EOSC Future Science Project:
Dashboard for the State of the Environment

Tjerk Krijger (MARIS)

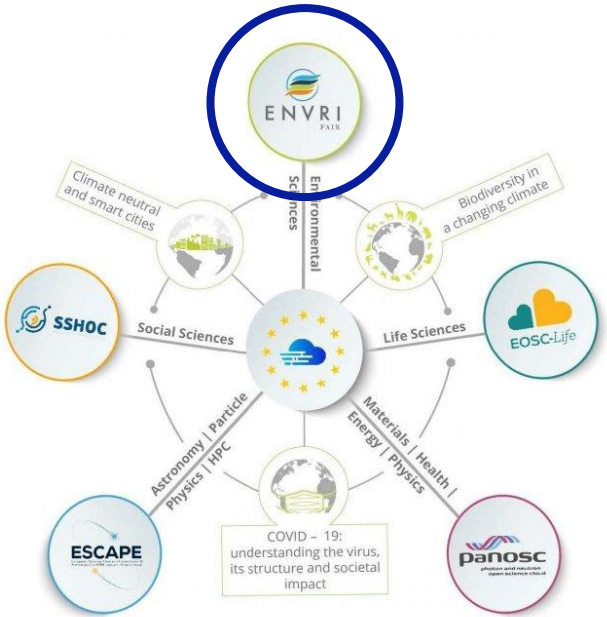
Pan-European digital assets supporting research communities – 5 December, 2022

The EOSC Future project is co-funded by the
European Union Horizon Programme call
INFRAEOSC-03-2020, Grant Agreement 101017536

Science projects EOSC Future

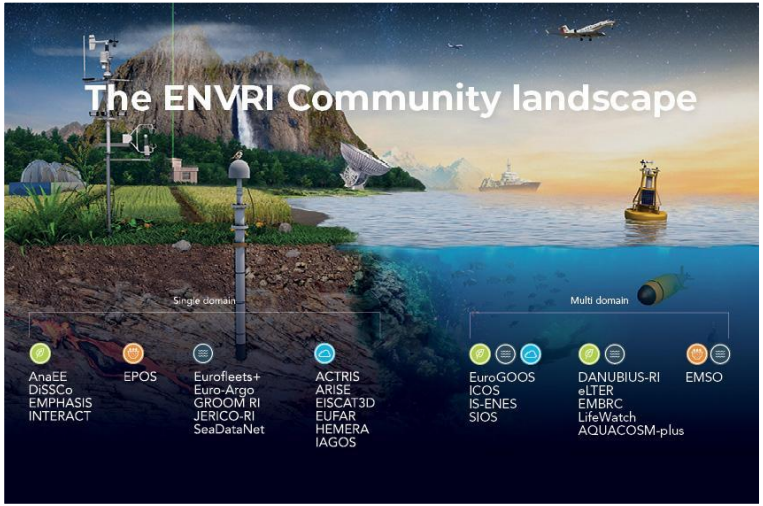
- ESFRI to shape collaboration in five thematic areas
- Bring research communities together in science clusters
- Each science cluster includes two science projects
- Through science projects:
  - Show added value EOSC
  - Supply/demand use side
  - Onboarding/integration of services with EOSC

Science clusters



ENVRI-FAIR Science Cluster

1. **Dashboard state of the Environment**
2. Climate change impact on biodiversity and ecosystems – Invasive species



Environmental Research Infrastructure (ENVRI) community

The Environmental Dashboard

Information on the state of the environment (for public, policy makers)

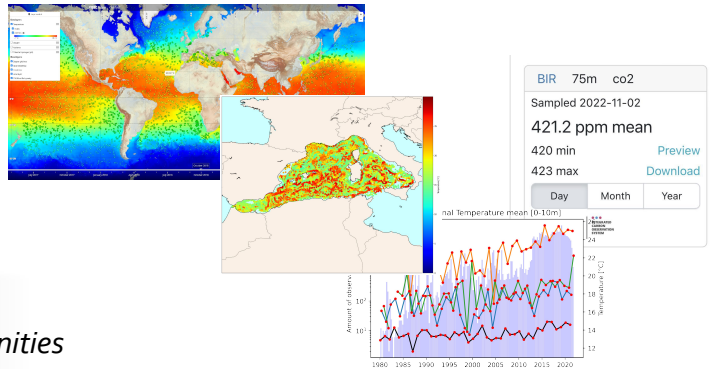
Switchboard to applications to explore data and models (for scientists)

Understand the impacts of a changing climate on biodiversity, atmosphere and oceans

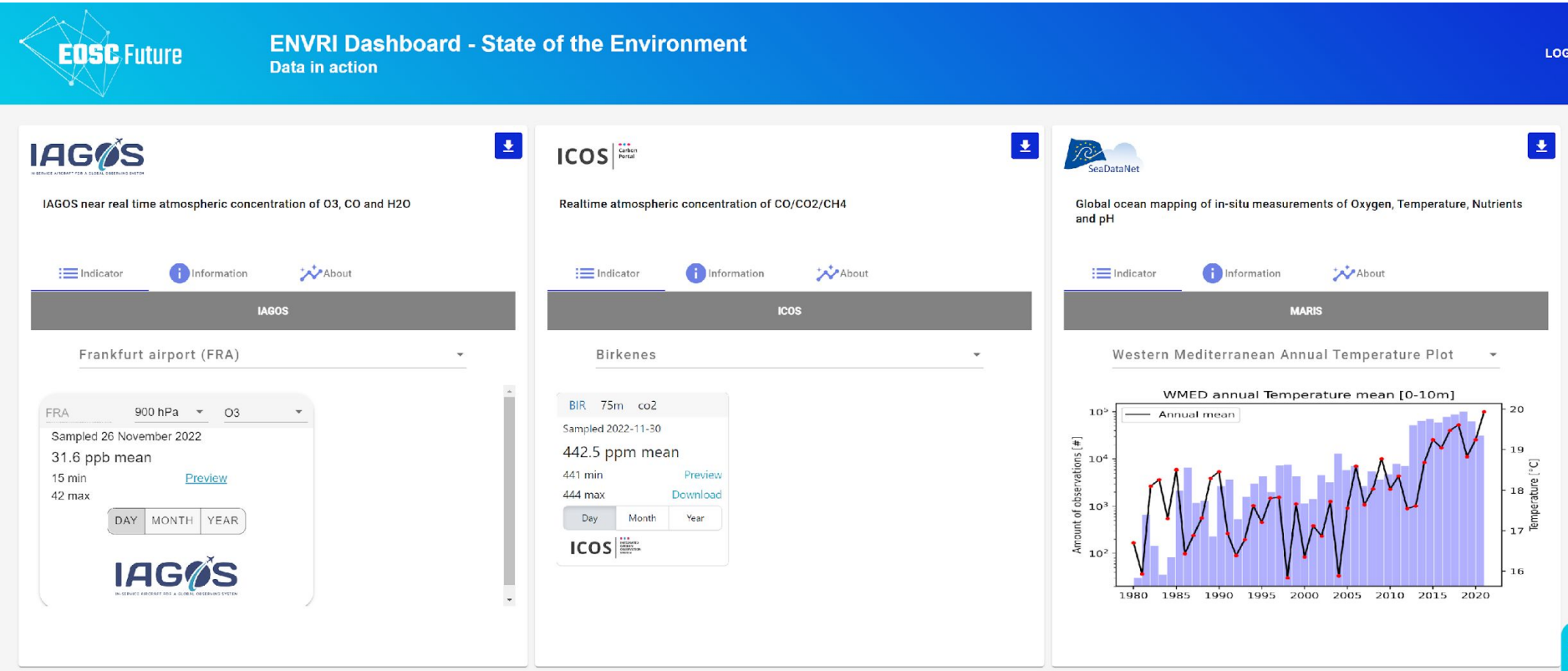
Strengthen the links with the ENVRI communities
Increase visibility of elaborated products provided by scientific communities

Results relevant to **the Sustainable Development Goals** of the UN and the **European Green Deal**

Easily understandable environmental indicators

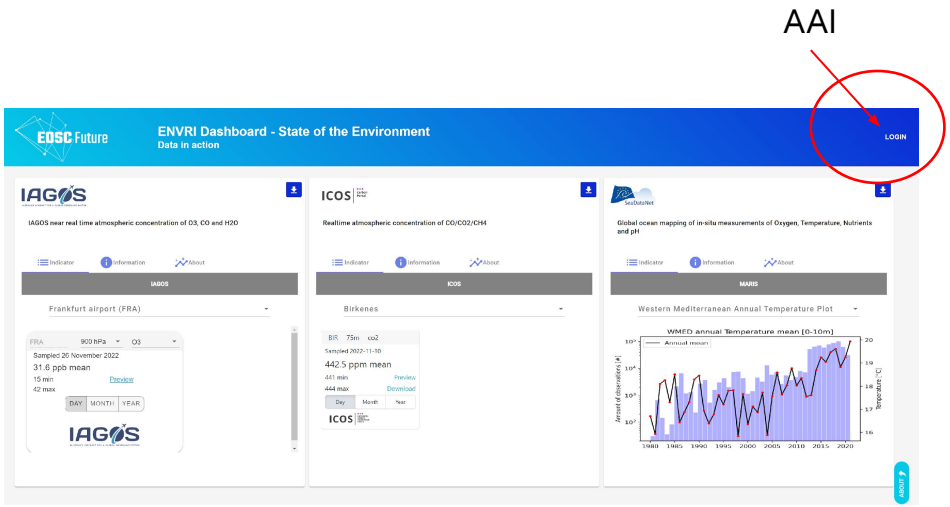


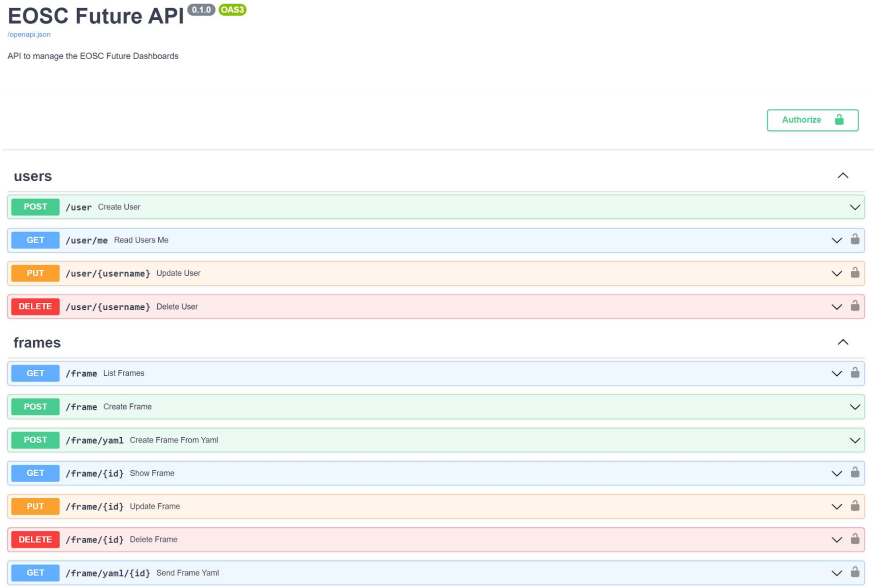
The Environmental Dashboard



The Environmental Dashboard

Frame management:
Add, Create and Upload (Yaml configuration)





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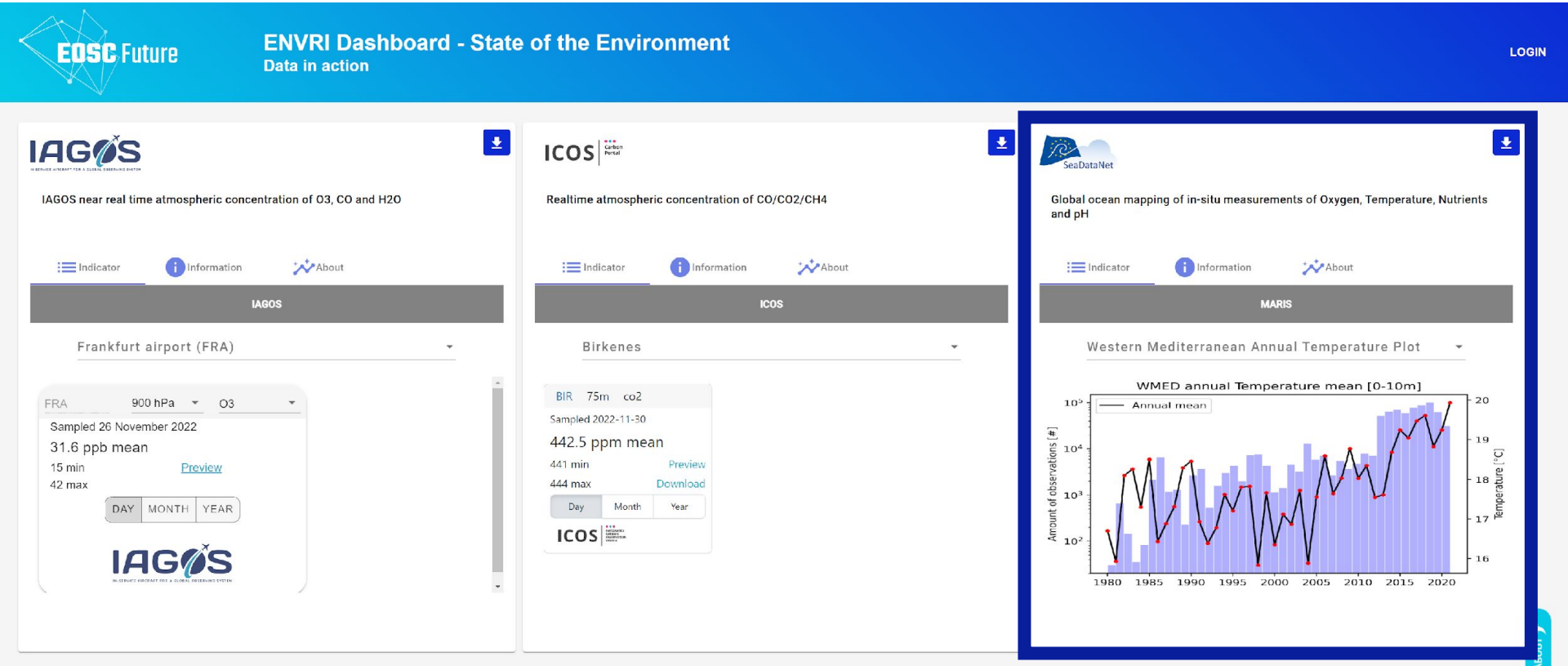
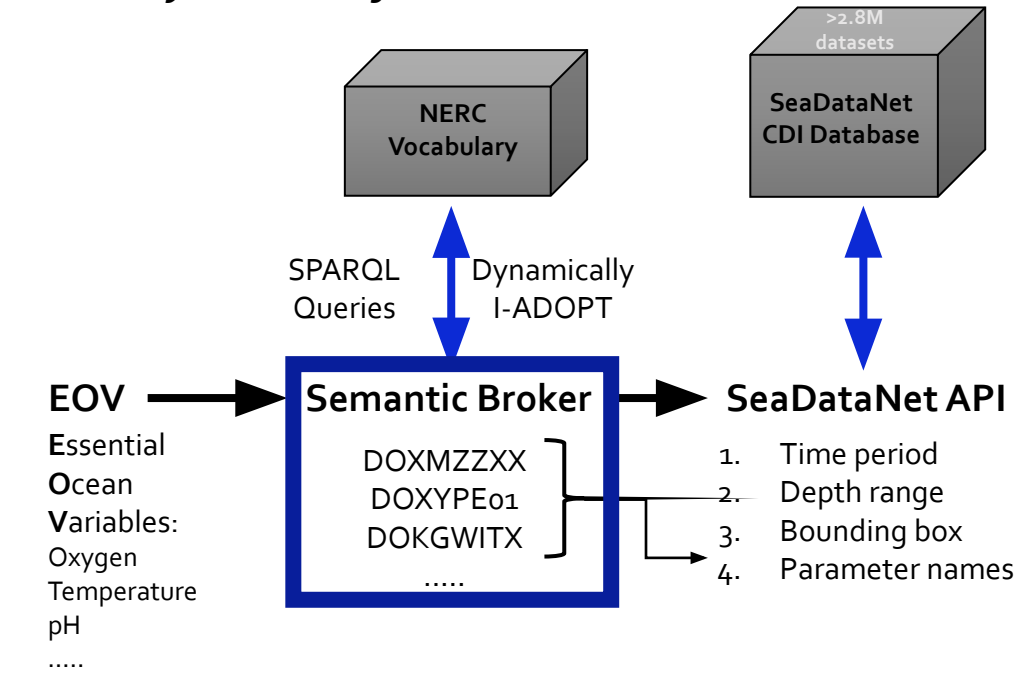
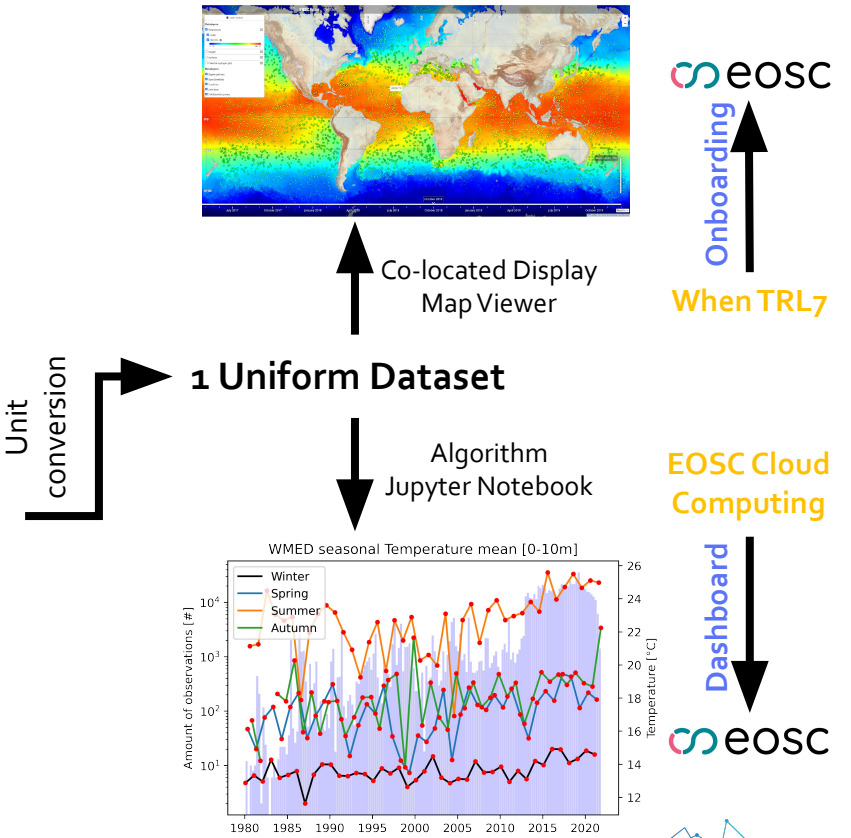


Engineering the Dashboard – Providers

Analytical workflow - SeaDataNet





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Semantic broker

SPARQL Queries for each Essential Ocean Variable (EOV)

For example: ***Oxygen***

Input → **Output**

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX pav: <http://purl.org/pav/>
PREFIX owl: <http://www.w3.org/2002/07/owl#>

select    ?dt ?P01notation ?prefLabel (group_concat(?R03notation;separator=",") as ?R03) (group_concat(?P09notation;separator=",") as ?P09) (group_concat(?P02notation;separator=",") as ?P02) where
 {
  <http://vocab.nerc.ac.uk/collection/A05/current/EV_OXY/>
<https://w3id.org/iadopt/ont#hasObjectOfInterest> ?ooi;
  <https://w3id.org/iadopt/ont#hasProperty> ?prop.
    optional{<http://vocab.nerc.ac.uk/collection/A05/current/EV_OXY>  <https://w3id.org/iadopt/ont#hasMatrix>
      ?mat .}

    optional{<http://vocab.nerc.ac.uk/collection/A05/current/EV_OXY/>  <https://w3id.org/iadopt/ont#hasConstraint> ?cons .}

   <http://vocab.nerc.ac.uk/collection/P01/current/>  skos:member ?dt  .
  ?dt owl:deprecated ?depr . FILTER((str(?depr)="false"))
  ?dt <https://w3id.org/iadopt/ont#hasObjectOfInterest> ?ooi;
      <https://w3id.org/iadopt/ont#hasProperty> ?prop.
 optional{?dt  <https://w3id.org/iadopt/ont#hasMatrix>
      ?mat .}

    optional{?dt  <https://w3id.org/iadopt/ont#hasConstraint> ?cons .}

  ?dt skos:prefLabel ?prefLabel .
  optional {    ?dt ?rel3 ?v3 . filter(regex(str(?v3),'R03/current/')) .  ?v3 skos:notation ?R03notation .}
   optional {    ?dt ?rel4 ?v4 . filter(regex(str(?v4),'P09/current/')) .  ?v4 skos:notation ?P09notation .}
    optional {    ?dt ?rel5 ?v5 . filter(regex(str(?v5),'P02/current/')) .  ?v5 skos:notation ?P02notation .}

?dt skos:prefLabel ?prefLabel .FILTER(langMatches(lang(?prefLabel), "en"))
    ?dt skos:notation ?P01notation .

} group by ?dt ?P01notation ?prefLabel ?P09 ?P02 ?R03

```

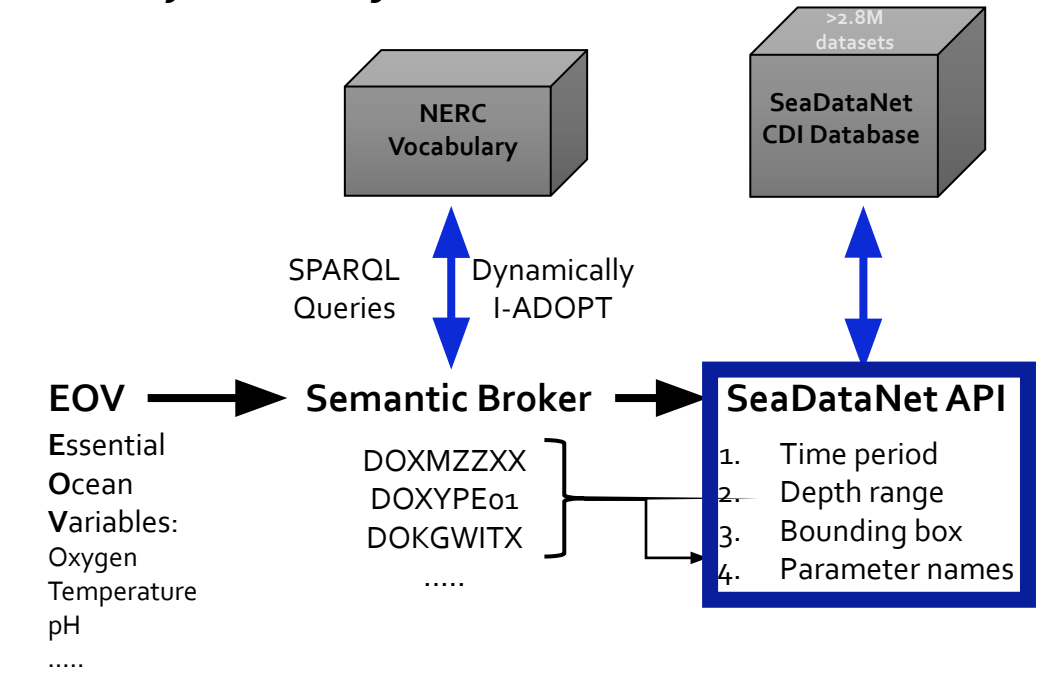
iop Properties

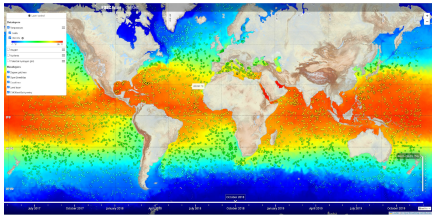
hasMatrix	S21:S21S027	water body
hasObjectOfInterest	S27:CS002779	oxygen
hasProperty	S06:S0600045	Concentration

SDN CDI	ARGO
P01notation	R03
SDN:P01::DOXMZZXX	SDN:R03::DOXY
SDN:P01::DOXYPE01	
SDN:P01::DOKGWITX	
SDN:P01::DOXYCZ01	
SDN:P01::DOXYUCKG	
SDN:P01::DOXYSC02	
SDN:P01::DOXYSE01	
SDN:P01::DOXYOP01	
SDN:P01::DOXYSU01	
SDN:P01::DOXYSCKG	
SDN:P01::OXYSMOD1	
SDN:P01::DOXYPR02	
SDN:P01::DOXYUZ01	
SDN:P01::DOXYWITX	
SDN:P01::DOXYAAOP	
SDN:P01::DOXYSU02	
SDN:P01::DOXYPR01	
SDN:P01::DOXYSE02	
SDN:P01::DOXYSC01	
SDN:P01::DOXYZZXX	
SDN:P01::DOXYZZ01	
SDN:P01::DOXYUZ02	

Engineering the Dashboard – Providers

Analytical workflow - SeaDataNet





eosc Onboarding

When TRL7

EOSC Cloud Computing

Dashboard

eosc

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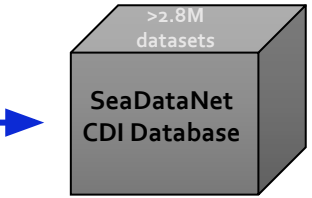
SeaDataNet API input

- Parameter names
- Time period
- Depth range
- Bounding box

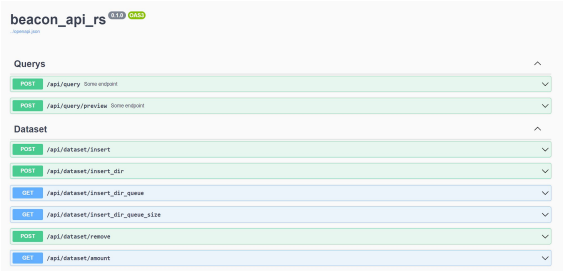
Example request

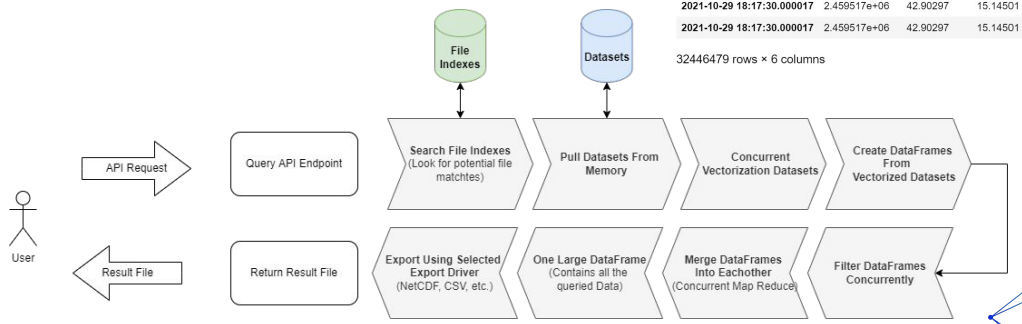
```
body = {"selections": [{
            "p01": f"{parameter}",
            "p06": f"{unitp}",
                "filters": [{
                        "min": parameter_min,
                        "max": parameter_max}]}],
        "date_range": {
            "start": startdt,
            "end": enddt},
        "depth_range": {
            "min": upbound,
            "max": botbound},
        "bbox": {
            "min_lat": lat_min,
            "min_lon": lon_min,
            "max_lat": lat_max,
            "max_lon": lon_max},
        "export": {
            "type": "netcdf"}}

body = json.dumps(body)
response = requests.post("http://beacon/api/query", body)
```



Datetime	TIME	LATITUDE	LONGITUDE	PRES	TEMPPR01	Season
1921-06-15 12:00:00.000000	2.422856e+06	48.50000	-5.20000	100.0	12.300	Spring
1921-06-15 12:00:00.000000	2.422856e+06	48.50000	-5.20000	125.0	12.300	Spring
1921-06-15 12:00:00.000000	2.422856e+06	48.50000	-5.20000	125.0	12.300	Spring
1921-06-15 12:00:00.000000	2.422856e+06	48.50000	-5.20000	50.0	12.300	Spring
1921-06-15 12:00:00.000000	2.422856e+06	48.50000	-5.20000	100.0	12.300	Spring
...	...	...	...	...	...	...
2021-10-29 18:17:30.000017	2.459517e+06	42.90297	15.14501	0.2	17.756	Autumn
2021-10-29 18:17:30.000017	2.459517e+06	42.90297	15.14501	191.5	13.002	Autumn
2021-10-29 18:17:30.000017	2.459517e+06	42.90297	15.14501	189.4	13.019	Autumn
2021-10-29 18:17:30.000017	2.459517e+06	42.90297	15.14501	6.1	17.763	Autumn
2021-10-29 18:17:30.000017	2.459517e+06	42.90297	15.14501	40.8	15.645	Autumn

32446479 rows × 6 columns





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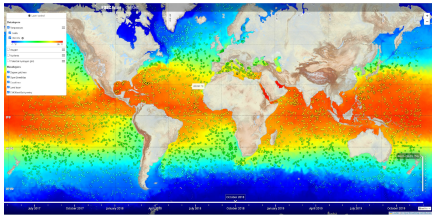

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>2.8M datasets

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Unit conversion

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EOV → **Semantic Broker** → **SeaDataNet API**

Essential
Ocean
Variables:
Oxygen
Temperature
pH
.....

DOXMZZXX
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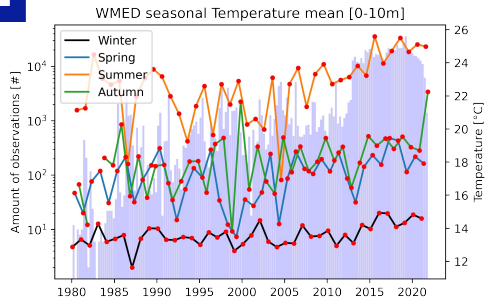

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Unit conversions

Unit conversions required for SeaDataNet API

- Measurements performed in various units

Preferred units

Temperature	Oxygen	Phosphate	Silicate	Nitrate	pH
[°C]	[mmol/m3]	[mmol/m3]	[mmol/m3]	[mmol/m3]	[-]

*Unit Conversions - **Oxygen***

toConvert	label	into	otherUnitLabel	multiplyBy	multiplier
To convert	Mole per Cubic Metre	into	Millimoles per cubic metre	multiply by	1000.0
To convert	Micromoles per litre	into	Millimoles per cubic metre	multiply by	1.0
To convert	Picomoles per litre	into	Millimoles per cubic metre	multiply by	0.000001
To convert	millimoles per litre	into	Millimoles per cubic metre	multiply by	1000.0
To convert	Mole Per Litre	into	Millimoles per cubic metre	multiply by	1000000.0
To convert	Picomoles per cubic metre	into	Millimoles per cubic metre	multiply by	0.000000001
To convert	Femtomoles per litre	into	Millimoles per cubic metre	multiply by	0.000000001
To convert	Millimoles per cubic metre	into	Millimoles per cubic metre	multiply by	1.0
To convert	Mol per Kilogram	into	Millimoles per cubic metre	multiply by	1025000.0
To convert	Nanomoles per kilogram	into	Millimoles per cubic metre	multiply by	0.001025
To convert	Micromoles per kilogram	into	Millimoles per cubic metre	multiply by	1.025
To convert	Picomoles per kilogram	into	Millimoles per cubic metre	multiply by	0.000001025
To convert	Femtomoles per kilogram	into	Millimoles per cubic metre	multiply by	
To convert	Millimole Per Kilogram	into	Millimoles per cubic metre	multiply by	1025.0
To convert	kilogram per cubic metre	into	Millimoles per cubic metre	multiply by	31251.171918946960511019163219
To convert	Kilogram per Cubic Metre	into	Millimoles per cubic metre	multiply by	31251.171918946960511019163219
To convert	Microgram Per Litre	into	Millimoles per cubic metre	multiply by	0.031251171918946960511019
To convert	Milligram Per Cubic Metre	into	Millimoles per cubic metre	multiply by	0.031251171918946960511019
To convert	Nanograms per litre	into	Millimoles per cubic metre	multiply by	0.000031251171918946960511
To convert	Milligram Per Litre	into	Millimoles per cubic metre	multiply by	31.251171918946960511019163
To convert	Gram Per Cubic Metre	into	Millimoles per cubic metre	multiply by	31.251171918946960511019163
To convert	Gram Per Cubic Centimetre	into	Millimoles per cubic metre	multiply by	31251171.918946960511019163218621
To convert	Microgram Per Cubic Metre	into	Millimoles per cubic metre	multiply by	0.000031251171918946960511
To convert	Nanograms per microlitre	into	Millimoles per cubic metre	multiply by	31.251171918946960511019163
To convert	Picofarad Per Metre	into	Millimoles per cubic metre	multiply by	0.000000031251171918946961
To convert	Picograms per litre	into	Millimoles per cubic metre	multiply by	0.000000031251171918946961
To convert	Femtograms per litre	into	Millimoles per cubic metre	multiply by	
To convert	Millilitre Per Cubic Metre	into	Millimoles per cubic metre	multiply by	0.044661
To convert	Microlitre Per Litre	into	Millimoles per cubic metre	multiply by	0.044661
To convert	Cubic microns per cubic metre	into	Millimoles per cubic metre	multiply by	0.000000000000044661
To convert	Millilitre Per Litre	into	Millimoles per cubic metre	multiply by	44.661
To convert	Cubic microns per millilitre	into	Millimoles per cubic metre	multiply by	0.000000044661

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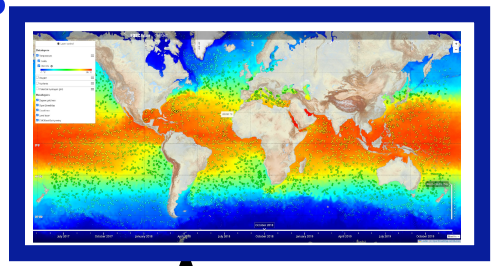
Analytical workflow - SeaDataNet



eosc Onboarding

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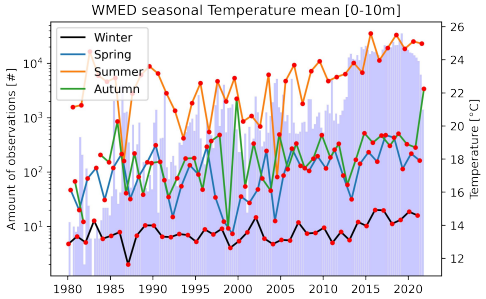

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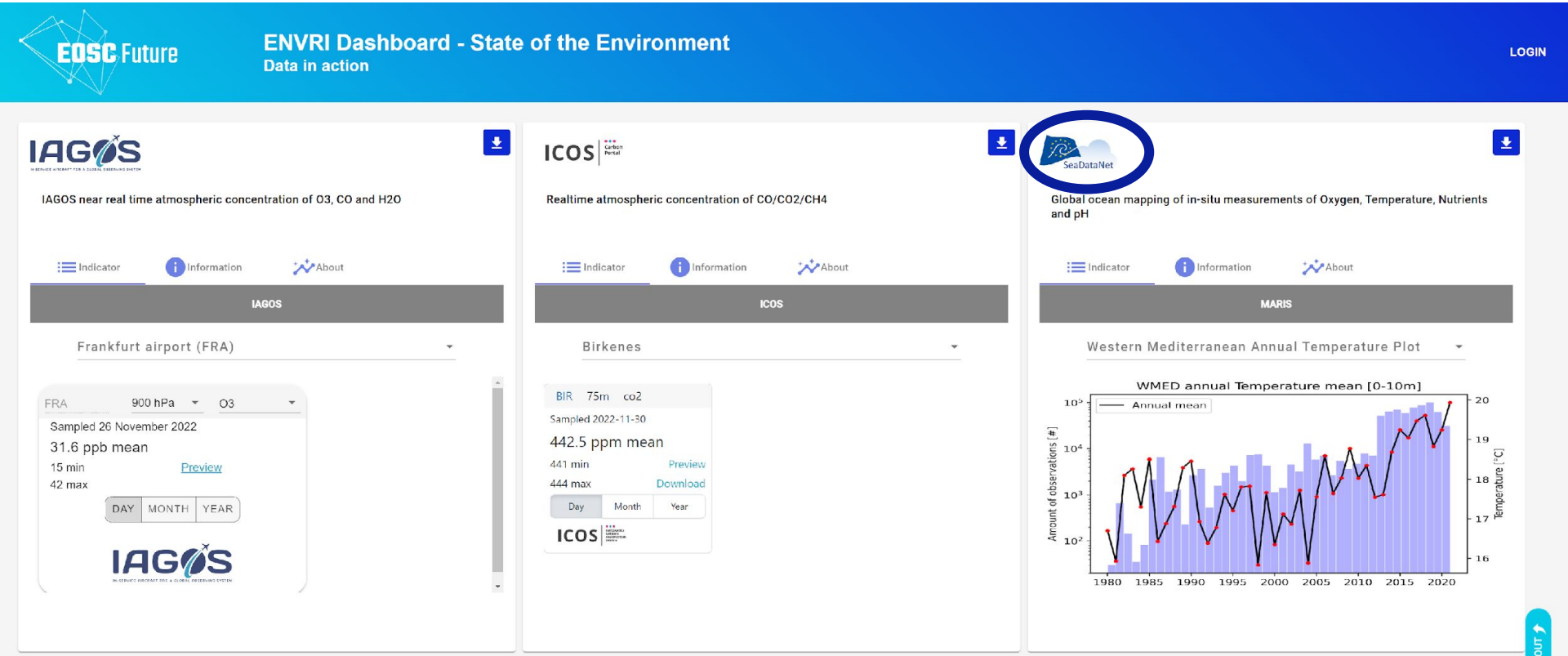
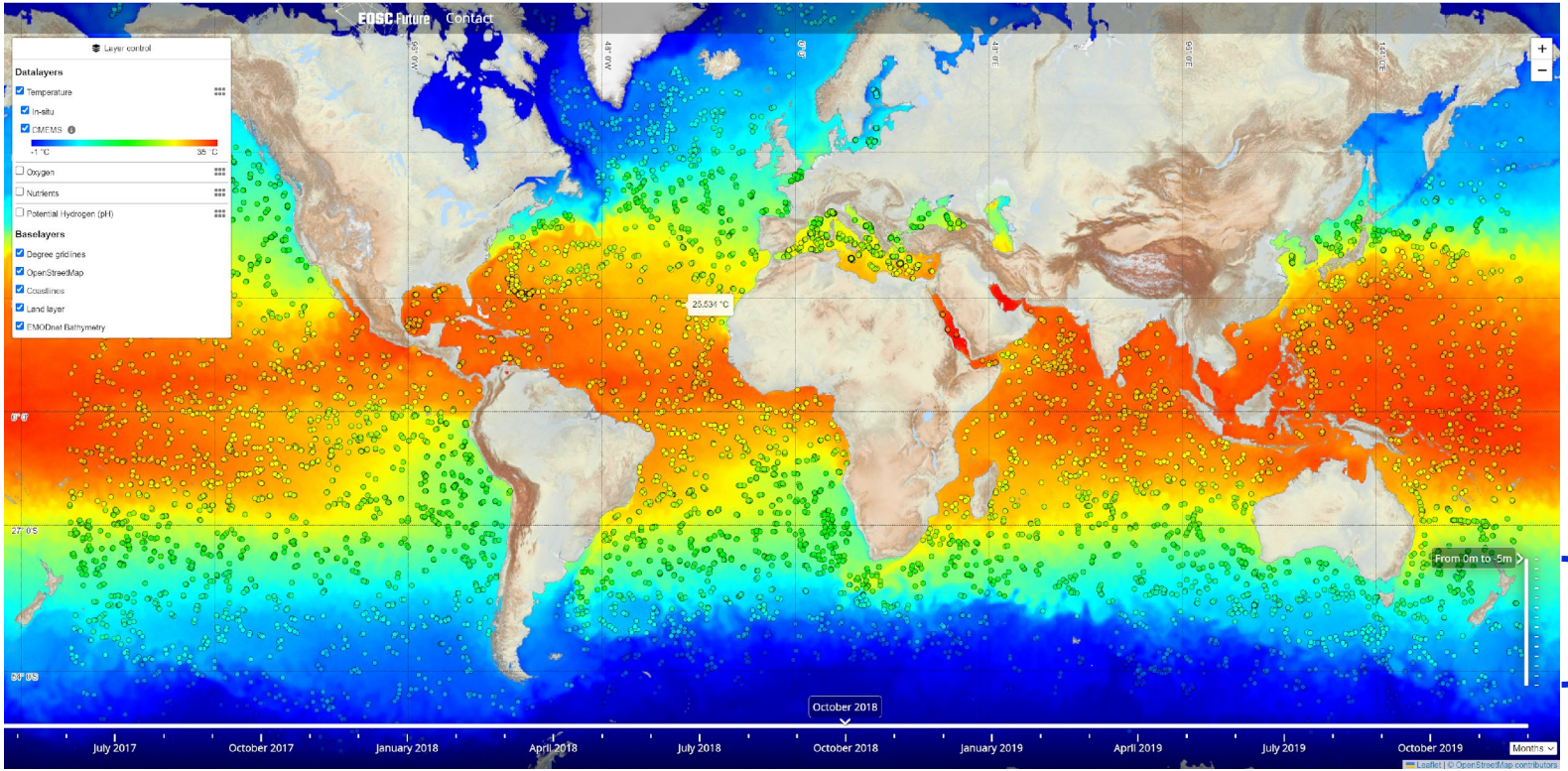


Web viewer



EOVs

Depth

Time period

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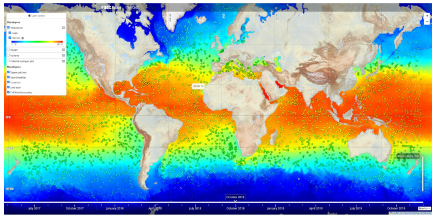

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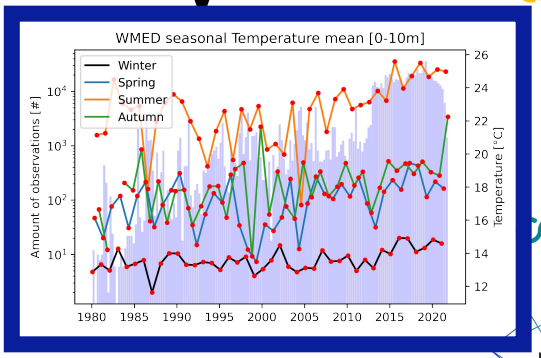

eosc

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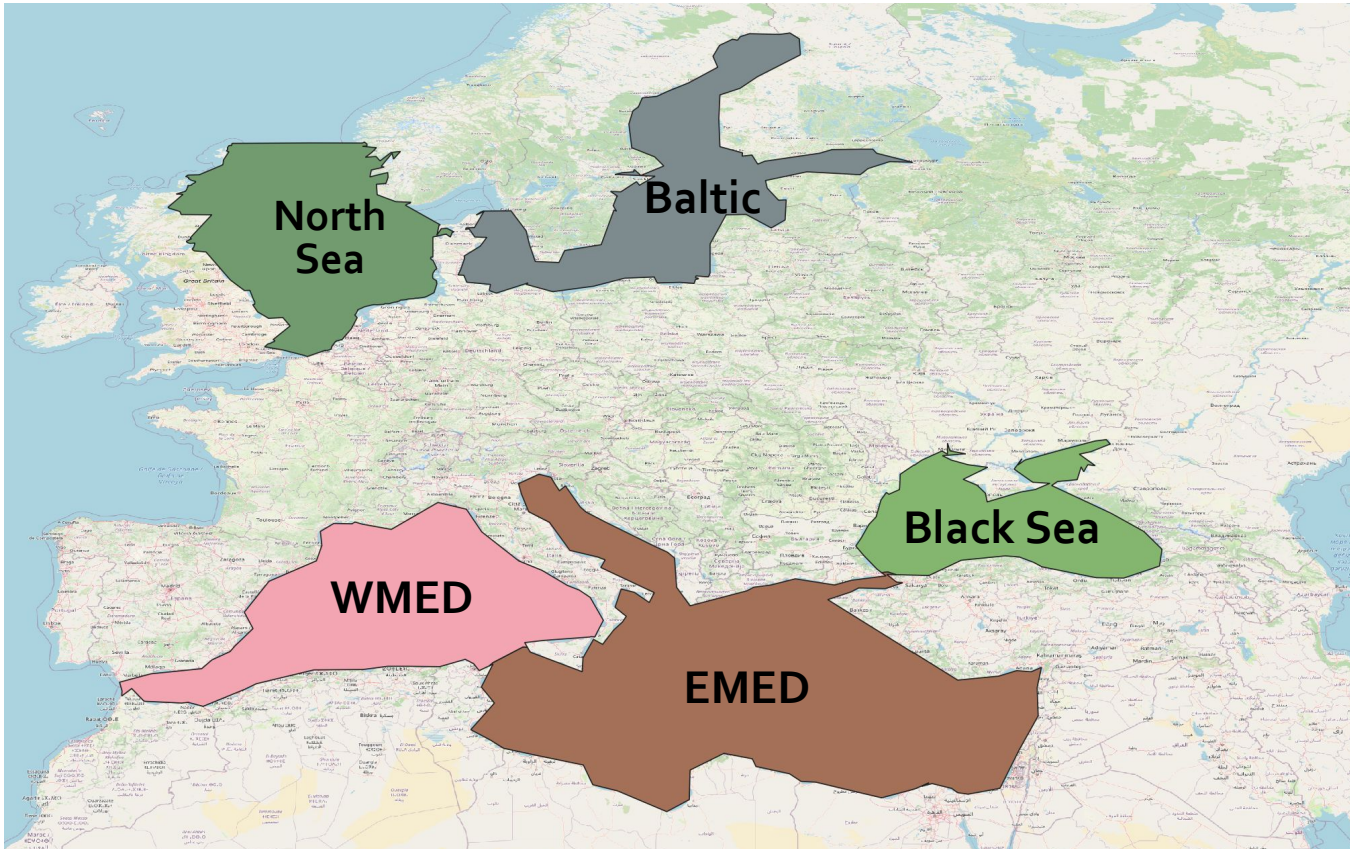
Ocean indicators – Sea Regions



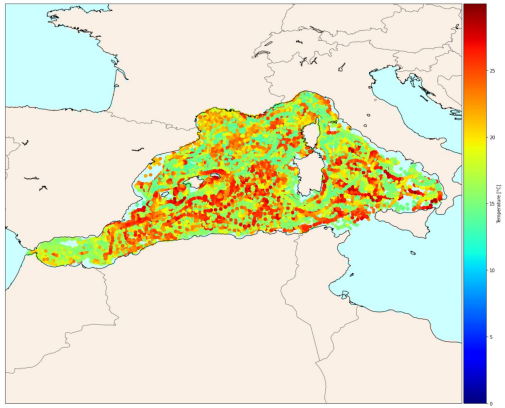
Ocean indicators

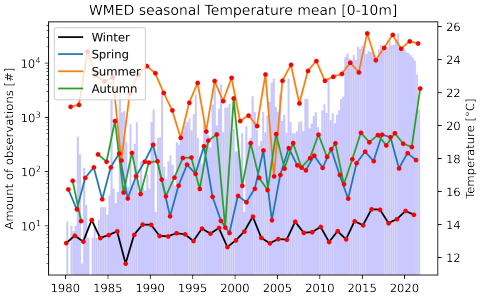
Region: ***WMED***

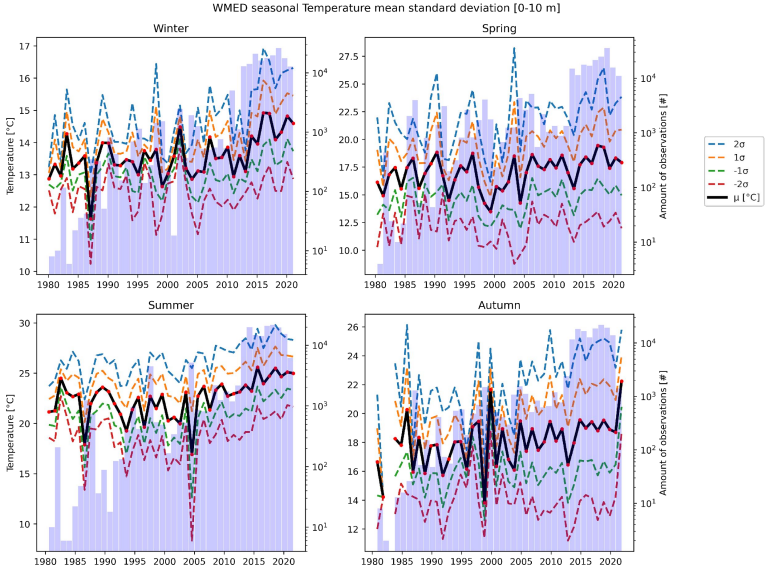
Time period: ***1980 – Present***

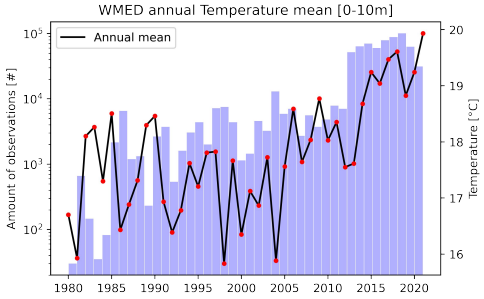
Depth: ***[0 - 10m]***

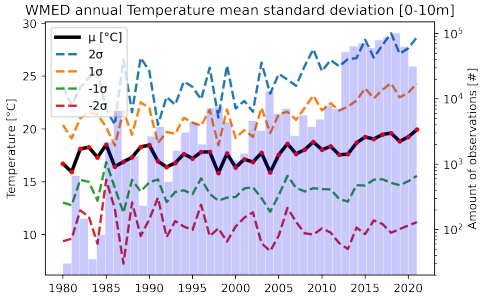
EOV: ***Temperature***











EOSC Future

Thank you for your attention

The EOSC Future project is co-funded by the European Union Horizon Programme call INFRAEOSC-03-2020, Grant Agreement 101017536

Get in touch

Tjerk Krijger <tjerk@maris.nl>

eoscfuture.eu @EOSCFuture in/EOSCfuture

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