Done
Color palette Rainbow
Visualize Sea Water Temperature
Interpolation Raw
°F
Depth (m)
Distance (m)
Auto-rotate
Leaflet | Base layer © MapBox
Temperature, salinity, nutrients, freons, oxygen, currents (ADCP), underway and other measurements collected in the Gulf of Mexico and Atlantic as part of the Gulf of Mexico and East Coast Carbon Cruise (GOMECC) 2007 (NODC Accession 0066603)
Date range Jul 11, 2007 06:19 (CEST) - Aug 3, 2007 01:42 (CEST)
Metadata https://www.nodc.noaa.gov/cgi-bin/OAS/prd/accession/66603


IT-IOOS
ITINERIS
7 Days
Login
Store Layer
Filters
time
depth (m)
parameter
platform type
research institute
ARPA
CNR
CMCC FOUNDATION
NATIONAL INSTITUTE OF OCEANOGRAPHY AND APPLIED GEOPHYSICS - OGS, DIVISION OF OCEANOGRAPHY
Leaflet | © OpenStreetMap contributors © CARTO

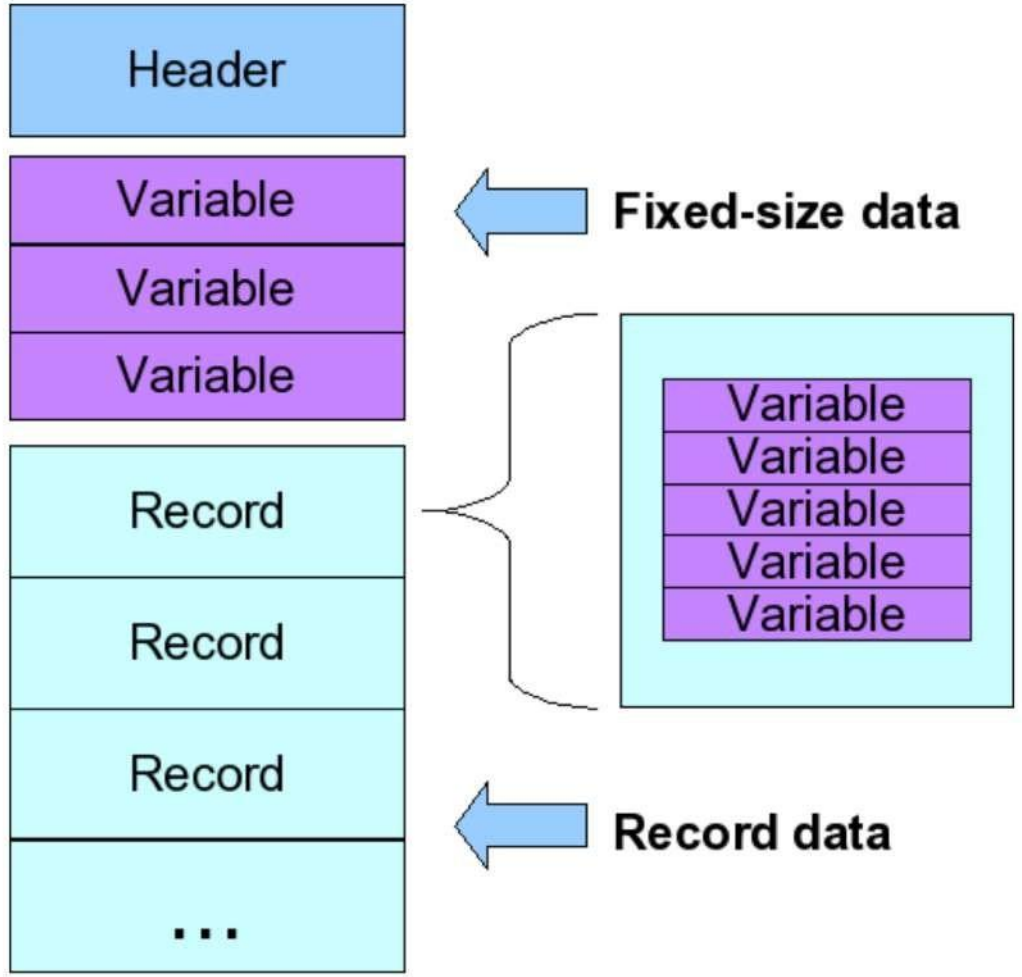
netCDF File Format



- Header
  - Number of record variables
  - Dimension list
  - Global attribute list
  - Variable list
- Data (row-major)
  - Fixed-sized data

    data for each variable is stored contiguously
  - Record data

    a variable number of fixed-size records, each of which contains one record for each of the record variables in order.
- Both use extended XDR



```
<dataset type="EDDTableFromErddap" datasetID="ORION_1_CTD" active="true" >
  <sourceUrl>http://oceano.bo.ingv.it/erddap/tabledap/ORION_1_CTD</sourceUrl>
  <reloadEveryNMinutes>60</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="MAMBO1_2021_2023_TS" active="true" >
  <sourceUrl>https://nodc.ogs.it/erddap/tabledap/MAMBO1_2021_2023_TS</sourceUrl>
  <reloadEveryNMinutes>60</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="OGS" active="true" >
  <sourceUrl>https://nodc.ogs.it/erddap/tabledap/allDatasets</sourceUrl>
  <reloadEveryNMinutes>1</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="INGV" active="true" >
  <sourceUrl>http://oceano.bo.ingv.it/erddap/tabledap/allDatasets</sourceUrl>
  <reloadEveryNMinutes>1</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="IFREMER" active="true" >
  <sourceUrl>https://erddap.ifremer.fr/erddap/tabledap/allDatasets</sourceUrl>
  <reloadEveryNMinutes>60</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="ISP" active="true" >
  <sourceUrl>https://bo.isp.cnr.it/erddap/tabledap/BB_584_SBE56</sourceUrl>
  <reloadEveryNMinutes>60</reloadEveryNMinutes>
  </dataset>

<dataset type="EDDTableFromErddap" datasetID="PTF" active="true" >
  <sourceUrl>https://erddap.ve.ismar.cnr.it/erddap/tabledap/PTF_SLEV_1991_2019 </sourceUrl>
  <reloadEveryNMinutes>60</reloadEveryNMinutes>
  </dataset>
```

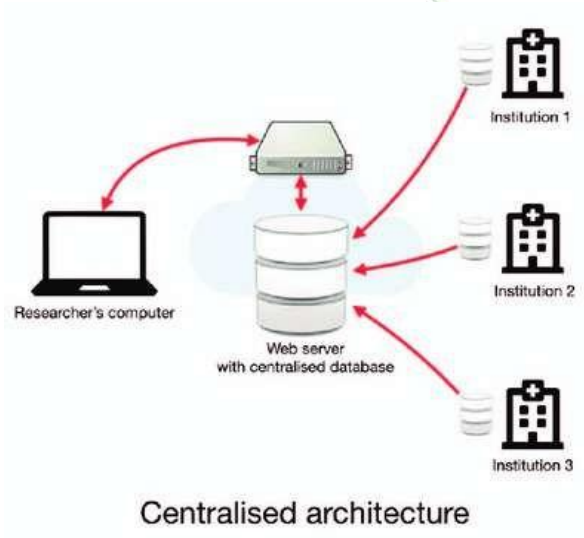
```
1116
1117  <dataset type="EDDGridFromNcFiles" datasetID="nettuno_a070_3f49_3b99" active="true"> ... </dataset>
1281
```

```
1117  <dataset type="EDDGridFromNcFiles" datasetID="nettuno_a070_3f49_3b99" active="true">
1118      <reloadEveryNMinutes>10080</reloadEveryNMinutes>
1119      <updateEveryNMillis>10000</updateEveryNMillis>
1120      <fileDir>/Data/nettuno/</fileDir>
1121      <fileNameRegex>.*\.grb</fileNameRegex>
1122      <recursive>true</recursive>
1123      <pathRegex>.*</pathRegex>
1124      <metadataFrom>last</metadataFrom>
1125      <matchAxisNDigits>20</matchAxisNDigits>
1126      <fileTableInMemory>false</fileTableInMemory>
1127      <!-- sourceAttributes>
1128          <att name="Conventions">CF-1.6</att>
1129          <att name="featureType">GRID</att>
1130          <att name="file_format">GRIB-1</att>
1131          <att name="GRIB_table_version">0,140</att>
1132          <att name="history">Read using CDM IOSP GribCollection v3</att>
1133          <att name="Originating_or_generating_Center">Rome (RSMC)</att>
1134          <att name="Originating_or_generating_Subcenter">0</att>
1135      </sourceAttributes -->
1136      <addAttributes>
1137          <att name="cdm_data_type">Grid</att>
1138          <att name="Conventions">CF-1.10, COARDS, ACDD-1.3</att>
1139          <att name="creator_name">Rome (RSMC)</att>
1140          <att name="creator_type">institution</att>
1141          <att name="grid_mapping_earth_radius" type="double">6367470.0</att>
1142          <att name="grid_mapping_name">latitude_longitude</att>
1143          <att name="infoUrl">???</att>
1144          <att name="institution">Rome (RSMC)</att>
1145          <att name="keywords">80-0-140-233, 80-0-140-245, 80-0-140-249, above, data, ground, height, height_above_ground, level, local, paramet
1146          <att name="license">[standard]</att>
1147          <att name="standard_name_vocabulary">CF Standard Name Table v70</att>
1148          <att name="summary">Rome (RSMC) data from a local source.</att>
1149          <att name="title">Rome (RSMC) data from a local source.</att>
1150      </addAttributes>
1151      <axisVariable>
1152          <sourceName>time</sourceName>
1153          <destinationName>time</destinationName>
1154          <!-- sourceAttributes>
1155              <att name="calendar">proleptic_gregorian</att>
1156              <att name="long_name">GRIB forecast or observation time</att>
1157              <att name="standard_name">time</att>
1158              <att name="units">Hour since 2023-09-28T00:00:00Z</att>
1159          </sourceAttributes -->
1160          <addAttributes>
1161              <att name="ioos_category">Time</att>
1162              <att name="units">hours since 2023-09-28T00:00:00Z</att>
1163          </addAttributes>
1164      </axisVariable>
1165      <axisVariable>
1166          <sourceName>height_above_ground</sourceName>
1167          <destinationName>altitude</destinationName>
```

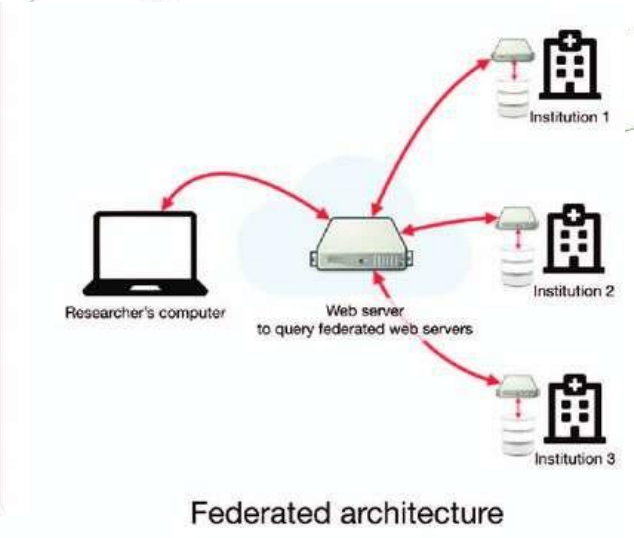
Definitions

- **Centralized system:** physical and logical facilities are managed at once in one single private cloud;
- **Distributed system:** the logical system is a single system but designed to operate using multiple servers in different locations to achieve faulty tolerance and parallel computing
- **Federation of systems:** multiple systems managed by different agents are connected through standard defined API and protocols and they act as a single system

- Cloud based solutions allow to provide **Software as a service** (SaaS) and **data as a service** (DaaS), this means that infrastructure provide resources
- **Service Oriented Architecture** (SOA) define only interfaces between systems and not the internal architecture of components



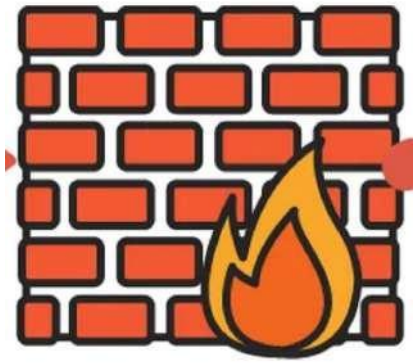
Centralised architecture



Federated architecture

ITINERIS

ITINERIS



ITINERIS

ERDDAP
Easier access to scientific data

ERDDAP

ERDDAP is a data server that gives you a simple, consistent way to download subsets of scientific datasets in common file formats and make graphs and maps. This particular ERDDAP installation has oceanographic data (for example, data from satellites and buoys).

Easier Access to Scientific Data

Our focus is on making it easier for you to get scientific data.

Different scientific communities have developed different types of data servers.

Start Using ERDDAP:
Search for Interesting Datasets

- **Do a Full Text Search for Datasets**

Search

- View a List of All 8 Datasets
- **Search for Datasets by Category**

CNR ISMAR ISTITUTO DI SCIENZE MARINE
ERDDAP
Easier access to scientific data

ERDDAP

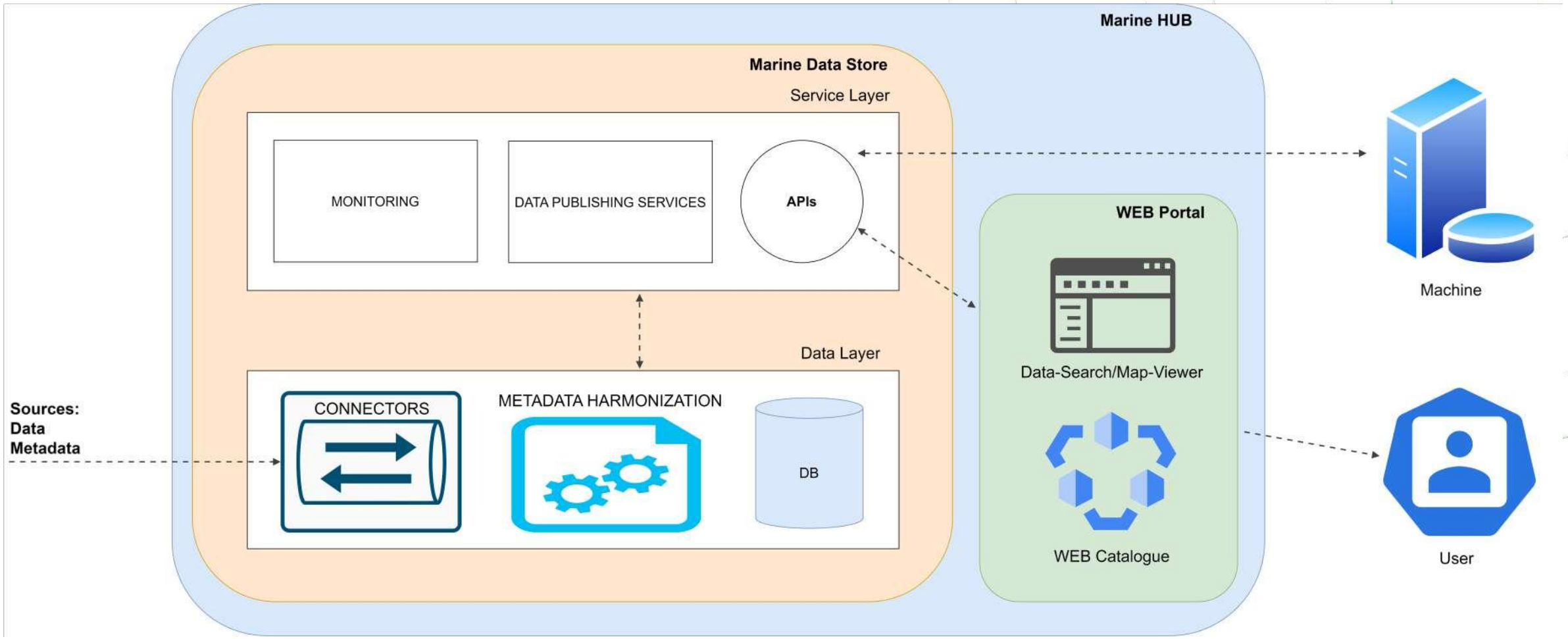
NODC's ERDDAP
Easier access to OGS's data

ERDDAP

INGV OCEANO GROUP BO ERDDAP
Easier access to scientific data

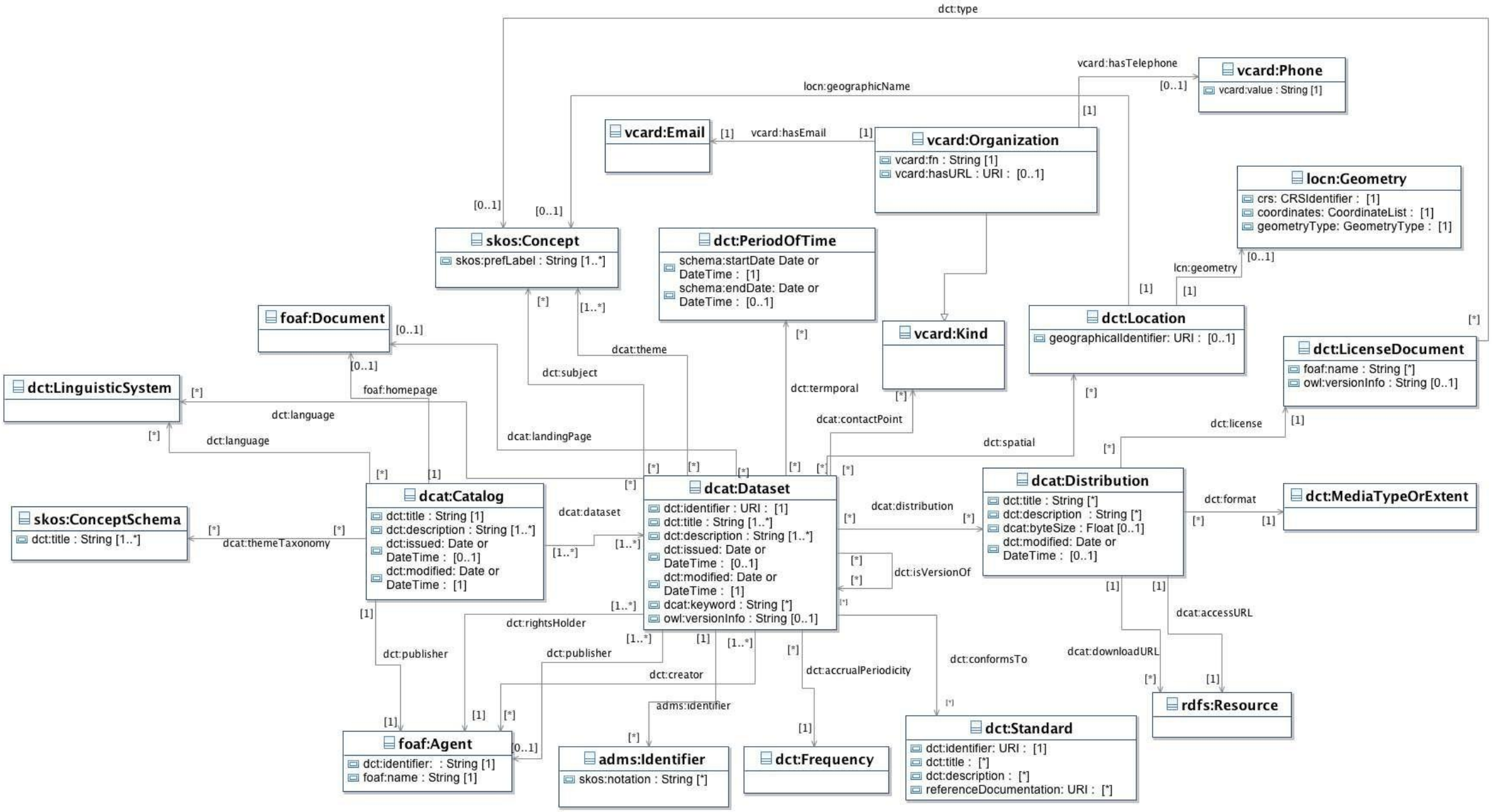
ERDDAP

Marine Data Store - WEB Portal

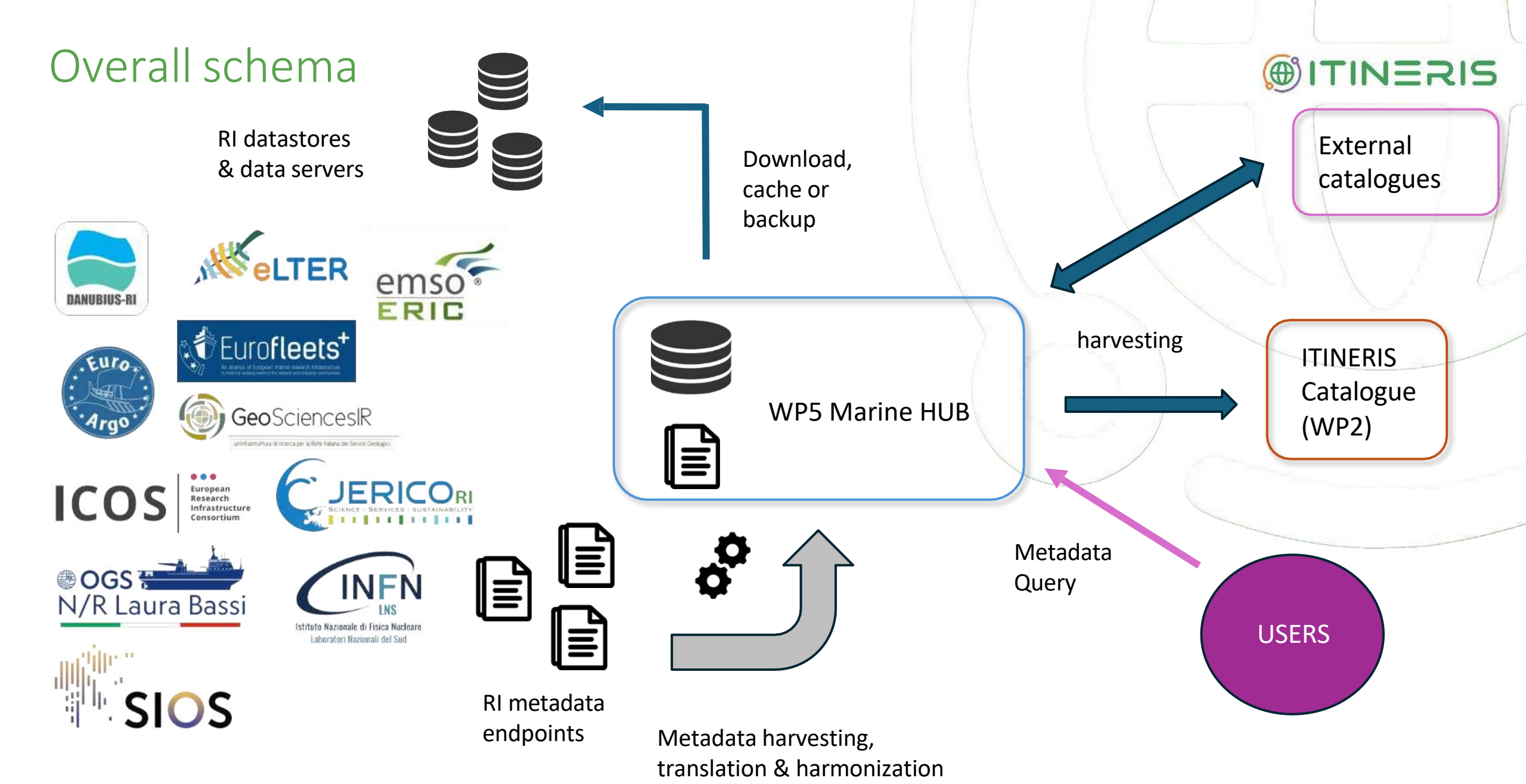


Metadata Catalogue

- Add proper metadata to each dataset is an essential requirement for a working data infrastructure
- However, since IT-IOOS data are multi-disciplinary, and each discipline uses specific metadata standard, as well as specific controlled vocabularies for annotating metadata records, the WP5 Data Catalogue infrastructure is designed to re-use as much as possible existing metadata, without requiring the original records to be re-created based on the reference standard (namely, DCAT-AP).
- Harvesting procedure will add metadata to the schema where necessary (e.g. label all datasets from a RI endpoint with RI name)


dct:type
vcard:hasTelephone
vcard:Phone
vcard:value : String [1]
locn:geographicName
vcard:Email
vcard:hasEmail
vcard:Organization
vcard:fn : String [1]
vcard:hasURL : URI : [0..1]
locn:Geometry
crs: CRSIdentifier : [1]
coordinates: CoordinateList : [1]
geometryType: GeometryType : [1]
skos:Concept
skos:prefLabel : String [1..*]
dct:PeriodOfTime
schema:startDate Date or DateTime : [1]
schema:endDate: Date or DateTime : [0..1]
locn:geometry
foaf:Document
vcard:Kind
dct:Location
geographicalIdentifier: URI : [0..1]
dct:LicenseDocument
foaf:name : String [*]
owl:versionInfo : String [0..1]
dct:theme
dct:subject
dct:termporal
dct:LinguisticSystem
foaf:homepage
dct:language
dct:language
dcat:landingPage
dcat:contactPoint
dct:spatial
dct:license
dcat:Catalog
dct:title : String [1]
dct:description : String [1..*]
dct:issued: Date or DateTime : [0..1]
dct:modified: Date or DateTime : [1]
dcat:Dataset
dct:identifier : URI : [1]
dct:title : String [1..*]
dct:description : String [1..*]
dct:issued: Date or DateTime : [0..1]
dct:modified: Date or DateTime : [1]
dcat:keyword : String [*]
owl:versionInfo : String [0..1]
dcat:Distribution
dct:title : String [*]
dct:description : String [*]
dcat:byteSize : Float [0..1]
dct:modified: Date or DateTime : [0..1]
dct:MediaTypeOrExtent
dct:format
skos:ConceptSchema
dct:title : String [1..*]
dcat:themeTaxonomy
dcat:dataset
dcat:distribution
dct:isVersionOf
dct:rightsHolder
dct:publisher
dct:publisher
dct:creator
dct:accrualPeriodicity
dct:conformsTo
dcat:accessURL
dcat:downloadURL
adms:identifier
foaf:Agent
dct:identifier: : String [1]
foaf:name : String [1]
adms:Identifier
skos:notation : String [*]
dct:Frequency
dct:Standard
dct:identifier: URI : [1]
dct:title : [*]
dct:description : [*]
referenceDocumentation: URI : [*]
rdfs:Resource

Overall schema



ITINERIS - from the Call to the Project: the ISMAR role

ITINERIS
Italian Integrated Environmental Research Infrastructures System

Call Requirements

- Dal Bando

- "**Creazione di nuove IR o potenziamento di quelle esistenti** che concorrono agli obiettivi di Eccellenza Scientifica di Horizon Europe e costituzione di reti"
- E' rivolto alle **IR aventi priorità alta e media**, così come individuate dal Ministero nel PNIR.
- I soggetti proponenti, ammessi alla presentazione della proposta progettuale oggetto del presente avviso, sono gli enti pubblici di ricerca di cui all'art. 1 del D.Lgs. n. 218/2016, le Università e le istituzioni universitarie italiane statali, comunque denominate (ivi comprese le scuole superiori ad ordinamento speciale), che siano stati altresì **individuati nel PNIR quali capofila di IR**.
- Le proposte progettuali dovranno riguardare una delle seguenti tipologie di intervento:
- potenziamento di IR presente nel PNIR a priorità alta;
  - **creazione di nuova IR presente nel PNIR a priorità alta e media**;
  - **creazione di reti tematiche o multidisciplinari di IR esistenti,** presenti nel PNIR a priorità alta e media, con indicazione del tema o del tema prevalente per reti multidisciplinari, tra le Aree ESFRI.
- L'impegno del Soggetto proponente e di ciascun co-proponente **a gestire l'infrastruttura di ricerca, garantendone la sostenibilità economico–finanziaria indipendentemente dal mercato, anche dopo la conclusione del progetto, per almeno 10 anni**

PNIR - IRs

ALTA PRIORITA'

Nome IR	Capofila	Ambito	Tipo
ACTRIS	CNR	ENV	Distributed
ANAEE	CNR	H&F	Distributed
Auger	INFN	PSE	Single site
BBMRI	CNR	H&F	Distributed
BRIEF	SS S. Anna	DIGIT	Distributed
CERIC-ERIC	Area Sci. Park	PSE	Distributed
CESSDA	CNR	SCI	Distributed
CLARIN-IT	CNR	SCI	Distributed
CTA	INAF	PSE	Distributed
DANUBIUS-RI	CNR	ENV	Distributed
DARIAH ERIC	CNR	SCI	Distributed
DiSSCo	CNR	ENV	e-IR
DTT	ENEA	ENE	Single site
EATRIS	CNR	H&F	Distributed
EBRAINS	CNR	H&F	Distributed
ECCSEL	OGS	ENE	Distributed
ECORD	CNR	EN	
ECRIN	CNR	H&F	Distributed
E-ELT	INAF	PSE	Single site
EGO	INFN	PSE	Single site
EIRENE RI	CNR	ENV	Distributed
ELETTRA	Area Sci. Park	PSE	Single site
ELI	CNR	PSE	Distributed
ELIXIR - IT	CNR	H&F	Distributed
eLTER	CNR	ENV	Distributed
EMBRC	SZN	H&F	Distributed
EMSO	INGV	ENV	Distributed
EPOS	INGV	ENV	Distributed
E-RIHS	CNR	SCI	Distributed
ESRF Grenoble	CNR	PSE	Single site
ESS ERIC	INAPP	SCI	Distributed
ESS ERIC (Spallation)	INFN	PSE	Single site
ET	INFN	PSE	Single site
EUFAR	CNR	ENV	
EuPRAXIA	INFN	PSE	Distributed
Euro-Argo	OGS	ENV	Distributed
EURO-BIOIMAGING	CNR	H&F	Distributed
EUROFEL	Area Sci. Park	PSE	Distributed
EuroNanoLab (ENL)	CNR	PSE	Distributed
EVN - JIVE	INAF	PSE	Distributed
FERMI	Area Sci. Park	PSE	Single site
Fondazione CMCC	INGV	ENV	Distributed
GARR-X	GARR	DIGIT	e-IR
IBISBA-IT	CNR	H&F	Distributed
ICOS	CNR	ENV	Distributed
ILL	CNR	PSE	Single site
INFRAFRONTIER	CNR	H&F	Distributed
INSTRUCT-ERIC	CNR	H&F	Distributed
ISBE	CNR	H&F	Distributed
ISIS	CNR	PSE	Distributed
KM3-NET	INFN	PSE	Distributed
LBT	INAF	PSE	Single site
LENS	CNR	PSE	Single site
LIFEWATCH	CNR	ENV	Distributed
LNF	INFN	PSE	Single site
LNGS	INFN	PSE	Single site
LNL	INFN	PSE	Single site
LNS	INFN	PSE	Single site
LOFAR	INAF	PSE	Distributed
METROFOOD-RI	ENEA	H&F	Distributed
MIRRI	Torino	H&F	Distributed
NFFA	CNR	PSE	Distributed
OPENAIRE	CNR	DIGIT	Distributed
OPERAS	CNR	SCI	Distributed
Phen-Italy - nodo IT di EMPHASIS	CNR	H&F	Distributed
PRACE-Italy	OGS	DIGIT	e-IR
RESILIENCE	CNR	SCI	Distributed
RFX	CNR	ENE	Single site
SESAME	INFN	PSE	Single site
SHARE-ERIC	CNR	SCI	Distributed
SIOS	CNR	ENV	Distributed
SKA	INAF	PSE	Distributed
SoBigData	CNR	DIGIT	Distributed
TNG	INAF	PSE	Single site

MEDIA PRIORITA'

Nome IR	Capofila	Ambito	Tipo
ASTRI Mini-Array	INAF	PSE	Single site
ATLaS	Firenze	ENV	Single site
BEaTriX	INAF	PSE	Single site
Beyond-Nano	CNR	PSE	
Bio-Memory	CNR	H&F	Distributed
CENTRO INPHOTEC	SS S. Anna	PSE	Single site
CeTrA	Cà Foscari	ENV	Single site
Ciclope	Bologna	PSE	Single site
CNCCS	CNR	H&F	Single site
COIRICH	Tor Vergata	SCI	Distributed
CRESCO	ENEA	DIGIT	Distributed
CUSBO	Politec. Milano	PSE	Single site
D4Science	CNR	DIGIT	Distributed
EHRI	CNR	SCI	Distributed
EPTRI	CNR	H&F	Distributed
EUROFLEETS-RI	CNR	ENV	Distributed
FNH-RI-IT	CNR	H&F	Distributed
GeoSciences	ISPRA	PSE	Distributed
Health Demographic Change and Wellbeing	Teramo	H&F	Single site
HPC-BD-AI	INFN	DIGIT	Single site
IR HPC	SISSA	DIGIT	Single site
JERICO-RI	CNR	ENV	Distributed
LASA	INFN	PSE	Single site
LGV	Politec. Milano	PSE	Single site
MeerKAT+	INAF	PSE	Single site
MONSTER	ENEA	ENE	Single site
N/R Laura Bassi	OGS	ENV	Single site
PIBE	ENEA	ENE	Single site
RISIS	CNR	SCI	Distributed
SLICES	CNR	DIGIT	Distributed
SMINO	OGS	ENV	Distributed
SOL-IN	ENEA	ENE	Distributed
SRT	INAF	PSE	Single site
STAR	Calabria	PSE	e-IR
VST	INAF	PSE	Single site

Call Requirements

- Dal Bando

I progetti finanziati a valere sul presente avviso debbono garantire il rispetto dei seguenti vincoli derivanti dal PNRR:

- **disparità territoriale**: almeno il **40%** dell'iniziativa 3.1 nel suo complesso deve avere una localizzazione nelle regioni del **Mezzogiorno**;
- disparità di genere: almeno il 40% del personale assunto a tempo determinato deve essere di genere femminile e almeno il 40% delle borse di dottorato deve essere assegnato a ricercatrici;
- campi di intervento: l'iniziativa nell'ambito del PNRR è stata ricondotta al "Campo di intervento 6: Investimenti nelle capacità digitali e nella diffusione di tecnologie avanzate - Dimensione DESI 4: Integrazione delle tecnologie digitali + raccolta di dati ad hoc - 055 - altre tipologie di infrastrutture TIC (compresi risorse/impianti informatici di grandi dimensioni, centri di dati, sensori e altri dispositivi wireless)" di cui all'allegato VII del Reg. (UE) 2021/241;
- **vincolo digital: 100%** dell'iniziativa 3.1 nel suo complesso (campo d'intervento sopra esplicitato).

Call Requirements

- Dal Bando

- **Principi FAIR**: L’acronimo FAIR indica una lista di princìpi che sono stati definiti da un gruppo di esperti composto da ricercatori, enti finanziatori, editori ed istituzioni di ricerca per garantire un uso ottimale dei dati della ricerca (qualità della ricerca, riutilizzo, migliori servizi, conservazione a lungo termine). I principi FAIR mirano a rendere i metodi di gestione dei dati digitali omogenei e ad accesso aperto. **FINDABLE**, i dati, metadati, infrastrutture devono poter essere reperibili; **ACCESSIBLE**, i dati, metadati devono essere accessibili; **INTEROPERABLE**, i dati, metadati devono essere interoperabili; **REUSABLE**, i dati, metadati devono essere strutturati in maniera tale da essere riutilizzabili. I principi si riferiscono a tre tipi di entità: dati (o qualsiasi oggetto digitale), metadati (informazioni su quell'oggetto digitale) e infrastrutture;

Main Objective

ITINERIS will build the Italian Hub of Research Infrastructures in the environmental scientific domain for the observation and study of environmental processes in the **atmosphere, marine domain, terrestrial biosphere, and geosphere**, **providing access to data and services** and supporting the Country to address current and expected environmental challenges.

The main goal is to develop cross-disciplinary research in environmental sciences through the use and re-use of existing (or pre-operational) data and services and new observations, to address scientifically and societally relevant issues such as:

- sustainable use of natural resources
- Green and Blue Economy,
- pollution reduction,
- ecosystem management and restoration
- carbon cycle
- mitigation of effects of climate and environmental change.

Landscape Analysis - ENV

GEOSPHERE: FROM THE SURFACE TO THE INTERIOR OF THE EARTH, FROM GEOHAZARDS TO GORESOURCES
(CURRENT STATUS, GAP, CHALLENGES AND FUTURE NEEDS)

ATMOSPHERE: FROM NEAR GROUND TO THE NEAR SPACE ATMOSPHERE
(CURRENT STATUS, GAP, CHALLENGES AND FUTURE NEEDS)

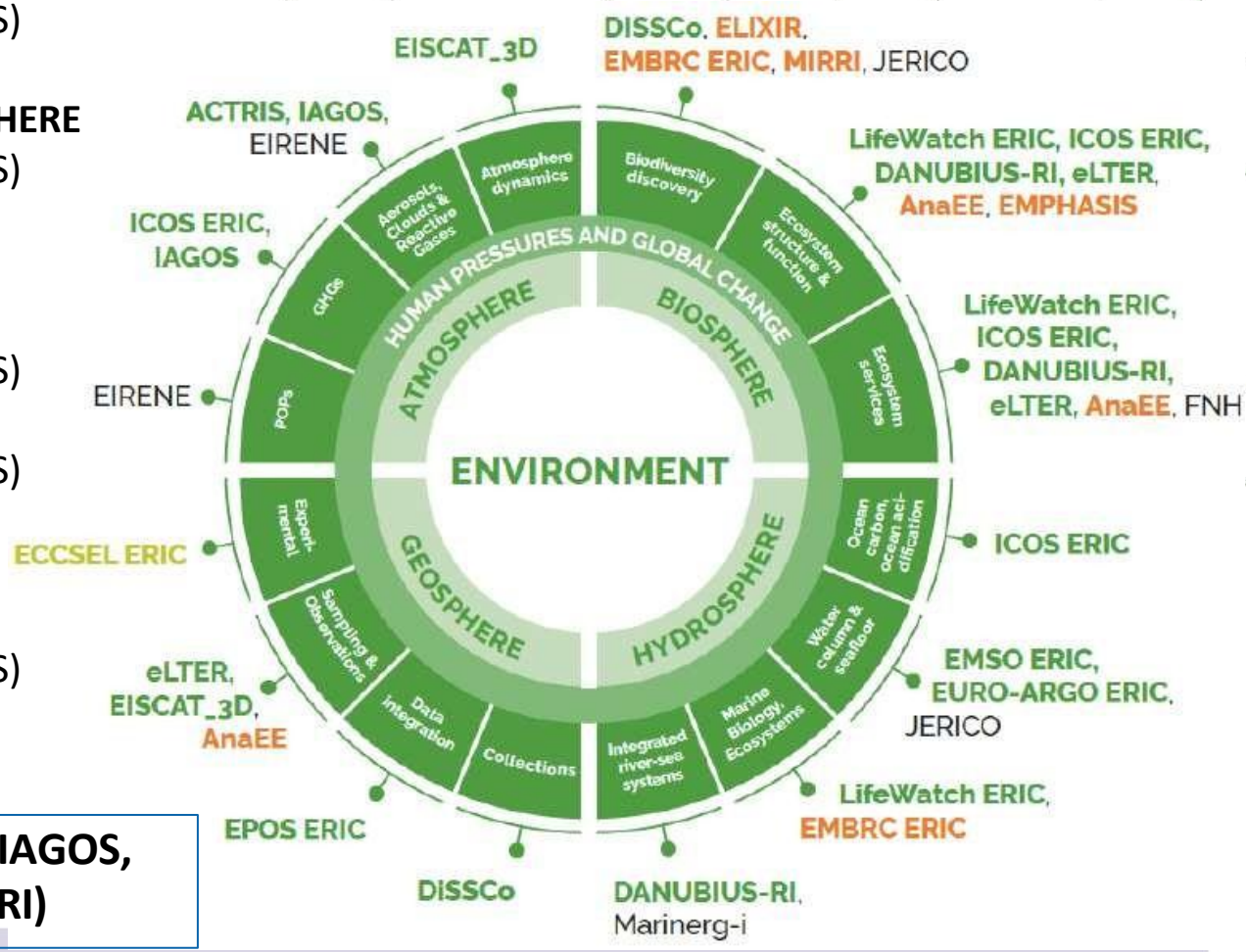
HYDROSHERE

FRESHWATER: ICE, GROUNDWATER, LAKES, RIVERS, ESTUARIES
(CURRENT STATUS, GAP, CHALLENGES AND FUTURE NEEDS)

MARINE: FROM COAST TO DEEP OCEANS AND ICE CAPS
(CURRENT STATUS, GAP, CHALLENGES AND FUTURE NEEDS)

BIOSPHERE: BIODIVERSITY AND ECOSYSTEMS
(CURRENT STATUS, GAP, CHALLENGES AND FUTURE NEEDS)

VISION and PERSPECTIVES



8 Landmarks (ACTRIS, EISCAT_3D, EMSO, EPOS, EURO-ARGO, IAGOS, ICOS, LifeWatch) and 3 Projects (DANUBIUS-RI, DiSSCo, eLTER RI)

ITINERIS - Italian Integrated Environmental Research Infrastructures System

- **7 Partners**

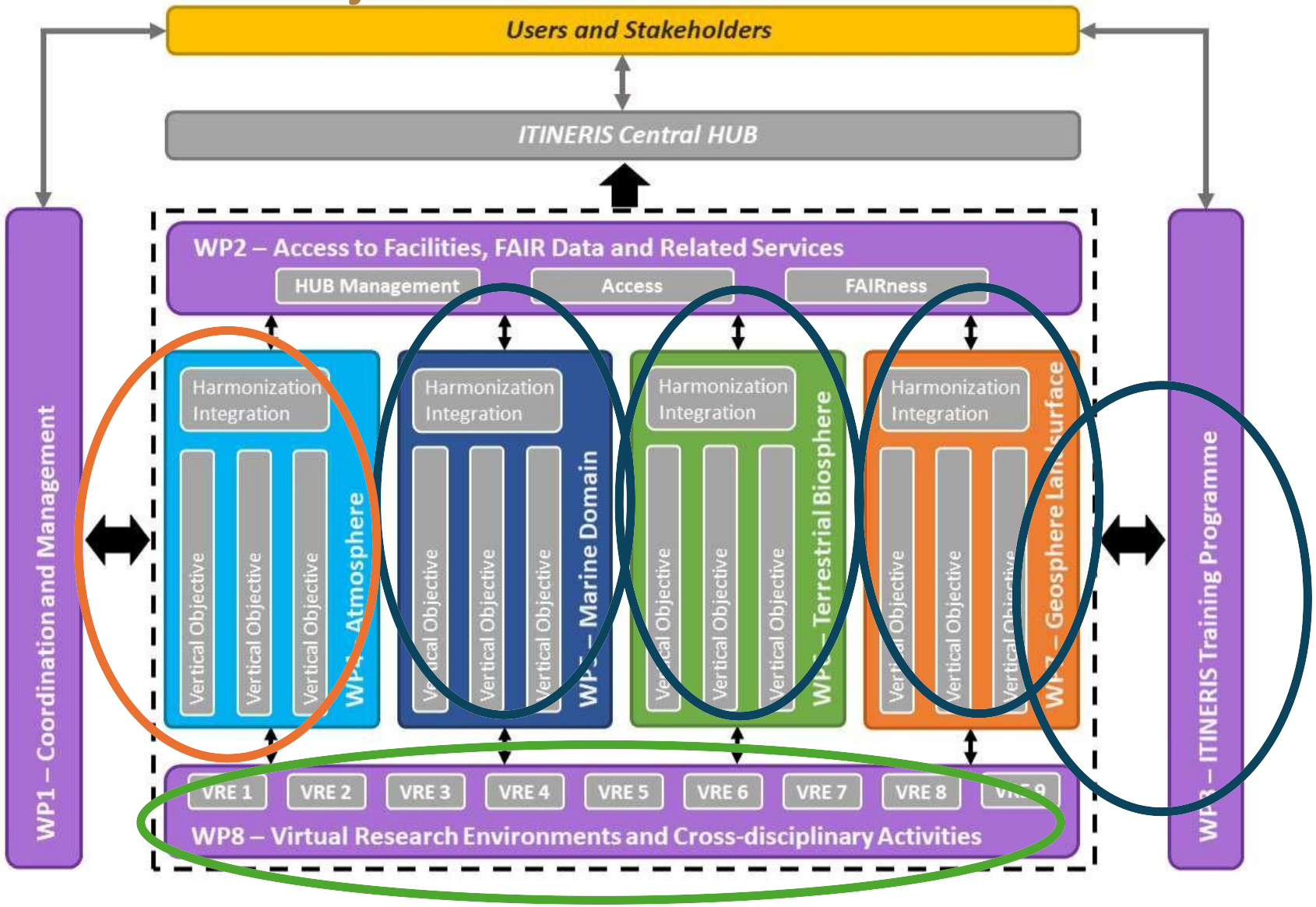
- **22 RIs:**

The participating RIs are the Italian nodes of the **ESFRI Landmarks** ACTRIS, EMSO, Euro-Argo, ICOS and LIFEWATCH, from the ENV domain and ANAEE from the H&F domain and closely linked to the ENV domain; the Italian nodes of the **ESFRI projects** DANUBIUS, DISSCO, eLTER, from the ENV domain, and EMPHASIS and EU-IBISBA from the H&F domain and also relevant for ENV; the **EU RIs** ECORD, EUFAR, Eurofleets, JERICO and SIOS, all from the ENV domain; and the national RIs ATLAS, CeTRA, Laura Bassi, and SMINO, from the ENV domain, and Geosciences and LNS, both from the PSE domain, that in ITINERIS support services in the marine domain.

- **Total budget: 155 ML Euro**

- **Start date: 1 November 2022 (for 30 + 6 months) + at least 10 years operation**

ITINERIS Project Structure



BUDGET

- **WP5: Marine Domain**
- Budget WP5: 45 **M€**
  - WP6: 1,6 **M€**
  - WP7: 2 **M€ (ISMAR+OGS+INGV)**
  - WP3 : 0,3 **M€**
  - WP8 : 0,4 **M€**
- **Total budget for the Italian nodes of the Marine RIs: 50 M€**
- **WP4: 0,6 M€**
- **WP8: 1,2M€ (ISMAR+ OGS)**

WP5: Marine Domain – International Context

Global Ocean Observing System

Observing the ocean is essential to quantify the changes that have occurred in the recent past and to monitor current changes and predict the future

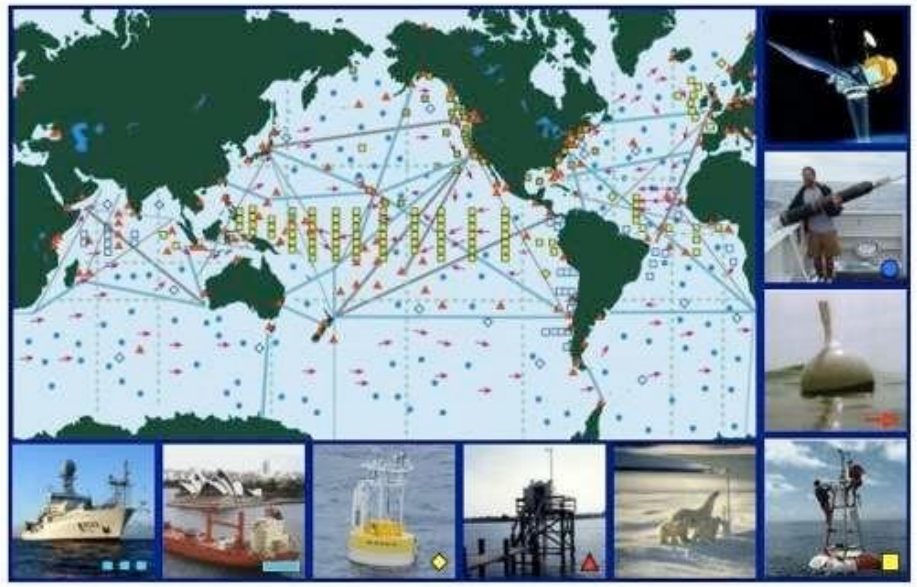
Ocean Essential Variable (EOV) includes the EBVs C ECVs

Training current future RI research staff: “Marine Data Management & D

WP5: Marine Domain – International Context

Integrated system designed to meet many requirements:

- Climate
- Weather prediction
- Global and coastal ocean prediction
- Marine hazards warning
- Transportation
- Marine environment and ecosystem monitoring
- Naval applications
- 8 of 9 Societal Benefits



- Tide gauge stations
- Drifting Buoys
- Moored Buoys
- Cabled observatory
- Profiling Floats
- Ocean gliders
- Ships of Opportunity
- Ocean Reference Stations
- Ocean Carbon Networks

The Global Ocean Observing System

GOOS

EOOS

2021 2030 United Nations Decade of Ocean Science for Sustainable Development

A Decade to provide the global framework:

- to support efforts to reverse the cycle of decline in Ocean health G create improved conditions for sustainable development
- to structure and boost scientific efforts at national and international levels
- to empower governments and societies with science-based solutions

WP5: Marine Domain Objectives

The ITINERIS Marine Domain aims to **integrate all marine RIs** to guarantee **access to Italian facilities, services and marine data and to ensure long term monitoring of EOVs, EBVs and ECVs.**

This will allow:

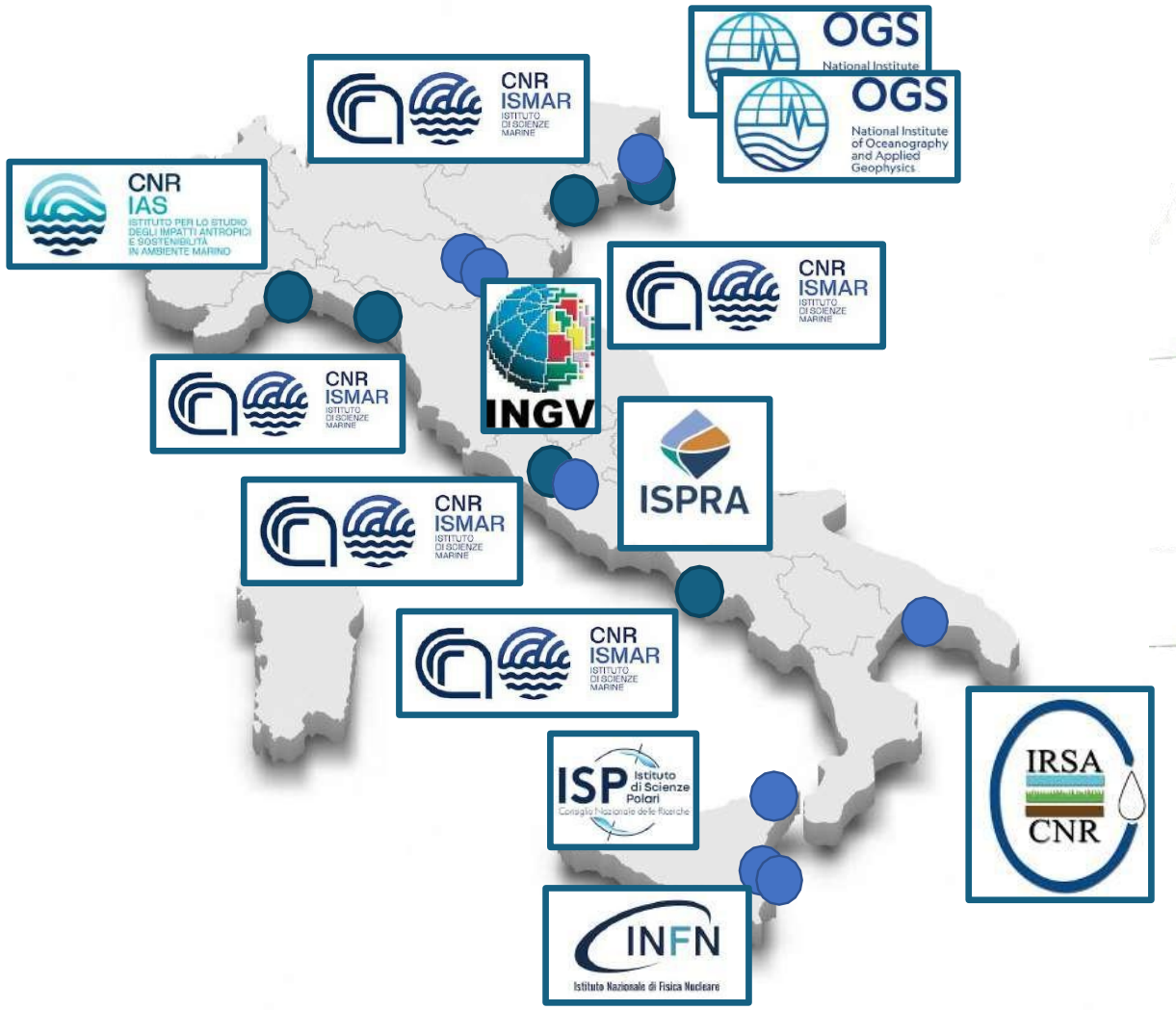
- to establish the **Italian Integrated Ocean Observing System (IOOS)** able to contribute to **European and International** effort on **ocean observations**: European Ocean Observing System **(EOOS)** and Global Ocean Observing System **(GOOS).**
- to contribute to **the major challenges** of **UN Ocean Decade of Science for Sustainable Development:**

predicting improving quality and interoperability of ocean data, for three critical themes:

climate, operational services, marine ecosystem health

WP5: Participants in the WP

CNR-ISMAR-Venezia
CNR-ISMAR-Bologna
CNR-ISMAR-Lerici
CNR-ISMAR-Roma
CNR-ISMAR-Napoli
CNR-IAS-Genova
CNR-IRSA-Taranto
CNR-ISP-Messina
OGS_OCE-Trieste
OGS_CGN-Trieste
INGV-BO -Bologna
INGV-WIS - Catania
INFN-LNS -Catania
ISPRA - Roma



WP5: Marine Domain RIs

The **11 RIs involved in the WP**: **8 RIs** developed in the **ESFRI** and for this reason with a strong international characterization and established links with extra-EU similar initiatives. + **3 National Large infrastructures**

Euro-Argo ERIC allows active coordination and strengthening of the European contribution to the international Argo programme to explore the open ocean.

https://www.euro-argo.eu

EMSO aims to observe the oceans in the long term, better understand the phenomena in and under them and their interactions and roles in terrestrial systems through a multidisciplinary approach.

https://emso.eu

DANUBIUS-RI mission is to facilitate and contribute excellent science on the continuum from river source to sea; to offer state-of-the art research infrastructure; and to provide the integrated knowledge required to sustainably manage and protect River-Sea Systems.

https://www.danubius-ri.eu/

The ICOS Marine component currently coordinates twenty-nine ocean stations from seven countries monitoring carbon uptake and fluxes. ICOS ensures high quality measurements that are independent, transparent and reliable, to quantify fluxes and to assess their variability and drivers.

www.icos-ri.eu

WP5: Marine Domain RIs

The eleven RIs involved in the WP. 8 Research Infrastrutcures developed in the ESFRI and for this reason with a strong international characterization and established links with extra-EU similar initiatives.

JERICO-RI is an integrated pan-European multidisciplinary and multi-platform research infrastructure dedicated to a holistic appraisal of coastal marine system changes.

https://www.jerico-ri.eu/

eLTER-RI is a pan-European in-situ research infrastructure whose mission is to study long-term ecological changes in terrestrial, freshwater and transitional ecosystems through a holistic 'whole system' approach.

https://www.elter-ri.eu/

The **Eurofleets+ project** will facilitate open access to an integrated and advanced research vessel fleet, designed to meet the evolving and challenging needs of the user community.

https://www.eurofleets.eu/

SIOS is a collaborative effort to develop and maintain a regional observational system for long-term measurements in and around Svalbard, addressing Earth System Science questions related to Global Change

https://sios-svalbard.org/

WP5: Marine Domain RIs

+ 3 National Large infrastructures

INFN LNS
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali del Sud

LNS is a national RI based in Sicily, hosting unique facilities for astroparticle, nuclear and applied physics and marine science. LNS owns and operates the largest scientific subsea cabled network in Europe .

https://www.lns.infn.it/en/

Laura Bassi is an icebreaker class research vessel, It operates in polar areas carrying out research and logistic activities for the Italian polar projects

https://www.ogs.it/it/content/nr-laura-bassi

GeoSciences

ISPRA

GeoScience is a network of Italian Regions and Regional Environmental Agencies providing access to data, service and scientific knowledge to carry out monitoring and environmental impact and strategic assessment procedures.

WP5: Participants in the WP per RIs

WP Leader:
Rosalia Santoleri

CNR ISMAR

Euro-Argo

***Elena Mauri** (OGS), Giulio Notarstefano (OGS), Emanuele Organelli (CNR-ISMAR)*

emso ERIC

***Laura Beranzoli**, Davide Embriaco,(INGV), Roberto Bozzano (CNR-IAS), Vanessa Cardin (OGS)*

Eurofleets

***Katrin Schroeder**, Anna Vetrano (CNR-ISMAR)*
Franco Coren (OGS)

eLTER

***Caterina Bergami** (CNR-ISMAR), Antonella Petrocelli (CNR-IRSA)*

DANUBIUS-RI
International Centre for Advanced Studies on River-Sea Systems

***Georg Umgiesser**, Francesca De Pascalis, Debora Bellafiore (CNR-ISMAR), Donata Canu (OGS)*

INFN LNS
Istituto Nazionale di Fisica Nucleare
Laboratori Nazionali del Sud

***Giorgio Riccobene**, Emidio Giorgio, Salvatore Viola (INFN-LNS)*

SIOS

***Maurizio Azzaro**, Federico Giglio, Francesco Filiciotto, Stefano Miserocchi (CNR-ISP)*

ICOS INTEGRATED CARBON OBSERVATION SYSTEM

***Michele Giani**, Giuseppe Civitarese (OGS), Carolina Cantoni (CNR-ISMAR)*

JERICO RESEARCH INFRASTRUCTURE

***Marcello Magaldi**, Mauro Caccavale, (CNR-ISMAR), Fabio Brunetti (OGS), Cosimo Solidoro (OGS)*

***Franco Coren** (OGS)*

GeoSciences ISPRA

***Giordano Giorgi** (ISPRA)*

WP6 & WP7: Marine Contribution per RIs

ECORD

http://www.iodp-italia.cnr.it/index.php/it/

Create a unique European collection that digitally unifies all European natural science assets under common access, curation, policies and practices involving EU natural history museums and institutions holding scientific collections.

www.dissco.eu

Francesca Maggiore

Gabriele Bucci

Lorenzo Cecchi

Andrea Argnani

Biagio Giaccio

Chiara Boschi

WP4: ISMAR Contribution to Atmospheric RIs

Produces high-quality data and information on short-lived atmospheric constituents and on the processes leading to the variability of these constituents in natural and controlled atmospheres.

www.actris.eu

Lucia Mona

Daniele Contini, Angela Marinoni

Vito Vitale

Davide Dionisi

Objective 1 - Integration and harmonization of Marine Domain RIs towards IOOS - Italian Integrated Ocean Observing System

Contributing RIs: all

The aim is to **harmonize data and products** from the different RIs and **build up an integrated system of systems** able to ensure continuity of data and services and to respond to user requirements and contribute international effort

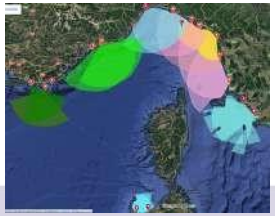
How:

- **Integration and harmonization** of Marine Domain RIs
- **Design and implementation of IOOS**
- Implementation of the **ITINERIS Marine Data Store**
- Upgrade the RIs by installing **new instrumentations responding to the digital requirements**
- Enounce capability of the **RI marine facilities to transfer data from offshore to inshore**










STATO DI FATTO:	AAOT	PALOMA	S1-GB	E1	MEDA ABATE	LAMPEDUSA	CORSICA	CANALE-SICILIA C01	CANALE-SICILIA C02	CANALE-SARDEGNA	RETE RADAR
ECV - Aerosols	0	0	0	0	0	0	0	0	0	0	0
ECV - Carbon Dioxide, Methane & Other Greenhouse Gases	0	2	0	0	0	0	0	0	0	0	0
ECV - Ozone	0	0	0	0	0	0	0	0	0	0	0
ECV - Precursors for Aerosols and Ozone	0	0	0	0	0	0	0	0	0	0	0
ECV - Atmosphere, Surface: Precipitation	4	1	1	0	0	0	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Sea Level Pressure	4	2	1	1	1	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Radiation Budget	2	3	0	0	0	3	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Air Temperature	4	3	1	1	1	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Water Vapour	4	2	1	1	0	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Wind Speed and Direction	9	6	2	2	2	1	0	0	0	0	0
ECV - Ocean, Physical: Ocean Surface Heat Flux	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Level	5	1	0	0	1	0	0	0	0	0	0
ECV - Ocean, Physical: Sea State	14	4	0	2	0	1	0	0	0	0	1
ECV - Ocean, Physical: Sea Surface Currents	0	0	0	0	0	0	0	0	0	0	1
ECV - Ocean, Physical: Sea Surface Salinity	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Surface Stress	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Surface Temperature	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Subsurface Currents	1	1	0	0	0	0	5	6	6	2	0
ECV - Ocean, Physical: Subsurface Salinity	3	0	2	2	0	1	15	12	7	4	0
ECV - Ocean, Physical: Subsurface Temperature	3	8	2	2	0	3	18	16	11	4	0
ECV - Ocean, Biogeochemical: Inorganic Carbon	0	9	0	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Nitrous Oxide	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Nutrients	2	5	1	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Ocean Colour	4	0	0	2	0	5	0	0	0	0	0
ECV - Ocean, Biogeochemical: Oxygen	2	4	1	1	0	1	1	2	0	0	0
ECV - Ocean, Biogeochemical: Transient Tracers	0	0	5	5	0	0	0	0	0	0	0
EOV - Biogeochemistry: Particulate Matter	0	1	2	0	0	0	0	0	0	0	0
EOV - Biogeochemistry: Stable Carbon Isotopes	0	0	0	0	0	0	0	0	0	0	0
EOV - Biogeochemistry: Dissolved Organic Carbon	1	0	0	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Phytoplankton Biomass and Diversity	6	3	2	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Zooplankton Biomass and Diversity	1	1	0	0	0	0	1	0	0	0	0
EOV - Biology and Ecosystems: Fish Abundance and Distribution	2	0	0	0	0	0	1	0	0	0	0
EOV - Biology and Ecosystems: Microbe Biomass and Diversity (*emerging)	0	0	0	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Invertebrate Abundance and Distribution (*emerging)	0	0	0	0	0	0	0	0	0	0	0
EOV - Cross-Disciplinary: Ocean Sound	2	2	1	0	0	0	0	0	0	0	0
	19	18	13	10	4	10	6	4	3	3	2
PERCENTUALE ECV/EOV/EBV	54%	51%	37%	29%	11%	29%	17%	11%	9%	9%	6%

EOV C ECV da coprire

Stato delle EOV coperte dalle infrastrutture CNR-ISMAR

Solo 50% delle variabili coperte dalle infrastrutture più grandi

STATO DI PROGETTO:	AAOT	PALOMA	S1-GB	E1	MEDA ABATE	LAMPEDUSA	CORSICA	CANALE-SICILIA C01	CANALE-SICILIA C02	CANALE-SARDEGNA	RETE RADAR
ECV - Aerosols	1	0	0	0	0	0	0	0	0	0	0
ECV - Carbon Dioxide, Methane & Other Greenhouse Gases	1	2	0	0	0	0	0	0	0	0	0
ECV - Ozone	0	0	0	0	0	0	0	0	0	0	0
ECV - Precursors for Aerosols and Ozone	0	0	0	0	0	0	0	0	0	0	0
ECV - Atmosphere, Surface: Precipitation	4	1	1	0	0	0	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Sea Level Pressure	4	2	1	1	1	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Radiation Budget	2	3	0	0	0	3	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Air Temperature	4	3	1	1	1	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Water Vapour	4	2	1	1	0	1	0	0	0	0	0
ECV - Atmosphere, Surface: Surface Wind Speed and Direction	9	6	2	2	2	1	0	0	0	0	0
ECV - Ocean, Physical: Ocean Surface Heat Flux	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Level	5	1	0	0	1	0	0	0	0	0	0
ECV - Ocean, Physical: Sea State	14	4	0	2	0	1	0	0	0	0	1
ECV - Ocean, Physical: Sea Surface Currents	1	0	0	0	0	0	0	0	0	0	1
ECV - Ocean, Physical: Sea Surface Salinity	1	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Surface Stress	1	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Sea Surface Temperature	1	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Physical: Subsurface Currents	1	1	0	0	0	0	5	6	6	2	0
ECV - Ocean, Physical: Subsurface Salinity	3	0	2	2	0	1	15	12	7	4	0
ECV - Ocean, Physical: Subsurface Temperature	3	8	2	2	0	3	18	16	11	4	0
ECV - Ocean, Biogeochemical: Inorganic Carbon	1	9	0	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Nitrous Oxide	0	0	0	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Nutrients	2	5	1	0	0	0	0	0	0	0	0
ECV - Ocean, Biogeochemical: Ocean Colour	4	0	2	2	0	5	0	0	0	0	0
ECV - Ocean, Biogeochemical: Oxygen	2	4	1	1	0	1	1	2	0	0	0
ECV - Ocean, Biogeochemical: Transient Tracers	0	0	5	5	0	0	0	0	0	0	0
EOV - Biogeochemistry: Particulate Matter	1	1	2	1	0	0	0	0	0	0	0
EOV - Biogeochemistry: Stable Carbon Isotopes	0	0	0	0	0	0	0	0	0	0	0
EOV - Biogeochemistry: Dissolved Organic Carbon	1	0	0	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Phytoplankton Biomass and Diversity	6	3	2	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Zooplankton Biomass and Diversity	1	1	0	0	0	0	1	0	0	0	0
EOV - Biology and Ecosystems: Fish Abundance and Distribution	2	0	1	0	0	0	1	0	0	0	0
EOV - Biology and Ecosystems: Microbe Biomass and Diversity (*emerging)	1	0	0	0	0	0	0	0	0	0	0
EOV - Biology and Ecosystems: Invertebrate Abundance and Distribution (*emerging)	0	0	1	0	0	0	0	0	0	0	0
EOV - Cross-Disciplinary: Ocean Sound	2	2	1	0	0	0	0	0	0	0	0
	28	18	16	11	4	10	6	4	3	3	2
PERCENTUALE ECV/EOV/EBV	80%	51%	46%	31%	11%	29%	17%	11%	9%	9%	6%

In verde le nuove EOV coperte da ITINERIS

ITINERIS amplierà anche la sensoristica per EOV già presenti

ITINERIS potenzierà la componente osservativa mobile

Objective 1 - Integration and harmonization of Marine Domain RIs towards IOOS - Italian Integrated Ocean Observing System

Deliverables

D5.1 Marine Data Centre Management Plan: management needs, service requirements, governance for the distributed and federated system (Activity 5.3; B3; OGS_OCE – Contributions from: **ISMAR Venezia and Napoli**, INGV, INFN, ISPRA, CNR-ISP)

D5.2 Report on Marine Data Store planning with data flows and connection standards for the distributed and federated system interfaced with ITINERIS central hub (Activity 5.2; B3; CNR-ISMAR-Napoli)

D5.3 Report on gap analysis of the national marine facilities and equipment and access procedures (Activity 5.1; B4; **CNR-ISMAR-Venezia** – Contributions from: INGV, CNR-IAS, INFN, ISPRA, OGS))

D5.4 Report on gaps identification in data acquisition of the Arctic region. Definition of the new architecture of SIOS infrastructure; procedures for implementation of the observatory platforms (Activity 5.14; B4; CNR-ISP-ME)

D5.6 Report on the design of the Italian Integrated Ocean Observing System (IOOS) based on gap analysis and governance (Activity 5.1; **B6; CNR-ISMAR- Venezia** – Contributions from: OGS, INGV, INFN, ISPRA)

D5.10 Report on desktop study for cable provision (Activity 5.5; B9; INGV-WIS)

Objective 2: Fill the gaps in biological and ecosystem observations
Contributing RIs: Euro-Argo, DANUBIUS, JERICO, eLTER, SIOS

The aim is to **fill the crucial data gaps in EOVs and EBVs observations** in order to ensure monitoring of biochemistry, biological and ecosystem EOVs measurements as national contributions to EOOS, GOOS and GEO BON.

How:

- Exploiting **new automated technologies** to acquire biological data
- Acquire **new technologically advanced sensors** and **install on autonomous platforms, marine observational sites** and **systems** and remote sites to address the digital revolution (e.g. **smart observatories, Argo floats, gliders, drifters**)
- Reduces the existing gap of EOVs data from instruments moored **in deep waters** (e.g. **cabled observatory**)
- Make available **NRT biological data** through **the IOOS Marine Data Store** interfaced with the ITINERIS HUB.

Objective 3 - Expand capability of NRT ship-based ocean observations
Contributing RIs: EUROFLEETS, Laura Bassi

The aim is to expand the Italian capacity to acquire and make available in near real time (NRT) physical, biogeochemical and geological ocean variables providing highest accuracy measurements obtainable only with research ships.

How:

- **Design the Italian contribution** to the international **research fleets** effort **on full-depth, NRT continuous measurements from coast-to-coast ;**
- **Acquisition G installation of autonomous systems** on board of Italian research ships: Laura Bassi C Gaia Blu;
- **Development of systems for NRT data quality control and data transmission from RV to the IOOS Marine Data Store;**
- Definition of the procedures for **data policy and access to fleets NRT observations;**
- **Adaptation of the procedures in order to guarantee FAIR data release.**

Objective 4: Develop Pilot services to tackle overarching marine issues
Contributing RIs: All

The aim is **to demonstrate the impact of the integration and harmonization of** data and facilities from different RIs by **developing five pilot services** to tackle **overarching marine issues and to respond** to key stakeholder requirements.

How:

Evaluate the impact of improved data availability **on modelling data assimilation and evaluation of model prediction**

- Develop **prototype services** for monitoring the **coastal marine environment** in support to Marine Strategy Framework Directive and Water Framework directive;
- **Prototype services integrating Eulerian and Lagrangian measurements** to **improve the representation of open sea environments**
- Identification of **new marine protected areas** for the implementation of EU Biodiversity Strategy 2030
- Impact of improved data availability **on data-driven models to describe the 4D ocean state**

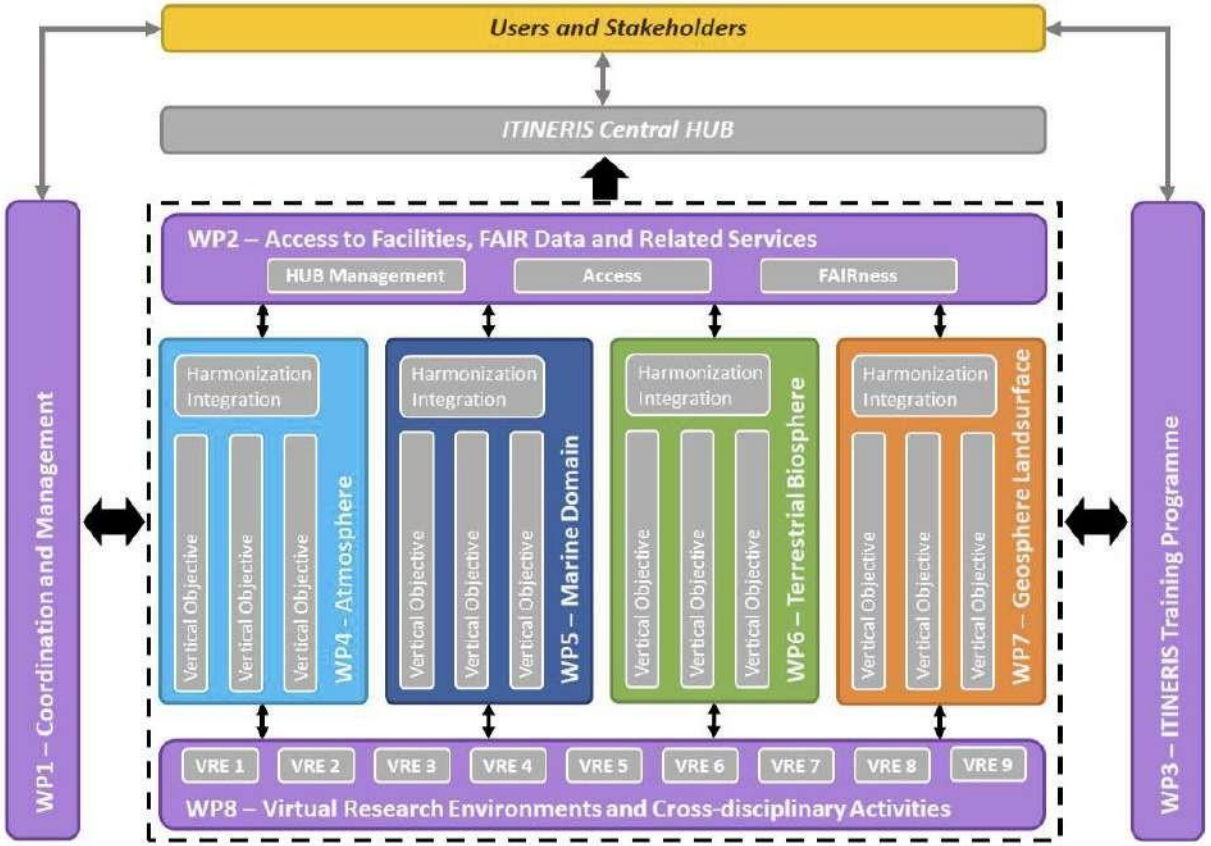
WP5: Most relevant expected outcomes

- **Implementation of the Italian Integrated Ocean Observing System (already existing in other Countries)**
- **Address the challenge to structure the Italian National Ocean Data Center (IOOS-NODC) as a distributed system, strengthening the role played by Italy in the European framework.**
- Contribute to GOOS C EOOS and G7/FSOI
- Address the challenges of Ocean Decade and contribute to the implementation of the Agenda 2030.
- **RIs data and services harmonized and integrated, data gaps in biological and ecosystem observations filled and NRT data and products available to the research community as well as to stakeholders.**
- New technologically advanced sensors acquired and installed on autonomous platforms, marine observational sites and systems and remote sites to address the digital revolution
- Installation of underway and/or continuous acquisition systems and real time data transmissions of data on board the Italian Research Vessels and contribute to international program (eg GO-SHIP)
- **Many WP5 core actions are based on the Southern Italian regions, increasing the infrastructural potential and leverage on their capacity building and development**
- WP5 will invest also in new generations of scientists and engineering and project managers to allow the full operativity of the IOOS, with a focus on the South.

International Impact

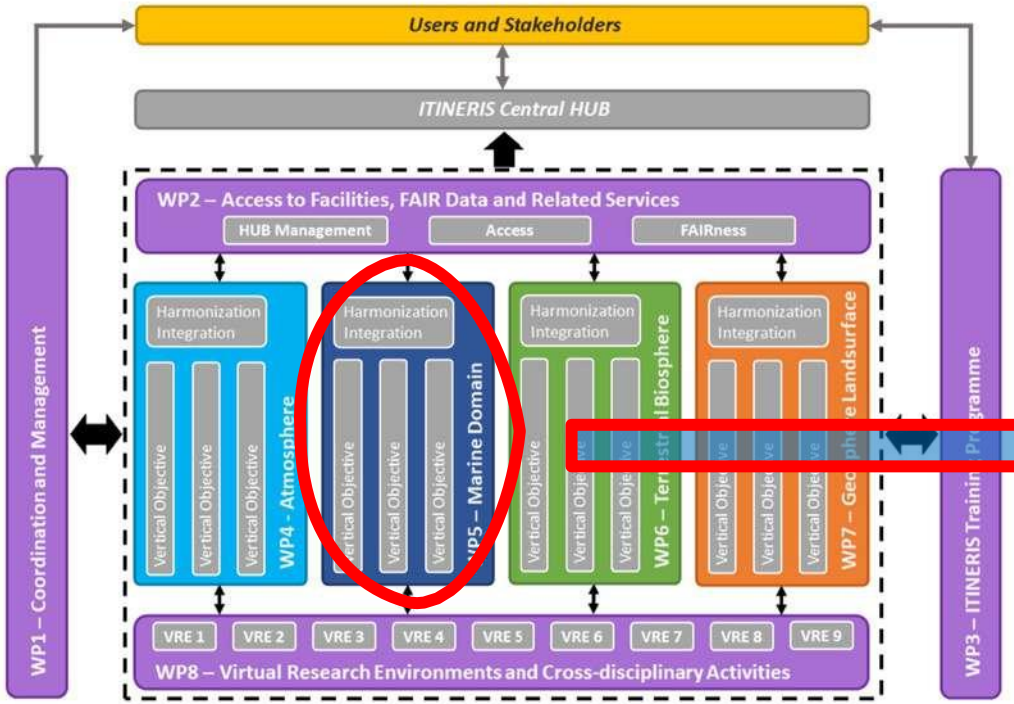
- ESFRI-European Strategy Forum on Research Infrastructures
- Copernicus Marine Service
- Copernicus Climate Change
- Copernicus Coastal HUB
- EMODNET – European Marine Observational and Data Network
- EU Mission: Restore our Ocean and Waters
- EU Partnership for the Blue Economy
- EU Horizon Europe
- GOOS – The Global Observing System
- GEO-GEOSS Group on Earth Observation / System of Systems
- ESA – European Space Agency
- EUMETSAT - European Organisation for the Exploitation of Meteorological Satellites
- EOSC -European Open Science Cloud
- ENVRI – Community

BUDGET CNR-ISMAR



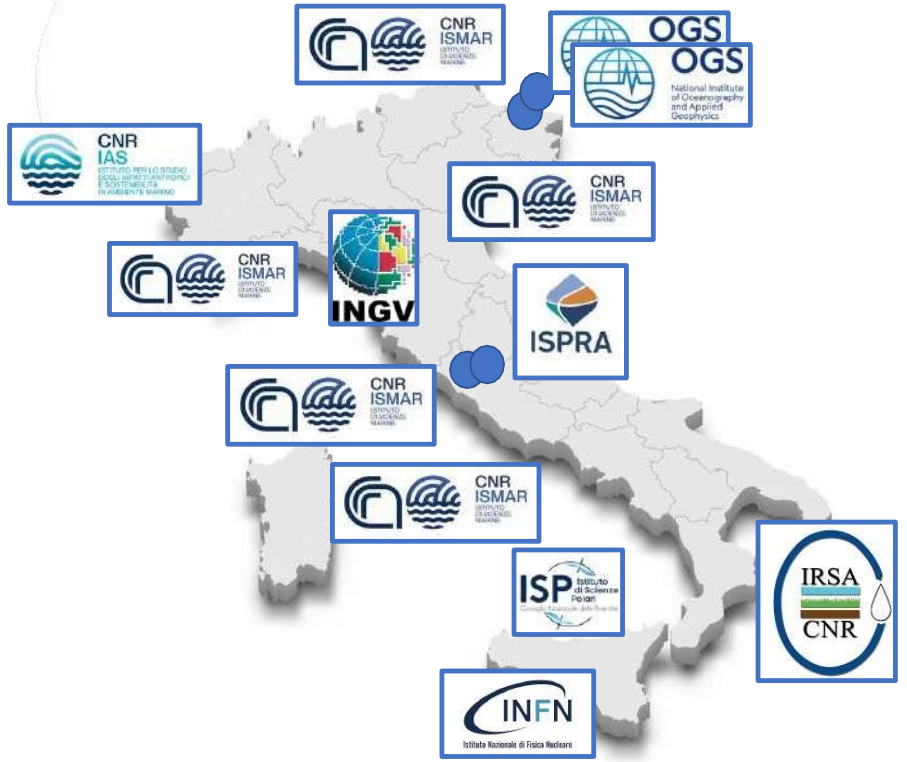
- **Finanziamento totale :** 25.567.890 €
- **KO:** 1 November 2022 – **Duration**: 30 months
- **WP3** : 133.750 €
- **WP4** : 608.102 €
- **WP5** : 21.093.874 €
- **WP6** : 1.640.895 € **(ISMAR 940.06€ IRSA700.831€)**
- **WP7** : 1.219.800 €
- **WP8** : 871.468 €

Deliverable 5.2: The Marine Data Store between ITINERIS HUB and WP5 RI's



WP5: Participants in the WP

CNR-ISMAR-Venezia
CNR-ISMAR-Bologna
CNR-ISMAR-Lerici
CNR-ISMAR-Roma
CNR-ISMAR-Napoli
CNR-IAS-Genova
CNR-IRSA-Taranto
CNR-ISP-Messina
OGS_OCE-Trieste
OGS_CGN-Trieste
INGV-BO -Bologna
INGV-WIS - Catania
INFN-LNS -Catania
ISPRA – Roma



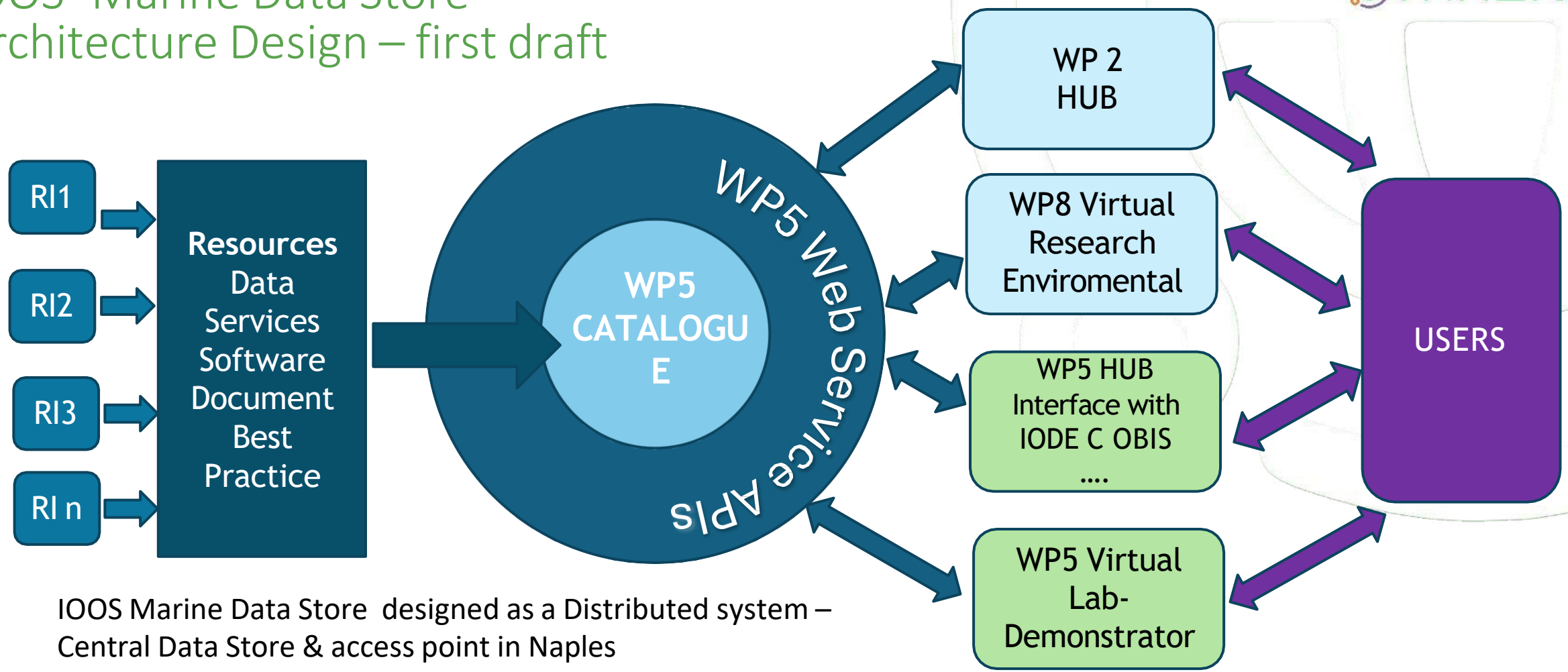
… WP8 (VRE) …

WP 5 ITINERIS
MARINE DOMAIN

D5.2 Report on Marine Data Store planning with data flows and connection standards for the distributed and federated system interfaced with ITINERIS central hub

ITINERIS
Italian Integrated Environmental Research Infrastructures System

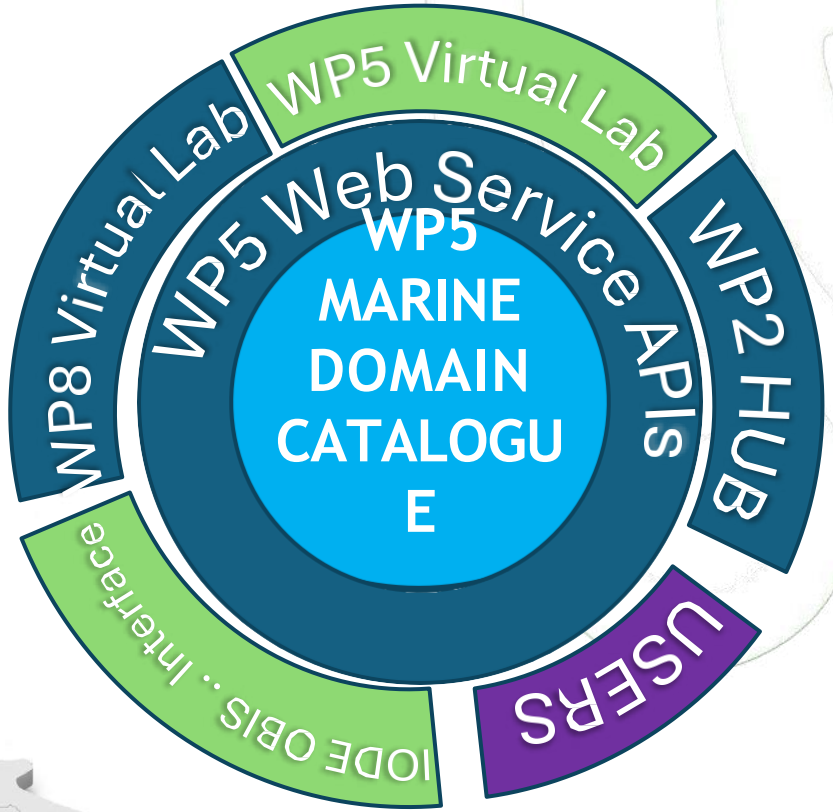
IOOS- Marine Data Store Architecture Design – first draft



IOOS Marine Data Store designed as a Distributed system – Central Data Store & access point in Naples

IOOS MDS will offer the facilities make the data available, access to processing & Store the data

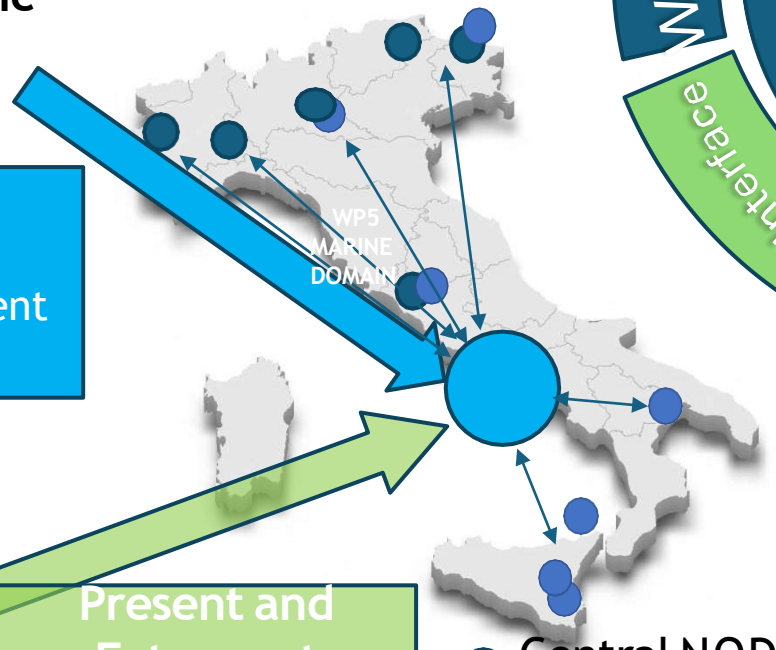
Possibility to store also other marine data in addition to ITINERIS



USERS Data Access based on **FAIR** principless

F indable
A ccessible
I interoperable
R eusable

Resources
Data Services
Software Document
Best Practice

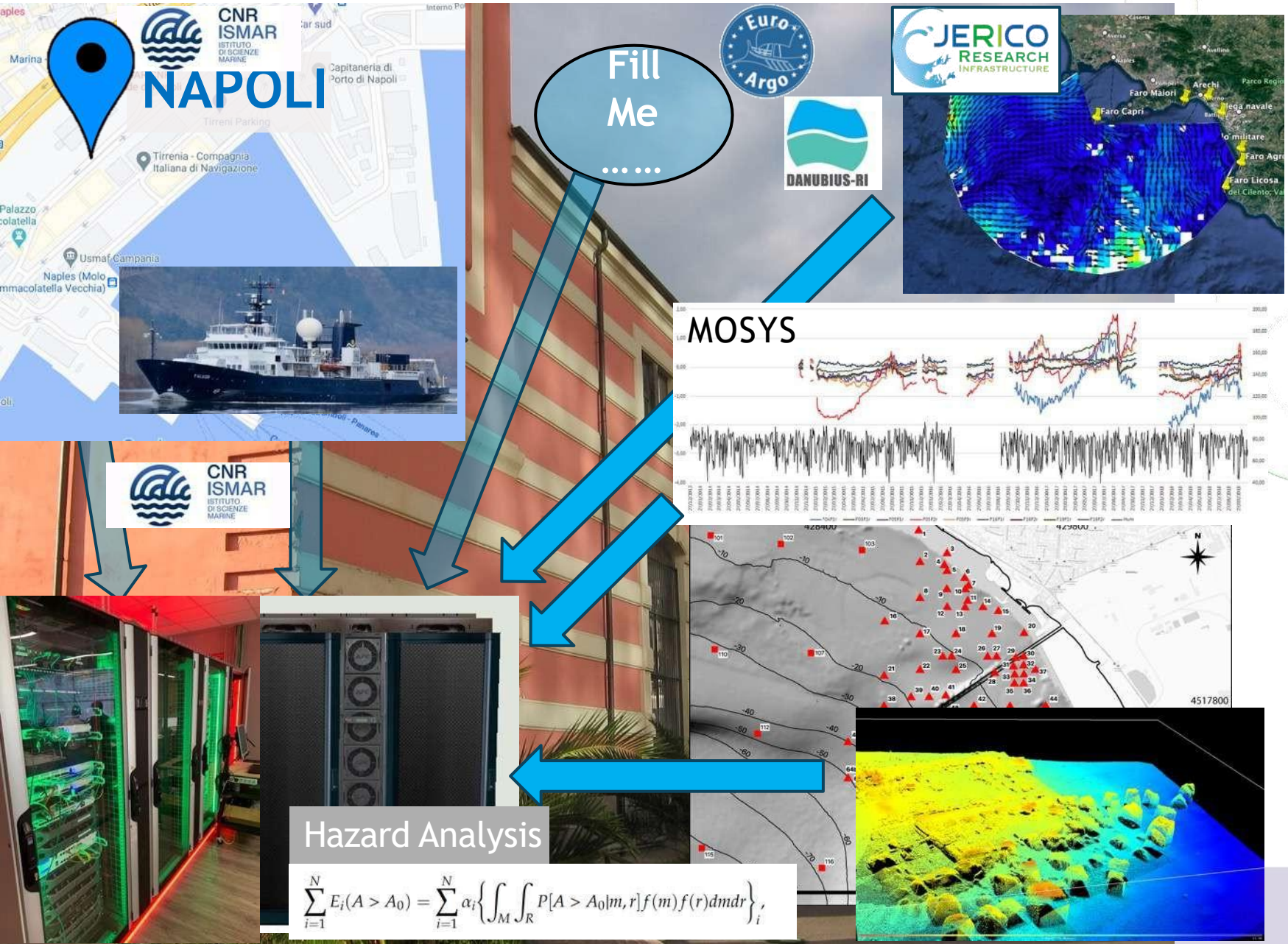


Present and Future not ITINERIS Data

- Central NODE
- Distribuited Resources

IOOS- Marine Data Store Architecture Design – first draft

IOOS MDS will offer the facilities make the data available, access to processing C Store the data



The NATIONAL CENTRAL NODE for CNR - ISMAR Marine Data

Store and manage data is NOT (only) a service to share.
It is the possibility learn and apply new meth. to BIG- heterogeneus –DATA

Portal/Service:
512 CPU
14 Tb RAM
40 Tb VM-Storage (SAN)

Ai (Wp.5.21):
8 GPU NVIDIA H100
2 Tb RAM
50 Tb Storage

Storage:
1.5 Pb on-line (NAS)
3.0 Pb off-line (Type library)

Deliverable 5.2 Report on Marine Data Store planning with data flows and connection standards for the distributed and federated system interfaced with ITINERIS central hub

Responsible CNR-ISMAR-Napoli, Activity 5.2; B3;

- Connection with WP2 ITINERIS central HUB
- Connection with partners and RI's data flows and connection standards definitions
- Connection with WP8 Virtual Research Enviromental
- "Relationship" with external stakeholder (SeaDataNET, EMODNET, IODE, …)

The RIs involved in D5.2 are DANUBIUS-RI, eLTER-RI, EMSO-ERIC, ICOS-ERIC, JERICO-RI, Euro-Argo ERIC, LNS, GeoSciences (and DISSCO from WP6, …)

WP5 and the Marine Data Store Central Hub

- **Implement of a single marine data collector**
  - Integrating and cooperating with the global collector of the ITINERIS project (WP2 – ITINERIS HUB)

- **Become the Italian reference point for RIs and Ocean Data**
  - easy, fast and open access to research and data acquired through the 11 RIs dealing with the marine sphere and including existing data/metadata products.

- **Implement the Italian Integrated Ocean Observing System** (IOOS)
  - contribute to the European and International efforts on ocean observations (EOOS and GOOS), responding to the major challenges of the Ocean Decade and for the Mediterranean Sea.

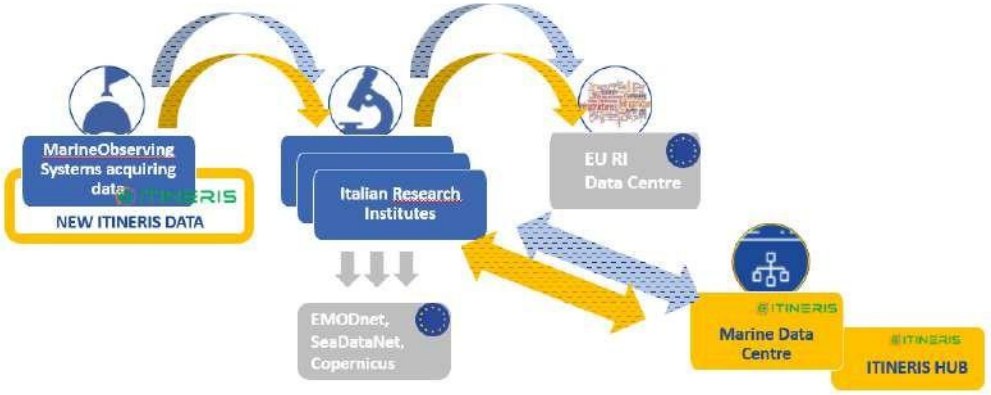
This objective will be realized by close “collaboration” between WP5 RIs and WP2/WP8, as well as with other stakeholders (COI, IODE, OBIS, EMODNET, SeaDataNet, …).

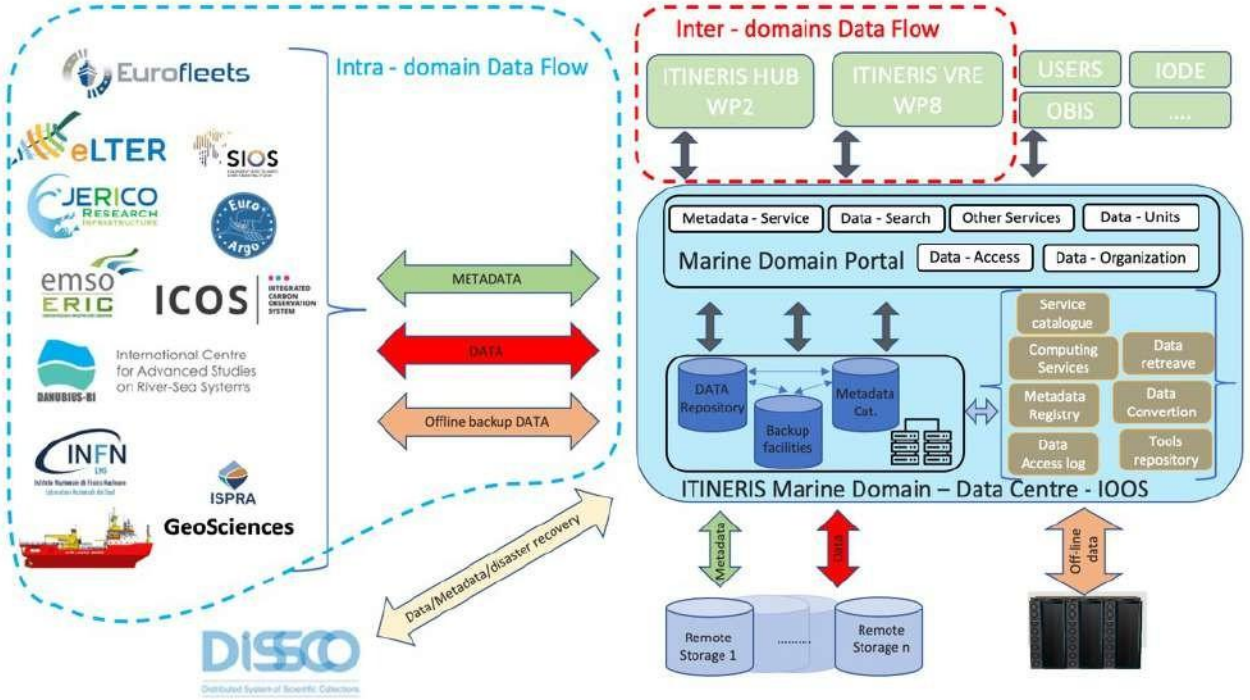
This will be done by establishing all necessary technical mechanisms to link resources and collaborative mechanisms for alignment and agreement on specifications and standards.

- The access portal to the data/metadata collected by the RIs involved;
- Considerable computing capacity and storage space, to guarantees efficient, stable, and secure services and storage, with redundancy;
- Providing the possibility of a security copy of the data with the possibility of long-term off-line copy for data;
- Provide access and interchange of data/metadata with other WPs of the project and with other infrastructures (IODE, COI, ...);
- Specific services and APIs to connect and exchange data/metadata (RIs – WP –Stakeholder - …);

The Data centre in Naples will be one of the distributed

Data and Metadata “possible” scenarios:

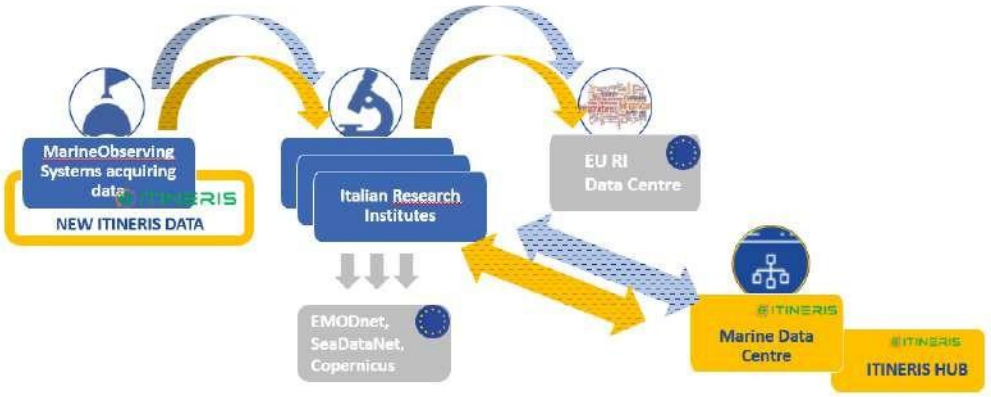


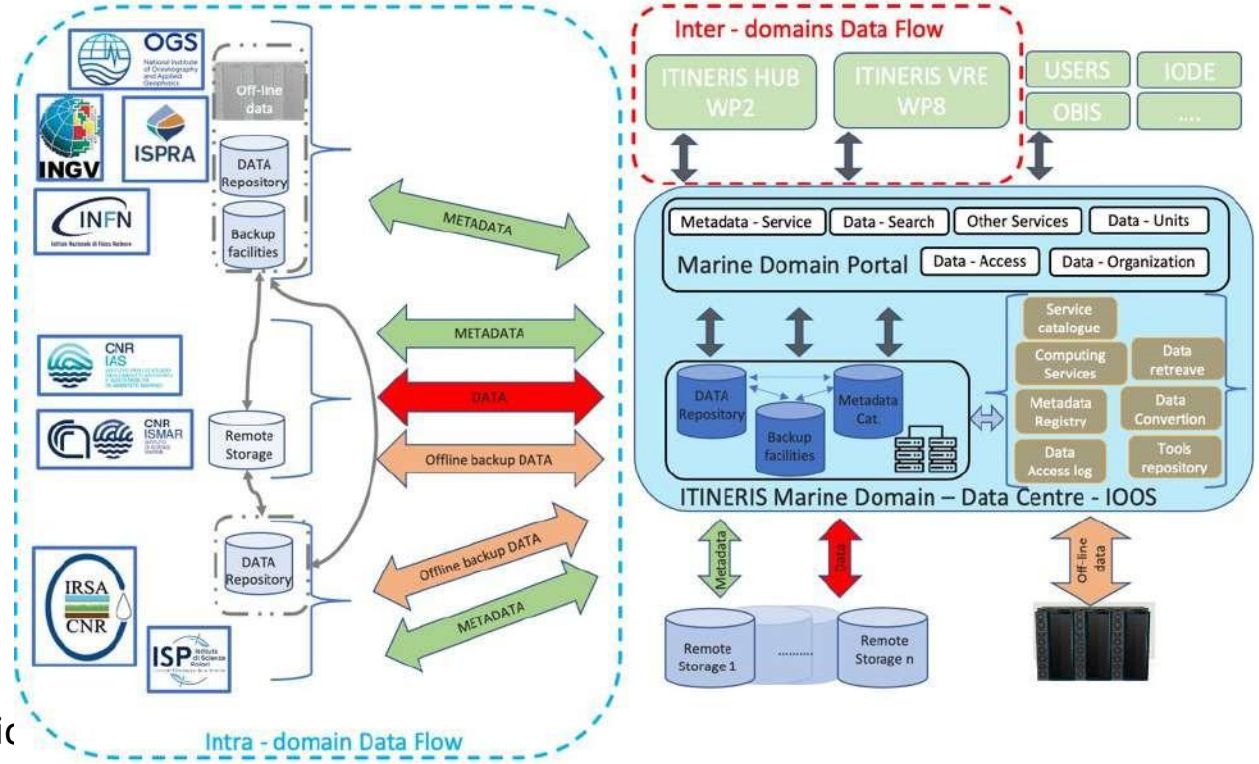


The first scenario provides that all the RIs/Partners involved in the Marine Domain (Intra-domain) exchange a copy of the data and metadata with the Marine Data Centre and then the Marine Domain takes care of the off-line backup copy of the RIs/Partners data. This is the "trivial" solution in which the search, organization, use of data for analysis is simplified and centralised …

WITH A DISTRIBUITED AND FEDERETED REDUNDANT SUPPORT INFRASTRUCTURE

Data and Metadata “possible” scenarios:



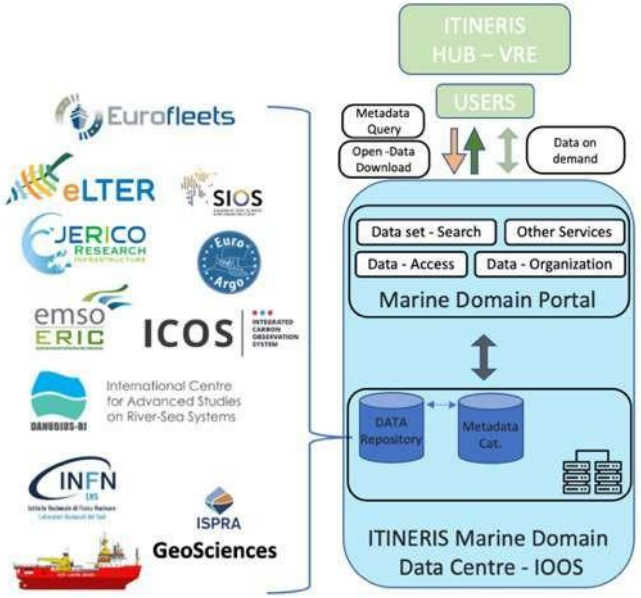


In this case, instead of the 11 RIs, the 5 different research institutic

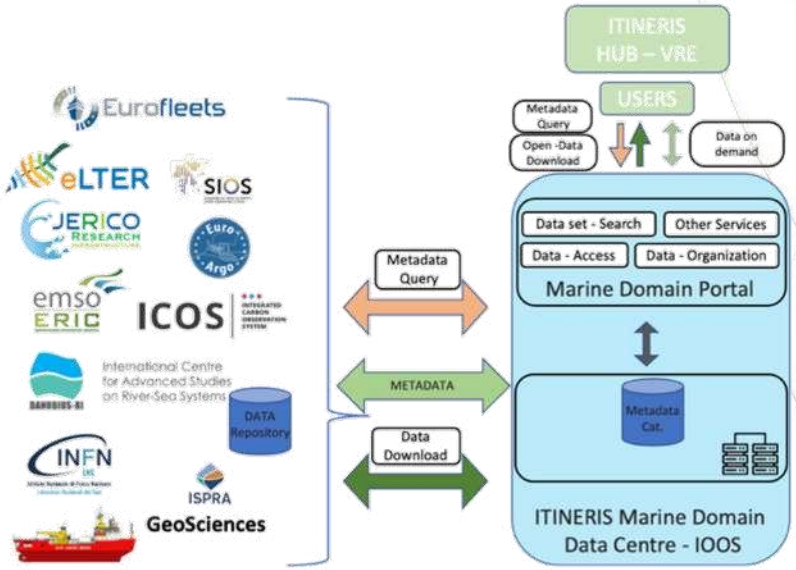
In this configuration, while all partners send the metadata to the data centre following the guidelines developed provided by the Marine Domains, only a few also send the data and make use of the possibility of off-line copying of the data.

All partners also provide access to a local copy (or EU RI Data Centre/EU Repository) of the data and possibly also to the off-line one, connecting all these systems with each other and with the data centre.

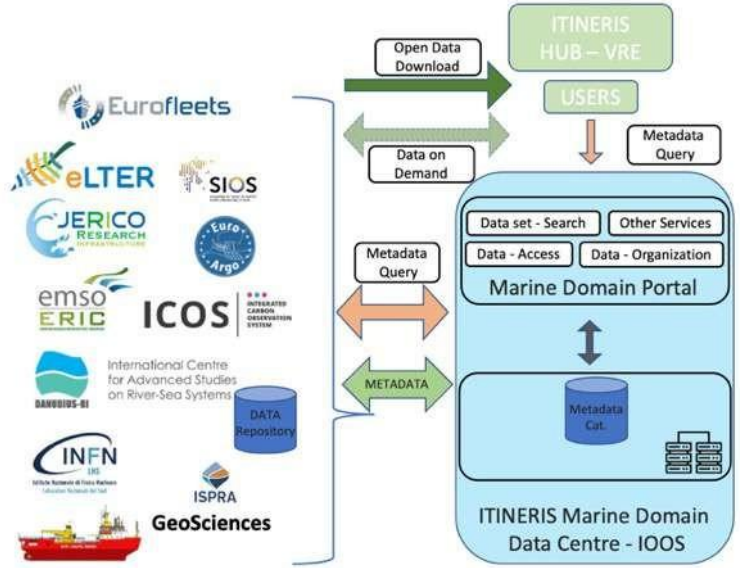
Data and Metadata “possible” data flow:



Simplest and quickest situation for the system to respond. The Data Centre receive a query on the portal, and the system makes the requested data available for download.



The Data Centre receive a query on the portal, and the system makes the requested data available for download after retrieval from external repositories.



The Data Centre receive a query on the portal, and the system provides link to external data repository.

The Marine Portal is the proxy the the data link.

The Marine Portal/External Repository guarantee the ITINERIS tag on required data

Data and Metadata situation

RIs National Infrastructures: not all RIs replicate at national level the general structure defined at international level, in terms of access portals, data management plans, data storage strategies, code/software repositories and/or guidelines.

- Difficulties to adopt a geographically widespread and federated approach at RIs level for the management, storage and dissemination of the data produced by individual RIs.

- Difficulty to adopt a strategy at the level of the partners, who manage the RIs, thus making it necessary and desirable to define shared strategies at national level to guarantee the correct data workflow and availability over time and secure storage.

Data and Metadata situation

Common Vocabularies: to facilitate data interoperability within the same hub: A fair degree of uniformity among the different RIs of the marine domain is found in the use of a shared vocabulary SeaDataNet

Data formats: to standardize the marine domain: the prevailing trend is to provide the same data in different formats. This solution makes it possible to diversify the output format for the end user without necessarily duplicating the stored data.

Licensing: almost all of the RIs in the marine domain adopt a CC-BY 4.0 data license (to be harmonising with ITINERIS licensing).

Unique data identification: The RIs use an unique PId, although there is some disparity as to type.

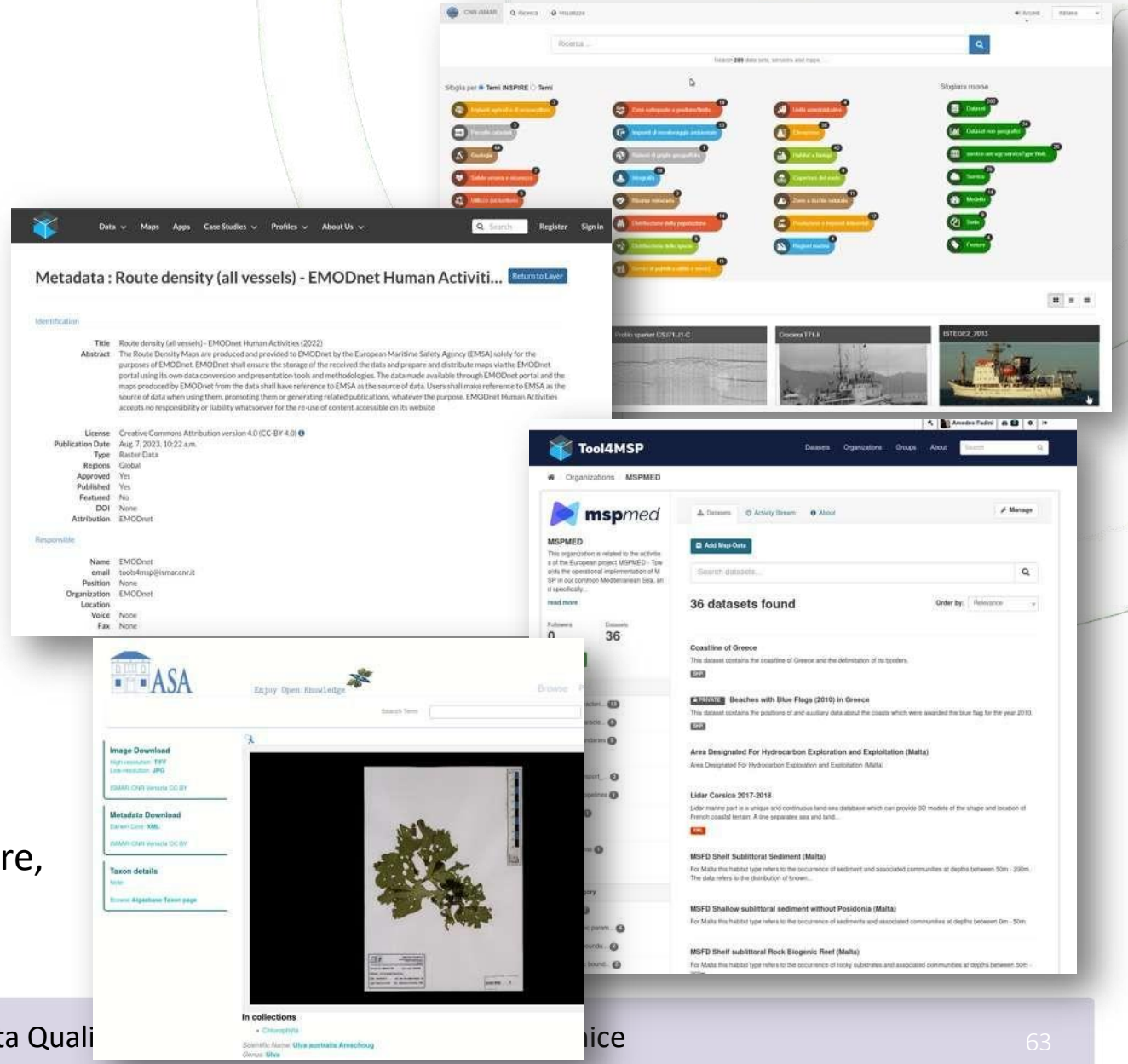
HOWEVER: a distributed and federated infrastructure, as has been designed, guarantee high efficiency in terms of data/metadata security, efficiency in its dissemination and interoperability, and the necessary computing and storage resources for current and future long-term data.

Metadata Catalogues - the CNR-ISMAR example

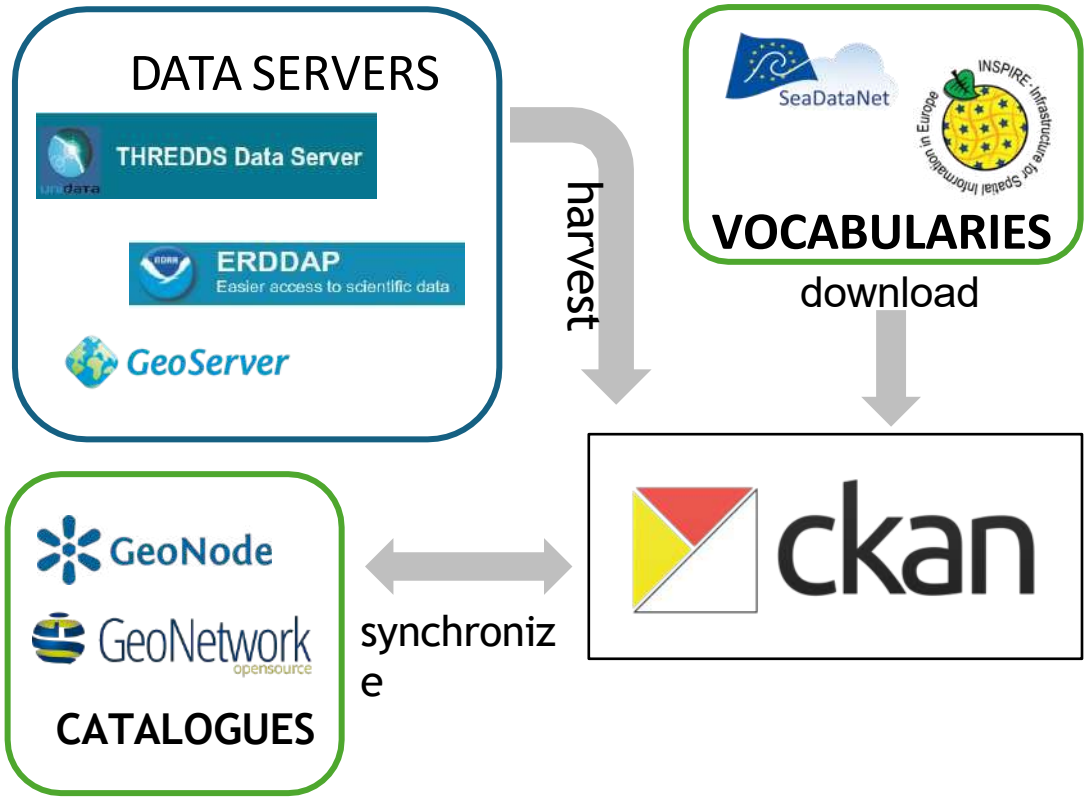
Online metadata portals:

- Geonetwork (Marine Spatial Metadata ISMAR/ISP)
- Geonode(Tools4msp, Cigno, Atlante della Laguna)
- CKAN (MSP Catalogue)
- Isladora/Drupal (Archivio Studi Adriatici)

All of them provide machine readable metadata trough API, JSON or XML standard formats (ISO 19115/19119, Dublin core, Darwin core)

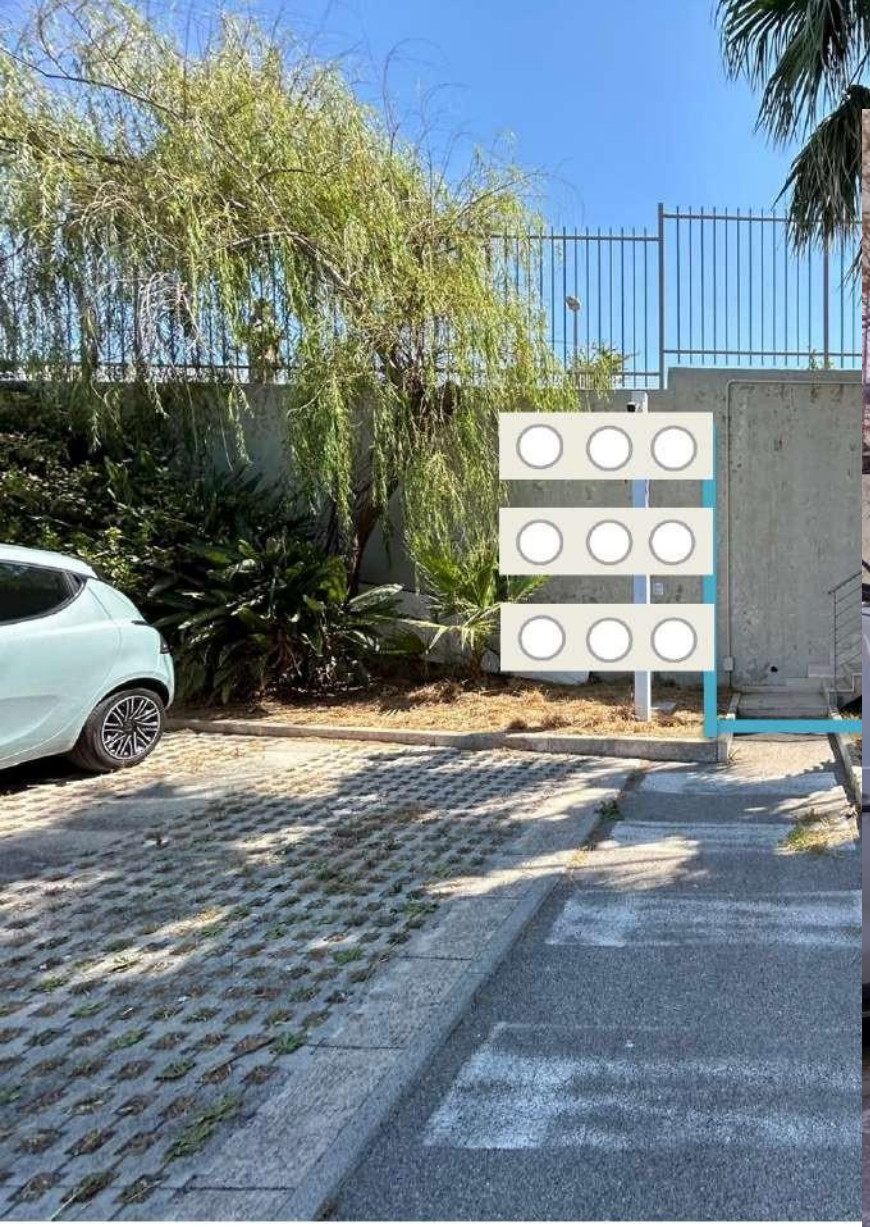


CKAN functionalities

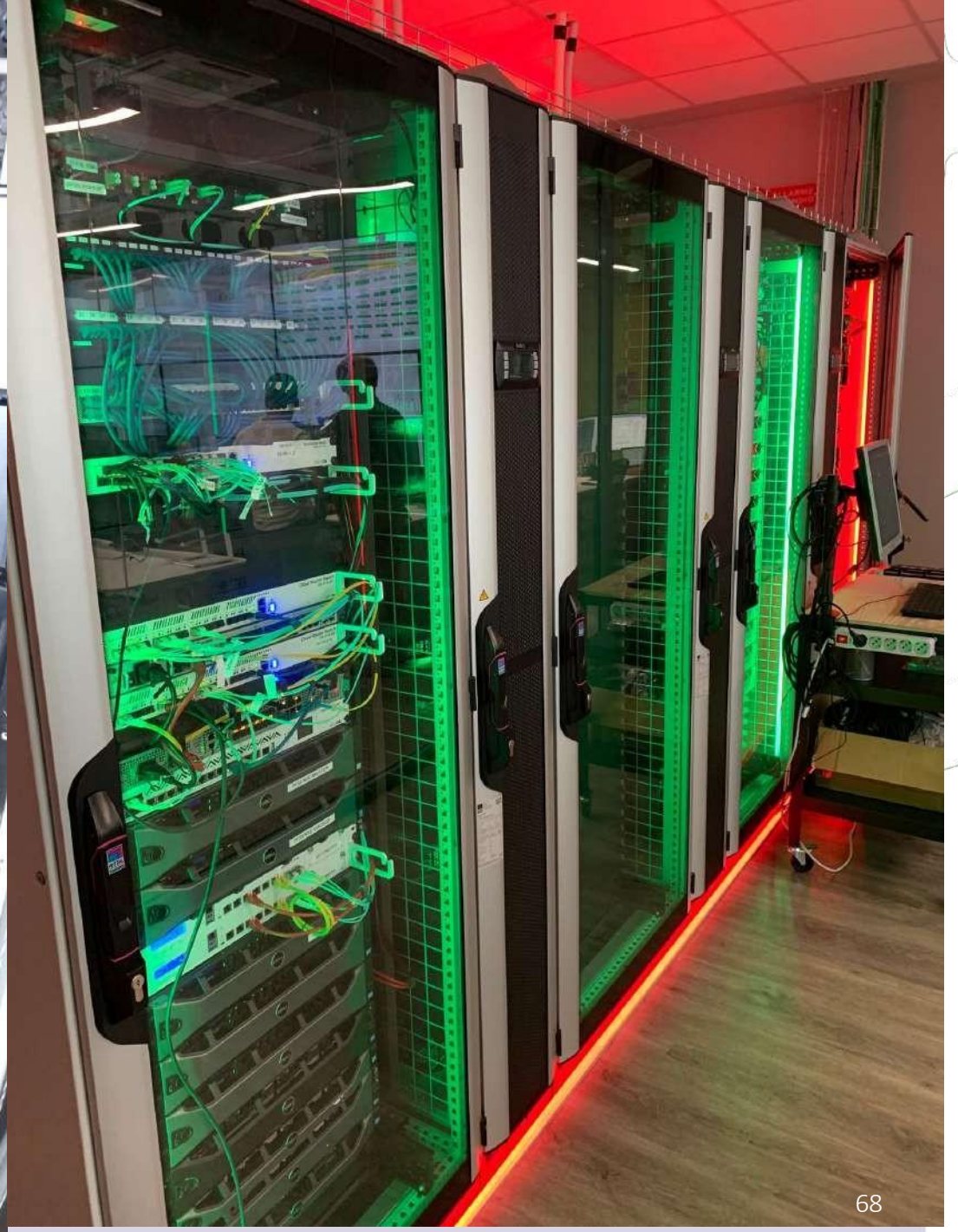


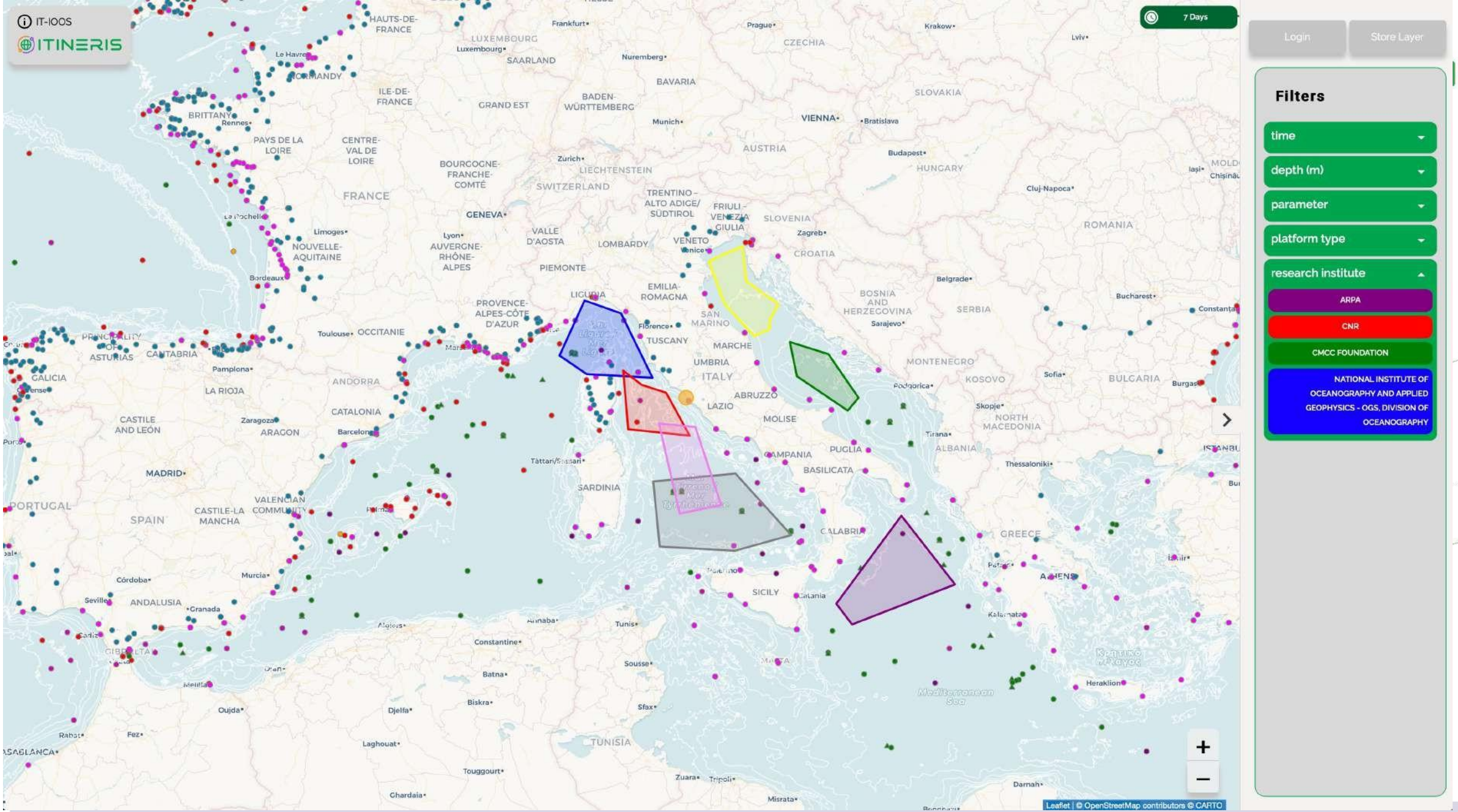
https://ckan.org/

- Support custom fields in schema
- Guided compilation
- Multiple organizations
- Multiple resources links for each dataset
- Spatial extension available
- Ready to use harvesting extensions (e.g. geonetwork)
- Python based, easy to extend to implement vocabularies (tested with MSP data framework)




DELL
PowerStore
DELL
DELL EMC
PowerVault

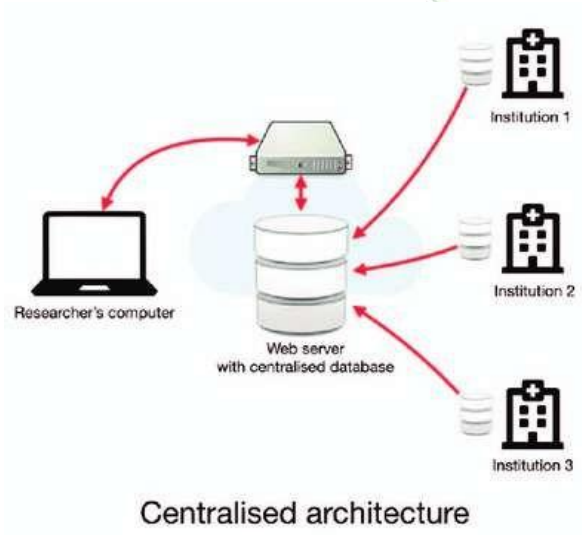



IT-IOOS
ITINERIS
7 Days
Login
Store Layer
Filters
time
depth (m)
parameter
platform type
research institute
ARPA
CNR
CMCC FOUNDATION
NATIONAL INSTITUTE OF OCEANOGRAPHY AND APPLIED GEOPHYSICS - OGS, DIVISION OF OCEANOGRAPHY
Leaflet | © OpenStreetMap contributors © CARTO

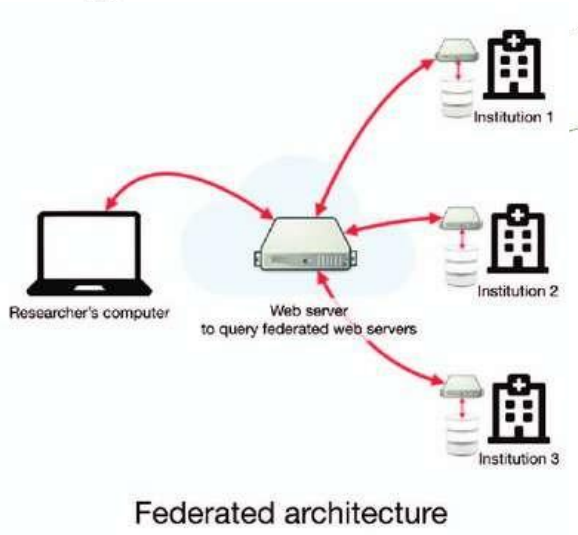
Definitions

- **Centralized system:** physical and logical facilities are managed at once in one single private cloud;
- **Distributed system:** the logical system is a single system but designed to operate using multiple servers in different locations to achieve faulty tolerance and parallel computing
- **Federation of systems:** multiple systems managed by different agents are connected through standard defined API and protocols and they act as a single system

- Cloud based solutions allow to provide **Software as a service** (SaaS) and **data as a service** (DaaS), this means that infrastructure provide resources
- **Service Oriented Architecture** (SOA) define only interfaces between systems and not the internal architecture of components



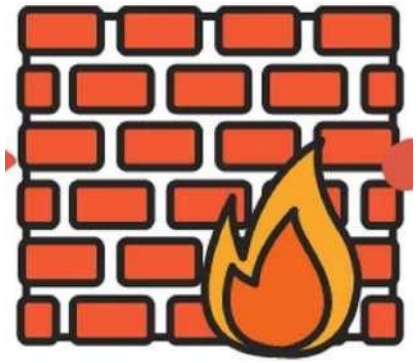
Centralised architecture



Federated architecture

ITINERIS

ITINERIS



ITINERIS

ERDDAP
Easier access to scientific data

ERDDAP

ERDDAP is a data server that gives you a simple, consistent way to download subsets of scientific datasets in common file formats and make graphs and maps. This particular ERDDAP installation has oceanographic data (for example, data from satellites and buoys).

Easier Access to Scientific Data

Our focus is on making it easier for you to get scientific data.

Different scientific communities have developed different types of data servers.

Start Using ERDDAP:
Search for Interesting Datasets

- **Do a Full Text Search for Datasets**

Search

- View a List of All 8 Datasets
- **Search for Datasets by Category**

CNR ISMAR ISTITUTO DI SCIENZE MARINE
ERDDAP
Easier access to scientific data

ERDDAP

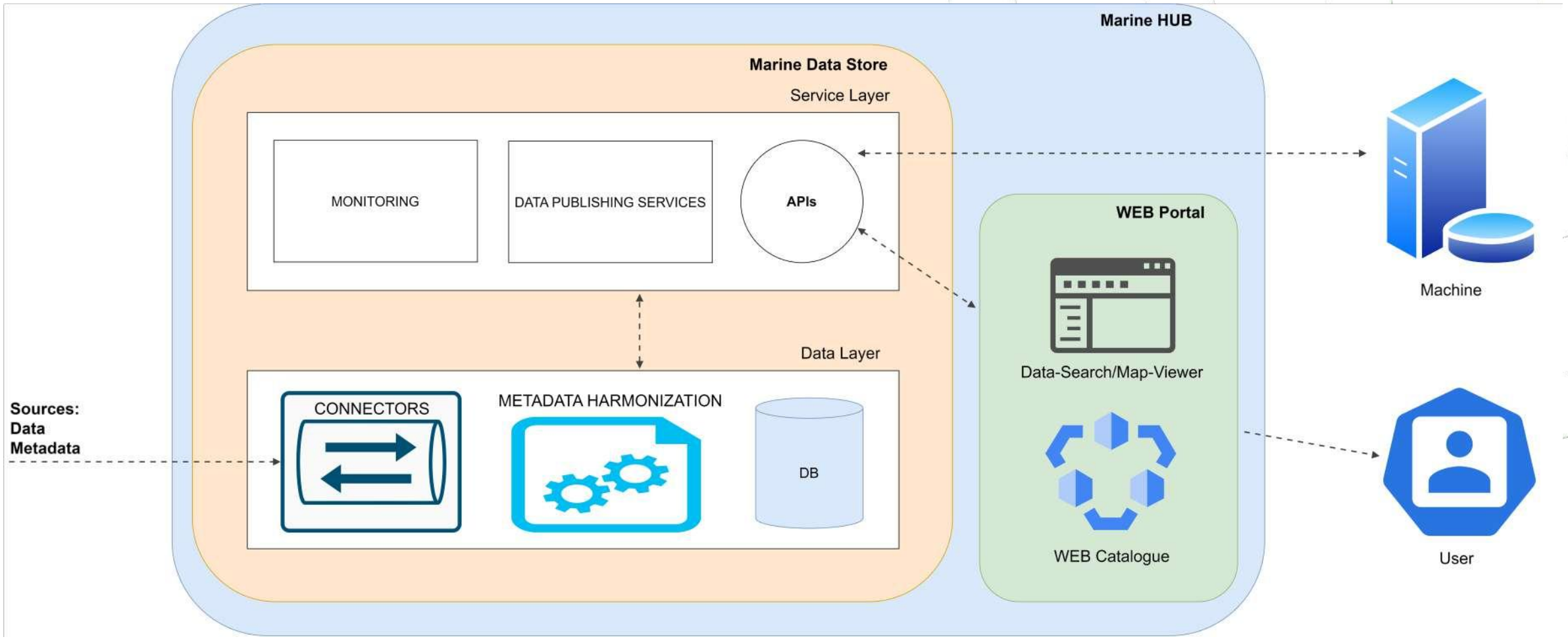
NODC's ERDDAP
Easier access to OGS's data

ERDDAP

INGV OCEANO GROUP BO ERDDAP
Easier access to scientific data

ERDDAP

Marine Data Store - WEB Portal



Metadata Catalogue

- Add proper metadata to each dataset is an essential requirement for a working data infrastructure
- However, since IT-IOOS data are multi-disciplinary, and each discipline uses specific metadata standard, as well as specific controlled vocabularies for annotating metadata records, the WP5 Data Catalogue infrastructure is designed to re-use as much as possible existing metadata, without requiring the original records to be re-created based on the reference standard (namely, DCAT-AP).
- Harvesting procedure will add metadata to the schema where necessary (e.g. label all datasets from a RI endpoint with RI name)

Overall schema

RI datastores
& data servers

Download,
cache or
backup

External
catalogues

WP5 Marine HUB

harvesting

ITINERIS
Catalogue
(WP2)

Metadata
Query

USERS

RI metadata
endpoints

Metadata harvesting,
translation & harmonization

ITINERIS

Thanks for your attention

E' stato comunque un piacere

THANKS! *CIAONEEEEEEEEEEEE!!!!!!*

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-Mission 4 "Education and Research" - Component 2: "From research to business" - Investment 3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures"

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani