

# PML

Plymouth Marine  
Laboratory

Listen to the ocean

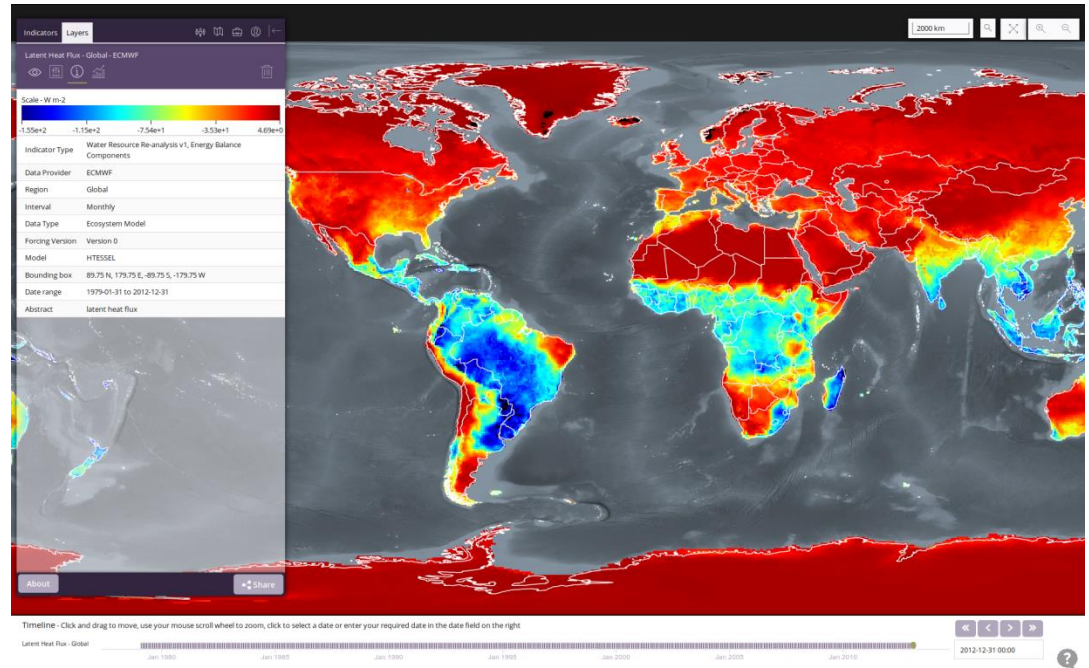
## Web Based Geographic Information System

Oliver Clements, Ben Calton



# Summary

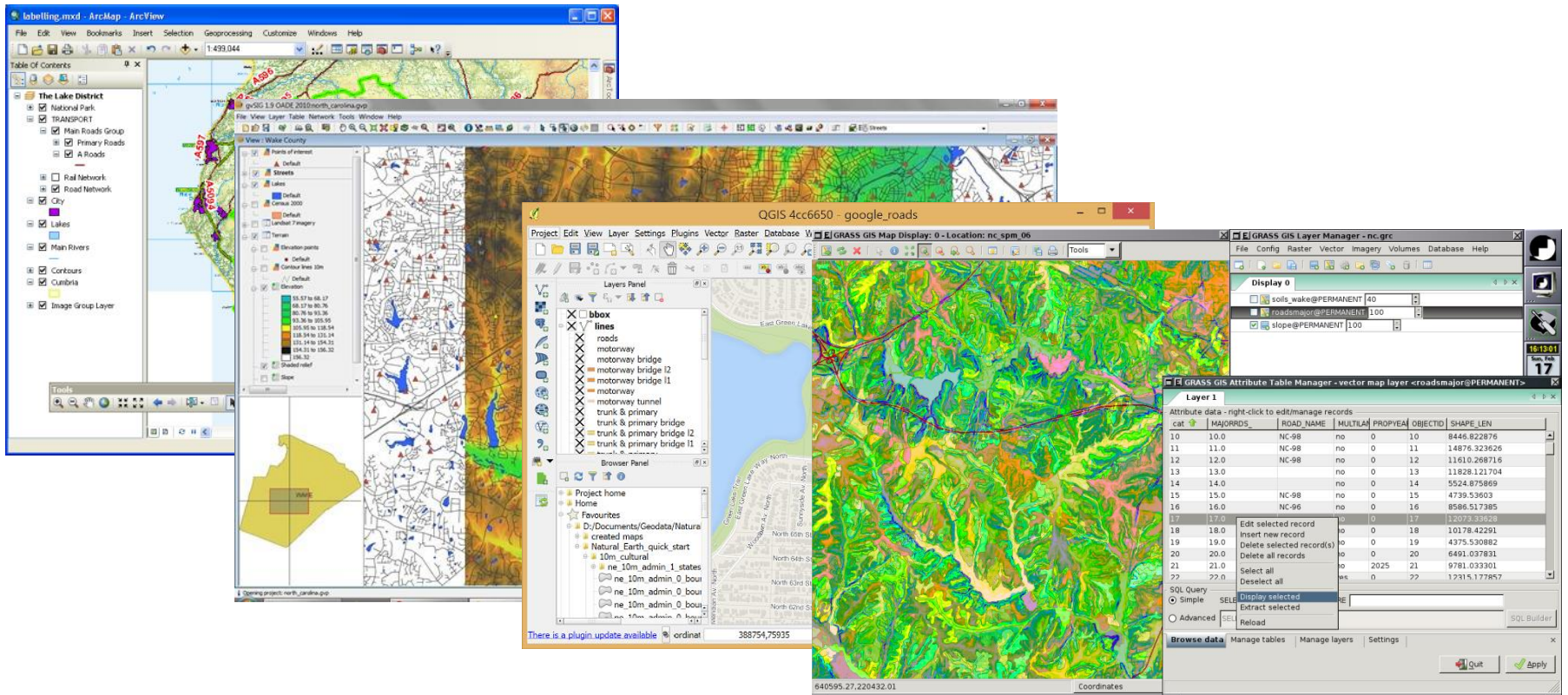
- What is GIS?
- Why web based?
- Portal overview
- Analysis overview
- Data download
- Collaboration
- Portal administration
- Future additions
- Questions



# What is GIS?

“A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on Earth’s surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships.”

Wikipedia [https://en.wikipedia.org/wiki/Geographic\\_information\\_system](https://en.wikipedia.org/wiki/Geographic_information_system)



## Why Web Based?

- Browsers are ubiquitous and available on all operating systems
- Internet connections & browser processing are becoming faster allowing more rich web applications
- The users do not need to download / install any software or dependencies
- Updates of the system get to users quicker so a rapid iterative development is possible

### Issues to overcome with web based

- Browser vendor specific bugs
- Limited bandwidth in developing areas
- No control of the way users access and interact with the GIS

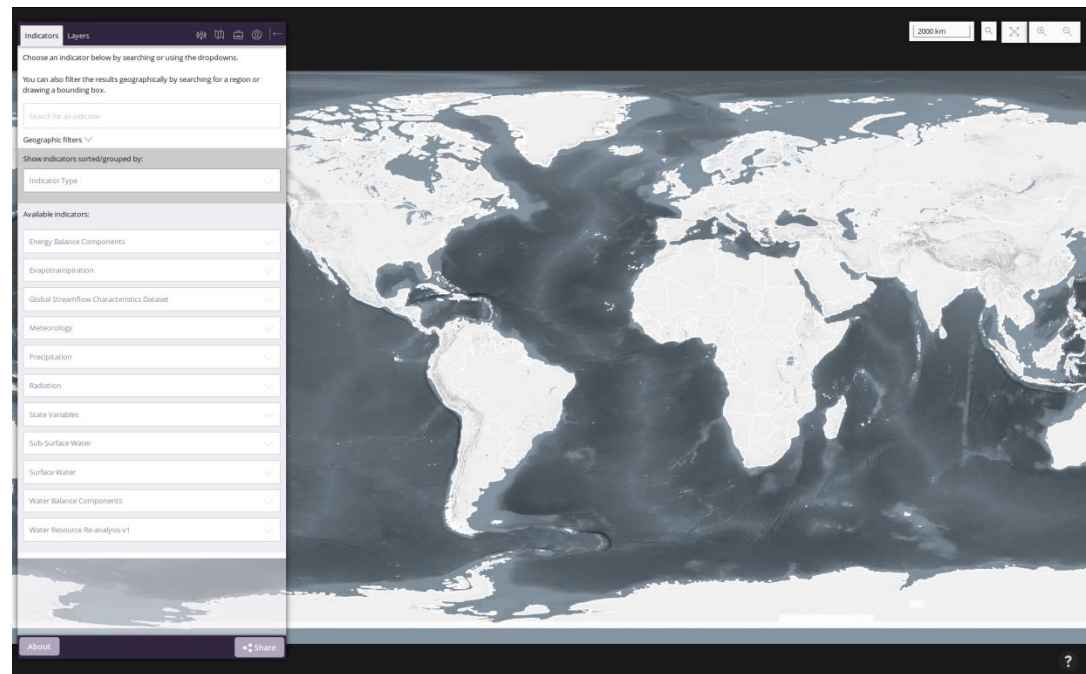
# Our Solution

- Standards based
  - We utilise known Open Geospatial Consortium standard interfaces
    - WMS for map tiles
    - WFS for vector data
    - WCS for data analysis
  - This allows new data to be added with minimal effort
- Open Source
  - We use GitLab internally to track issues/branches
  - Every commit is pushed to our public github repo
  - Slight overhead but benefit from fixes and ideas being contributed



# Portal Overview

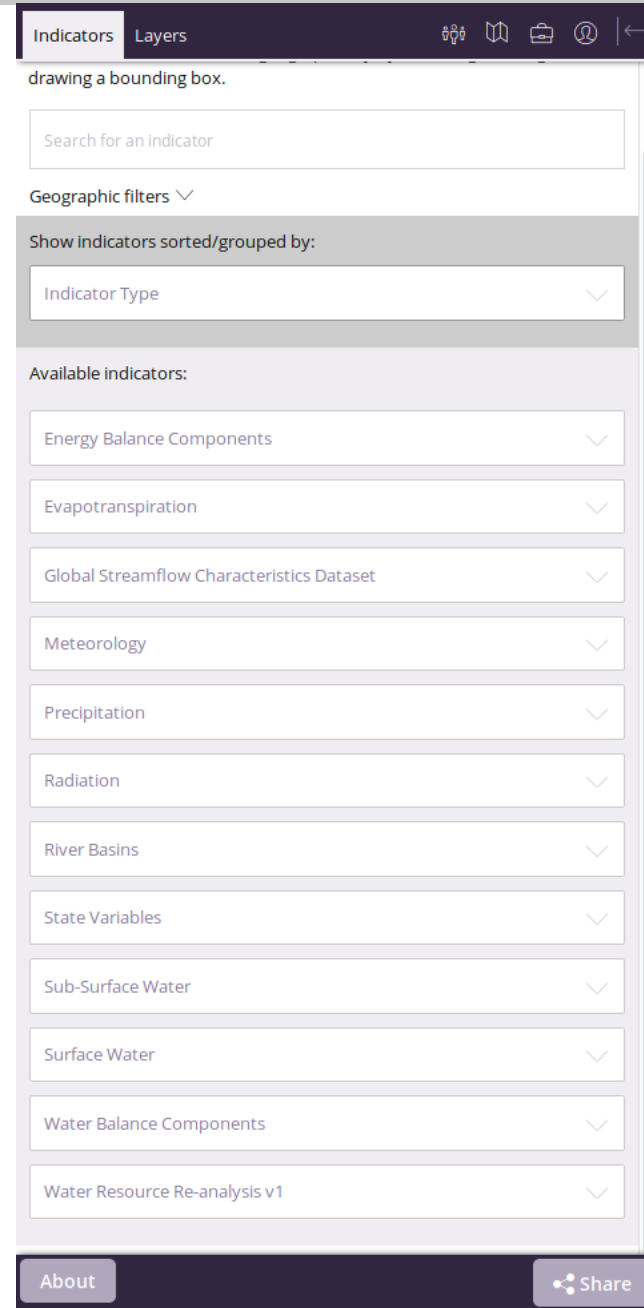
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When multiple options still remain these are provided allowing users to get quickly to the data they want

The screenshot shows a web portal interface with a dark purple header containing the text "Indicators Layers" and several icons. Below the header, a message states: "There are now 2 Average Surface Temperature indicators to choose from. Use the select lists below to refine your selection".

The interface features three stacked selection menus:

- Data Provider:** A dropdown menu currently showing "ECMWF" with a close icon (X).
- Select an Indicator Type:** A dropdown menu with three visible options:
  - Water Resource Re-analysis V1 (2 matches)
  - State Variables (2 matches)
  - Meteorology (2 matches)
- Select an Interval:** A dropdown menu with two visible options:
  - Daily
  - Monthly
- Select a Model:** A dropdown menu currently showing "HTESSSEL" with 2 matches.

At the bottom of the interface, there is a "Cancel" link.



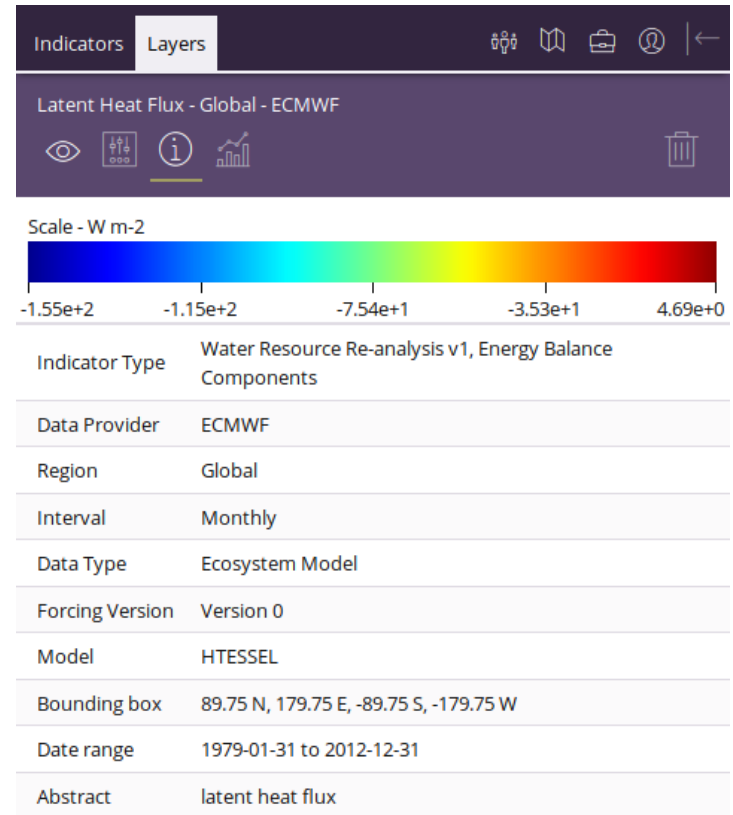
# Portal Overview

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Offering users multiple top level categories to choose from.

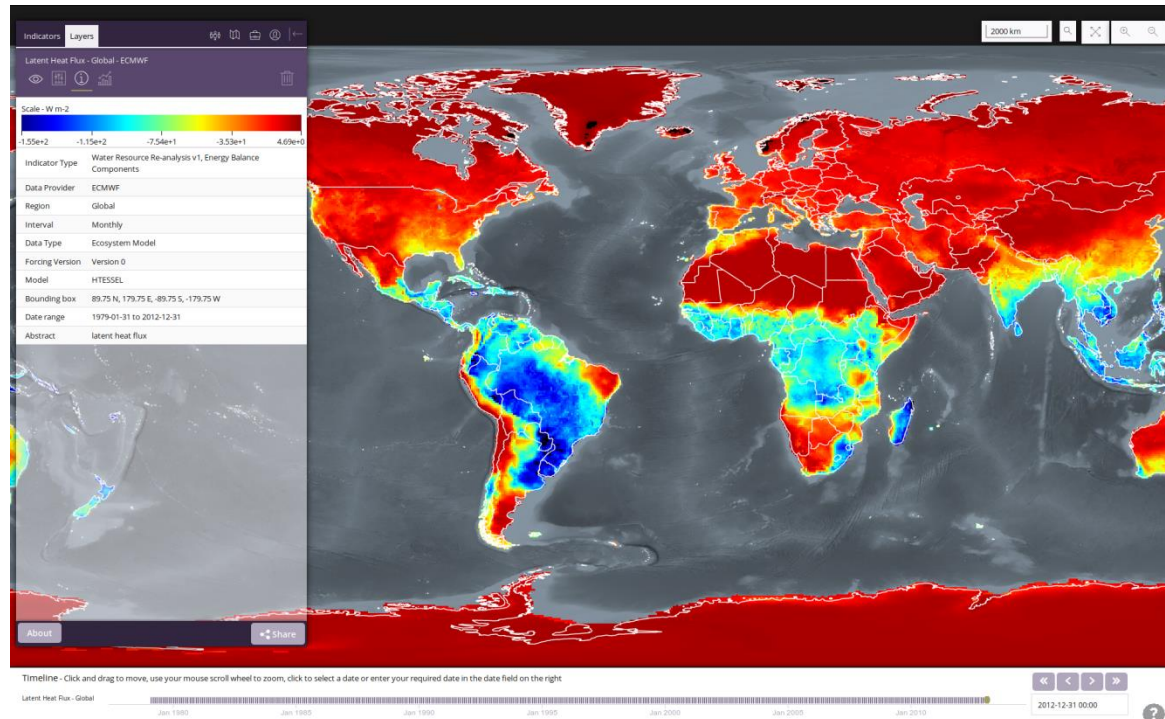
When multiple options still remain these are provided allowing users to get quickly to the data they want

Once the user has selected their chosen layer it is displayed on the map and summary information given to the user in the “layer panel”



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Layers are loaded from WMS and if a time dimension is available the most recent data are loaded by default.



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The available dates/times for a layer are shown on a timebar at the bottom of the page. The purple background shows the temporal extent and dark lines show individual images

Timeline - Click and drag to move, use your mouse scroll wheel to zoom, click to select a date or enter your required date in the date field on the right



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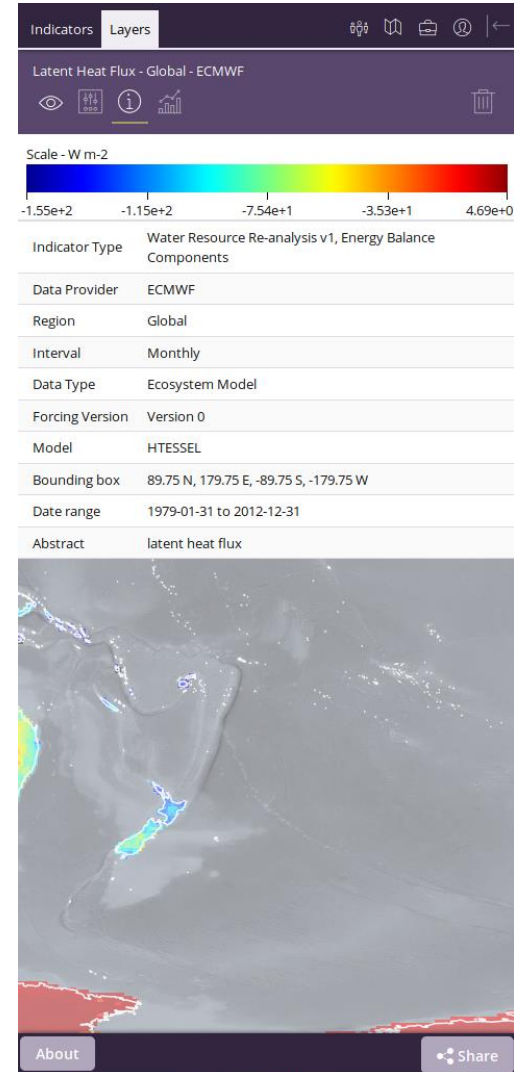
Timeline - Click and drag to move, use your mouse scroll wheel to zoom, click to select a date or enter your required date in the date field on the right



The user can navigate by simply clicking on the timebar for the date they need. There is also the option to move the currently shown image by both single steps or blocks of ten using the forward and back controls

# Layer Metadata

Layer information is provided in two ways. Basic information is shown in a table on the layer info panel



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More in depth information is available in a slide out panel. This info is stored as markdown and then rendered to the browser as HTML.

These panels of information give the user all they need to understand what the data are and where they have come from. This is also where any citations needed to be included in data reuse are available.

The screenshot displays a web interface for a data layer. At the top, there are tabs for 'Indicators' and 'Layers'. The main title is 'Total Surface Chlorophyll-a - Plymouth Marine Laboratory'. Below this is a color scale legend for 'Scale - mg C/m<sup>3</sup>' ranging from 1.68e-4 to 1.13e+1. A metadata table follows, and a 'More Information' panel is open on the right, showing detailed text about the simulation and forcing.

Scale - mg C/m <sup>3</sup>	1.68e-4	2.83e+0	5.67e+0	8.50e+0	1.13e+1
Domain	Global				
Simulation Mode	Projection				
Variable	Biological				
Research Sector	Predicting Change, Energy, Environmental Health, Food				
Bounding box	89.5 N, 179.5 E, -89.5 S, -179.5 W				
Date range	1890-01-16 to 2007-11-18				
Abstract	Total surface Chlorophyll-a				
Contact Person	Lee de Mora				
Email	<a href="mailto:ledm@pml.ac.uk">ledm@pml.ac.uk</a>				
	<a href="#">More Information...</a>				

**Global**  
The one degree resolution global ocean domain is a coarse resolution model grid that covers the entire globe, including the five major oceans. It is characterised by the presence of large scale features such as the Equatorial and Antarctic Circumpolar currents, the Atlantic, Indian and Pacific gyres, and ice in the polar seas.

Models of this resolution are ideal for the study of large scale or global behaviours, or long term studies of the impact of climate change. However, due to this models coarse resolution, it may struggle to recreate of fine scale structure such as eddy formation, coastal upwelling, the impact of rivers, and the behaviour of the shallow shelf seas.

**Simulation period**  
Hindcast: Jan 1950 - Dec 2006

**Forcing**  
: After initialisation at the year 1890, the models were run for 60 years (1890–1949 inclusive) under the so-called “normal year” of version 2 forcing for common ocean–ice reference experiments (CORE2-NYF; Large and Yeager, 2009). Subsequently, the models were run under transient interannual forcing from the same data set (CORE2-IAF) for a further 58 years (1950–2007 inclusive).

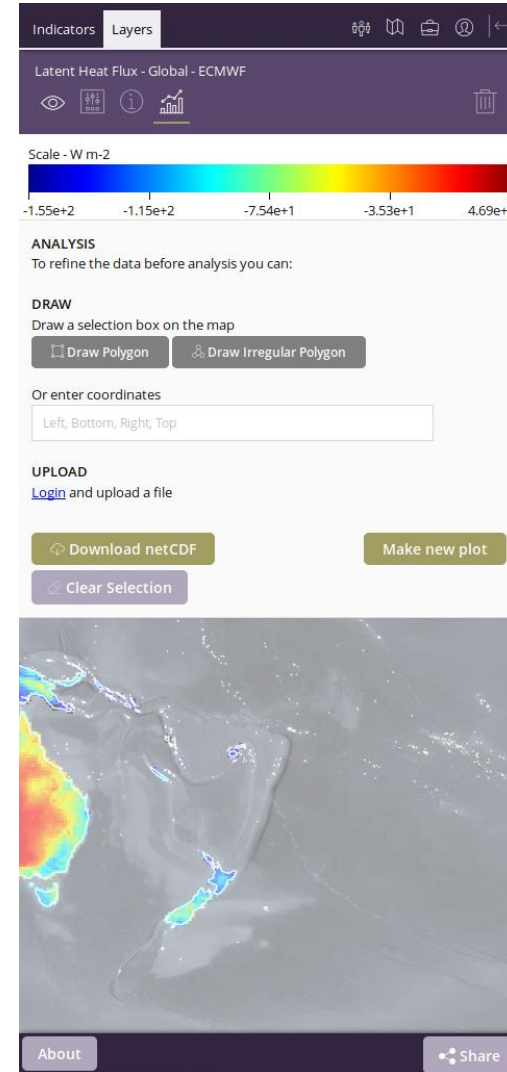
Large, W. and Yeager, S.: The global climatology of an interannually varying air–sea flux data set, *Clim. Dynam.*, 33, 341–364, 2009

**Model Skill**  
: the skill of the model has been assessed in Kwiatkowski et al. (2014) and is available at <https://www.pml.ac.uk/indicators/total-surface-chlorophyll-a>



# Analysis Overview

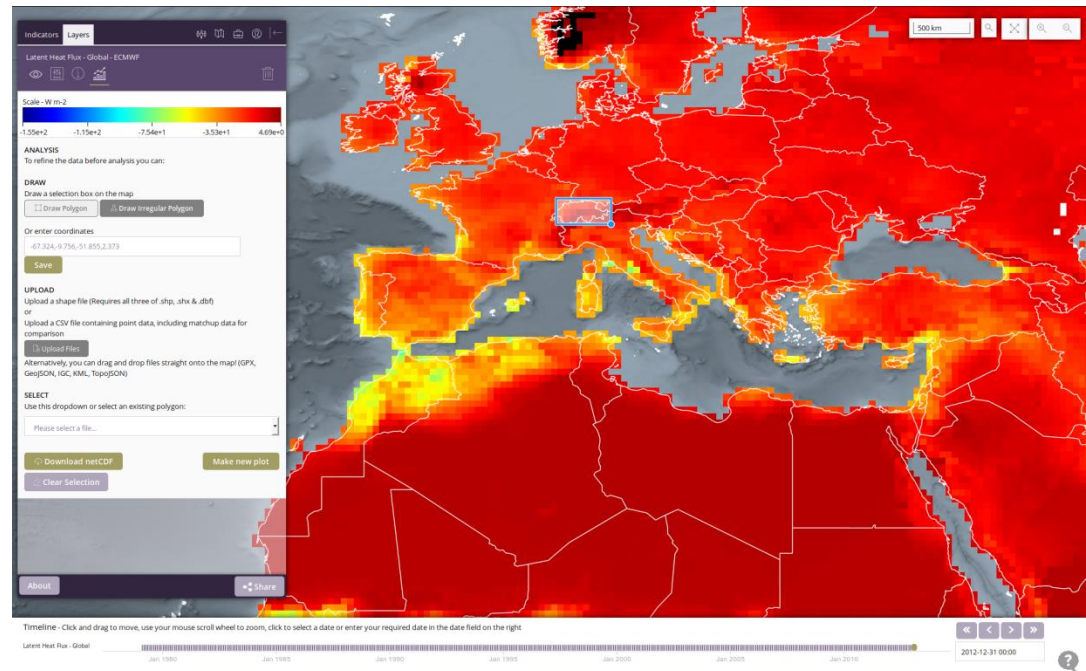
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As with the rest of the portal we have tried to make analysis simple for the user. The process starts with the user selecting an area using polygon drawing tools.

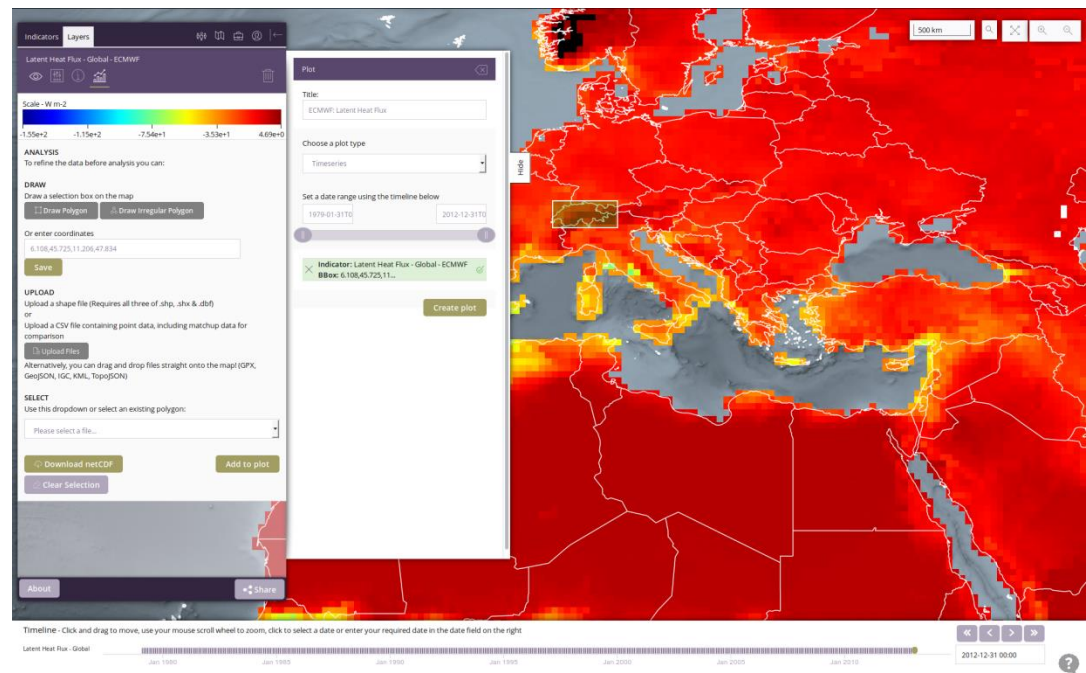


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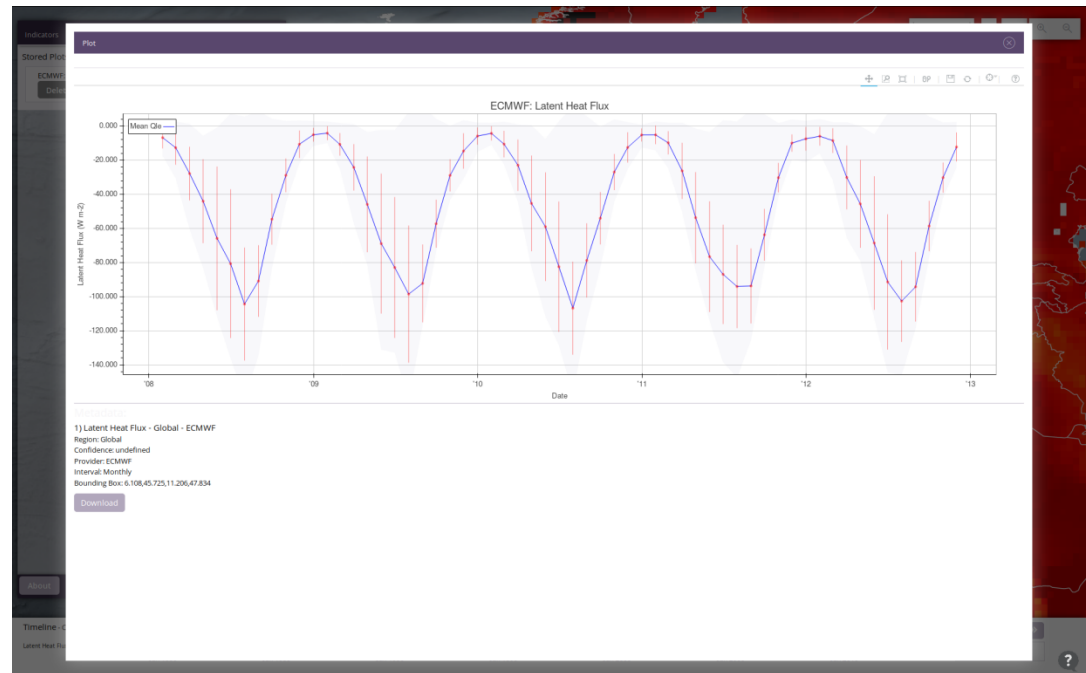
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- Timeseries



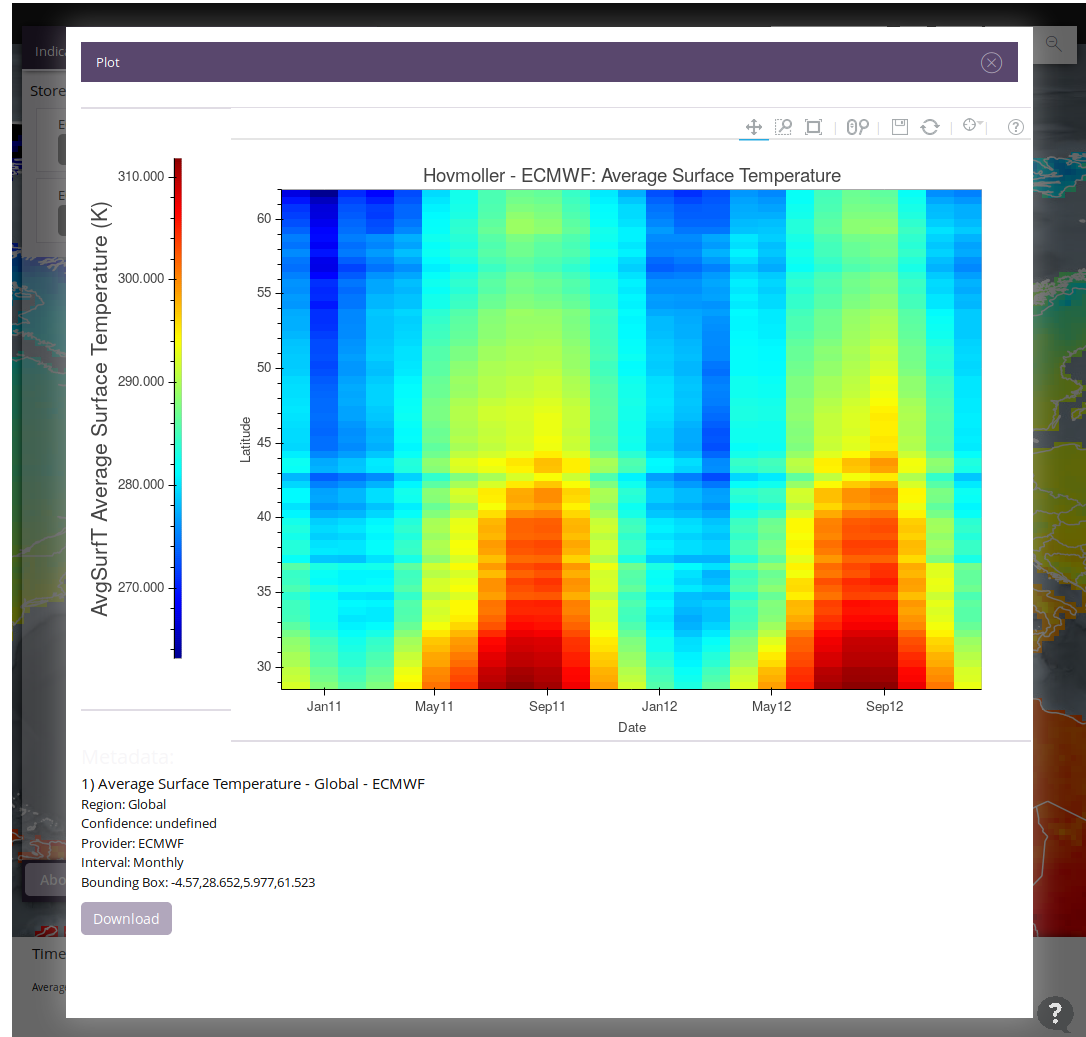
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- Timeseries
- Hovmoller



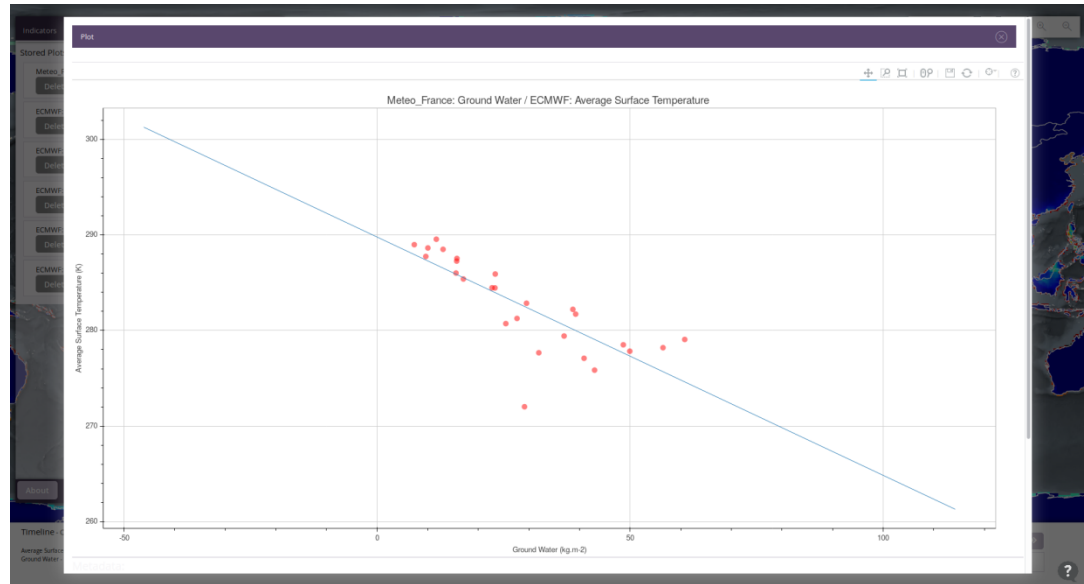
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- Timeseries
- Hovmoller
- Scatter/Regression





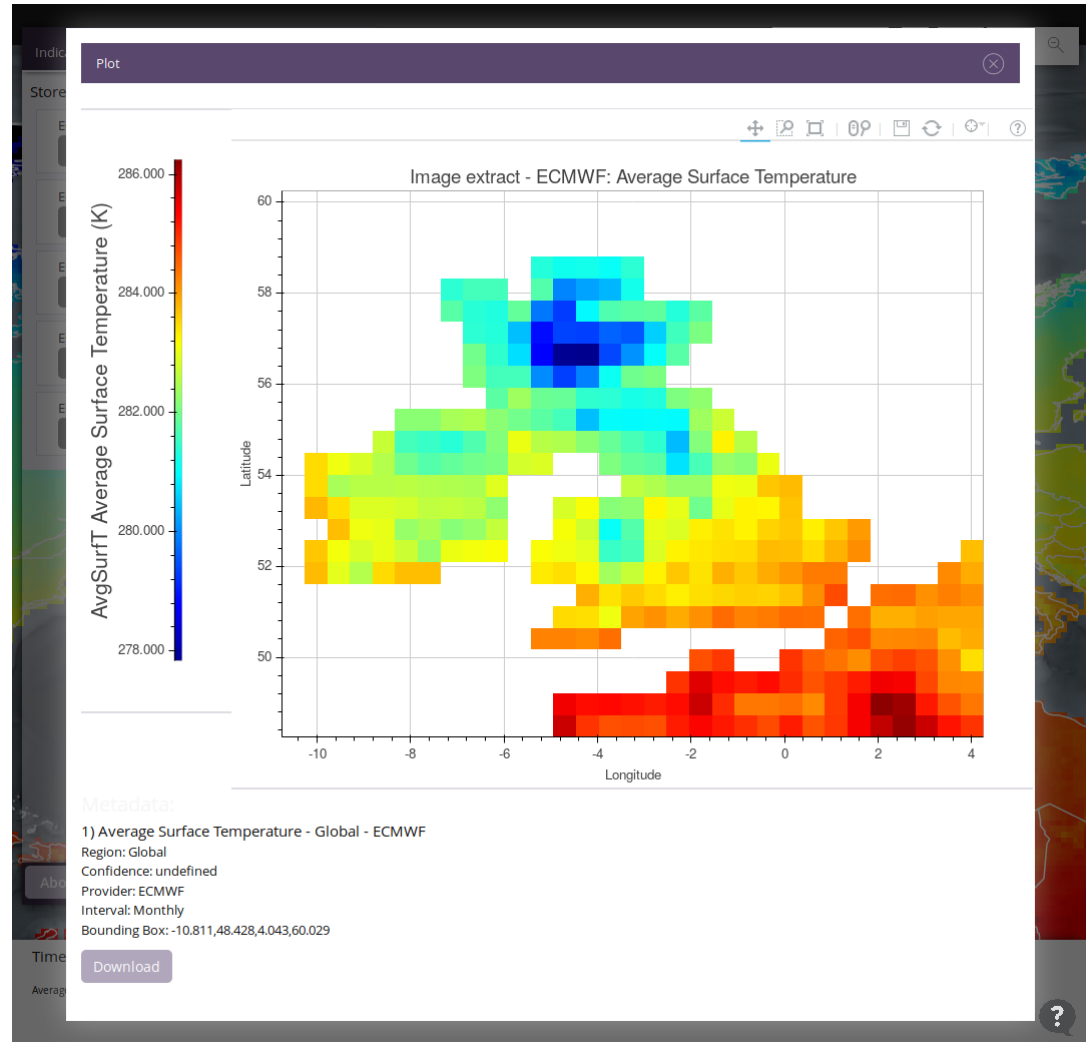
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- Timeseries
- Hovmoller
- Scatter/Regression
- Composite



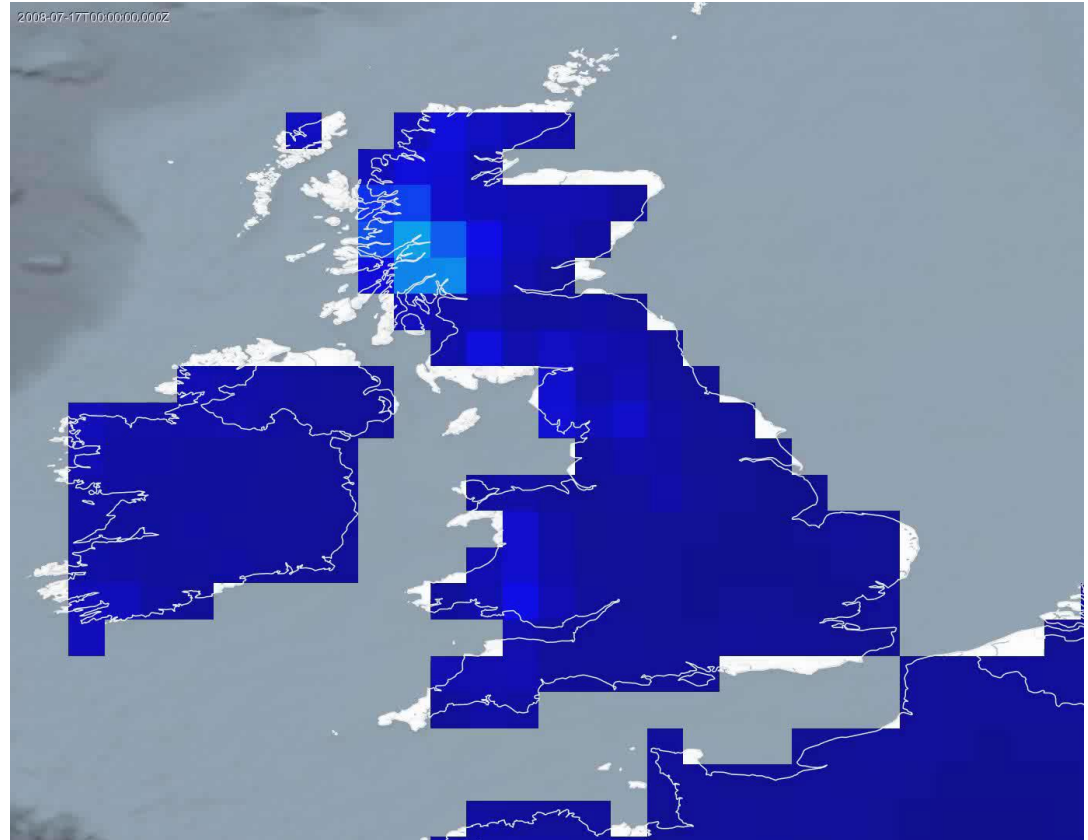
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- Timeseries
- Hovmoller
- Scatter/Regression
- Composite
- Animation



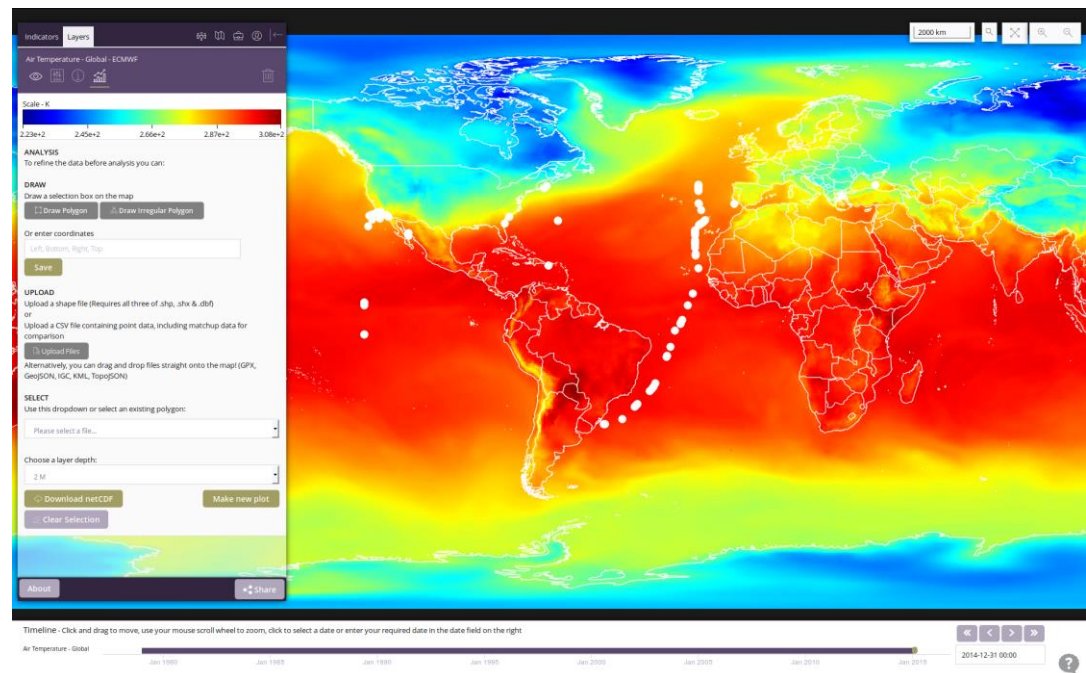
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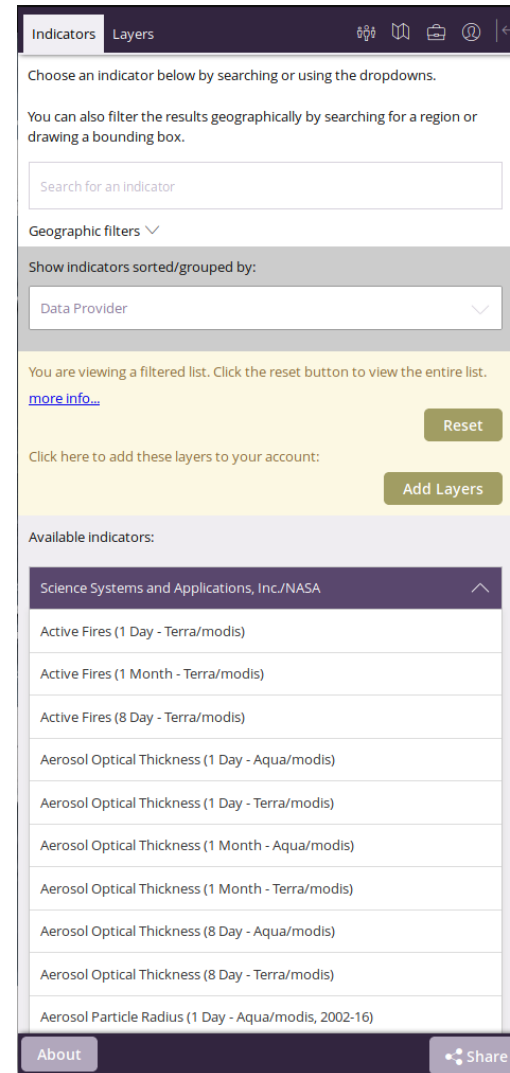
- Timeseries
- Hovmoller
- Scatter/Regression
- Composite
- Animation
- Match Ups



# Using Additional Data

Users are not limited to visualising data already registered in the portal.

If a users has data available through a WMS they have the ability to add the layers through a simple form. By adding the base URL for the data service the portal will parse the GetCapabilities XML document and make all suitable layers available.

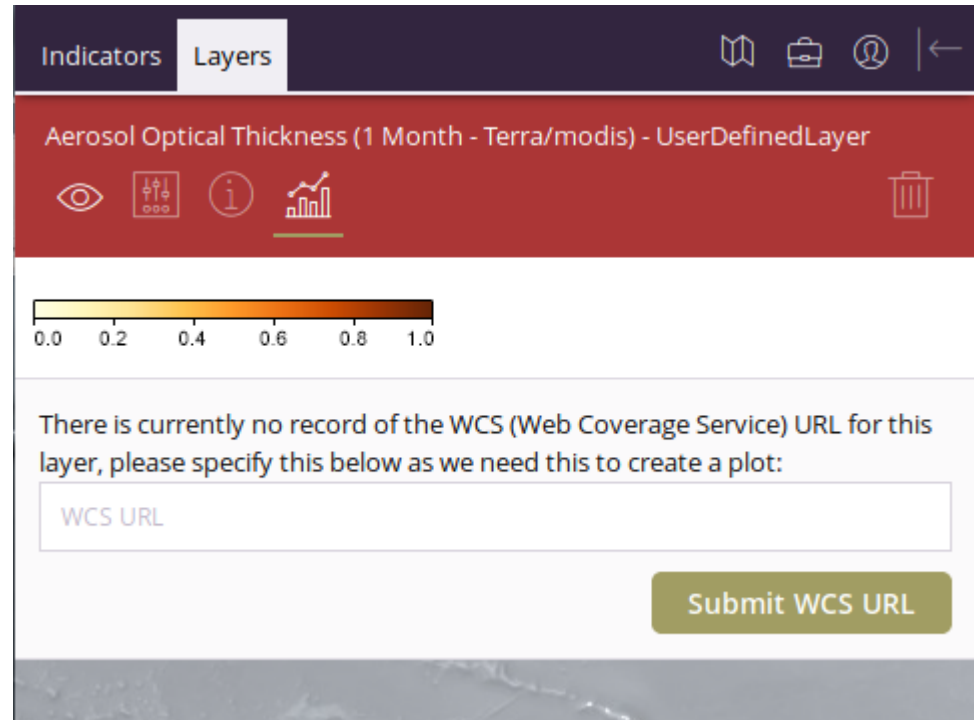


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If the user wishes to carry out analysis they are prompted for the WCS endpoint that corresponds to the data within the WMS layer they are analysing.



The screenshot displays a web interface with a dark blue header containing 'Indicators' and 'Layers' tabs, and navigation icons. Below the header, a red banner identifies the layer as 'Aerosol Optical Thickness (1 Month - Terra/modis) - UserDefinedLayer'. A toolbar includes icons for visibility, zoom, information, analysis, and deletion. A color scale legend ranges from 0.0 (light yellow) to 1.0 (dark brown). A text prompt asks for the WCS URL, followed by an input field and a 'Submit WCS URL' button.

# Data Access / Download

Data download is still key to most of our users. Although web services and online analysis provide many features there will always be a subset of users that prefer to work locally and have the hardware to do this.

For these people we offer the data they select for plotting as a straight netcdf download. This works with both regular and irregular polygons.

The screenshot shows a web application interface for downloading NetCDF data. The main panel displays a color scale for 'Monthly HAB Risk (Karenia) Cornwall - Cornwall - PML' ranging from 0.00e+0 (blue) to 9.79e-1 (red). Below the scale are sections for 'ANALYSIS', 'DRAW', 'UPLOAD', and 'SELECT'. The 'DRAW' section includes buttons for 'Draw Polygon' and 'Draw Irregular Polygon', and a text input for coordinates with a 'Save' button. The 'UPLOAD' section has an 'Upload Files' button. The 'SELECT' section has a dropdown menu. A 'Download netCDF' button is visible at the bottom of the main panel. A 'Download NetCDF' dialog box is open on the right, showing a date range from 2002-07-31T0 to 2012-04-30T0 and a 'Download' button. The background shows a map of Cornwall with a color-coded overlay.



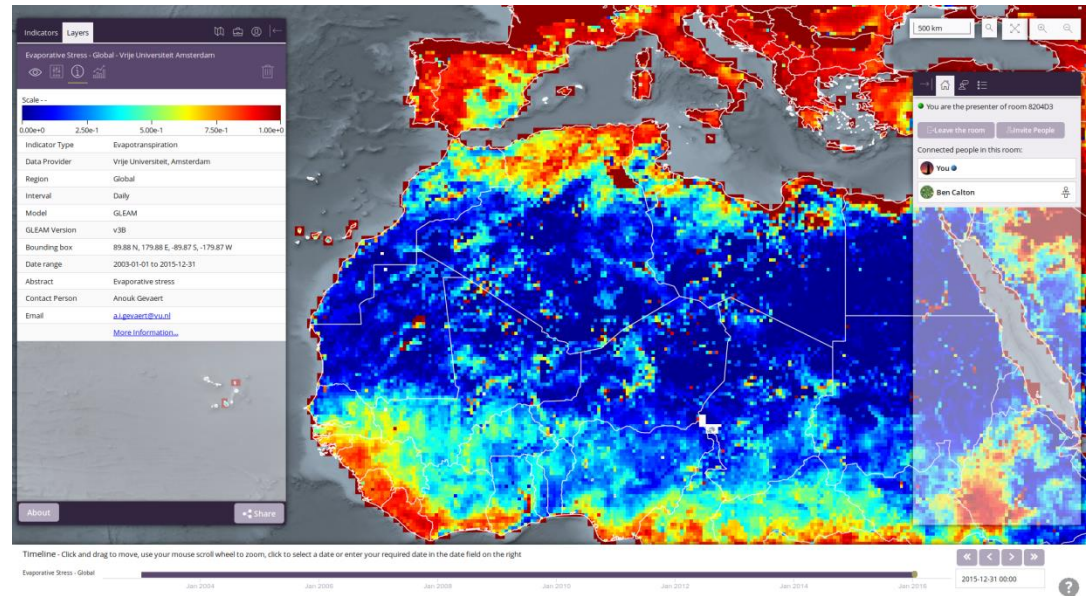
# Collaboration

The portal also allows users to either create a collaboration session or join an existing one.

In the context of the GISportal a collaboration session is similar to a screen sharing session using something like webEx.

The prime difference being that you are not just seeing an image of the presenters screen. The actions they carry out are mirrored in your browser.

This gives the benefit that once the session has ended all attendees have working portals with all work done available to them.



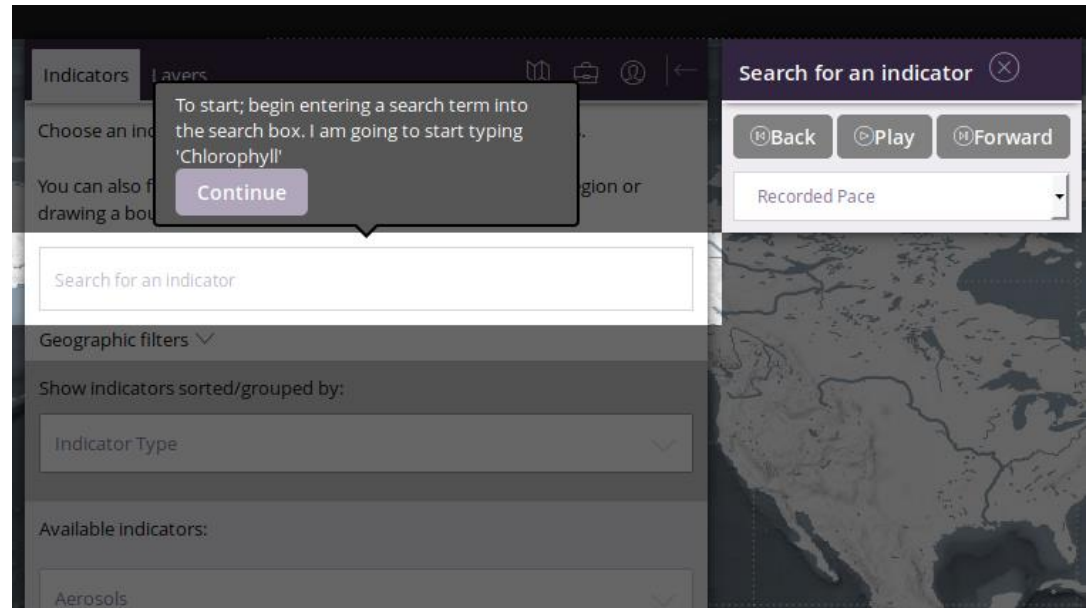
# Help Walk-through

The portal provides a system by which administrators can create and save *walk-throughs*.

These are predefined work flows with additional textual pointers added.

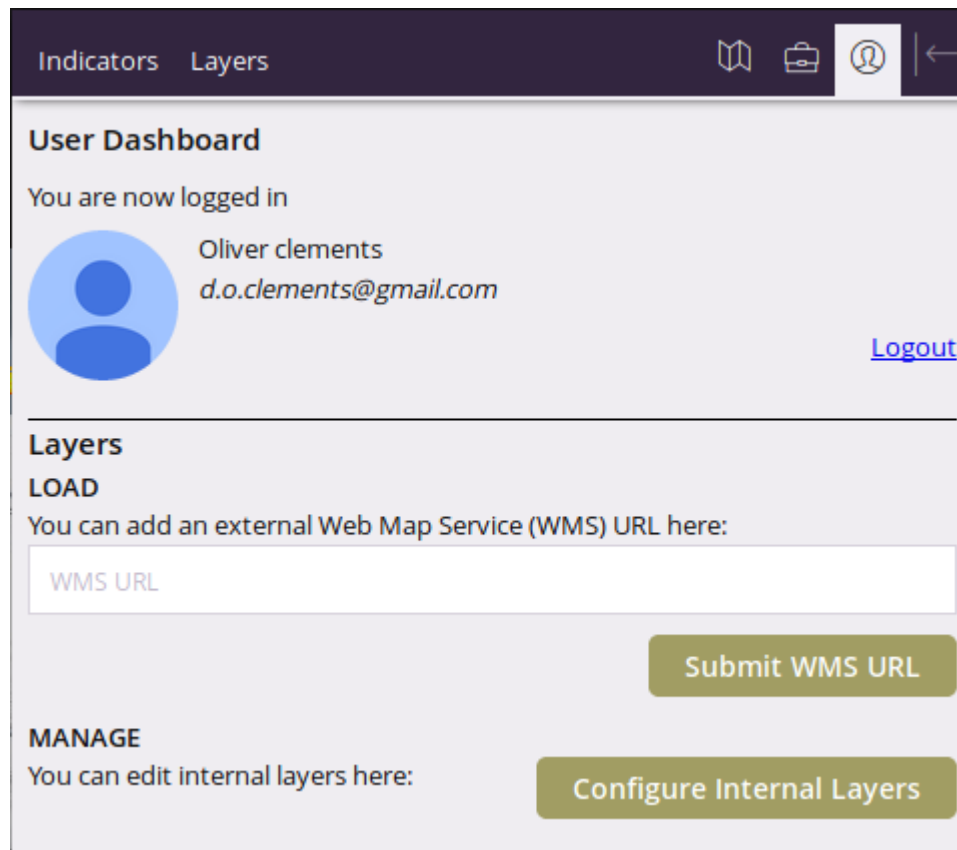
The purpose of the system is to provide guidance to new users or to highlight specific features.

The creator can specify what text is shown at each step, which element is highlighted and how long each step should be displayed for (if auto play is enabled)



# Portal Administration

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Server List					
Server Name	Owner	Provider	Cache Time Stamp	Configure Tools	
aquauusers.dhi-gras.com-thredds-wms-Daily-GRAS_A_TOTAL_443	portal.aqua-users.eu	DHI GRAS	2016-09-12T12:56:34.047Z		
aquauusers.dhi-gras.com-thredds-wms-GHR5ST_L4_MUR	portal.aqua-users.eu	DHI GRAS	2016-10-23T12:56:09.587Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_PIG_443	portal.aqua-users.eu	DHI GRAS	2016-09-12T12:56:39.738Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_PIG_443_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:29:22.499Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_PIG_443_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:13:22.410Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_Y5_443	portal.aqua-users.eu	DHI GRAS	2016-05-24T10:01:09.026Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_Y5_443_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:19:51.182Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_A_Y5_443_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:15:08.881Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_BB_SPM_443_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:34:36.417Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_BB_SPM_443_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:31:16.534Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_CHL_A	portal.aqua-users.eu	DHI GRAS	2016-10-23T12:56:16.206Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_CHL_A_monthly	portal.aqua-users.eu	DHI GRAS	2016-09-19T13:32:05.663Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_CHL_A_weekly	portal.aqua-users.eu	DHI GRAS	2016-09-19T13:32:07.083Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_KD490	portal.aqua-users.eu	DHI GRAS	2016-09-12T12:56:53.812Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_KD490_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-24T08:38:54.462Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_KD490_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-24T08:35:15.491Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_TSM	portal.aqua-users.eu	DHI GRAS	2016-05-24T10:09:52.768Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_TSM_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-23T09:39:40.096Z		
aquauusers.dhi-gras.com-thredds-wms-GRAS_TSM_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-25T14:52:37.291Z		
aquauusers.dhi-gras.com-thredds-wms-MODIS_CHL_A_Daily	portal.aqua-users.eu	DHI GRAS	2016-10-23T12:56:44.357Z		
aquauusers.dhi-gras.com-thredds-wms-VIIRS_CHL_A	portal.aqua-users.eu	DHI GRAS	2016-09-14T08:14:42.350Z		
aquauusers.dhi-gras.com-thredds-wms-VIIRS_Rrs	portal.aqua-users.eu	DHI GRAS	2016-05-23T15:39:32.817Z		
aquauusers.dhi-gras.com-thredds-wms-monthly-GRAS_A_TOTAL_443_monthly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:30:22.671Z		
aquauusers.dhi-gras.com-thredds-wms-weekly-GRAS_A_TOTAL_443_weekly	portal.aqua-users.eu	DHI GRAS	2016-05-24T09:12:20.317Z		
oceanwatch.pfeg.noaa.gov-thredds-wms-satellite-JS-ssta-1day	portal.aqua-users.eu	NOAA	2016-10-23T12:56:57.604Z		

# Portal Administration

The portal uses Google Account OAuth for login. We are looking at adding more providers shortly.

Once logged in users are able to look at and edit the currently configured layers as well as add new data to the portal.

Each entry is based of a single WMS server, each individual layer offered can be configured or excluded from the set offered to users. Admins can set the labels for layers as well as the categories it belongs to.

aquausers.dhi-gras.com-thredds-wms-Daily-GRAS\_A\_TOTAL\_443
✕

**Provider:**

**Address:**

**WCS URL:**

**Maintainer:**

**Position:**

**Email:**

**Phone:**

**Owner:**

---

a\_total\_443 (1/1)
?

**Display Name:**

**Abstract:**

**Scale Points?**

**Scalebar Custom URL:**

**Color Bar Only?**

**Height:**

**Width:**

Min and Max values are overwritten by Auto Scale if it is on, Logarithmic is not valid with min and/or max values of zero or less

**Logarithmic**

**Min:**  **Max:**  **Colour Bands:**

**Indicator Type (comma separated values):**

**Region:**

**Interval:**

**Suggestions (Click to populate):**  
[Weekly](#)

**Model:**

## Future Additions

- Improving the analysis options
  - More charts available
  - Better comparison options, i.e. create diff layer on the fly and view on map
  - In situ data visualisation and use in analysis

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  - In situ data visualisation and use in analysis
- Admin tools for adding different data sources
  - SOS
  - WFS
- Admin tools for editing layer “extra information”



# Getting involved

- The project is Open Source and available on GitHub
  - <http://github.com/pmlrsg/GISportal>
- Documentation on installation and configuration are available on the GitHub wiki
  - <http://github.com/pmlrsg/GISportal/wiki>
- Please don't hesitate to contact our team if you have any further question
  - [olcl@pml.ac.uk](mailto:olcl@pml.ac.uk)
  - [bac@pml.ac.uk](mailto:bac@pml.ac.uk)

# Thank you – Questions?

