

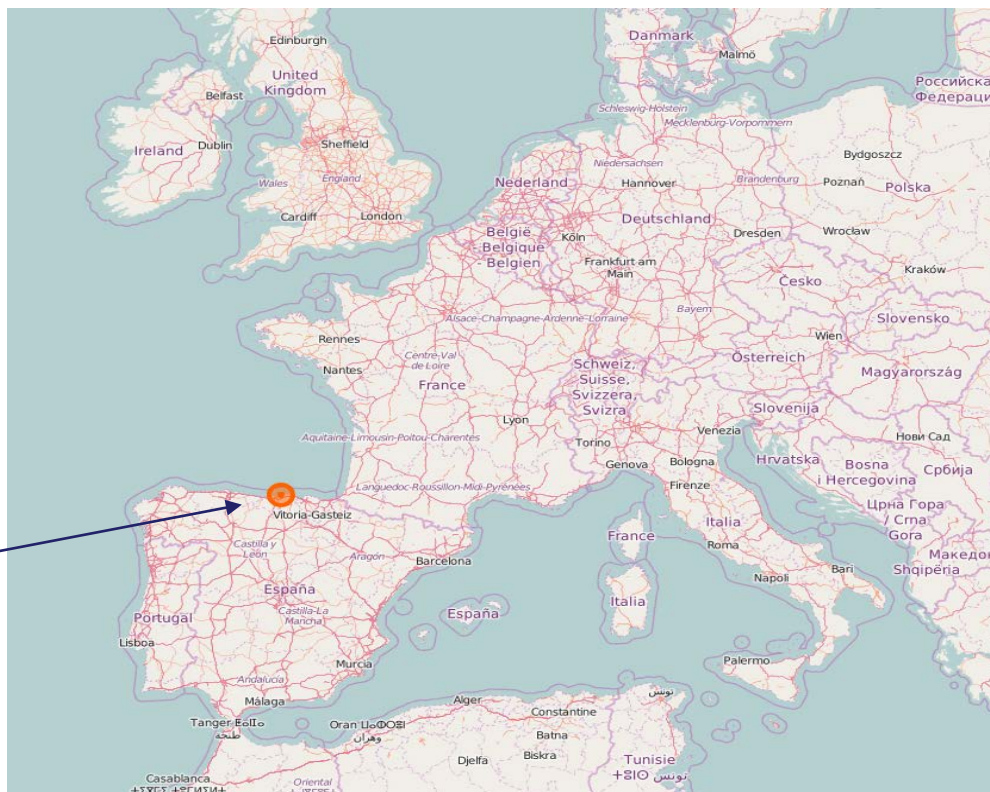
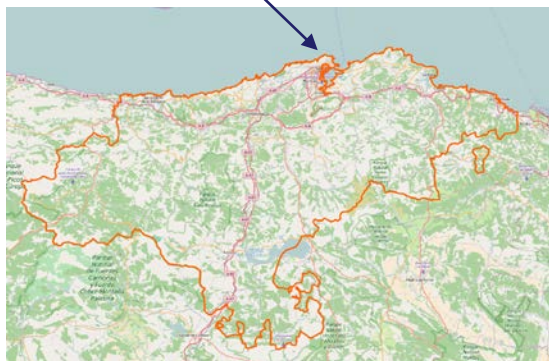
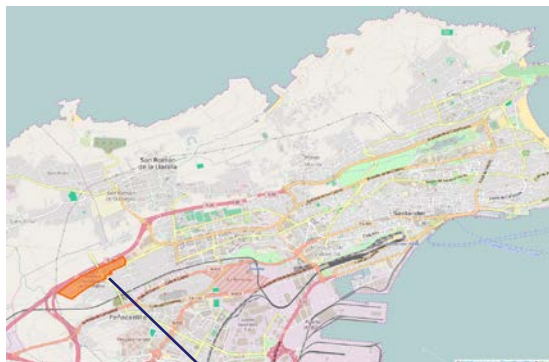
# THREDDS Explorer

Access and visualization of Meteo-Oceanographic  
dynamic data with QGIS

Harold Hormaechea  
Mauri Benedito-Bordonau  
Víctor Velarde  
Felipe Fernández  
Raúl Medina



PCTCAN < Santander < Cantabria < Spain  
Coordinates: 43°27'12.28N 3°52'18.65 O

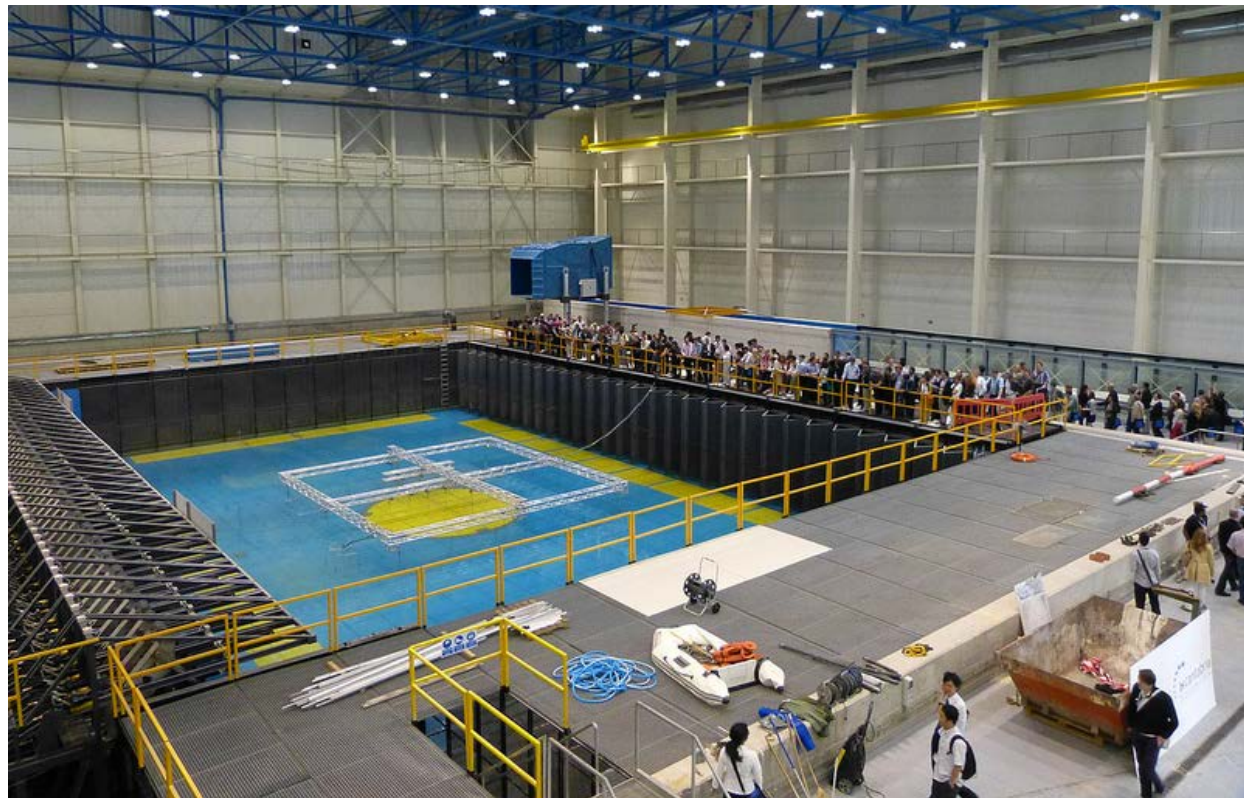






- ~140 people
- Water cycle research
- Areas:
  - Hydrobiology and Environmental Management
  - Climate, Energy and Offshore Structures
  - Hydraulic and Coastal Engineering
  - Information Technologies

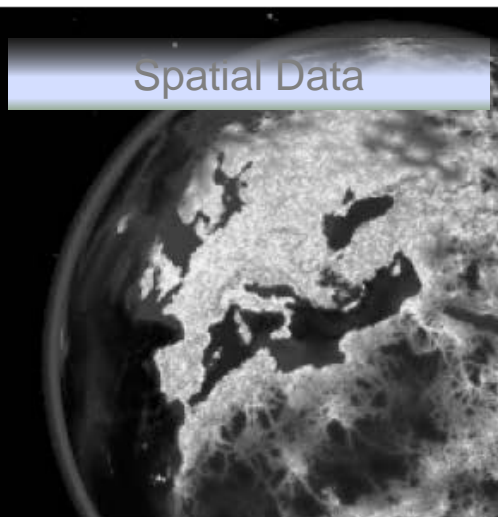
Cantabria Coastal and Ocean Basin(CCOB)



Software



Spatial Data



Cluster



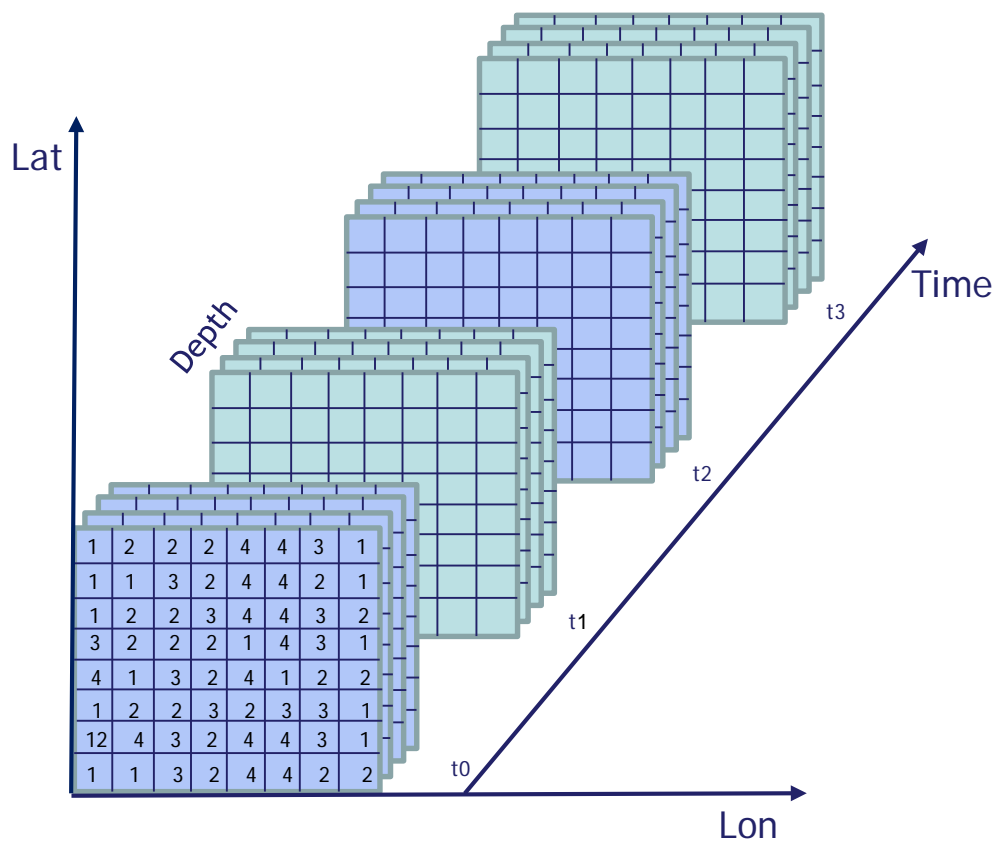
## IHLAB COMPUTING

The Information Technology Team (IH-IT) works mainly in three fields:

1. Software development ([Web & Desktop](#))
2. Management of spatial information ([Data](#))
3. Management of clusters and numerical processing capacity ([Clusters](#))



## Multidimensional Data



Variable: Wind Speed

## Data Providers



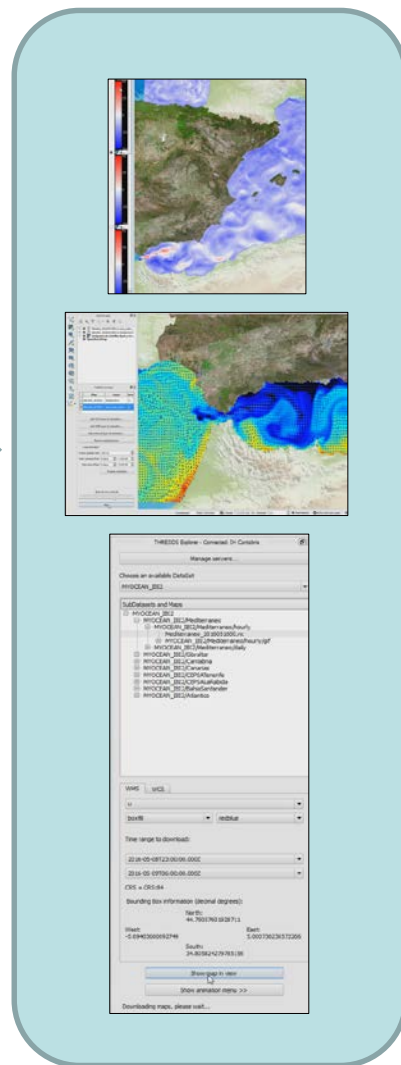
THREDDS Data Server

- Between data providers and users
- Enables Discovery and use of scientific data
- Organizes datasets and services via catalogs

### Dataset



## Products



### 1) Discovering the information

- Using web browser
- Diving into XML files

**PFEL TDS** Catalog <http://oceanwatch.pfeg.noaa.gov/thredds/catalog.html>

Dataset	Size	Last Modified
ERD THREDDS Data Server		--
Satellite Datasets		--
Carbon		--
Particulate Organic Carbon, Aqua MODIS, NPP, Global, Science Quality/		--
Particulate Inorganic Carbon, Aqua MODIS, NPP, Global, Science Quality/		--
Particulate Organic Carbon, NPP-Suomi, VIIRS, New Global, Evaluation Data/		--
Particulate Inorganic Carbon, NPP-Suomi, VIIRS, New Global, Evaluation Data/		--
Particulate Organic Carbon, NPP-Suomi, VIIRS, New Global, Evaluation Data, Deprecated Version/		--
Particulate Inorganic Carbon, NPP-Suomi, VIIRS, New Global, Evaluation Data, Deprecated Version/		--
Particulate Organic Carbon (Deprecated Older Version), NPP-Suomi, VIIRS, Global, Evaluation Data/		--
Particulate Inorganic Carbon (Deprecated Older Version), NPP-Suomi, VIIRS, Global, Evaluation Data/		--
Color		--
OSU Bloom Products/		--
OSU USWC MODIS Chlorophyll Anomaly Products/		--
Chlorophyll-a, NPP-Suomi, VIIRS, Global, New Evaluation Data/		--
Chlorophyll-a, NPP-Suomi, VIIRS, Global, New Evaluation Data, Deprecated Version/		--
Chlorophyll-a (Deprecated Older Version), NPP-Suomi, VIIRS, Global, Evaluation Data/		--
Chlorophyll-a, Aqua MODIS, NPP, Global, Science Quality/		--
Chlorophyll-a (Deprecated Older Version), Aqua MODIS, NPP, Global, Science Quality/		--
Chlorophyll-a, Aqua MODIS, NPP, Pacific Ocean/		--
Chlorophyll-a, Aqua MODIS, NPP, West US/		--
Chlorophyll-a, Aqua MODIS, NPP, East US/		--
Chlorophyll-a, Aqua MODIS, NPP, Gulf of Mexico/		--
Chlorophyll-a, Aqua MODIS, NPP, Indonesia/		--
Chlorophyll-a, Aqua MODIS, NPP, West US/		--



**PFEL TDS Catalog** <http://oceanwatch.pfeg.noaa.gov/thredds/catalog.html>

**Datas** [oceanwatch.pfeg.noaa.gov/thredds/wms/satellite/VH2/poc/mday?service=WMS&version=1.3.0&request=GetCapabilities](http://oceanwatch.pfeg.noaa.gov/thredds/wms/satellite/VH2/poc/mday?service=WMS&version=1.3.0&request=GetCapabilities)

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</LegendURL>
</Style>
```

- 1) Discovering the information
  - Using web browser
  - Diving into XML files
- 2) Visualizing maps using GODIVA2

1) Di  
- Us  
- Div

2) Vi

☒ Auto-zoom on select

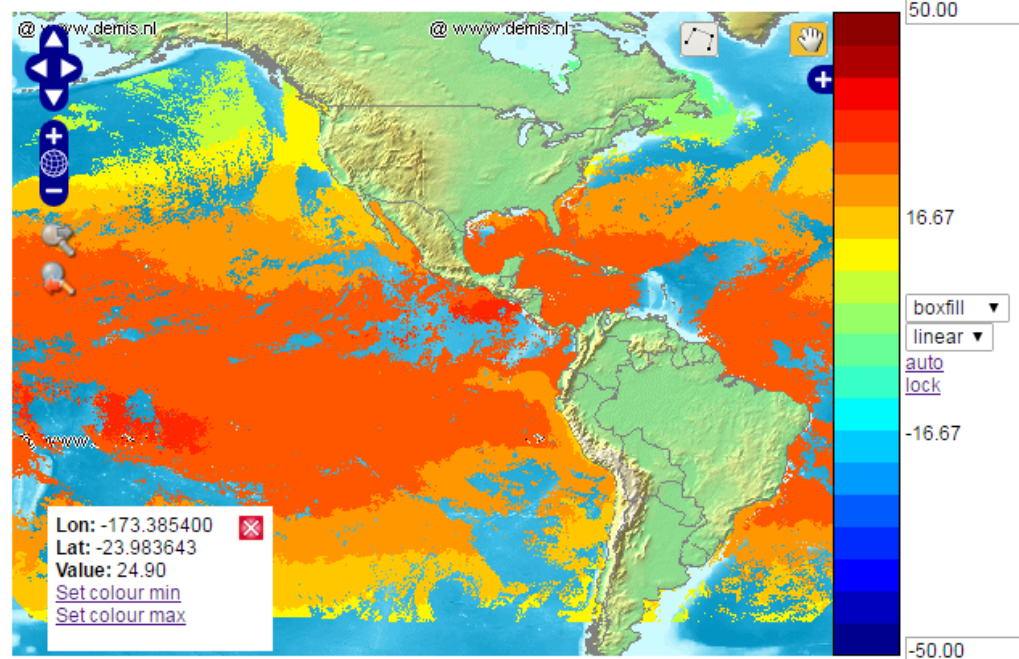
PFEL TDS

SST, NOAA GOES Imager, Day and Night,  
0.05 degrees, Western Hemisphere  
└─ sea\_surface\_temperature

Layer: PFEL TDS > SST, NOAA GOES Imager, Day and Night, 0.05  
degrees, Western Hemisphere > sea\_surface\_temperature  
Units: degree\_C  
Height (m):   
Date/time: 02 May 2016 12:00:00 UTC [first frame](#) [last frame](#)  
[Create animation](#) from 2016-05-19T12:00:00.000Z to

May, 2016						
« Today »						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				
Select date						

[Fit layer to window](#)



[User guide](#)



[test image](#) [Open in Google Earth](#)

Overlay opacity:

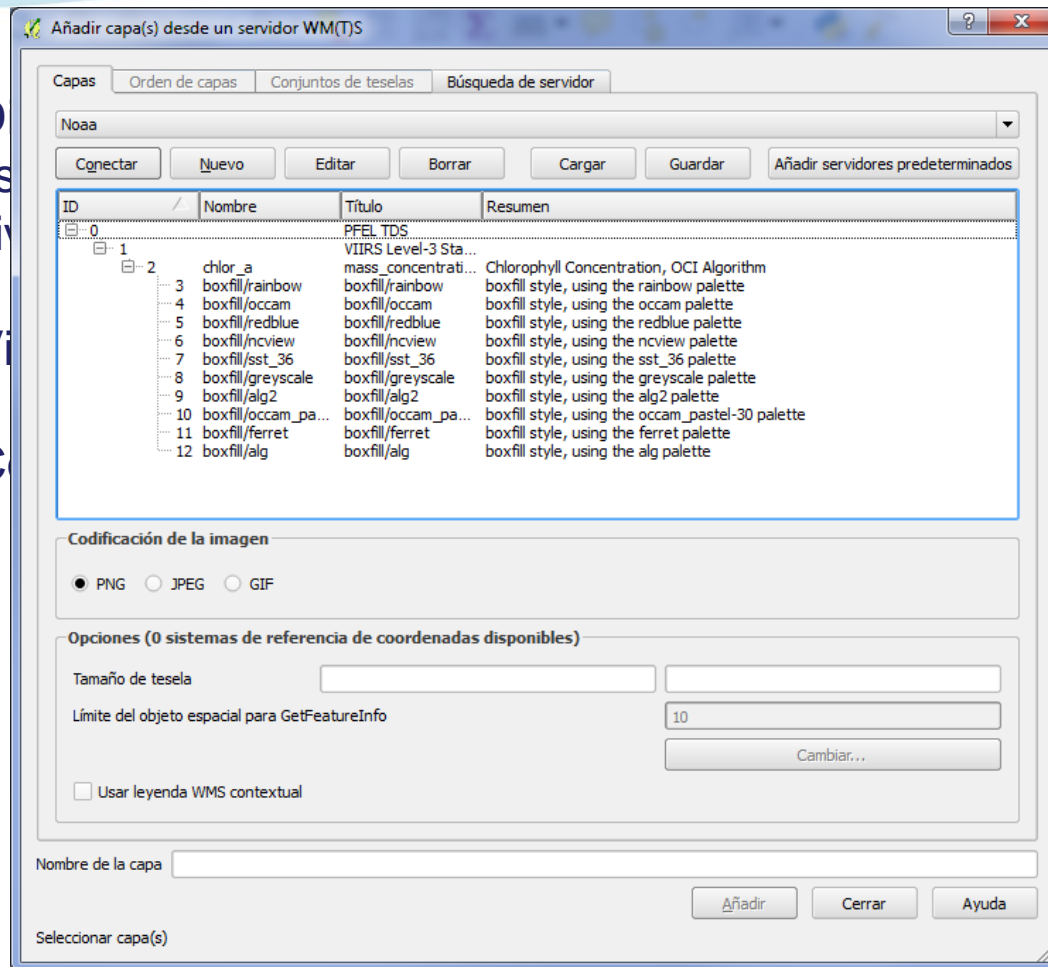
Powered by [OpenLayers](#) and [OGC](#) standards

[Permalink](#) | [email](#)

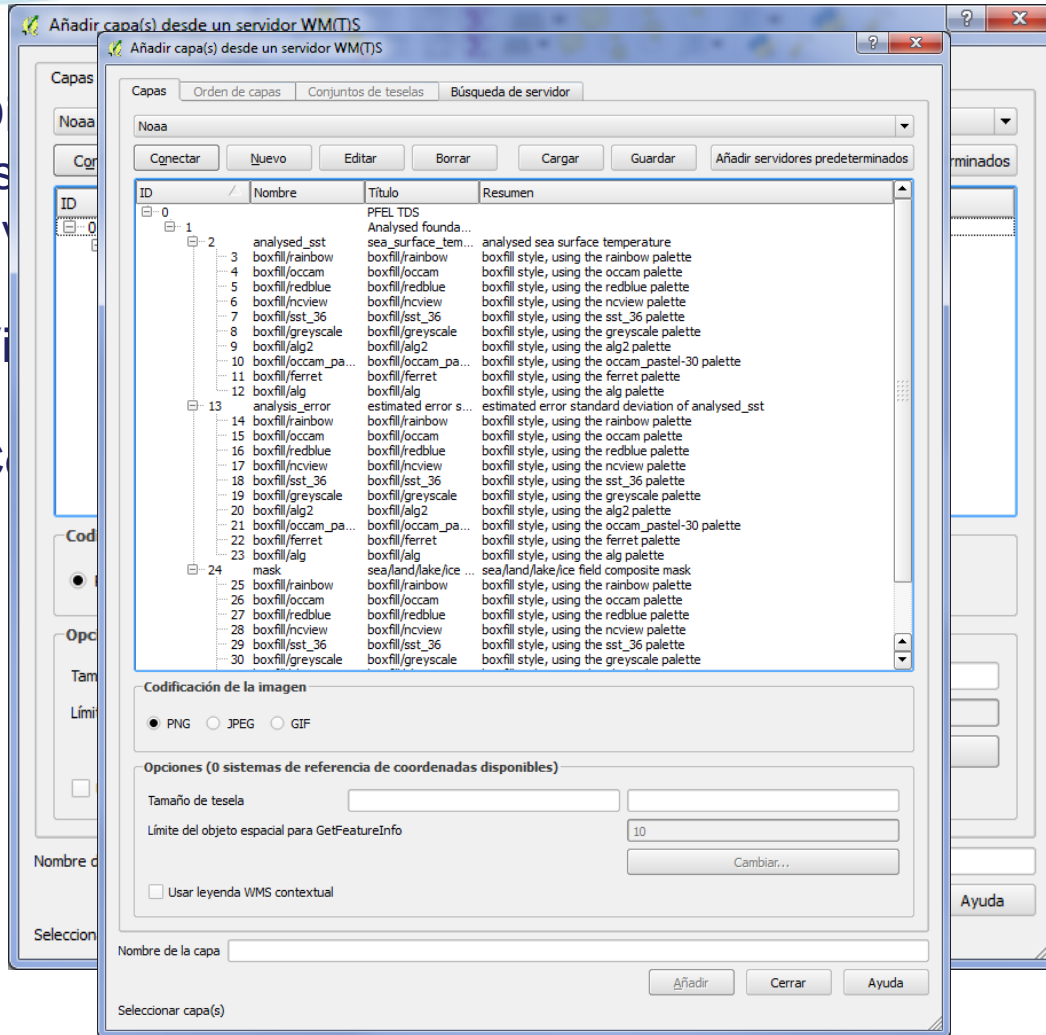
- 1) Discovering the information
  - Using web browser
  - Dive into XML files
- 2) Visualize maps using GODIVA2
- 3) Connecting to each WMS/WCS in QGIS



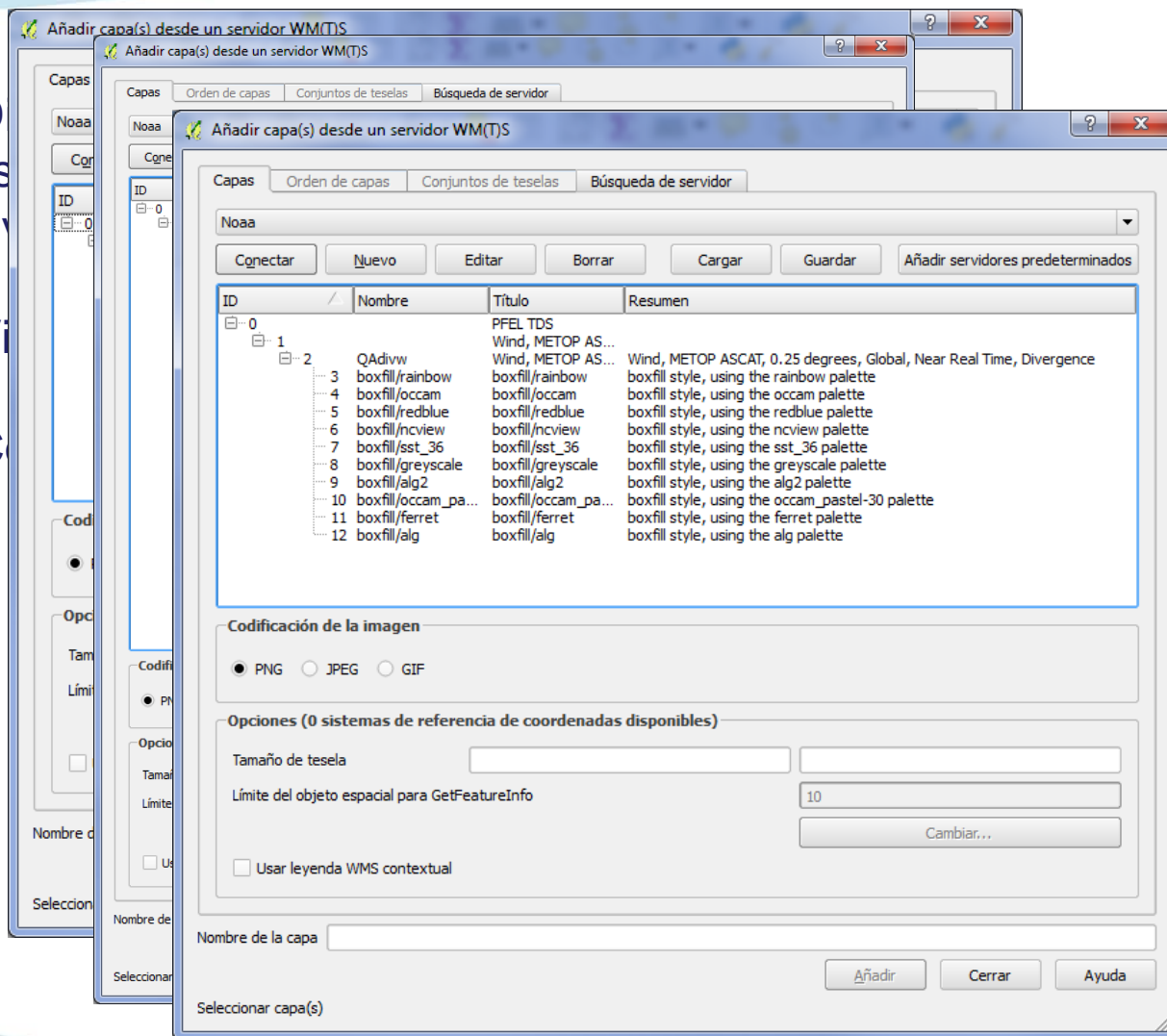
- 1) D
- Us
- Div
- 2) Vi
- 3) C



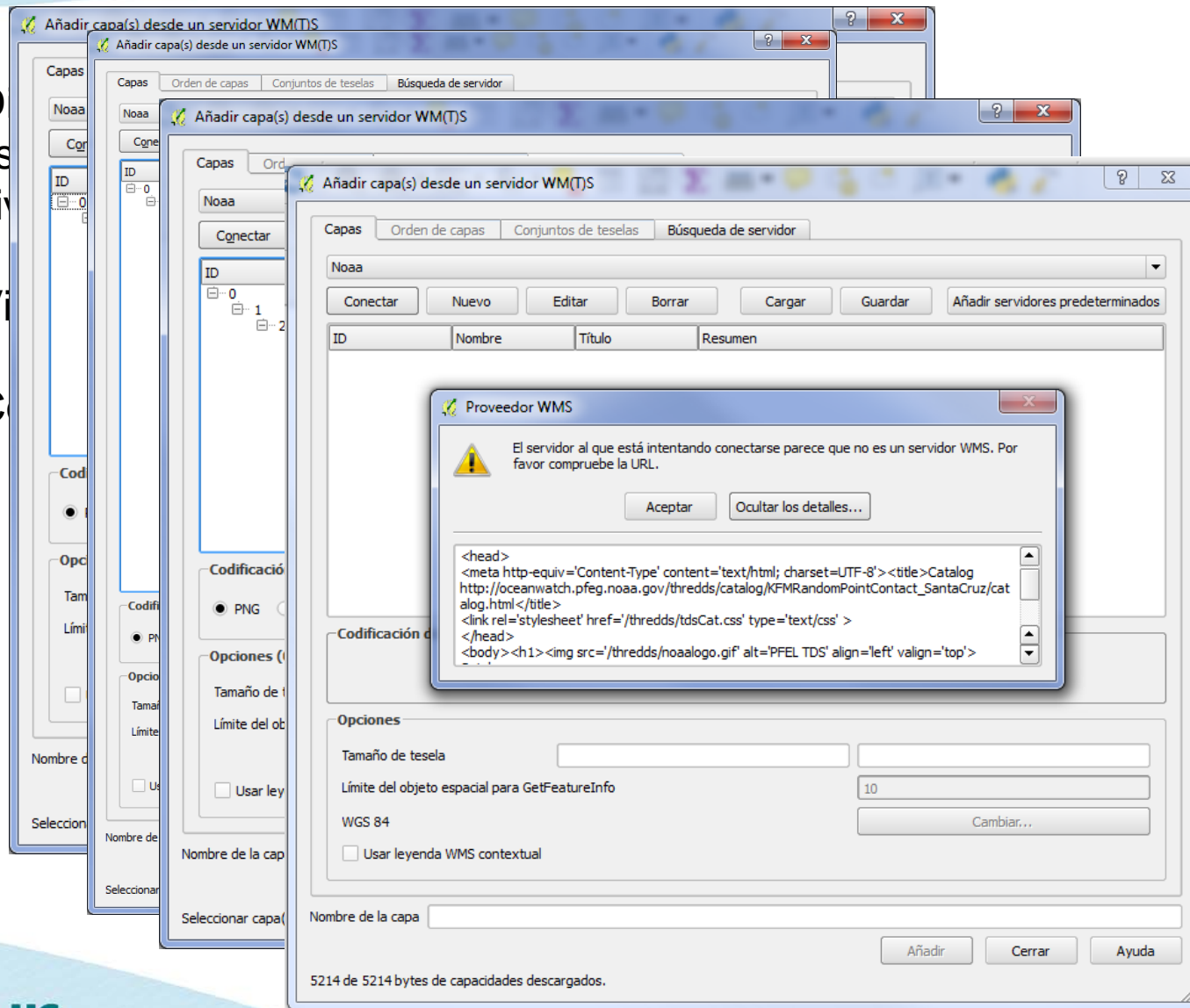
- 1) D
- Us
- Div
- 2) Vi
- 3) C



- 1) D
- Us
- Div
- 2) Vi
- 3) C



- 1) D
- Us
- Div
- 2) Vi
- 3) C





QGIS 2.14.2-Essen

Proyecto Edición Ver Capa Configuración Complementos Vectorial Ráster Base de datos Web Procesos Ayuda

Panel de capas

hourly mean surface fields from Atlantic Iberian...  
sea water\_potential\_temperature (K)

THREDDS Animator

Map	Layer	times
1 Mediterraneo_20...	temperature	[2016-05-21T23:00:...

Add WCS layer to animation...

Add WMS layer to animation...

Add external layer to animation...

Remove selected layer

☐ Loop animation

Frame update rate: 500 ms

Time variation/frame: 0 days 1:00:00

Max time offset: 0 days 0:00:00

Prepare animation

Play

THREDDS Explorer - Connected: IH Cantabria

Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052300.nc
        - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
    - MYOCEAN\_IBI2/Gibraltar
    - MYOCEAN\_IBI2/Cantabria
    - MYOCEAN\_IBI2/Canarias
    - MYOCEAN\_IBI2/CEPSATenerife
    - MYOCEAN\_IBI2/CEPSALaRabida
    - MYOCEAN\_IBI2/BahiaSantander
    - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill rainbow

Time range to download:

2016-05-21T23:00:00.000Z

2016-05-21T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North: 44.75057601928711

West: -5.69403600692749 East: 5.000736236572266

South: 34.805824279785156

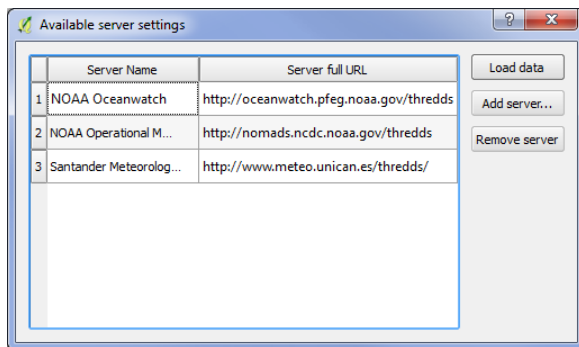
Show map in view

Hide animation menu <<

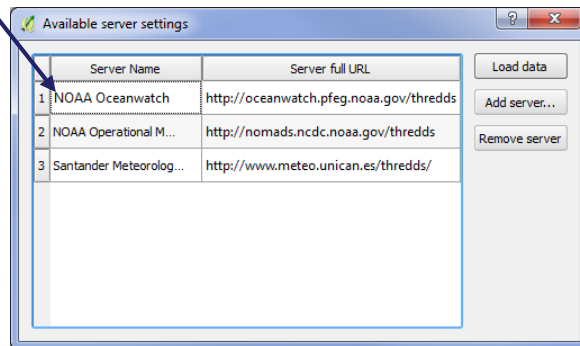
Layer 'temperature' [WMS]retrieved

Coordenada 898966,4177865 Escala 1:2.550.463 Rotación 0,0 Representar EPSG:25830 (al vuelo)

- Visualize and download the content of any THREDDS server
- OGC protocols (WMS/WCS)
- Combine maps and layers of different catalogs and servers
- Parameters selection
  - Variable
  - Color scheme
  - Temporal series
  - Instant in time
- Animation Extension

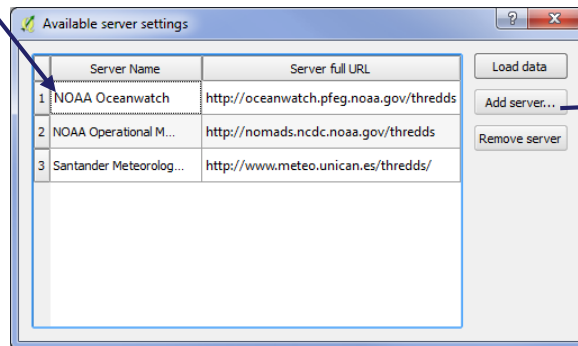


1- Select server

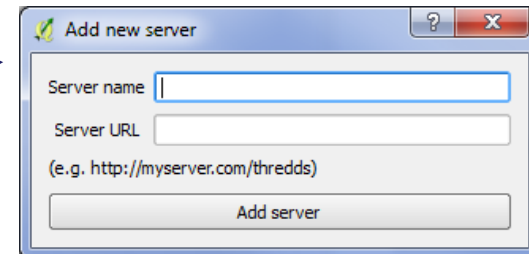




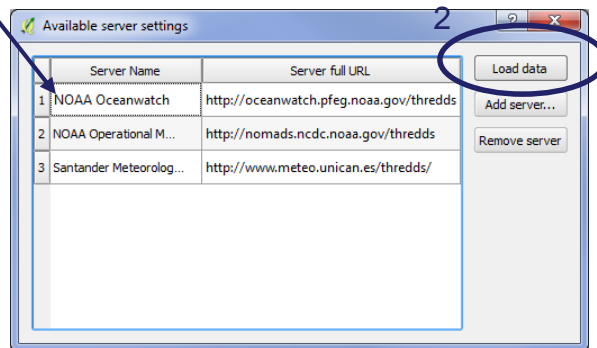
1- Select server



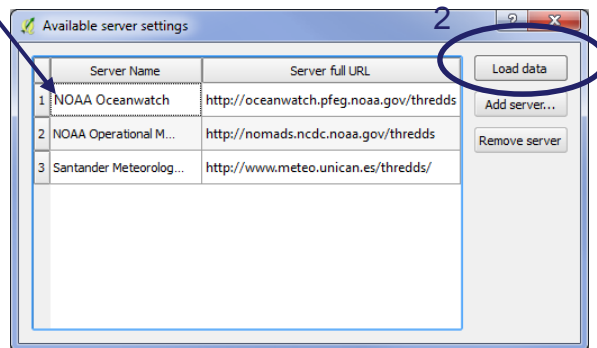
Add new server to the list of servers



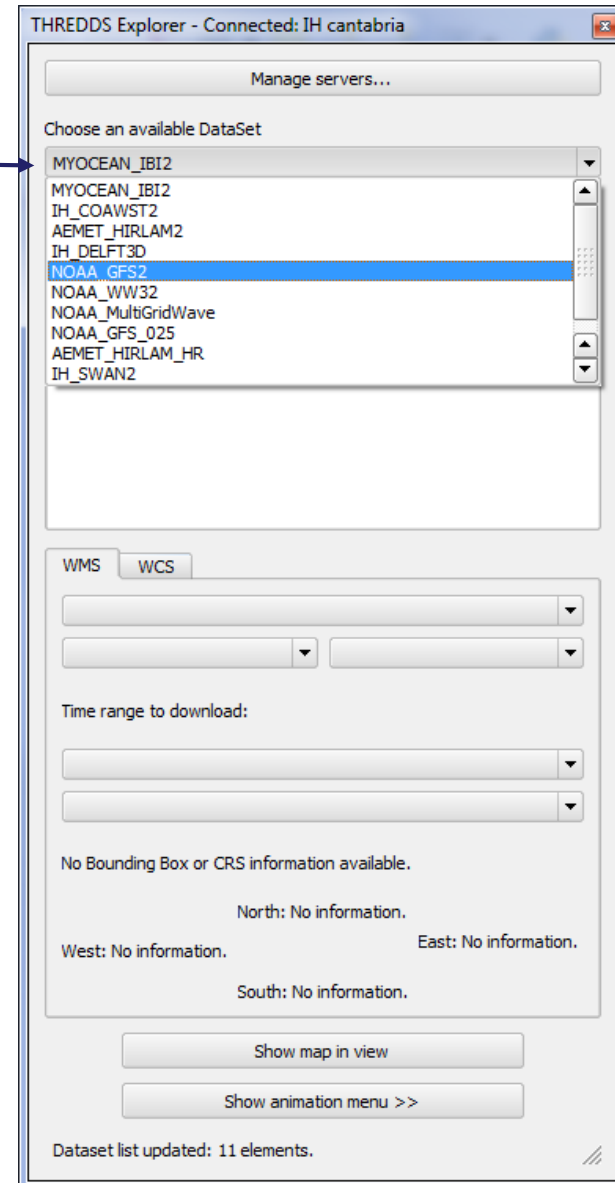
1- Select server



1- Select server



3- Choose Dataset



Available maps

THREDDS Explorer - Connected: IH cantabria

Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052400.nc
      - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
    - MYOCEAN\_IBI2/Mediterraneo/daily
  - MYOCEAN\_IBI2/Gibraltar
  - MYOCEAN\_IBI2/Cantabria
  - MYOCEAN\_IBI2/Canarias
  - MYOCEAN\_IBI2/CEPSATenerife
  - MYOCEAN\_IBI2/CEPSALaRabida
  - MYOCEAN\_IBI2/BahiaSantander
  - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill rainbow

Time range to download:

2016-05-22T23:00:00.000Z

2016-05-22T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North:  
44.75057601928711

West:  
-5.69403600692749

East:  
5.000736236572266

South:  
34.805824279785156

Show map in view

Show animation menu >>



Available maps

Protocol

THREDDS Explorer - Connected: IH cantabria

Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052400.nc
      - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
      - MYOCEAN\_IBI2/Mediterraneo/daily
    - MYOCEAN\_IBI2/Gibraltar
    - MYOCEAN\_IBI2/Cantabria
    - MYOCEAN\_IBI2/Canarias
    - MYOCEAN\_IBI2/CEPSATenerife
    - MYOCEAN\_IBI2/CEPSALaRabida
    - MYOCEAN\_IBI2/BahiaSantander
    - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill rainbow

Time range to download:

2016-05-22T23:00:00.000Z

2016-05-22T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North:  
44.75057601928711

West:  
-5.69403600692749

East:  
5.000736236572266

South:  
34.805824279785156

Show map in view

Show animation menu >>

Available maps

Protocol

Variable

THREDDS Explorer - Connected: IH cantabria

Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052400.nc
      - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
      - MYOCEAN\_IBI2/Mediterraneo/daily
    - MYOCEAN\_IBI2/Gibraltar
    - MYOCEAN\_IBI2/Cantabria
    - MYOCEAN\_IBI2/Canarias
    - MYOCEAN\_IBI2/CEPSATenerife
    - MYOCEAN\_IBI2/CEPSALaRabida
    - MYOCEAN\_IBI2/BahiaSantander
    - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill rainbow

Time range to download:

2016-05-22T23:00:00.000Z

2016-05-22T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North:  
44.75057601928711

West:  
-5.69403600692749

East:  
5.000736236572266

South:  
34.805824279785156

Show map in view

Show animation menu >>

Available maps

Protocol

Variable

Color Scheme

THREDDS Explorer - Connected: IH cantabria

Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052400.nc
      - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
    - MYOCEAN\_IBI2/Mediterraneo/daily
  - MYOCEAN\_IBI2/Gibraltar
  - MYOCEAN\_IBI2/Cantabria
  - MYOCEAN\_IBI2/Canarias
  - MYOCEAN\_IBI2/CEPSATenerife
  - MYOCEAN\_IBI2/CEPSALaRabida
  - MYOCEAN\_IBI2/BahiaSantander
  - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill rainbow

Time range to download:

2016-05-22T23:00:00.000Z

2016-05-22T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North:  
44.75057601928711

West:  
-5.69403600692749

East:  
5.000736236572266

South:  
34.805824279785156

Show map in view

Show animation menu >>

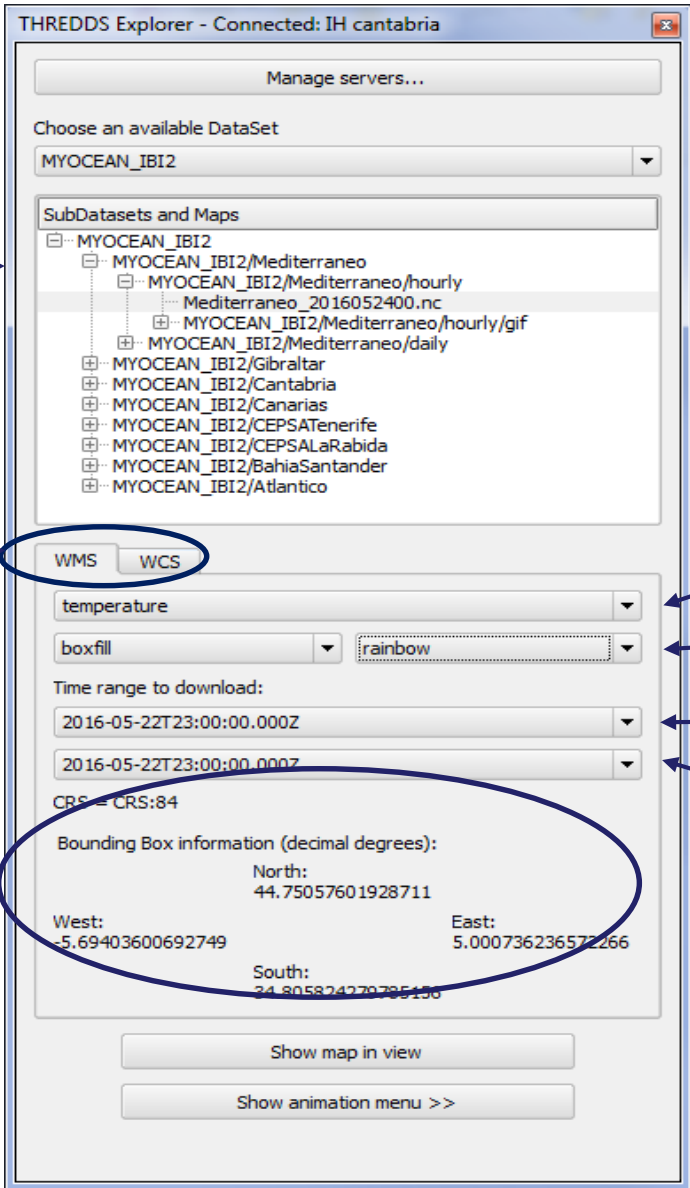
The screenshot shows the THREDDS Explorer interface. Annotations point to various components:

- Available maps:** Points to the "SubDatasets and Maps" tree view.
- Protocol:** Points to the "WMS" and "WCS" tabs.
- Variable:** Points to the "temperature" dropdown menu.
- Color Scheme:** Points to the "rainbow" dropdown menu.
- Initial Time:** Points to the top time range input field.
- End Time:** Points to the bottom time range input field.

The interface includes the following elements:

- Manage servers...
- Choose an available DataSet: MYOCEAN\_IBI2
- SubDatasets and Maps tree view showing various datasets like MYOCEAN\_IBI2/Mediterraneo, MYOCEAN\_IBI2/Gibraltar, etc.
- Protocol tabs: WMS (selected) and WCS.
- Variable: temperature
- Color Scheme: rainbow
- Time range to download: 2016-05-22T23:00:00.000Z to 2016-05-22T23:00:00.000Z
- CRS = CRS:84
- Bounding Box information (decimal degrees): North: 44.75057601928711, West: -5.69403600692749, East: 5.000736236572266, South: 34.805824279785156
- Show map in view
- Show animation menu >>

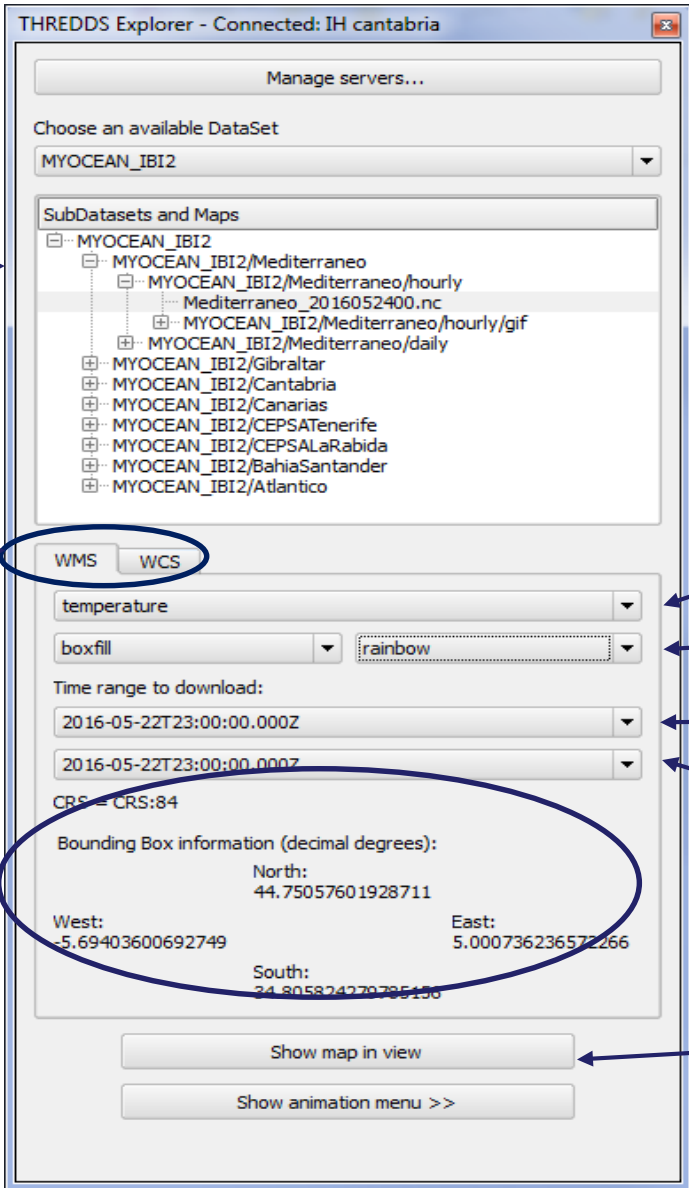




The screenshot shows the THREDDS Explorer interface with the following components and annotations:

- Available maps:** Points to the "SubDatasets and Maps" tree view on the left, which lists various datasets under "MYOCEAN\_IBI2".
- Protocol:** Points to the "WMS" and "WCS" tabs, with "WMS" currently selected.
- Variable:** Points to the "temperature" dropdown menu.
- Color Scheme:** Points to the "rainbow" dropdown menu.
- Initial Time:** Points to the first date/time input field, showing "2016-05-22T23:00:00.000Z".
- End Time:** Points to the second date/time input field, showing "2016-05-22T23:00:00.000Z".
- Map ext info:** Points to the "Bounding Box information (decimal degrees)" section, which displays coordinates for North, West, East, and South.

Buttons at the bottom include "Show map in view" and "Show animation menu >>".



The screenshot shows the THREDDS Explorer interface with the following components and annotations:

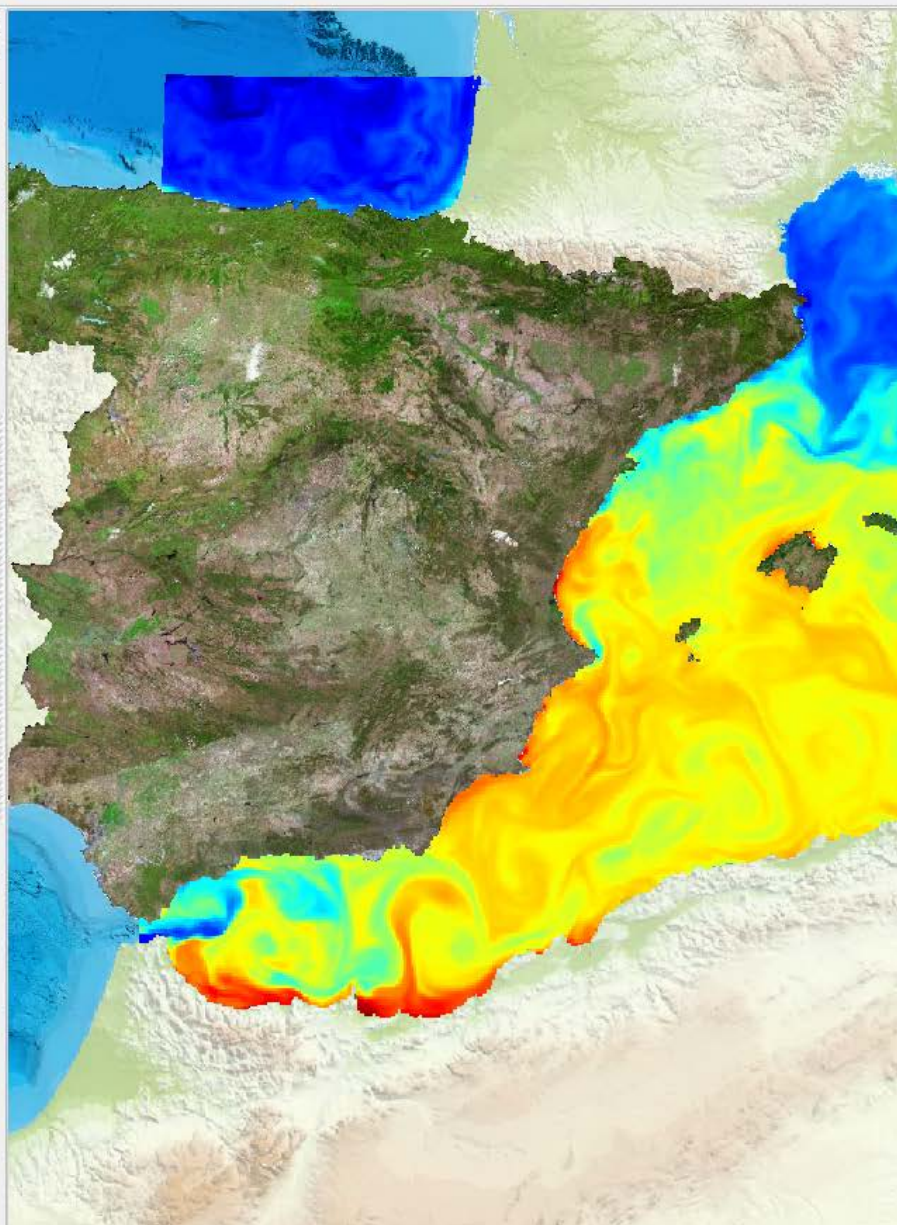
- Available maps:** Points to the "SubDatasets and Maps" tree view showing a hierarchy of datasets under "MYOCEAN\_IBI2".
- Protocol:** Points to the "WMS" and "WCS" tabs, with "WMS" currently selected.
- Variable:** Points to the "temperature" dropdown menu.
- Color Scheme:** Points to the "boxfill" and "rainbow" dropdown menus.
- Initial Time:** Points to the first "Time range to download:" dropdown, showing "2016-05-22T23:00:00.000Z".
- End Time:** Points to the second "Time range to download:" dropdown, showing "2016-05-22T23:00:00.000Z".
- Map ext info:** Points to the "Bounding Box information (decimal degrees):" section, which includes coordinates for North, West, East, and South.
- Load map on QGIS as a layer:** Points to the "Show map in view" button.

Additional interface elements include a "Manage servers..." button at the top, a "Choose an available DataSet" dropdown set to "MYOCEAN\_IBI2", and a "Show animation menu >>" button at the bottom.



Panel de capas

- hourly mean surface...
  - 308
  - 298
  - 288
  - 278
  - 268
 sea\_water\_potential\_temperature (K)
- Imágenes de satelit...



Manage servers...

Choose an available DataSet

MYOCEAN\_IBI2

SubDatasets and Maps

- MYOCEAN\_IBI2
  - MYOCEAN\_IBI2/Mediterraneo
    - MYOCEAN\_IBI2/Mediterraneo/hourly
      - Mediterraneo\_2016052400.nc
        - MYOCEAN\_IBI2/Mediterraneo/hourly/gif
    - MYOCEAN\_IBI2/Gibraltar
    - MYOCEAN\_IBI2/Cantabria
    - MYOCEAN\_IBI2/Canarias
    - MYOCEAN\_IBI2/CEPSATenerife
    - MYOCEAN\_IBI2/CEPSALaRabida
    - MYOCEAN\_IBI2/BahiaSantander
      - MYOCEAN\_IBI2/BahiaSantander/hourly
        - BahiaSantander\_2016052400.nc
          - MYOCEAN\_IBI2/BahiaSantander/hourly/gif
            - BahiaSantander\_sea\_water\_velocity\_20160524...
            - MYOCEAN\_IBI2/BahiaSantander/hourly/gif/leve...
              - BahiaSantander\_sea\_water\_velocity\_20160...
              - No subsets found
        - MYOCEAN\_IBI2/BahiaSantander/daily
      - MYOCEAN\_IBI2/Atlantico

WMS WCS

temperature

boxfill sst\_36

Time range to download:

2016-05-22T23:00:00.000Z

2016-05-22T23:00:00.000Z

CRS = CRS:84

Bounding Box information (decimal degrees):

North: 44.75057601928711

West: -5.69403600692749 East: 5.000736236572266

South: 34.805824279785156

Show map in view

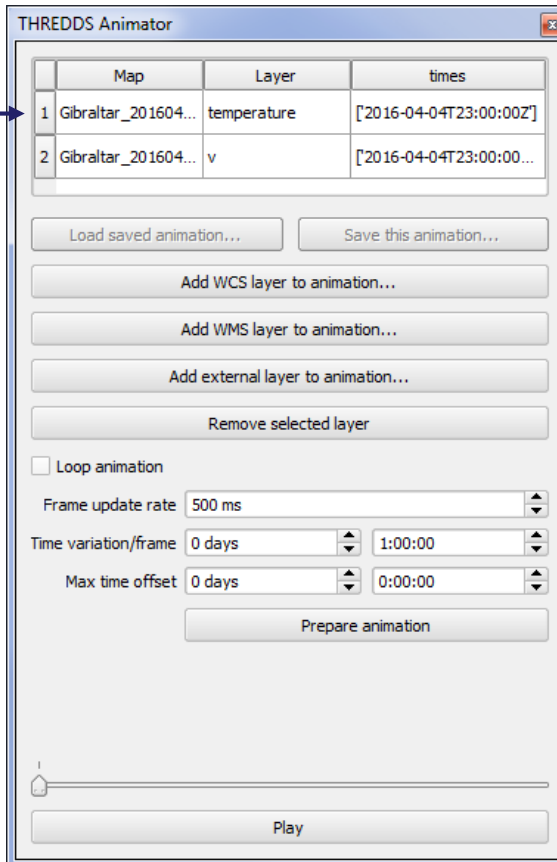
Show animation menu >>

## THREDDS Explorer Plugin Animator

Layers to animate

Add and remove layers

Configuration options



The screenshot shows the THREDDS Animator window. It features a table with columns 'Map', 'Layer', and 'times'. Below the table are buttons for 'Load saved animation...', 'Save this animation...', 'Add WCS layer to animation...', 'Add WMS layer to animation...', 'Add external layer to animation...', and 'Remove selected layer'. There is a checkbox for 'Loop animation' and several input fields for 'Frame update rate', 'Time variation/frame', and 'Max time offset'. A 'Prepare animation' button is located below these fields. At the bottom, there is a 'Play' button. Annotations on the left side of the image point to specific parts of the window: 'Layers to animate' points to the table; 'Add and remove layers' points to the buttons for adding and removing layers; and 'Configuration options' points to the checkbox and input fields.

	Map	Layer	times
1	Gibraltar_201604...	temperature	[2016-04-04T23:00:00Z]
2	Gibraltar_201604...	v	[2016-04-04T23:00:00...

Load saved animation... Save this animation...

Add WCS layer to animation...

Add WMS layer to animation...

Add external layer to animation...

Remove selected layer

☐ Loop animation

Frame update rate 500 ms

Time variation/frame 0 days 1:00:00

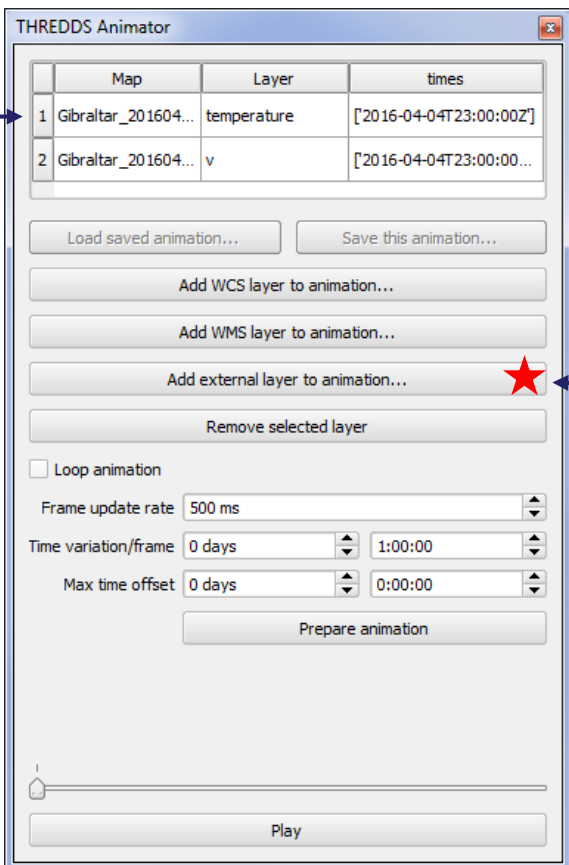
Max time offset 0 days 0:00:00

Prepare animation

Play



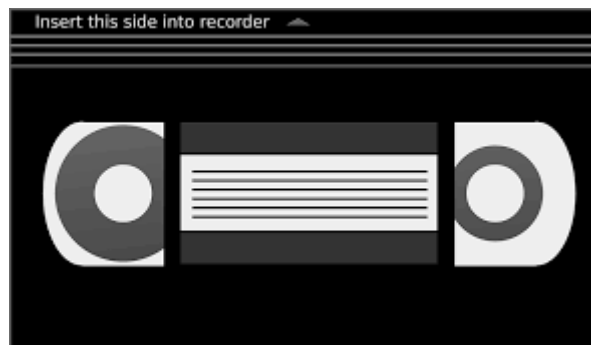
## THREDDS Explorer Plugin Animator



The screenshot shows the THREDDS Animator window with the following components and annotations:

- Layers to animate:** A table with 3 columns: Map, Layer, and times.
 

Map	Layer	times
1 Gibraltar_201604...	temperature	['2016-04-04T23:00:00Z']
2 Gibraltar_201604...	v	['2016-04-04T23:00:00...
- Add and remove layers:** A group of buttons including "Load saved animation...", "Save this animation...", "Add WCS layer to animation...", "Add WMS layer to animation...", "Add external layer to animation..." (highlighted with a red star), and "Remove selected layer".
- Configuration options:** A group of settings including:
  - ☐ Loop animation
  - Frame update rate: 500 ms
  - Time variation/frame: 0 days, 1:00:00
  - Max time offset: 0 days, 0:00:00
  - Prepare animation button
- External layer:** A label pointing to the "Add external layer to animation..." button, which is marked with a red star.
- Play button:** A button at the bottom of the window.



Source code:

<https://github.com/IHCantabria/THREDDSExplorer>

Video:

<https://vimeo.com/167414368>



Thanks!!