



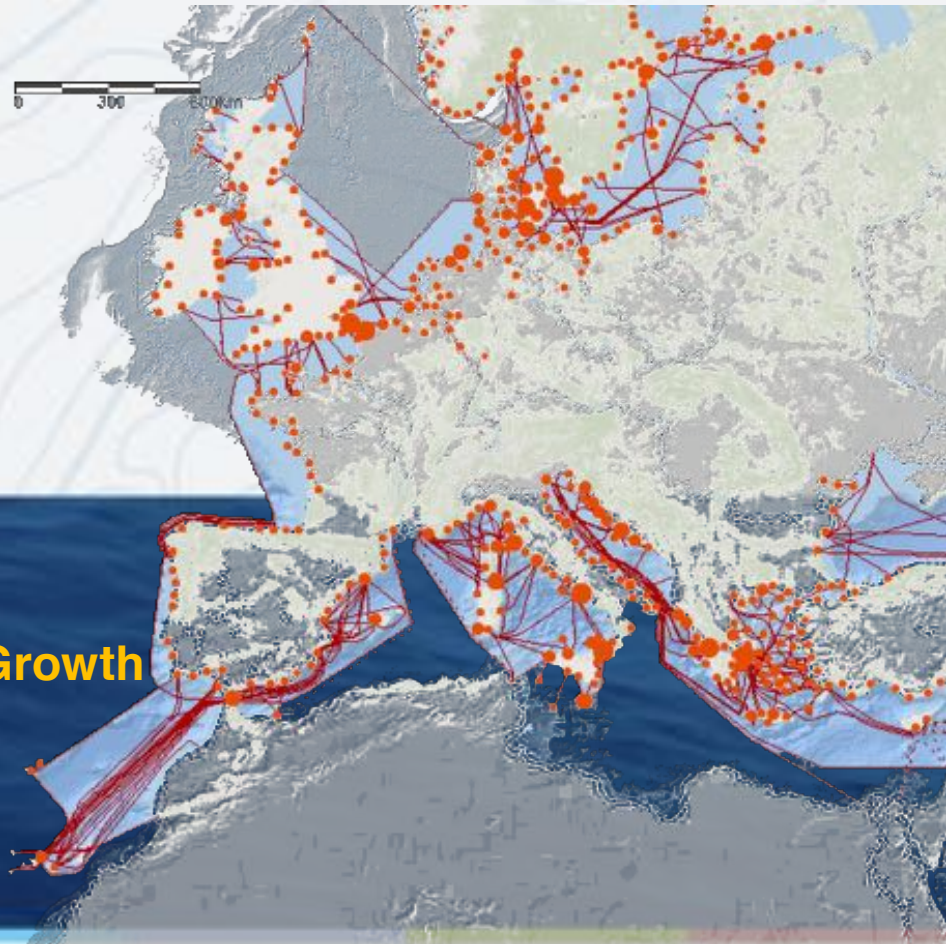
EMODnet



European Marine
Observation and
Data Network

Your gateway to marine data in Europe

0 300 600 km



Malta Summer School 2018
Operational Oceanography for Blue Growth

Accessing EMODnet data
R exercises

Credits: Pascal Derycke (EMODnet
Secretariat) & Laurent Dubroca (IFREMER)

Code is under GPL-3 license



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Questions to the participants?



📍 EC OPEN DATA Policy?

📍 INSPIRE Web Services?
(ex: WMS, WFS,
WCS,...)

📍 Processing solutions:
Python, R, IDL, Matlab,
Julia,...?



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Exercices



- 📍 The exercices:
- Accessing EMODnet Bathymetry (WCS)
 - Accessing EMODnet Human Activities & Physics data (WFS)
 - Accessing EMODnet Seabed & Geology layers
 - European Atlas of the Seas: example of a new map on climate change (SST trends per MPAs)

Outputs: maps and aggregated maps, 3D views, netCDF, geojson, csv files,...



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Accessing EMODnet Data products from OGC/INSPIRE Web services

📍 EMODnet Bathymetry

<http://ows.emodnet-bathymetry.eu/ows?>

📍 EMODnet Biology

<http://geo.vliz.be/geoserver/Emodnetbio/ows?>

📍 EMODnet Chemistry

(<http://ec.oceanbrowser.net/emodnet-combined/Python/web/wms?>)

<http://ec.oceanbrowser.net/emodnet-combined/Python/web/wms?ELEVATION=-0.0&TIME=winter 2000>

📍 EMODnet Geology

<http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/ows>



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EMODnet Geology

<http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/ows>

EMODnet Human Activities

<http://www.emodnet-humanactivities.eu/geoserver/emodnet/ows>

EMODnet Physics

<http://geoserver.emodnet-physics.eu/geoserver/emodnet/ows>

EMODnet Seabed (New GEONODE instance release coming soon)

<http://213.122.160.75/scripts/mapserv.exe?map=D:/Websites/MESHAtlantic/map/MESHAtlantic.map>



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EMODnet Bathymetry

🎯 Objective of exercise 1:

The region of interest (bbox) is a MPA shapefile downloaded from www.protectedplanet.com

The bathymetry data for the bbox is extracted from the WCS of the EMODnet Bathymetry portal.

<http://ows.emodnet-bathymetry.eu/ows>



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EMODnet Bathymetry

Outputs:

- 2D plots with isobath
- Plotting of a 3D view
- Mean and standard deviation for the Bbox
- Save the accessed bathymetry data in a netCDF file



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Steps to follow:

- ① Create folder "jerico" in c:/temp/
c:/temp/jerico/
- ① Create folder "shapefile" in c:/temp/jerico/
c:/temp/jerico/shapefile/



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- 🎯 Open in an Web browser the following domain:
- 🎯 <https://protectedplanet.net/>

- 🎯 Select a MPA and download the shapefile of the MPA (advice: select a large MPA close to the coast)
Unzip and save the file into the folder « shapefile »



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📍 Download a MPA shapefile from

<https://www.protectedplanet.net/marine>

Ex: <https://www.protectedplanet.net/pertuis-charentais-site-of-community-importance-habitats-directive>



7/12/2018

10



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Open R studio

🎯 Install the following R libraries:

- rgdal
- rasterVis
- downloader
- directlabels
- ggplot2
- rgl
- ncdf4
- mapdata
- jsonlite



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Notepad ++

🎯 Exercice 1:

- edit the wdpaid with the ID of the downloaded MPA
- edit the path to correctly access the shapefile("C:/temp/jerico/shapefile/WDPA_July2018_protected_area_555623626-shapefile-polygons.shp")



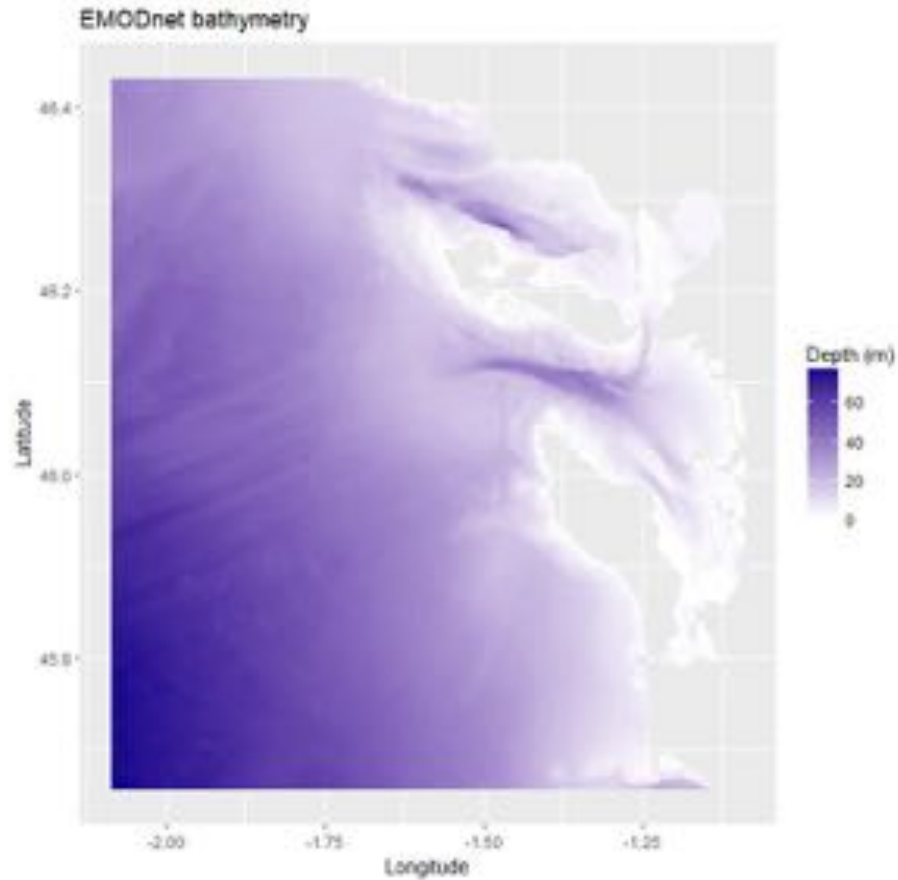
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2D plot of the bathymetry

R exercise 1.r



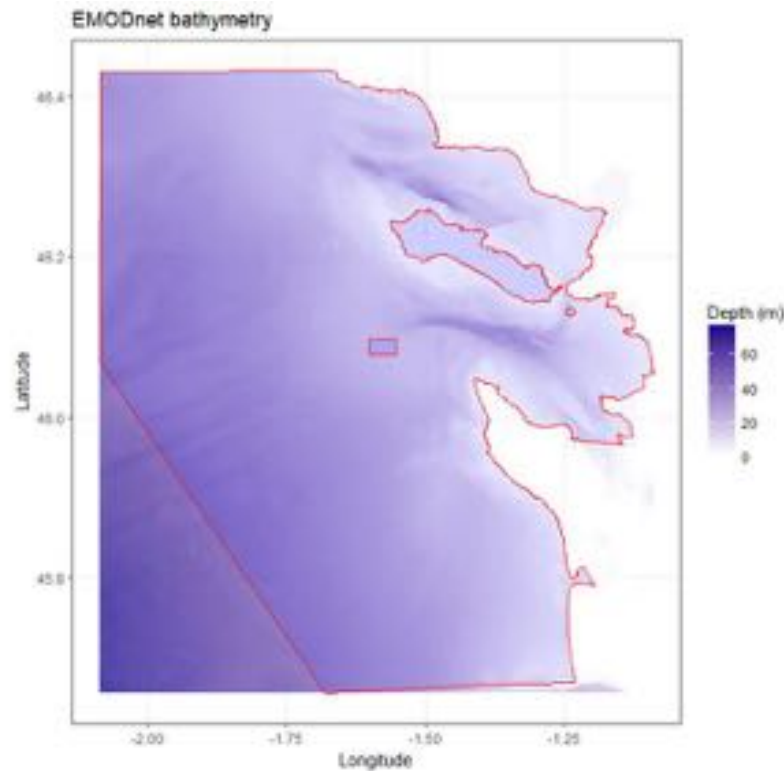


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Bathymetry & MPA

R exercise 1a.r



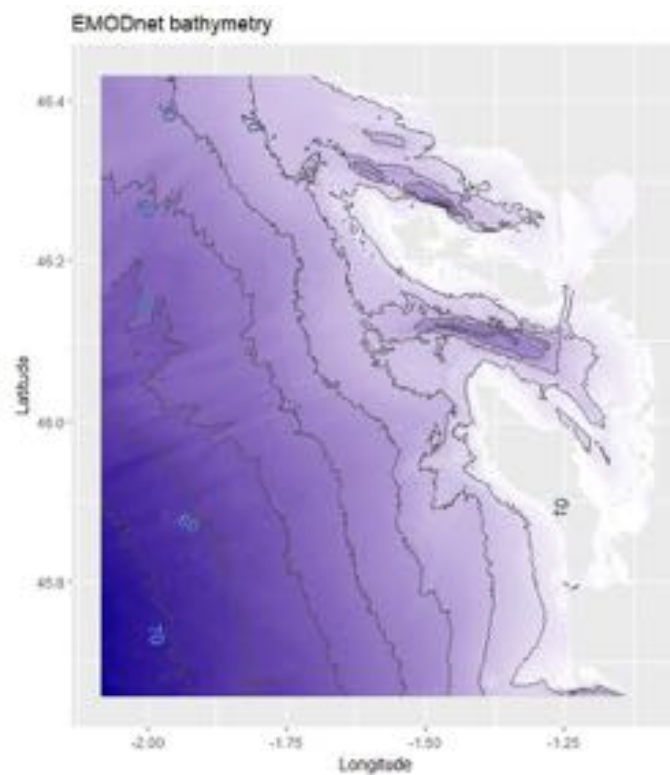


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2D plot with isobaths (ggplot2)

R exercise 1b.r



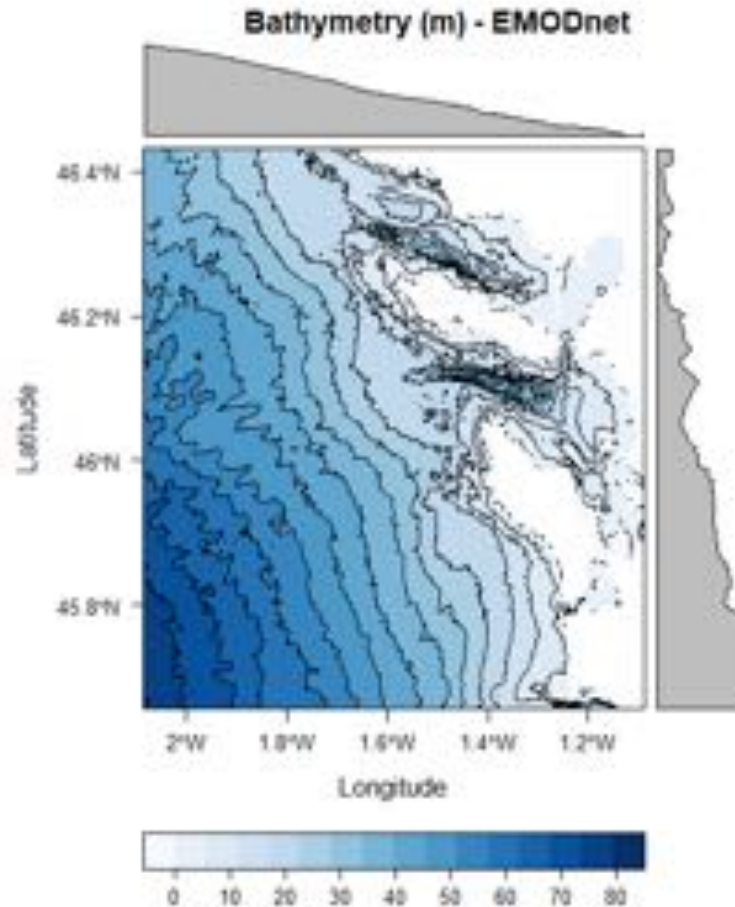


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2D plot with isobaths (RasterVis:levelplot)

R exercise 1c.r

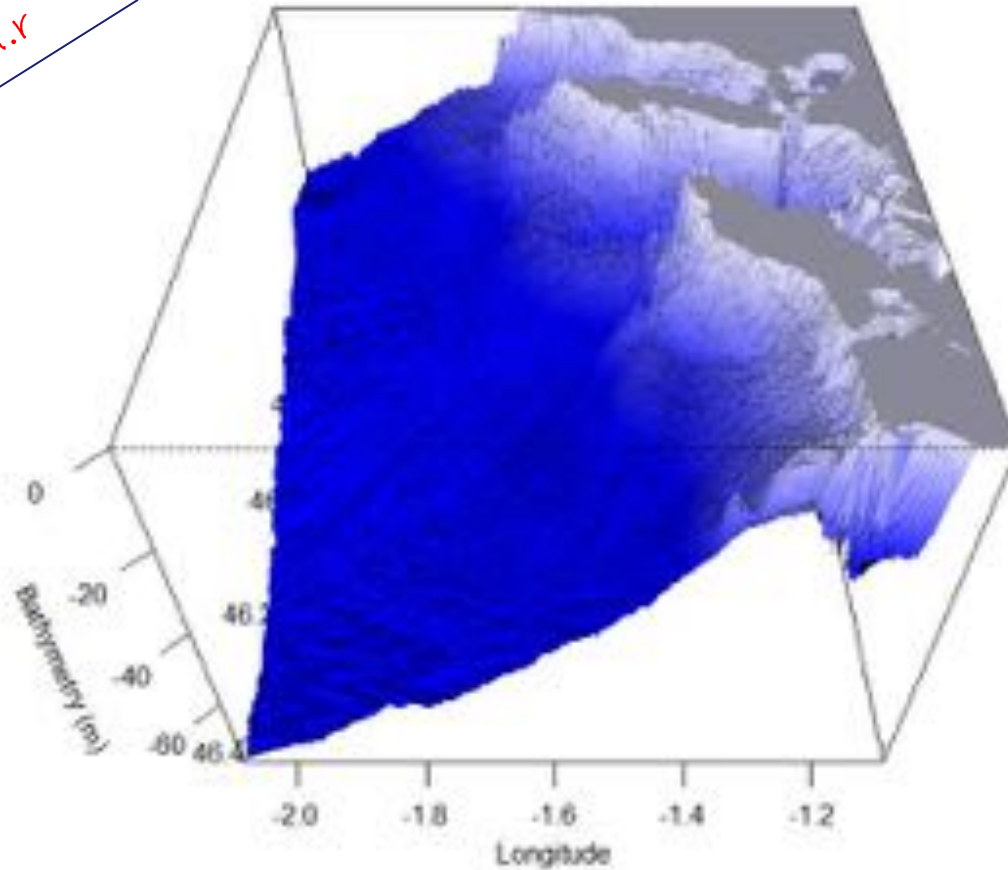




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3D view

Rexercice 1d.r



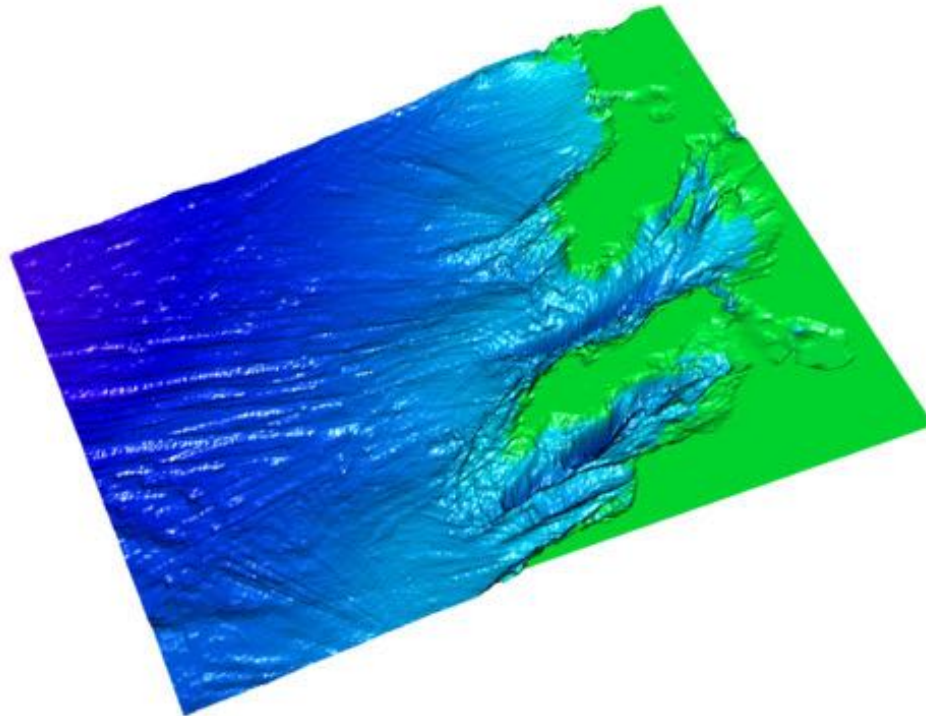


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Interactive 3D view

R exercise 1e.r





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R exercise 1f.r

Save data as netCDF

MEAN = 31.94 and STD DEV = 20.25

The screenshot displays the HDFView 3.8 interface. The main window shows the metadata for the netCDF dataset 'emodnet.mean'. The metadata is organized into several sections:

- General Object Info:**
 - Name: emodnet.mean
 - Path: /
 - Type: HDF5 Scalar Dataset
 - Number of Attributes: 6
 - Object Ref: 7848
- Dataspace and Datatype:**
 - No. of Dimension(s): 2
 - Dimension Size(s): 372 x 478
 - Max Dimension Size(s): 372 x 478
 - Data Type: 32-bit floating-point
- Storage Layout:**
 - Storage Layout: CHUNKED: 372 X 478
 - Compression: 8.166.1GZIP: level = 7
 - Filters: GZIP
 - Storage: SIZE: 87101, allocation time: incremental
 - Fill value: -72127.35

On the right side, a smaller window titled 'emodnet.mean at / [EMODnet_bathymetry1_5555...' displays a map visualization of the data. The map shows a geographical area with a color scale on the right ranging from -3.40E to -1.93E. The map is currently showing a value of (0.0).

At the bottom of the main window, the command line shows the current object being viewed: `emodnet.mean at / [EMODnet_bathymetry1_555526224.nc in C:\temp\temp] [dims0x1, start0x0, count372x478, stride1x1]`



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Open Panoply

📍 When the netCDF file is saved open it with Panoply

A link is available in the share folder:

\\labshare.srv.csc.net.mt\Jerico\Day 4 - EMODnet\Pascal Derycke\Panoply.exe

Double-click emodnet.mean and select "create 2D plot" with longitude/X and latitude/Y



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Maritime spatial planning

🎯 Objective of exercise 2:

The WFS of the EMODnet Human Activities portal allows to collect all kind of information for the region of interest (bbox).

<http://www.emodnet-humanactivities.eu/geoserver/emodnet/ows?service=WFS&request=GetCapabilities&version=2.0.0>



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EMODnet Human Activities WFS getcapabilities request

Gestionnaire des sources de données | WFS

Explorateur

- Vecteur
- Raster
- Texte Délimité
- GéoPackage
- Spatiale
- PostgreSQL
- MSSQL
- Oracle
- DIG
- Couche virtuelle
- WFS
- WCS
- WFS

Service de carte ArcGIS

Service d'entités ArcGIS

Geolocate

Connexions au serveur

EMODnet Human activities

Connexion Nouveau Éditer Supprimer Charger Enregistrer

Filtre

Title	Name	Abstract	Sql
ICES Statistical Areas	emodnet-icesareas	The ICES Statistic...	
HELCOM Maritime Area	emodnet-helcom	This dataset visual...	
Freshwater Production	emodnet-freshwater	The dataset provi...	
Fish Catches by FAO Fishery Statist...	emodnet-subunitcatches	The geodatabase ...	
Fish Catches by FAO Fishery Statist...	emodnet-subdivisioncatches	The geodatabase ...	
Fish Catches by FAO Fishery Statist...	emodnet-subareacatches	The geodatabase ...	
Fish Catches by FAO Fishery Statist...	emodnet-majorcatches	The geodatabase ...	
Fish Catches by FAO Fishery Statist...	emodnet-divisioncatches	The geodatabase ...	
First Sales of Fish	emodnet-fishsales	The geodatabase ...	
Finfish Production	emodnet-finfish	The dataset provi...	
Dumped Munitions (Polygons)	emodnet-munitionspoly	Shapes with mun...	
Dumped Munitions (Points)	emodnet-munitions	Shapes with mun...	
Dredging	emodnet-dredging	The geodatabase ...	
Dredge Spoil Dumping (Polygons)	emodnet-dredgespoilpoly	Shapes about da...	
Dredge Spoil Dumping (Points)	emodnet-dredgespoil	Shapes about da...	
Cables - Landing Stations	emodnet-landingstations	The dataset on su...	
Bucharest Convention	emodnet-bucharest	This dataset visual...	
BSH CONTIS Cables	emodnet-bshcontiscables	The datasets on s...	
Boneholes	emodnet-hydrocarbons	The database on ...	
Barcelona Convention	emodnet-barcelona	This dataset visual...	
Aggregate Extraction	emodnet-aggregates	The geodatabase ...	
Advisory Councils (Southwestern ...	emodnet-southwesternwat...	This shape lists th...	
Advisory Councils (Pelagic Stocks)	emodnet-pelagicstocks	This shape lists th...	
Advisory Councils (Outermost Regl...	emodnet-outermostregions	This shape lists th...	

Utiliser le titre en tant que nom de couche

Regarder uniquement les entités dans la vue courante

Système de coordonnées de référence (SCR)

EPSG:4326

Modifier ...

Construire une requête Close Ajouter Help

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<http://www.emodnet-humanactivities.eu/geoserver/emodnet/ows?service=WFS&request=getcapabilities&version=2.0.0>

```
emodnet-humanactivities.eu/ge... X
www.emodnet-humanactivities.eu/geoserver/emodnet/ows?service=WFS&request=getcapabilities&version=2.0.0
--<WFS_Capabilities version="1.0.0" xmlns:schemaLocation="http://www.opengis.net/wfs http://77.246.172.208/geoserver/schemas/wfs/1.0.0/WFS-
capabilities.xsd">
  -<Service>
    <Name>WFS</Name>
    <Title>GeoServer Web Feature Service</Title>
  -<Abstract>
    This is the reference implementation of WFS 1.0.0 and WFS 1.1.0, supports all WFS operations including Transaction.
  </Abstract>
  <Keywords>WFS, WMS, GEOSERVER</Keywords>
  <OnlineResource>http://77.246.172.208/geoserver/emodnet/wfs</OnlineResource>
  <Fees>NONE</Fees>
  <AccessConstraints>NONE</AccessConstraints>
  </Service>
  -<Capability>
    +<Request></Request>
  </Capability>
  -<FeatureTypeList>
    -<Operations>
      <Query>
      <Insert>
      <Update>
      <Delete>
      <Lock>
    </Operations>
```




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To read the names of the columns of the data layer

<http://77.246.172.208/geoserver/emodnet/wfs?SERVICE=WFS&VERSION=1.1.0&request=describeFeatureType&typeName=shellfish&bbox=-1.3,0.3,49.2,49.9>

```
<!--xsd:schema elementFormDefault="qualified" targetNamespace="www.emodnet.co.uk"-->
<xsd:import namespace="http://www.opengis.net/gml" schemaLocation="http://77.246.172.208/geoserver/schemas/gml/3.1.1/base/gml.xsd"/>
<!--xsd:complexType name="shellfishType">
  <!--xsd:complexContent>
    <!--xsd:extension base="gml:AbstractFeatureType">
      <!--xsd:sequence>
        <xsd:element maxOccurs="1" minOccurs="0" name="site_name" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="species" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="shellid" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="country" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="site_typology" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="position_info" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="distance_to_shore_m" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="costal_inland" nillable="true" type="xsd:string"/>
        <xsd:element maxOccurs="1" minOccurs="0" name="the_geom" nillable="true" type="gml:GeometryPropertyType"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>
<xsd:element name="shellfish" substitutionGroup="gml:_Feature" type="emodnet:shellfishType"/>
</xsd:schema>
```




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Maritime spatial planning

Outputs:

- Localisation of Shellfish production sites
- Localisation of other sites of interest
- Production of a Natura 2000 sites geojson file for the bbox

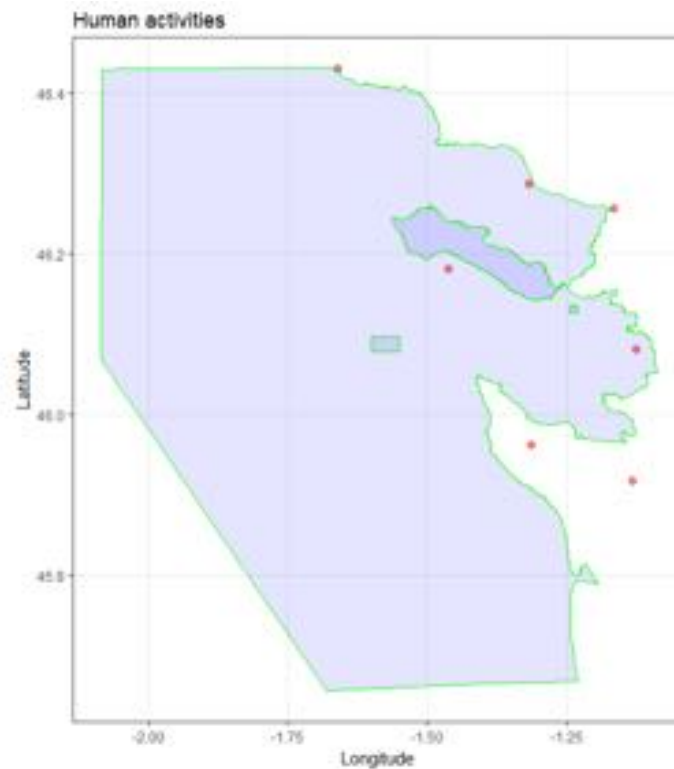


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Shellfish production sites

R exercise 2.r





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Available data:

(see also:

<http://www.knowcean.eu/har>)

- ⊙ "finfish",
- ⊙ "shellfish",
- ⊙ "dredging",
- ⊙ "hydrocarbons",
- ⊙ "aggregates",
- ⊙ "portvessels",
- ⊙ "portlocations",
- ⊙ "platforms",
- ⊙ "windfarms",
- ⊙ "dredgespoil",
- ⊙ "munitions"
- ⊙ ...



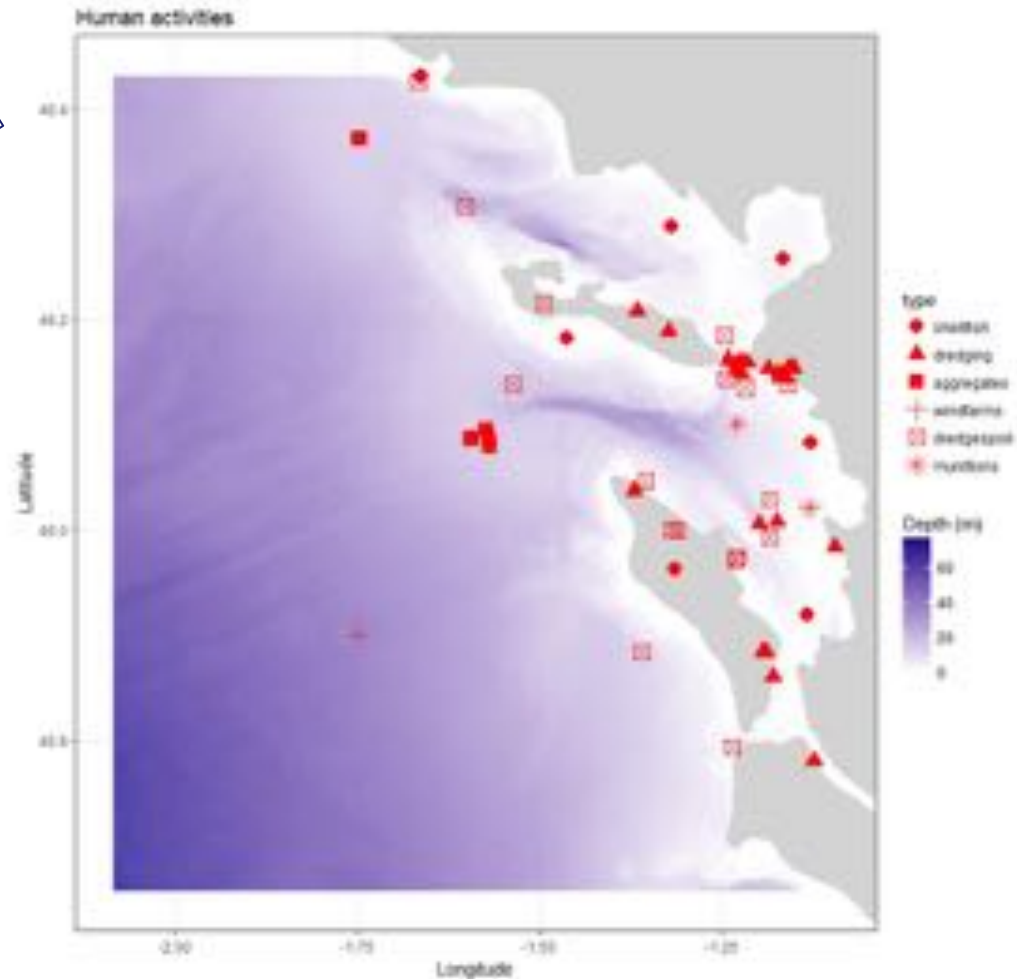
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Localisation of sites of interest

R exercise 2a.r



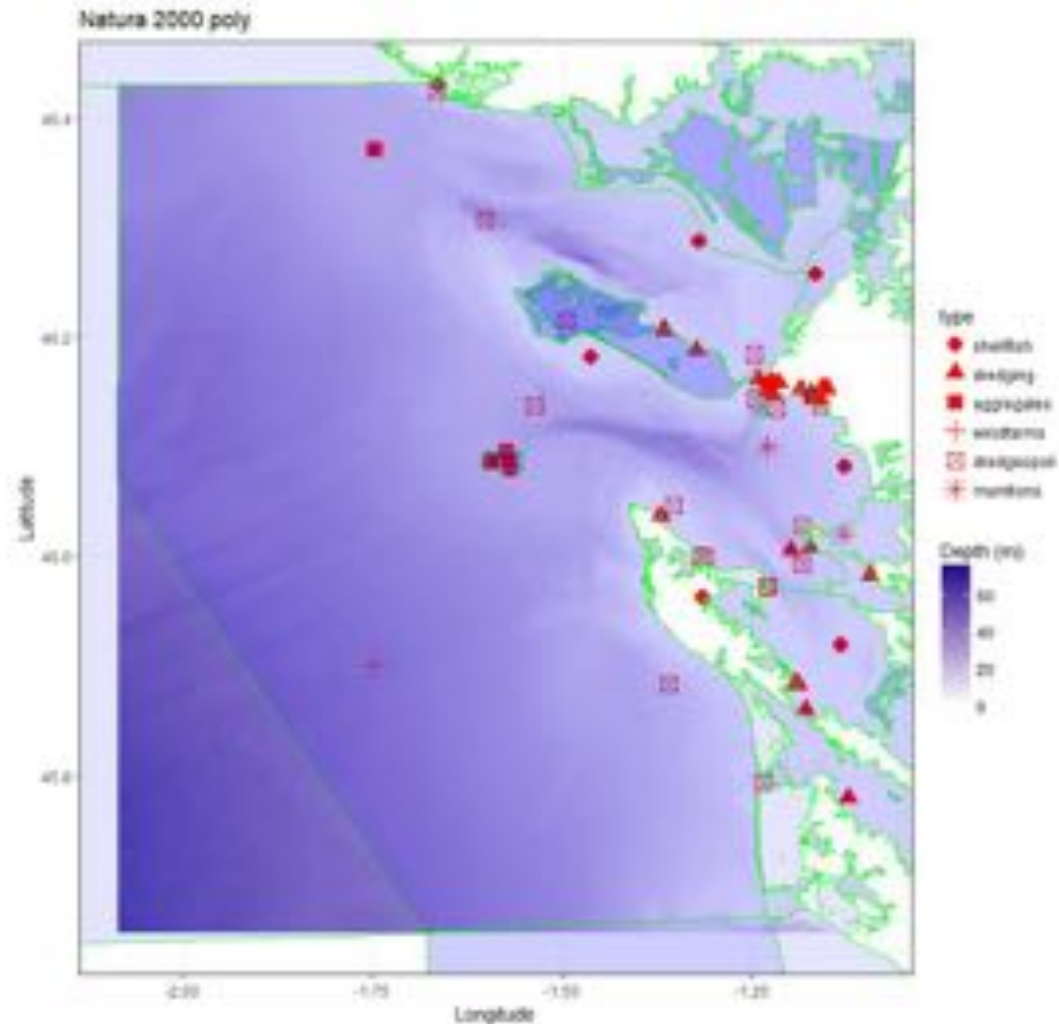


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Extraction of Natura 2000 sites as a geojson file

R exercise 2b.r





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Oceanographic instruments

🎯 Objective of exercise 3:

The WFS of the EMODnet Physics portal offers the possibility to identify the existing in-situ measurements for the region of interest (bbox).

<http://geoserver.emodnet-physics.eu/geoserver/emodnet/ows?service=WFS&request=GetCapabilities&version=1.0.0>



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Oceanographic instruments

Outputs:

- Localisation of the different type of platforms for the bbox
- Production of a csv file



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The screenshot shows the EMODnet web application interface. The main map displays the Atlantic Ocean with numerous red markers representing river gauging stations. A sidebar on the left contains a 'Layers (2)' panel with 'River gauging stations' as the top active layer and 'Countries' below it. A 'Select Basemap' section is also visible. A pop-up window titled 'River gauging stations' provides the following details:

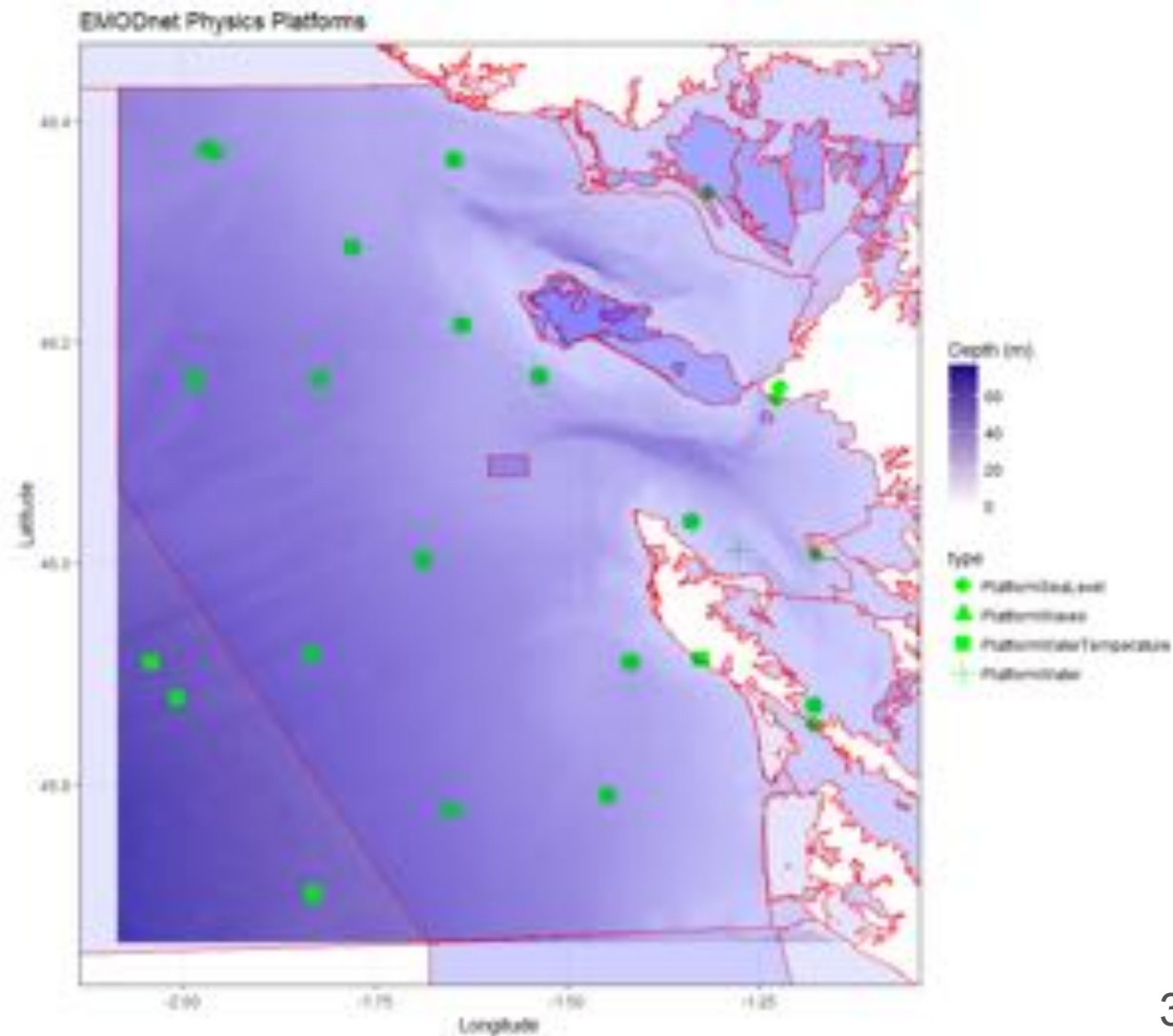
fid:	242929
position:	-2.3822, 47.5004
PlatformID:	29755
MapPlatformID:	252088
ProjectsDescr:	CNEMS INSTAC, AtlantOS
PlatformCode:	IF000271
WMOCode:	
SeaRegionCode:	Atlantic, Bay of Biscay, Celtic Sea, AtlantOS
SeaRegionDescr:	Bay of Biscay, AtlantOS
ParametersGroupCode:	16
ParametersGroupDescr:	River
ParametersCodeDescr:	DEPH;RYFL
DataTypeDescr:	NRT,NRT M,REP
LastDataMeasured:	2018/07/02 02:00:00
Country:	France
DataOwner:	EAUF - Service public d'information sur l'eau - France
DataProvider:	Eaufrance - Service public d'information sur l'eau
LogoURL:	http://www.emodnet-physics.eu



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In-situ measurements

R exercise 3.r





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EMODnet Physics Web services

- ④ **UniqueURL (netCDF, metadata,)**

<http://www.emodnet-physics.eu/map/platinfo/piradar.aspx?platformid=10273>

<http://www.emodnet-physics.eu/map/platinfo/pidashboard.aspx?platformid=10273>

- ④ **Service description @**

<http://www.emodnetphysics.eu/map/spi.aspx>

- ④ **API (REST, SOAP) web services [latest 60 days of data]**

www.emodnet-physics.eu/map/Service/WSEmodnet2.aspx

www.emodnet-physics.eu/map/service/WSEmodnet2.asmx

- ④ **OGC (WMS, WFS, ...)**

<http://geoserver.emodnet-physics.eu/geoserver/emodnet/ows>



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EMODnet Physics Web services

⦿ Opendap/THREDDS [HFR data, Ice, climatologies] (netCDF)

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

Unidata's **THREDDS Data Server** (TDS) is a web **server** that provides metadata and **data** access for scientific datasets, using OPeNDAP, OGC WMS and WCS, HTTP, and other remote **data** access protocols.

⦿ ERDDAP [latest 60 days of data]

<http://erddap.emodnet-physics.eu/erddap/index.html>

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).

⦿ Widgets

<http://www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=8427&timerange=7>



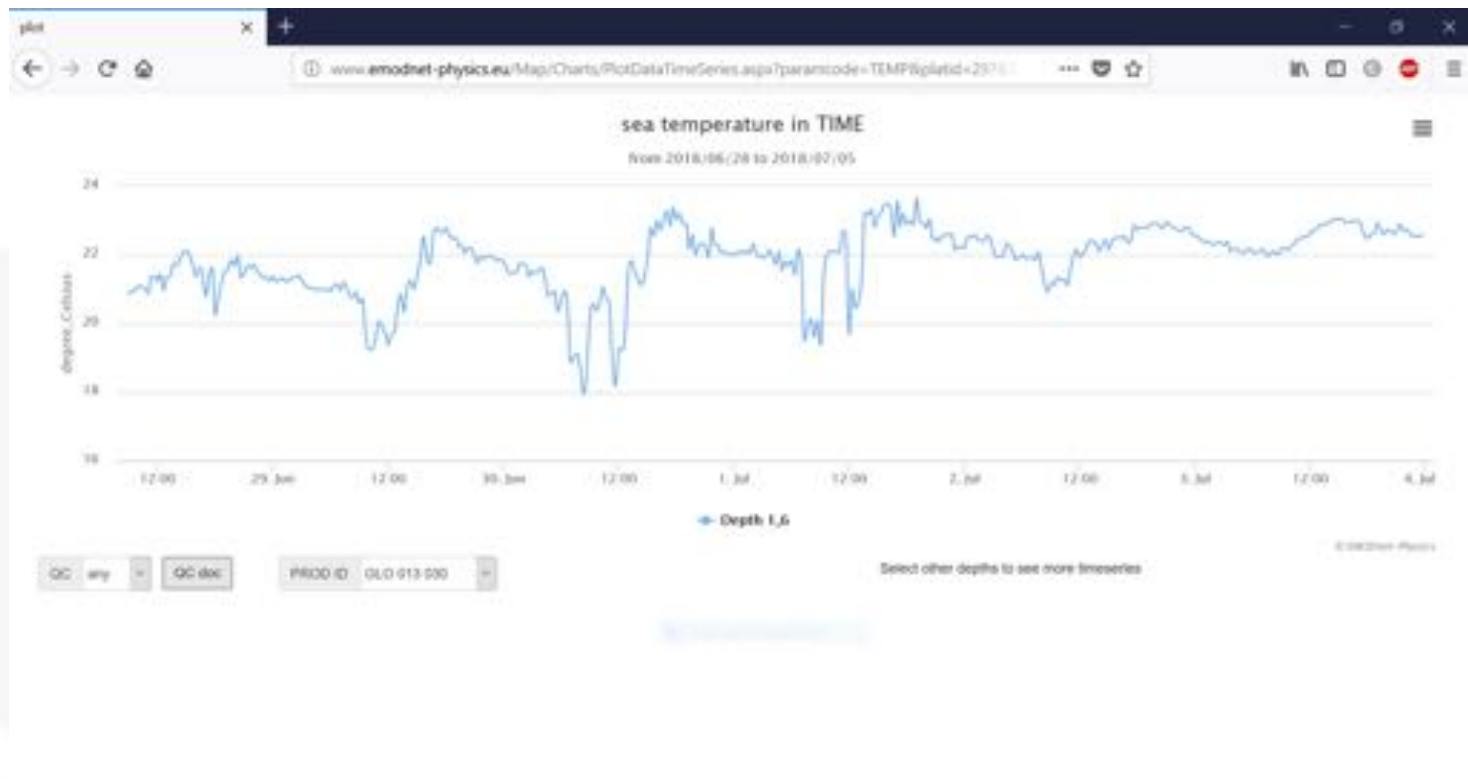
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EMODnet Physics Widget

<http://www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=TEMP&platid=29742&timerange=7>





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EMODnet Physics Widget

<http://www.emodnet-physics.eu/Map/Charts/PlotDataTimeSeries.aspx?paramcode=PSAL&platid=29742&timerange=7>



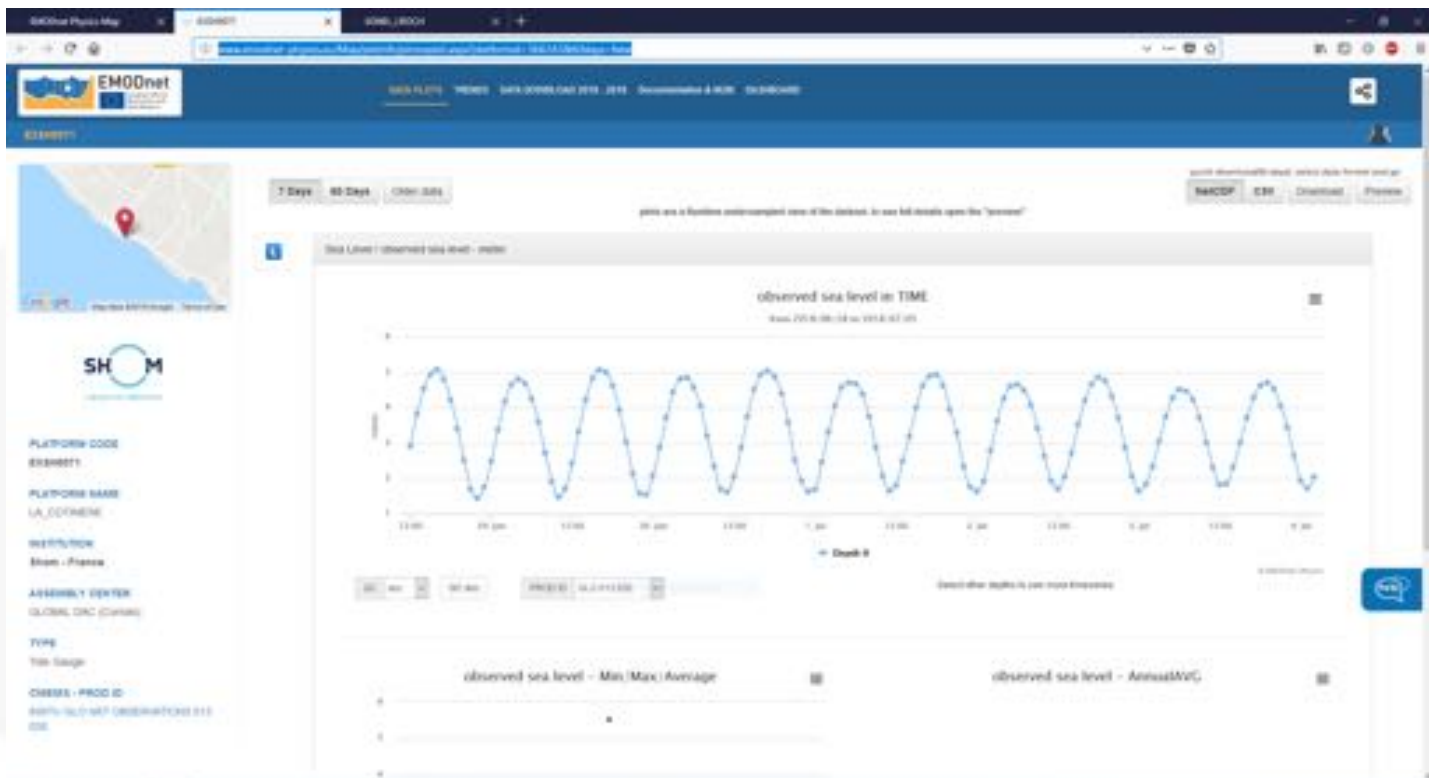


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<http://www.emodnet-physics.eu/Map/platinfo/piroosplot.aspx?platformid=366243&60days=false>



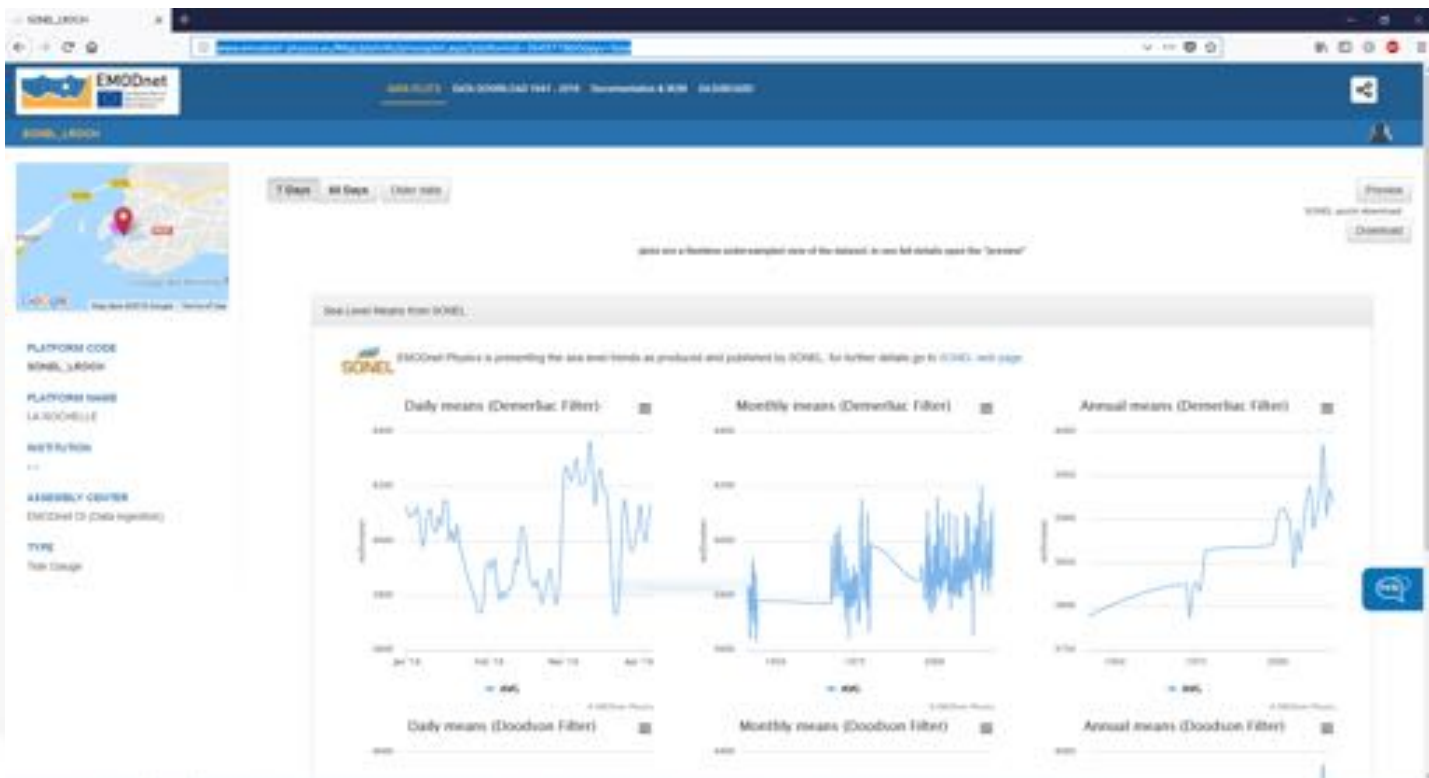


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<http://www.emodnet-physics.eu/Map/platinfo/piroosplot.aspx?platformid=364977&60days=false>





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Seabed habitats and geology

🎯 Objective of exercise 4:

Gather information on the sea bottom from the Web Map Services of the EMODnet Seabed and Geology portals.

<http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/ows?service=WMS&request=GetCapabilities&version=1.1.0>

<http://213.122.160.75/scripts/mapserv.exe?map=D:/Websites/MESHAtlantic/map/MESHAtlantic.map>

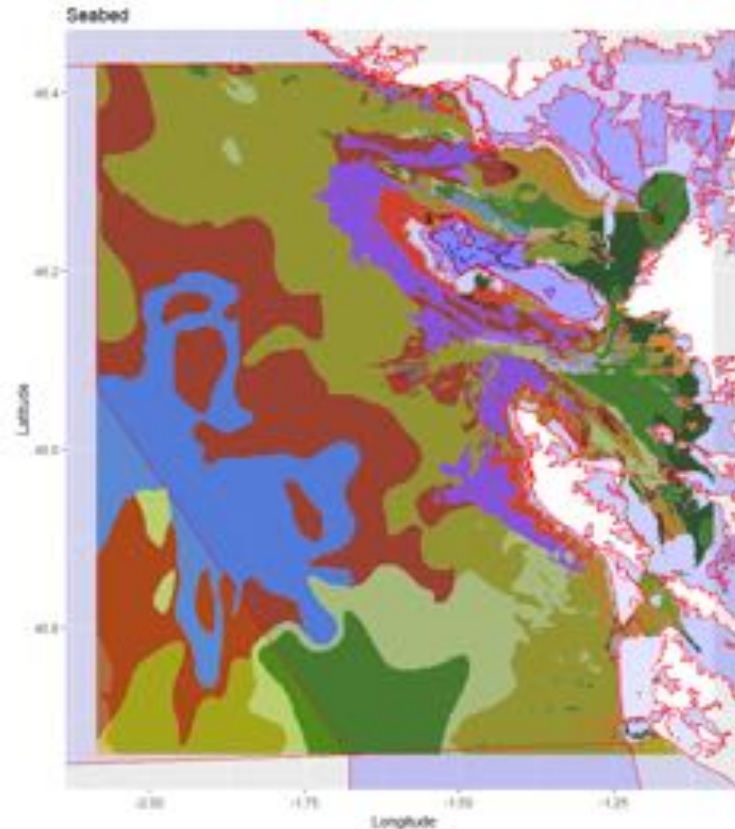


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EMODnet Seabed Habitats

Re exercise 4.1



<http://52.49.27.224/geoserver/wms?service=WMS&request=GetLegendGraphic&format=image/png&layer=emodnet:eusm2016>



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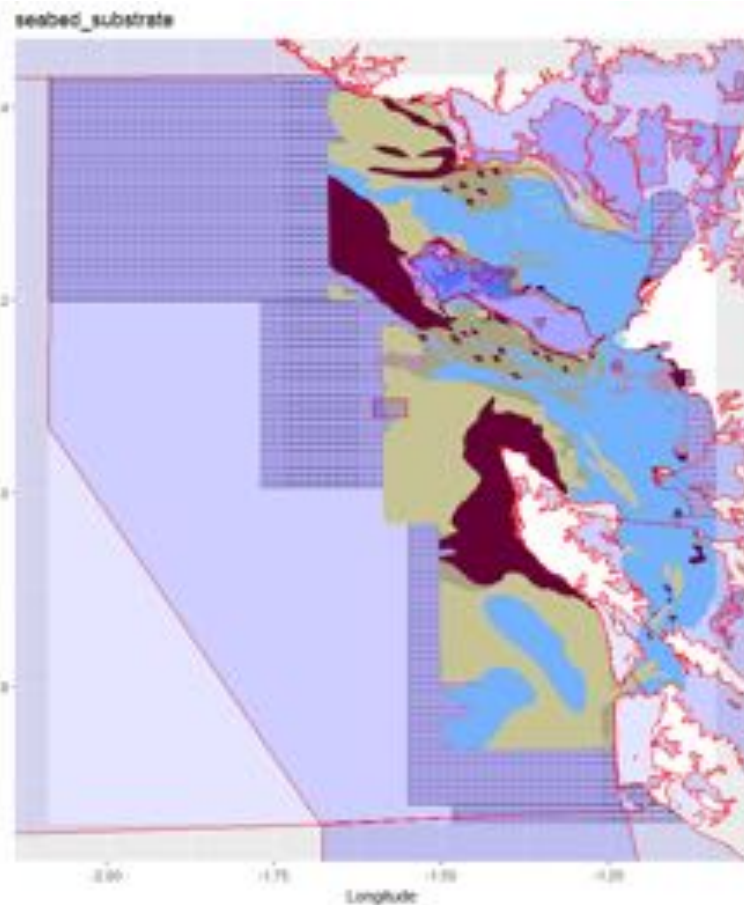
EMODnet Geology Seabed substrate

R exercise 4a.r

Folk 5-class Classification

-  1. Mud to muddy Sand
-  2. Sand
-  3. Coarse substrate
-  4. Mixed sediment
-  5. Rock & Boulders
-  6. No data at this level of Folk
-  9. Restricted data

http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/wms?service=WMS&request=GetLegendGraphic&format=image/png&layer=seabed_substrate25
[Ok](#)





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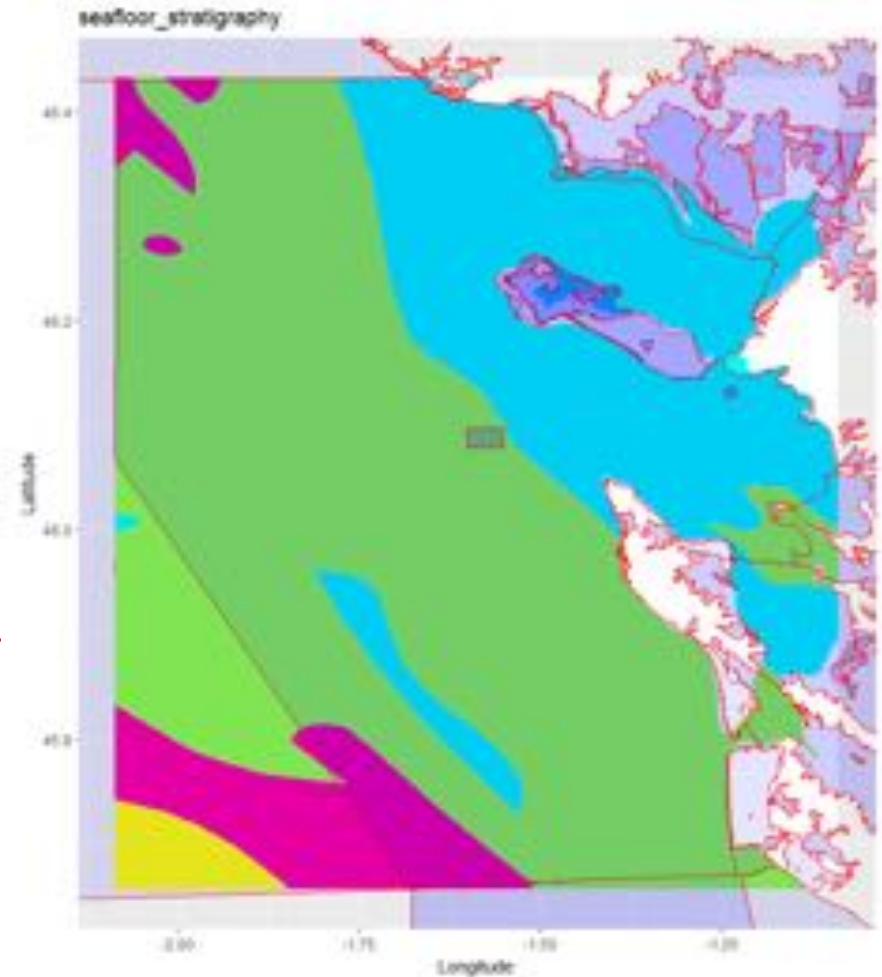


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EMODnet Geology Seafloor stratigraphy

R exercise 4b.r

http://drive.emodnet-geology.eu/geoserver/EMODnetGeology/wms?service=WMS&service=WMS&request=GetLegendGraphic&format=image/png&layer=EMODnetGeology:seafloor_stratigraphy





EMODnet



Climate Change

- 📍 Production of a new map for the European Atlas of the Seas illustrating the Climate Change

The objective is to produce the Sea Surface Temperature trend per MPA.

The calculation of the SST trends is based on a 10 years dataset of monthly SST(JRC, MODIS-T, 2007-01/2017-12)

The queried service is a WCS-Time.



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R studio server on the cloud



7/12/2018



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Scalable processing capacities

Servers > Rprocessing ▾

General information

Hostname: Rprocessing

Location: Bissen, Luxembourg (LU-B11)

IP address: 46.226.109.72

Server: **Running** [Stop](#) [Reboot](#)

Operation in progress: 0

[Add note](#)

[Delete this server](#)



System administration

OS: Ubuntu 16.04 LTS

Emergency console: Inactive [Change status](#) [Change the password](#)

Root access: yes

1,021/hour (history)

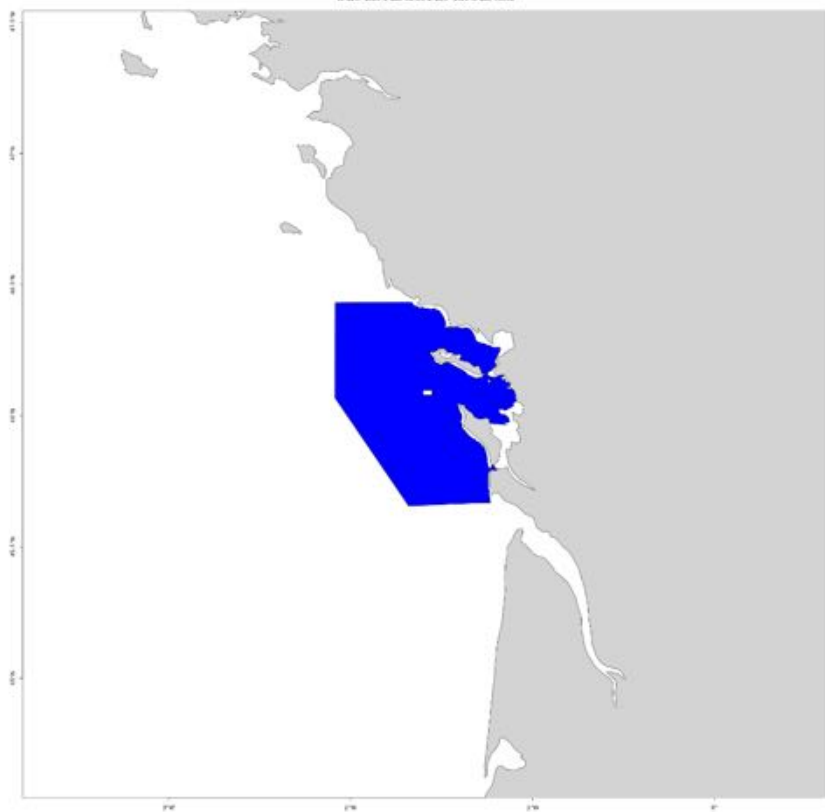
- 4 cores ([Modify](#))
- 8192 MB ([Modify](#))
Server limit 8 GB ([Modify](#))
- 1 disk attached ([Modify](#))
No backup disk
15 GB of attached disk quota
- 1 attached network interface ([Add](#))
100.00 Mbits of dedicated bandwidth ([Modify](#))
- Statistics: [Access](#)



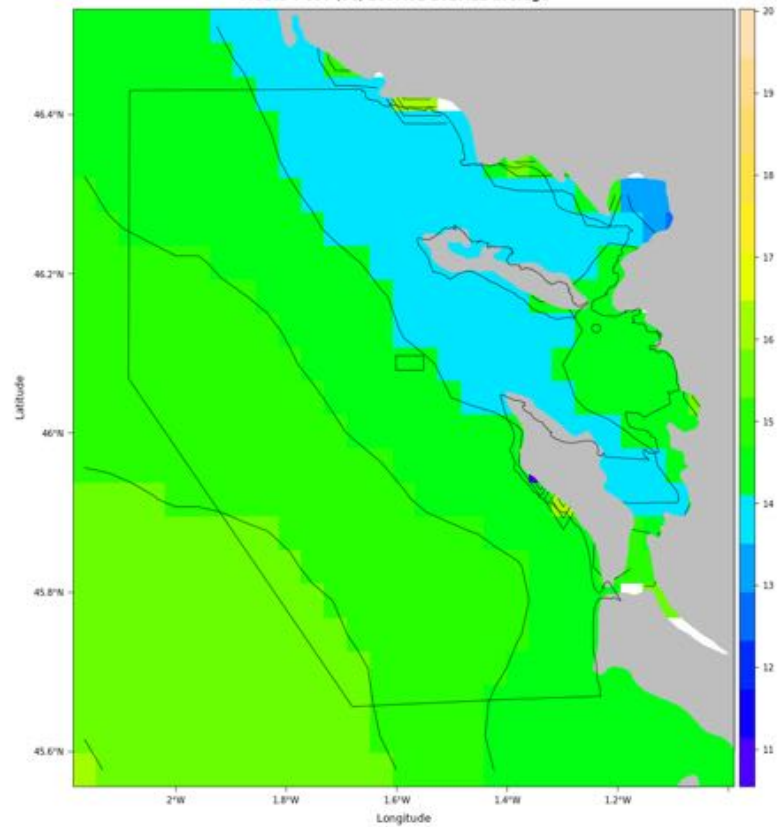
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W Lon: -2.00 E Lon: 45.84 E Lon: -1.00 N Lon: 46.40



MODIS T SST (oC) 2007.01-2017.12 average

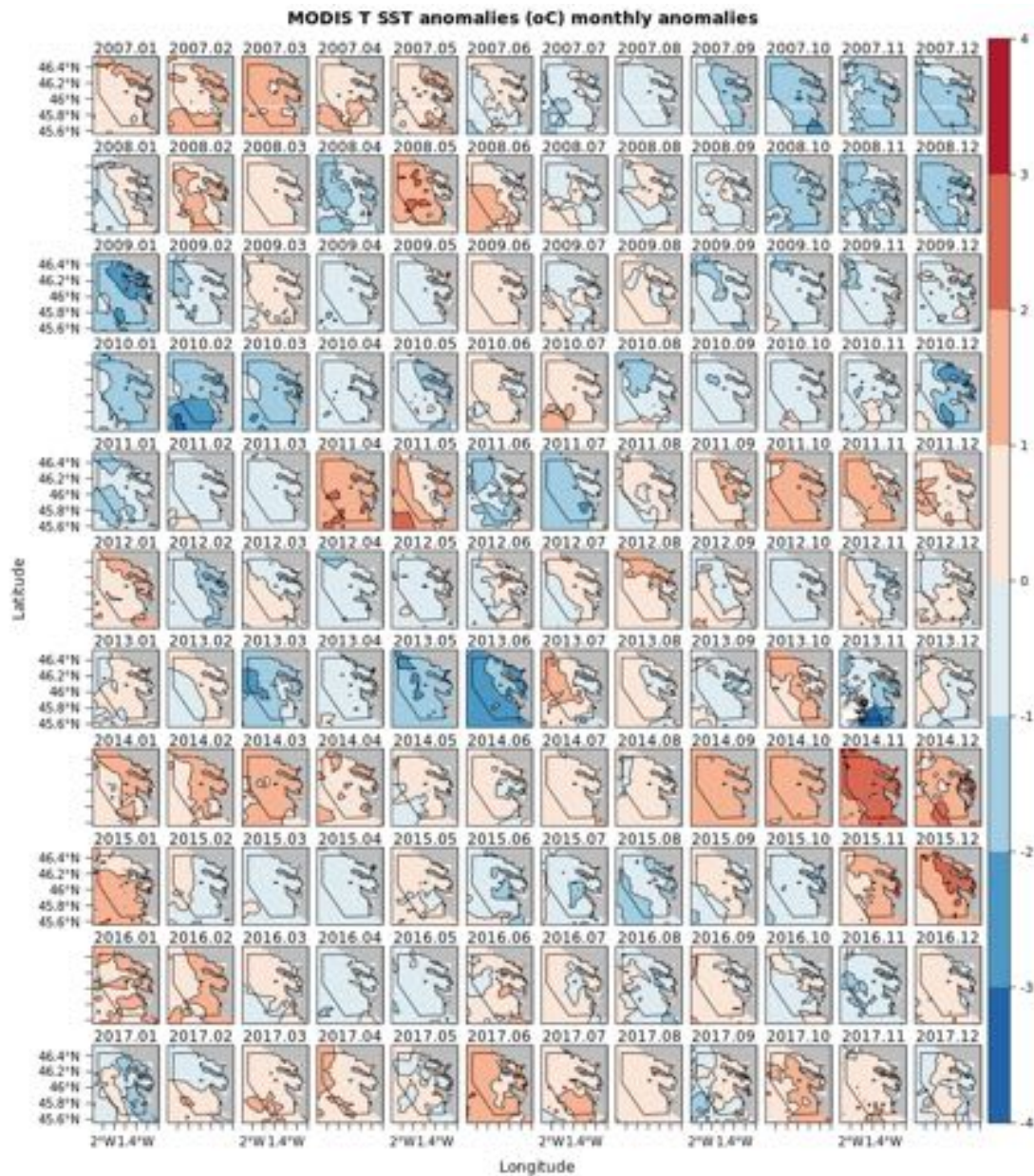




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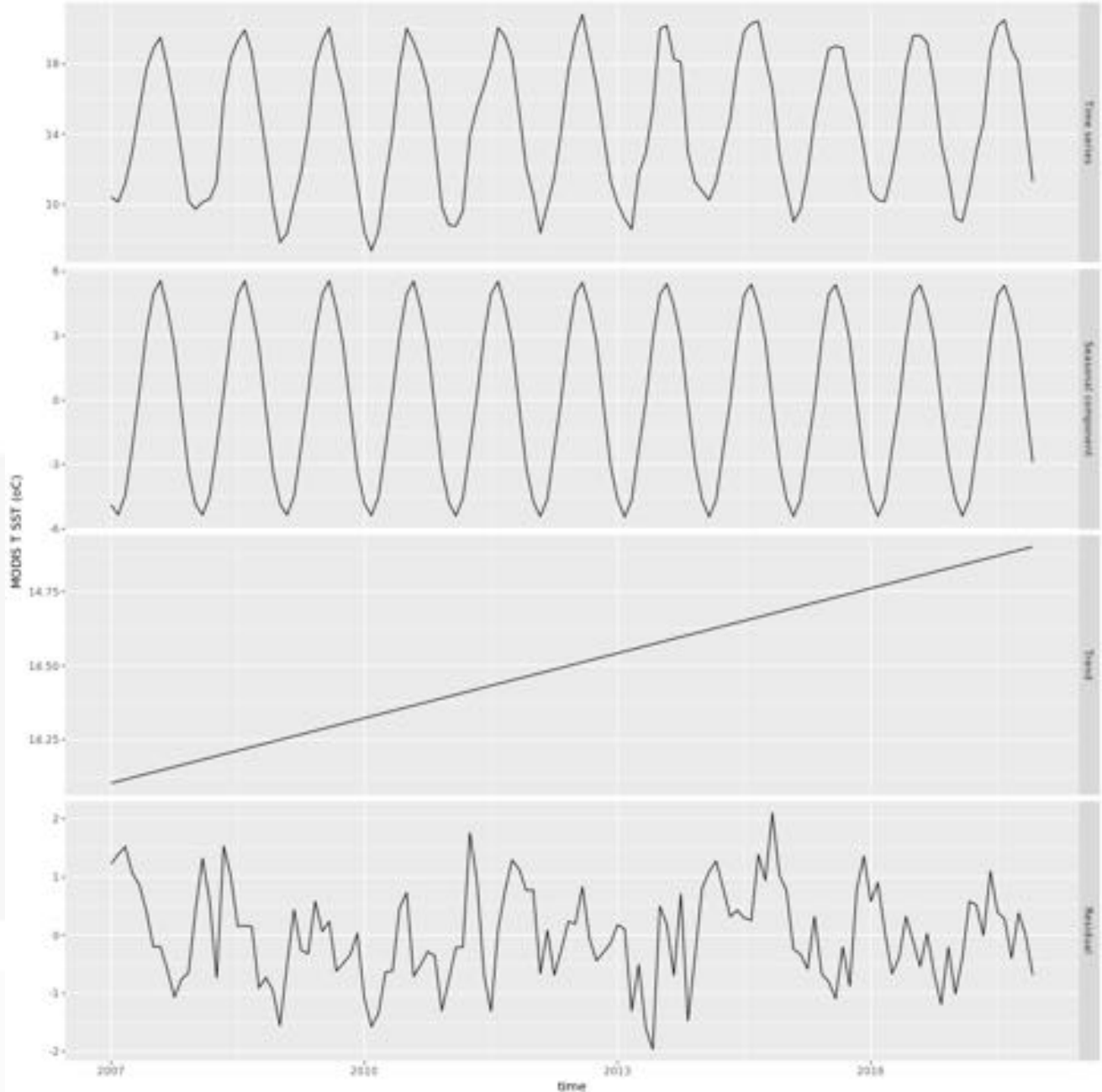
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name	unite	timerange	pixelnb	fracnbna	fractsna	mean	sd	min	max	varseason	vartrend	trendtest	sen.slope
MODIS T SST	oC	2007.01/2017.12	310.0000	0.0100	0.0000	14.5061	3.9649	4.0500	22.2850	95.4223	0.3473	0.0000	0.0728



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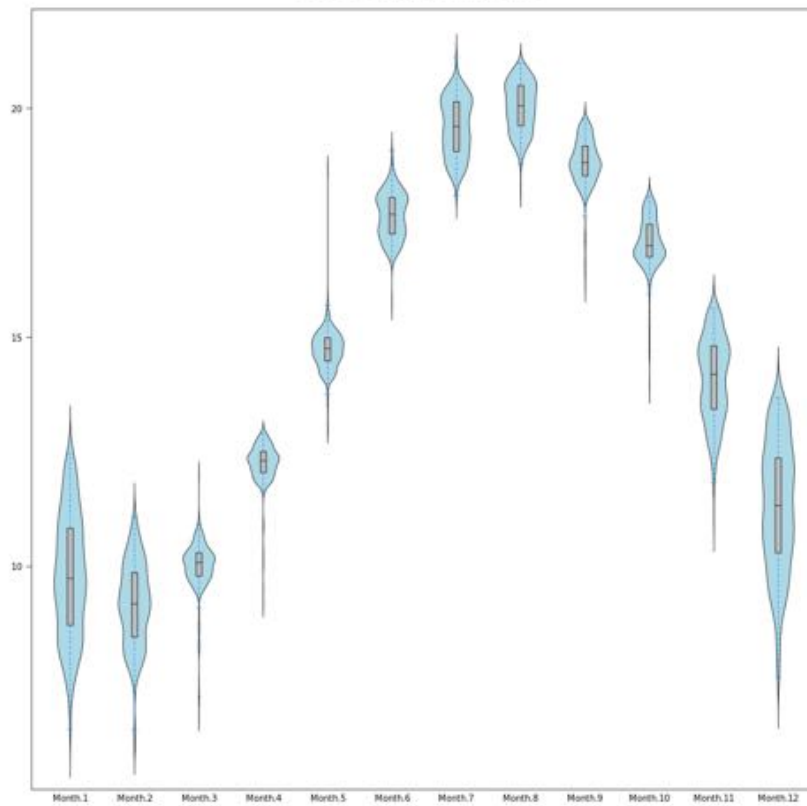


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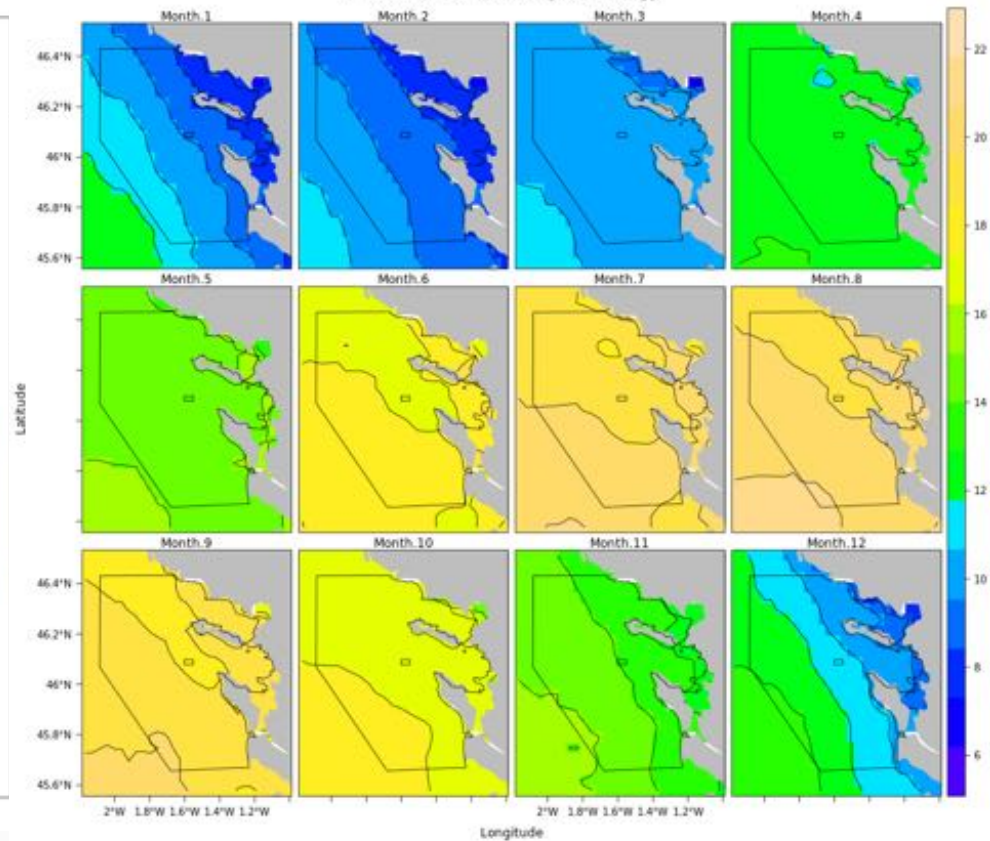


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MODIS T SST (oC) monthly boxplot



MODIS T SST (oC) monthly climatology

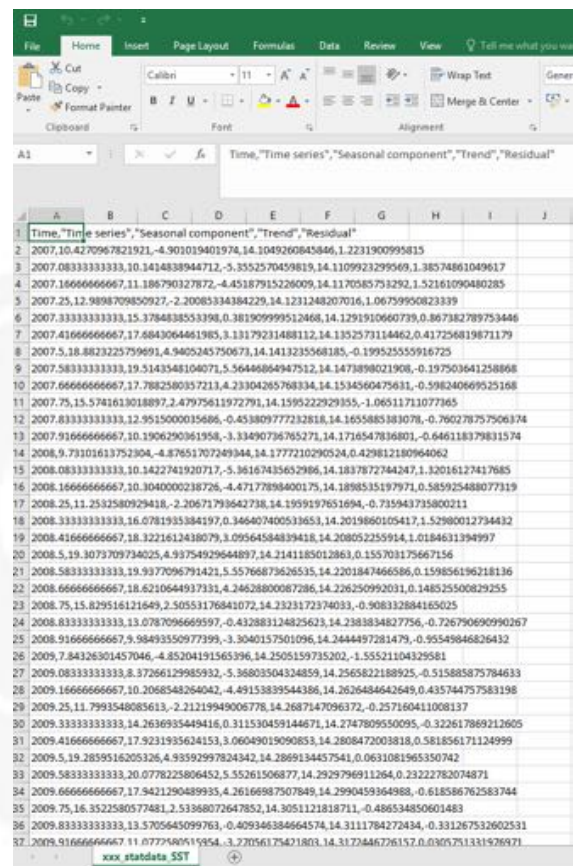
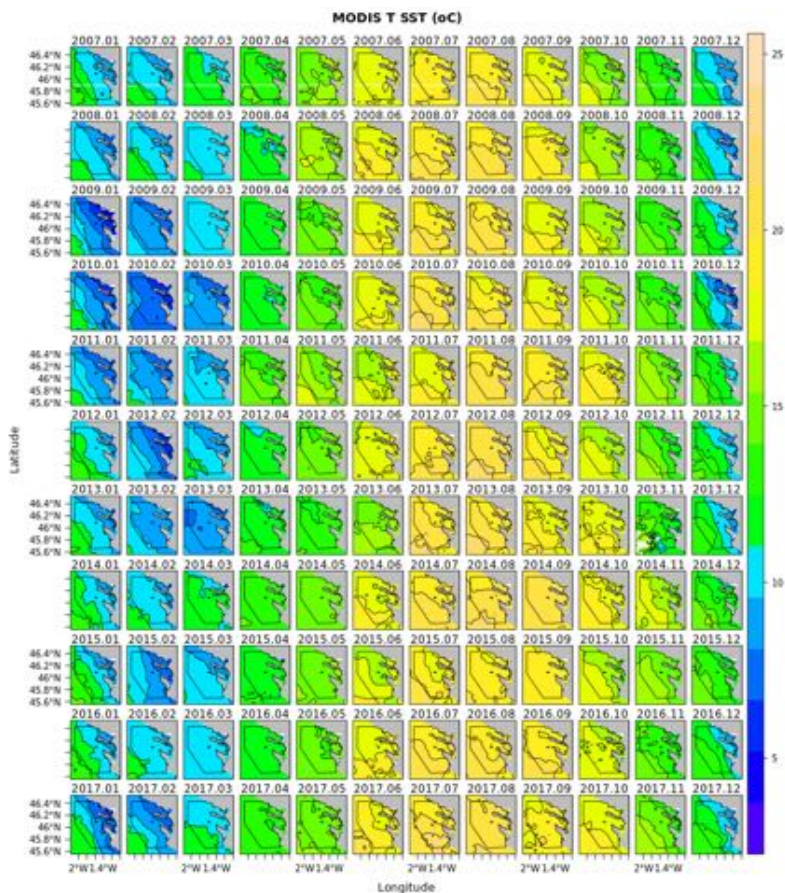




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54



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