

# Easy access to climate data – round up of the current landscape.

## Background

The CDSSG is keen to encourage the exploitation of climate data from space, both by existing expert groups and new users. The group has been developing a framework for climate data supply, the 'seamless supply chain', which proposes sustainable modes for data production and delivery. Climate services for end users are a current area of focus, both for this group and in the UK and European EO communities more generally. Recent work by this group has included the development of a demonstration app for climate data exploration by PML, and a number of group members are involved in developing ESA's CCI open data access portal.

This document describes what is currently available to the end user community for online access and visualisation of climate data. This includes: single dataset access sites, using very simple visualisations for new users; specific data access sites, which often require a degree of user knowledge or expertise; dedicated visualisation websites, which can be used in conjunction with existing data, or to compare data; and visualisation resources that are intended to explore the use of visualisations as a research tool. The list comprises information from the stakeholder group and the NCEO community. It is therefore representative rather than exhaustive.

## Types of easy access and visualisation site

### 1. Centre-, dataset- or project-specific

Visualisation is usually not the main purpose of the site, rather the purpose is to provide a quick look or first look at data, prior to access either on the site or elsewhere. This type of data visualisation is useful to get a very quick idea of whether an idea is feasible or correct (e.g. is the SST increasing in the North Atlantic more quickly than in the tropical western Pacific), or to orient the user through imagery before beginning to explore a dataset (for example to look at sea ice extent across the whole arctic before considering a specific basin)

### 2. Data access portals

Often have multiple datasets, usually to serve a particular community e.g. cryosphere, atmosphere. These websites are easy access in the sense of providing a one-stop-shop but often assume or require some prior knowledge of the user. They may or may not have a visualisation component and/or easy-to use formats.

#### i. Large European collaborations

There are several pan-European organisations, involved in Earth Observation and/or climate, which provide multiple data access sites across several EO or climate themes. A summary of the stated mission of each is given in Section.

### 3. Dedicated visualisation websites

May not host data themselves, just provide a platform to visualise existing datasets

### 4. Expositionary – exploring new methods and visualisations

Sites that attempt to use data visualisation in new ways or as a research tool

### 5. Under construction/not for general circulation.

## List of visualisation and data access sites

This list was compiled from suggestions by the UK community, and does not comprise purely UK sites.

|  | <b>Variables /theme</b>                            | <b>Lead organisation/UK organisations <sup>a</sup></b> | <b>URL</b>  |
|--|--|--|---|
| CPOM - Sea Ice   | Sea Ice  | UCL, NCEO, Leeds                                       | <a href="http://www.cpom.ucl.ac.uk/csopr">www.cpom.ucl.ac.uk/csopr</a>  |
| SST CCI  | SST  | ESA, NCEO  | <a href="http://www.esa-sst-cci.org">http://www.esa-sst-cci.org</a>   |
| IASI SO2 NRT   | SO2  | NCEO, NCAS, University of Oxford                       | <a href="http://www.nrt-atmos.cems.rl.ac.uk/">http://www.nrt-atmos.cems.rl.ac.uk/</a>   |
| FIRE NRT (test)  | Wildfire   | KCL  | <a href="http://wildfire.geog.kcl.ac.uk/wildfire/">http://wildfire.geog.kcl.ac.uk/wildfire/</a>   |
| TAMSAT   | Precip   | UoR, NCEO, EC  | <a href="http://www.tamsat.org.uk">www.tamsat.org.uk</a>  |
| Magnetosphere  | Magnetosphere                                      | ESA,RAL  | <a href="http://www.cluster.rl.ac.uk/csdsweb/index.html">http://www.cluster.rl.ac.uk/csdsweb/index.html</a>   |
| CloudSat <sup>a</sup>  | Clouds   | NASA   | <a href="http://www.cloudsat.cira.colostate.edu/quicklooks">http://www.cloudsat.cira.colostate.edu/quicklooks</a>   |
| <b>2. Bigger Data access portals– many variables, or multi-product</b> |  |  |   |
| NEODAAS  | EO   | NERC,NCEO, Dundee SRS, Dundee University, PML          | <a href="https://www.neodaas.ac.uk">https://www.neodaas.ac.uk</a>   |
| BADC   | Atmos  | NERC   | <a href="http://badc.nerc.ac.uk">http://badc.nerc.ac.uk</a>   |
| ICARE (fr)   | Cloud, aerosol, water                              | ICARE  | <a href="http://www.icare.univ-lille1.fr/browse/">http://www.icare.univ-lille1.fr/browse/</a>   |
| KNMI climate explorer  | EO, CMIP5, reanalysis                              | KNMI   | <a href="https://climexp.knmi.nl/">https://climexp.knmi.nl/</a>   |
| SMHI   | River basin  | SMHI   | <a href="http://balt-hypeweb.smhi.se">http://balt-hypeweb.smhi.se</a>   |
| Giovanni   | All EO   | NASA   | <a href="http://giovanni.gsfc.nasa.gov/giovanni/">http://giovanni.gsfc.nasa.gov/giovanni/</a>   |
| <b>2.i Pan-European Initiatives <sup>b</sup></b>                       |  |  |   |
| Copernicus Services  | EO, models, reanalyses for land, ocean, atmosphere | EC, ESA, Eumetsat, ECMWF, EEA, Mercator Ocean          | <a href="http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus">http://www.esa.int/Our_Activities/Observing_the_Earth/Copernicus</a>                           |
| Climate Adapt  | Adaptation   | EC, EEA  | <a href="http://climate-adapt.eea.europa.eu/">http://climate-adapt.eea.europa.eu/</a>   |
| SAFs   | EO   | Eumetsat   | <a href="http://www.eumetsat.int/website/home/Satellites/GroundSegment/Safs/index.html">http://www.eumetsat.int/website/home/Satellites/GroundSegment/Safs/index.html</a> |
| CEOS   | EO   | CEOS   | <a href="http://ceos.org/">http://ceos.org/</a>   |
| <b>3. Expository – exploring new methods and visualisations</b>        |  |  |   |
| MELODIES   | -  | UoR  | <a href="http://www.melodiesproject.eu">http://www.melodiesproject.eu</a>   |
| <b>4. Visualisation only</b>   |  |  |   |
| Thredds/ Godiva2   | -  | ReSC   | <a href="http://reading-escience-centre.github.io/edal-java/ncWMS_user_guide.html">http://reading-escience-centre.github.io/edal-java/ncWMS_user_guide.html</a>           |
| Godiva3  | -  | IEA/ReSC   | <a href="http://behemoth.nerc-essc.ac.uk/ncWMS2/Godiva3.html">http://behemoth.nerc-essc.ac.uk/ncWMS2/Godiva3.html</a>   |
| PML visualiser   | -  | PML Applications                                       | <a href="https://jasmin.eofrom.space">https://jasmin.eofrom.space</a><br><a href="https://cdssg.eofrom.space">https://cdssg.eofrom.space</a>                              |
| <b>5.Under construction/not for general circulation</b>                |  |  |   |
| CCI data Portal  | CDRs   | Telespazio   | <a href="http://cci.esa.int/content/access-key-cci-data-products">http://cci.esa.int/content/access-key-cci-data-products</a>   |
| RAL NRT CH <sub>4</sub> , O <sub>3</sub>                               | Monitoring operational data production             | RAL  |   |
| CLIPC  | Climate impact indicators                          | STFC lead, KNMI visualisation lead                     | <a href="http://www.clipc.eu">http://www.clipc.eu</a>   |

Table 1: List of data access and visualisation sites provided by the UK community.

a For data access portals, the institutions listed are only those associated with the portal, they do not include dataset providers.

b Links to data access tools and lists maintained by these sites are provided in Section 4.

c. The CloudSat quicklook page is given here as an example of NASA’s platform-specific visualisations. In general, each NASA platform or instrument will have an associated easy-access data page.

Site capabilities

1. Centre-, variable-, or project- specific

For smaller visualisation sites, functionality may be limited. These tables summarise the visualisation and data access capabilities of smaller sites.

| 1. Centre-, variable- or project-specific |                                |                                 |                   |                        |
|---|--------------------------------|---------------------------------|-------------------|------------------------|
|   | Visualisation                  | Download?                       | Download subsets? | Registration required? |
| CPOM - Sea Ice                            | Interactive map                | Yes, from visualisation         | No                | No                     |
| SST CCI                                   | Clickable map, no image        | Yes, from map                   | Timeseries only   | No                     |
| IASI SO2                                  | Images                         | No download, visualisation only | -                 | No                     |
| FIRE (beta)                               | Interactive map                | No download, visualisation only | -                 | No                     |
| TAMSAT                                    | Viewer temporarily unavailable | Yes                             | Yes – time series | No                     |
| Magnetosphere                             | Quicklook plots                | No                              | -                 | No                     |
| CloudSat                                  | Quicklook images               | Yes                             | Yes               | Yes for download       |

Table 2: Properties of small centre-, variable-, or project-specific easy access data sites.

2. Bigger Data access portals– many variables, or multi-product

For larger sites, visualisation may be via either image display or interactive map. Some sites may provide data access but no visualisation.

| 2. Bigger Data access portals– many variables, or multi-product |                            |                                  |                  |                              |
|---|----------------------------|----------------------------------|------------------|------------------------------|
|   | Image/ map                 | Download from visualisation page | Download Subsets | Registration required?       |
| NEODAAS   | Images                     | No                               | Yes – on request | Yes                          |
| BADC  | No                         | No                               | No               | Yes                          |
| ICARE (fr)  | Images                     | No                               | No               | No to browse, Yes for access |
| KNMI climate explorer   | Interactive map reanalysis | Link on selection page           | Yes              | No                           |
| SMHI  | Interactive map            | Yes                              | No               | No                           |
| Giovanni  | Interactive map            | Yes                              | Y from map       | No                           |

Table 3: Properties of data access portals

## 2.i Pan-European Initiatives

Pan-European data access sites are also increasingly common. The stated purpose of each is given below, together with a list of themes, and a link to the relevant pages on collected tools and resources.

**Copernicus services.** The Copernicus services are an EU programme which aims to develop information services based on Earth Observation and in-situ environmental data. Of the six Copernicus themes, those addressing the land, marine, atmospheric, and security themes are in service, as is the mapping component of the emergency management service. Each theme, security excepted, provides a data catalogue and some mapping element. In general, the user is expected to be either a scientific or policy related public body, and so some prior knowledge is assumed for e.g. navigation of data catalogues. Access to the catalogues is summarised in Table 4.

| Copernicus Services Theme | URL   |
|---------------------------|---|
| Land                      | <a href="http://land.copernicus.eu">http://land.copernicus.eu</a>   |
| Marine                    | <a href="http://marine.copernicus.eu">http://marine.copernicus.eu</a>   |
| Atmosphere                | <a href="http://atmosphere.copernicus.eu">http://atmosphere.copernicus.eu</a>   |
| Emergency mapping         | <a href="http://emergency.copernicus.eu/mapping/ems/emergency-management-service-mapping">http://emergency.copernicus.eu/mapping/ems/emergency-management-service-mapping</a> |

Table 4: Copernicus Services

**Climate Adapt.** This is the European climate adaptation platform. It provides data and tools relevant to the adaptation community, in addition to publications and reports. It also provides a listing of relevant information portals relevant to the adaptation community.

**SAFs.** The Eumetsat Satellite Applications Facilities also cover a number of themes, of which Land, Climate monitoring, Ozone and atmospheric chemistry and Ocean and Sea Ice are of potential relevance to the climate community. Each SAF manages its own data portal, which are summarised in Table 5.

| SAF                             | Data Portal   | Visualisation               | Registration |
|---------------------------------|---|-----------------------------|--------------|
| Land                            | <a href="http://landsaf.meteo.pt">http://landsaf.meteo.pt</a> | Product example images only | Yes          |
| Climate monitoring              | <a href="http://www.cmsaf.eu">http://www.cmsaf.eu</a>         | Product example images only | Yes          |
| Ozone and atmospheric Chemistry | <a href="http://o3msaf.fmi.fi/">http://o3msaf.fmi.fi/</a>     | No                          | Yes          |
| Ocean and Sea Ice               | <a href="http://www.osi-saf.org">http://www.osi-saf.org</a>   | NRT Quicklook Images        | Yes          |

Table 5: Eumetsat Satellite Applications Facilities

**CEOS.** The Committee on Earth Observation Satellites Working Group on Information Systems and Services, rather than supplying data or visualisations, creates and supports the creation of systems which support the delivery of EO data. It also curates the International Directory Network, which provides free access to metadata on Earth Science data held around the world.

### 3. Expositionary – exploring new methods and visualisations

Some features in visualisation tools are designed not merely to improve access to data, but also to facilitate research. Projects such as Melodies build new interfaces for conducting research. One example from within Melodies is the UK land use map, which allows interactive mapping of land types from one standard list (UK) to another (EU), allowing the user to make dynamic choices about categorisation mapping.

### 4. Visualisation only

Finally, an alternative to data portals with visualisation software is to produce flexible visualisation software that can then be downloaded as a package and used with any dataset (or, indeed, offline for your own data). The Thredds/Godiva2 model takes this approach – anyone using Thredds to serve their data can link to Godiva2 to visualise the data, providing quick and easy access to their data. Godiva 3 is the most up to date version of this visualiser and can be used locally as a standalone package, or as a visualiser for any Web Map Service (WMS) data.

PML Applications have built a demonstration visualisation portal, hosted at PML and Jasmin, available at <https://cdssg.eofrom.space> and <https://jasmin.eofrom.space> respectively. The package is available in a docker container from <https://hub.docker.com/r/pmlrsg/gisportal/>

### 5. Under construction

**CCI.** The ESA climate change initiative programme aims specifically to support the development of stable, long-term, climate quality data using satellite data. Currently there is no specific visualisation portal associated with the programme, and only the SST CCI provides any easy-access data services. A data portal is currently under construction, led by Telespazio, and is expected to be completed in May 2016.

### Summary

- There is no single data portal that does everything. Common types include:
  - **Centre-, dataset- or project-specific**
  - **Large data access sites and portals**
  - **Dedicated visualisation websites**
  - **Expositionary – exploring new methods and visualisations**
- Easy to use sites either have a well-defined end user, and/or use simple visualisation to facilitate quick orientation in a new dataset.
- The larger sites containing multiple data sets usually require the user to have some knowledge of the product in advance. They are ‘easy-access’ in the sense of providing many datasets in one place, and/or providing some visualisation for orientation, or comparison purposes. Often it is not easy to get started, however they can provide access to many datasets once the user is familiar with the tools.
- An interesting model for visualisation of data is to use a flexible data visualisation platform that can be used with any dataset, rather than the data portal approach of bringing many datasets to a single visualisation portal. The Thredds model uses this approach – any dataset that can be accessed via a thredds server can also be visualised on Godiva2. The means that once the user has found their data, it is easy to visualise quickly, on a familiar platform.
- There is no single resource for finding visualisation or data access sites based on your requirements, although there are several examples of aggregator portals (e.g. CEOS IDN, Climate Adapt). A community list could be a useful resource.
- Sites which bring many datasets together into a ‘one stop shop’ do not necessarily serve a wide audience, and in particular, access for non-expert users may require substantial effort.