Copernicus Data Space Ecosystem

Making Space for Data

EGI 2023

Poznan, 22 June 2023

dataspace.copernicus.eu

AGENDA

About Copernicus

Data Access legacy

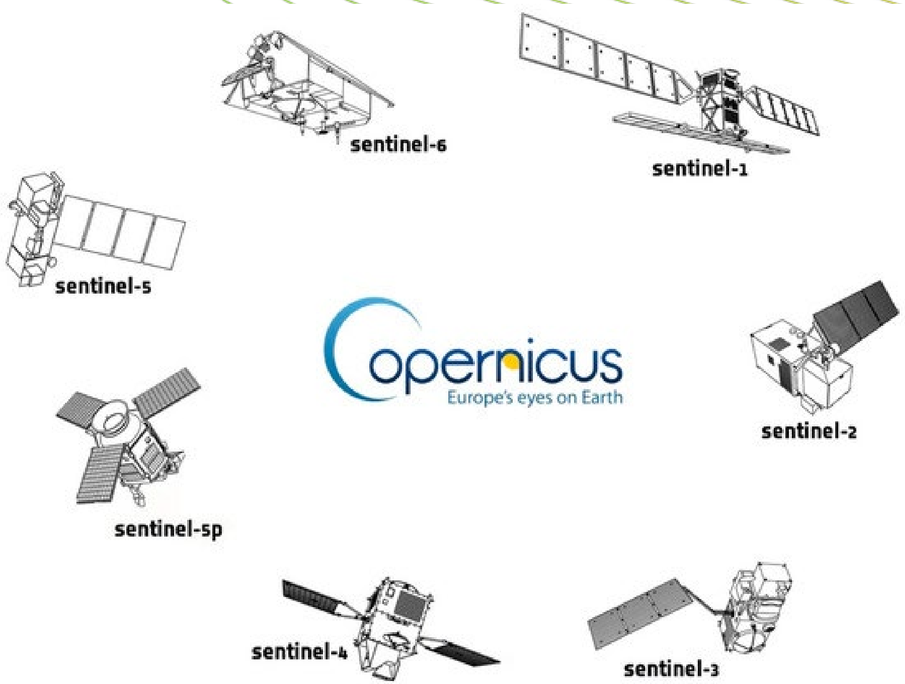
New Copernicus Data Space Ecosystem

Impact on Science, Business and Policy Makers

About Copernicus

Copernicus is the Earth Observation (EO) component of the European Union's Space programme, looking at our planet and its environment to benefit all European citizens. It offers information services that draw from **satellite Earth Observation and in-situ (non-space) data.** The information services provided are **free** and **openly** accessible to users.

The European Commission manages the Programme. It is implemented in partnership with the Member States, the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT), the European Centre for Medium-Range Weather Forecasts (ECMWF), EU Agencies and Mercator Océan.

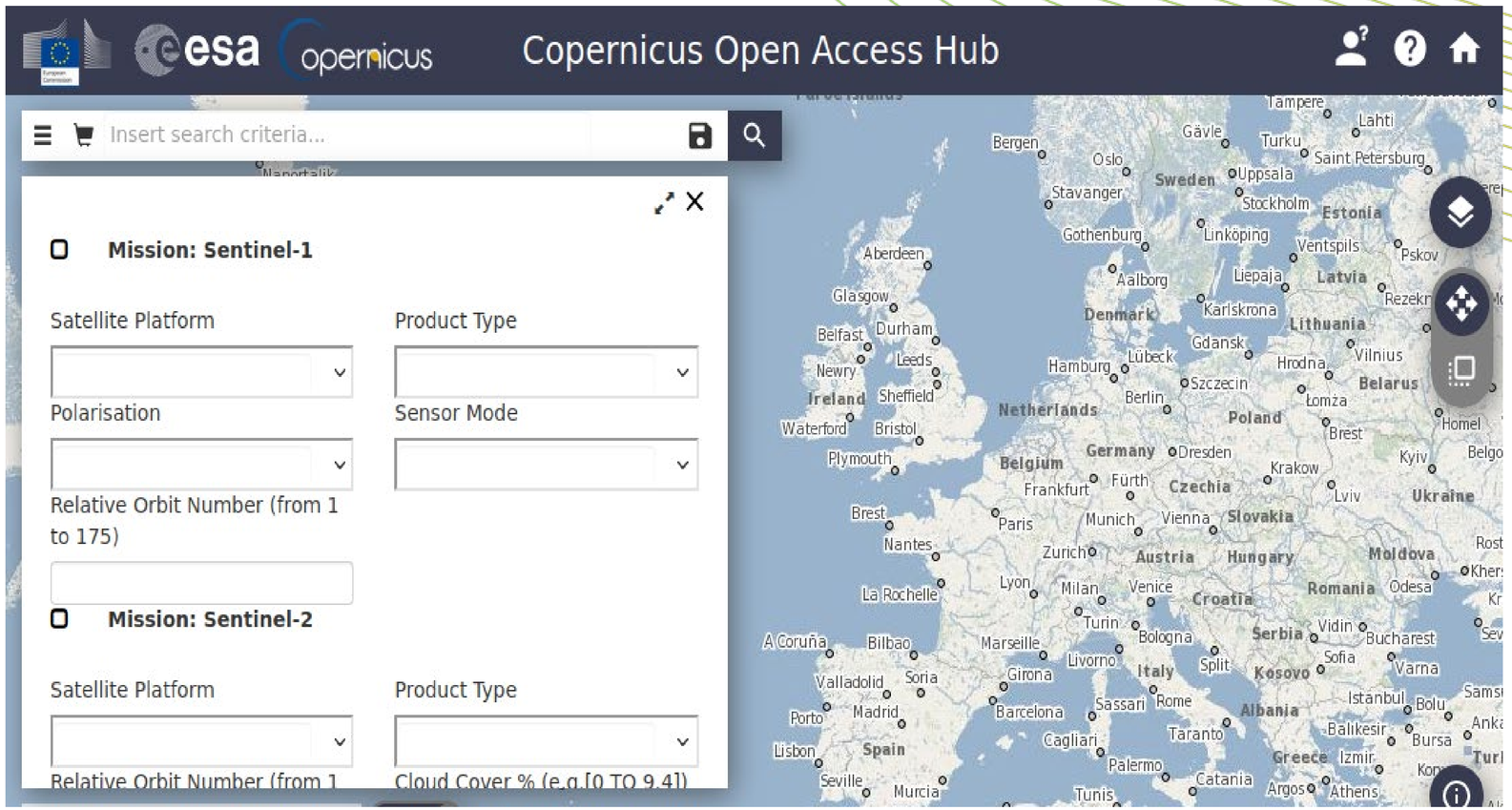


Copernicus Services

Data acquired by the constellation of the Sentinels satellites together with ancillary in-situ/satellite measurements are processed by the **Copernicus Services** in other to **generate value-added products**
e.g., weather forecast, flood warnings, vegetation indices.

Current way(s) to access Sentinel satellite products

- Copernicus Open Access Hub for Sentinel-1,2,3 data.
- Sentinel-5P has its own hub.
- Sentinel-6 is distributed by EUMETSAT.
- Rolling archive policy – no immediate access to archival data (older than 1-3 years)



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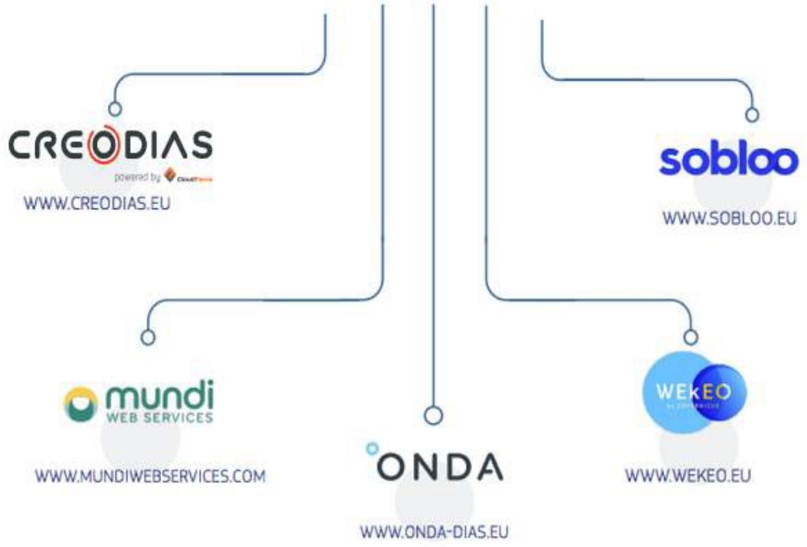
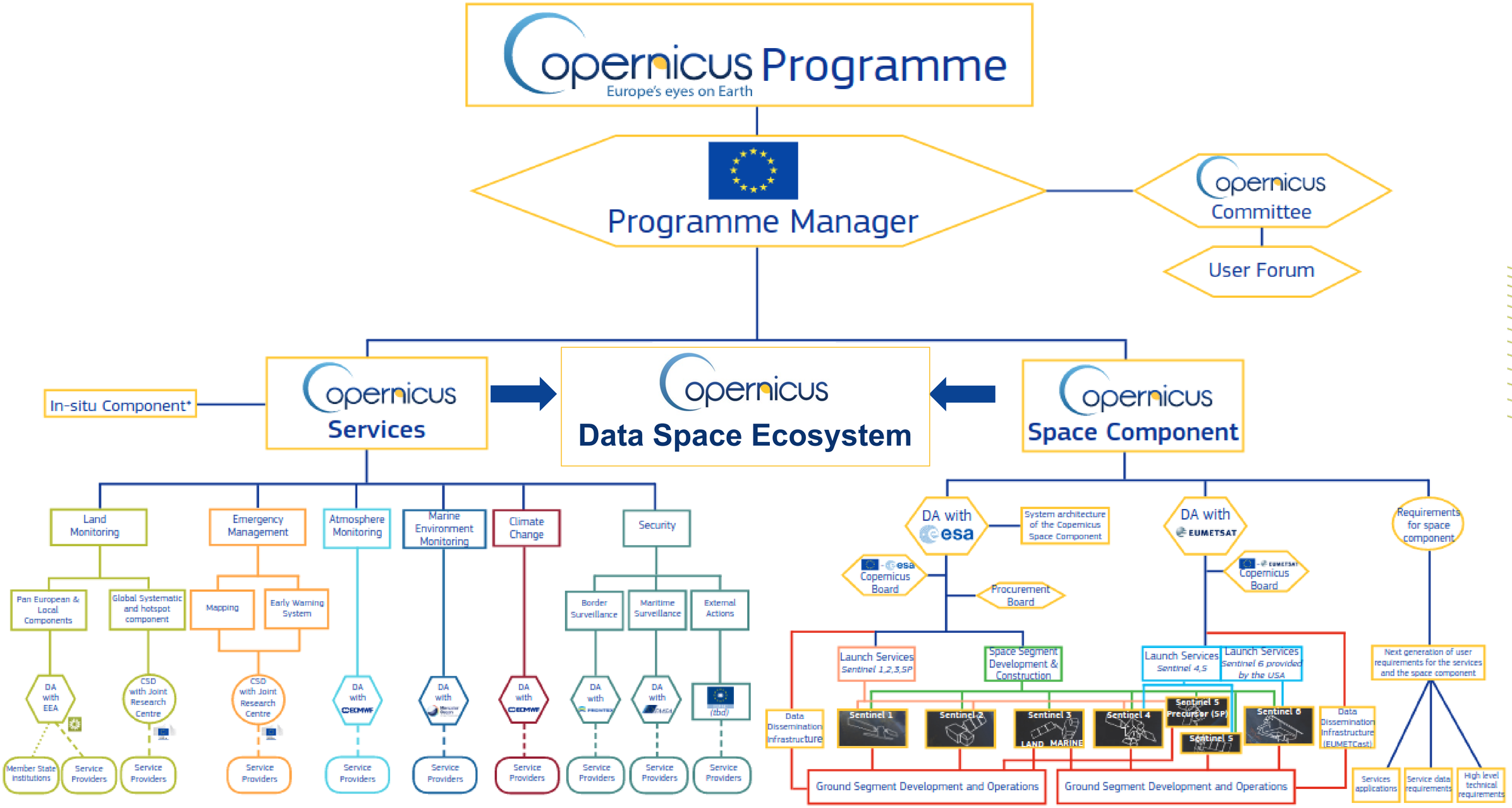
Copernicus cloud-based platforms for Data and Information Access Services (DIAS)

To facilitate and standardise access to data, the European Commission has funded the deployment of **five cloud-based platforms**. They provide centralised access to Copernicus data and information, as well as to processing tools.

The five DIAS online platforms allow users to **discover, manipulate, process and download Copernicus data** and information. All DIAS platforms provide access to Copernicus Sentinel data, as well as to the information products from the six operational services of Copernicus, together with cloud-based tools (open source and/or on a pay-per-use basis).





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About Copernicus Data Space Ecosystem

The **Copernicus Data Space Ecosystem** is the next step in the evolution of Earth observation data access to replace current data hubs. The Ecosystem aims to gather EO data, tools and computing resources to unlock the full potential of the EO data. This will allow developing new applications to increase impact of Earth Observation data for a sustainable society.

The Ecosystem offers immediate access to large amounts of open and free EO data and scalable interfaces on top the Copernicus Sentinel satellites, including both new and historical Sentinel images, commercial datasets, as well as Copernicus Contributing Missions.

What revolution does the Copernicus Data Space Ecosystem bring to Earth Observation?

Cooperation of experts across Europe!

The Copernicus Data Space Ecosystem is powered by leading European cloud and earth observation service providers.

The combination of the partners' experience and the guidance of ESA ensures a comprehensive, high-quality and user-friendly ecosystem.

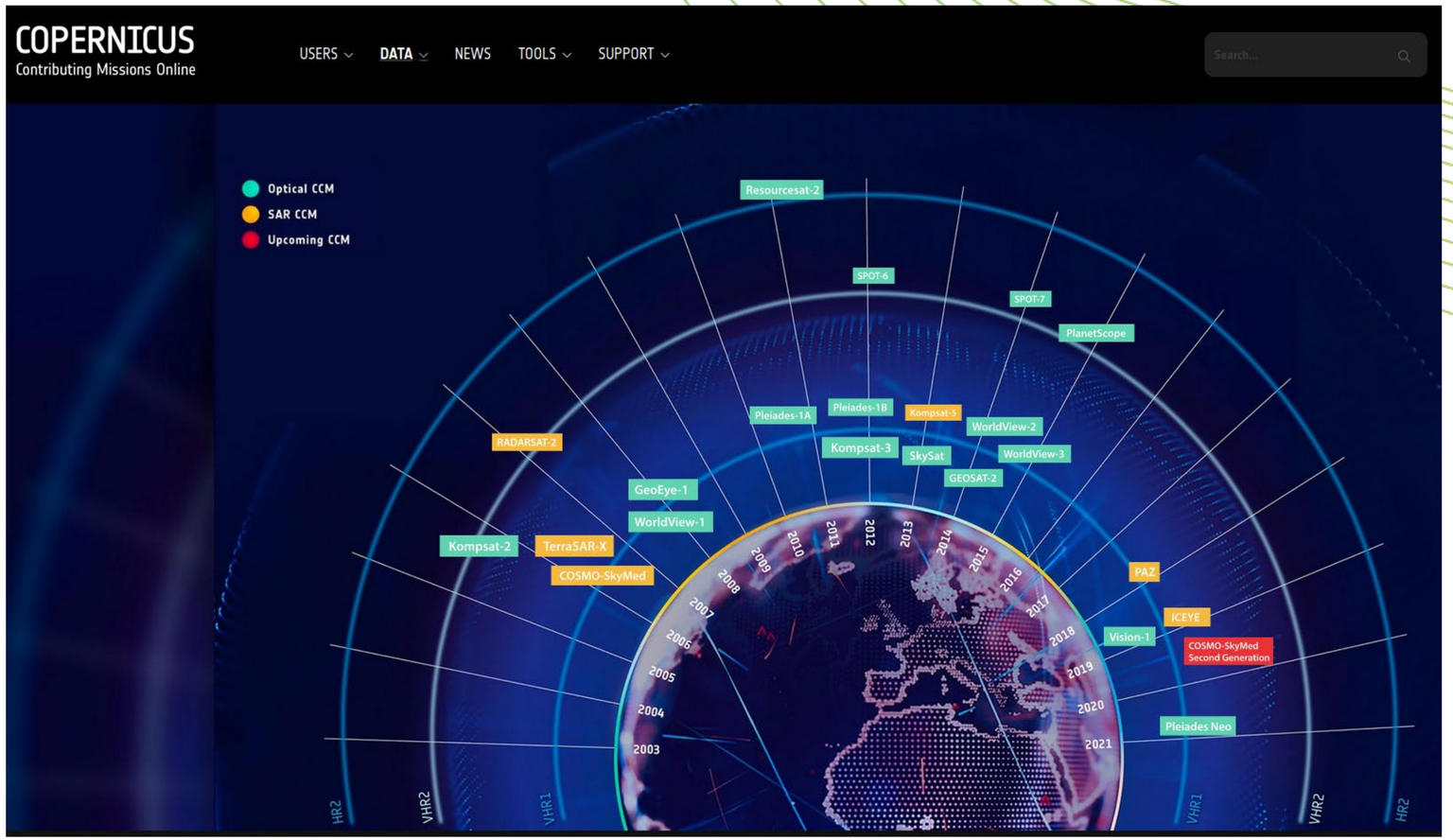
Free and instantaneous access to EO data

- All Sentinel's products from beginning of mission in immediate access (35 PB++)
- Including upcoming Sentinel-2 Collection 1
- Level-3 Sentinel-1 & -2 temporal mosaics (i.e. monthly, quarterly, yearly)
- On-demand processing in a "best effort" mode (e.g. Sentinel-1 coherence generation)
- Landsat imagery over Europe
- SMOS (Soil Moisture and Ocean Salinity), Envisat MERIS and ASAR
- Jason-3 altimetry
- Selected products generated by the Copernicus Services
- more to come ….

Access to Copernicus Contributing Missions (CCMs)

The Copernicus Contributing Missions play a vital role in Earth observation, delivering data that complements the output of the Copernicus Sentinel missions.

Comprising missions from ESA, its Member States and other European and international third party operators, these satellites help cover the needs of Copernicus Service Providers, particularly for very high resolution data.



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Access to Very High Resolution (VHR) imagery via API & Help Desk

AIRBUS DEFENCE & SPACE

MAXAR TECHNOLOGIES

planet.

AEUSI EUROPEAN SPACE IMAGING

SIIS

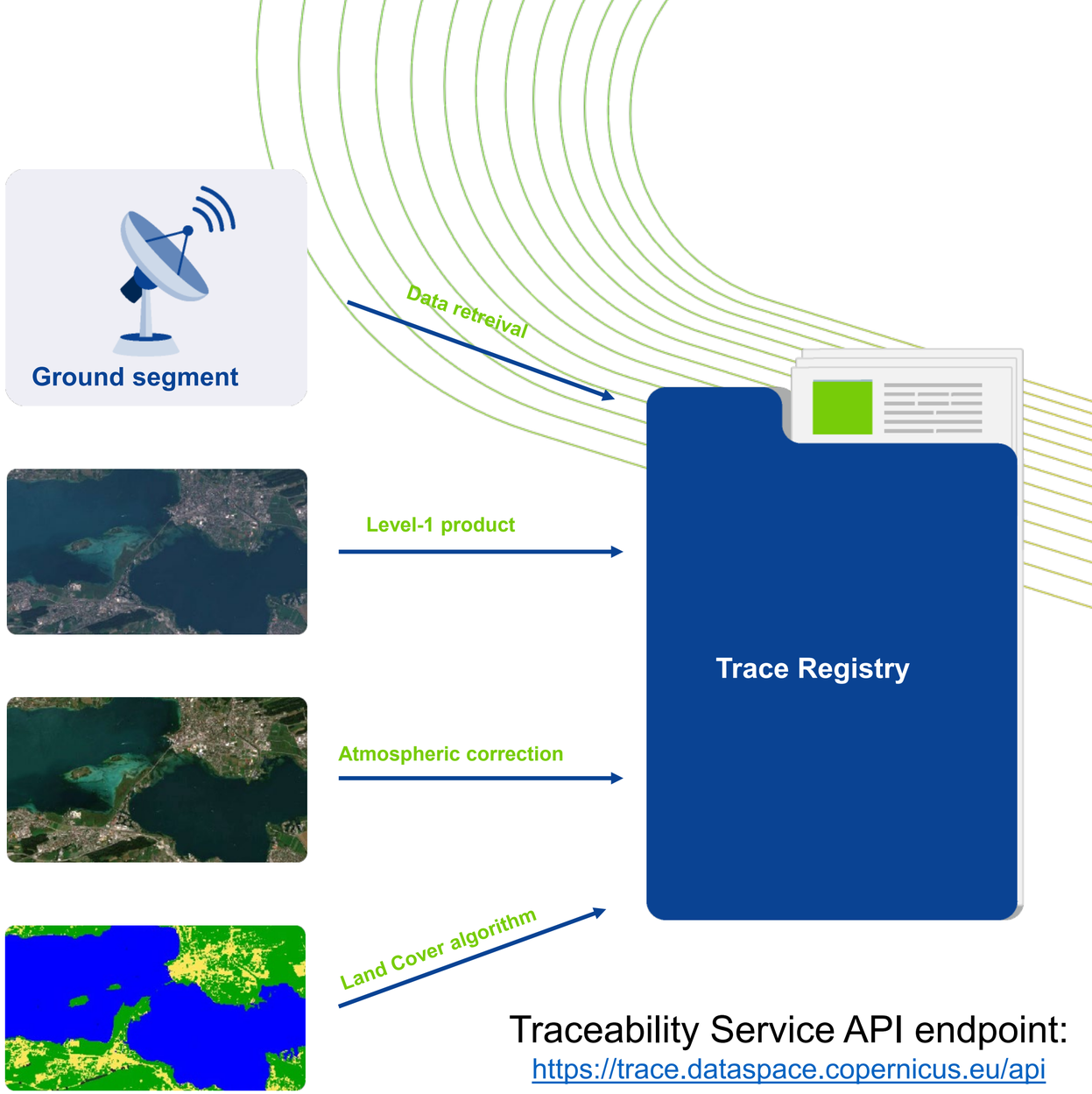
KGS SPACE TECHNOLOGIES

AXELSPACE

CG SATELLITE

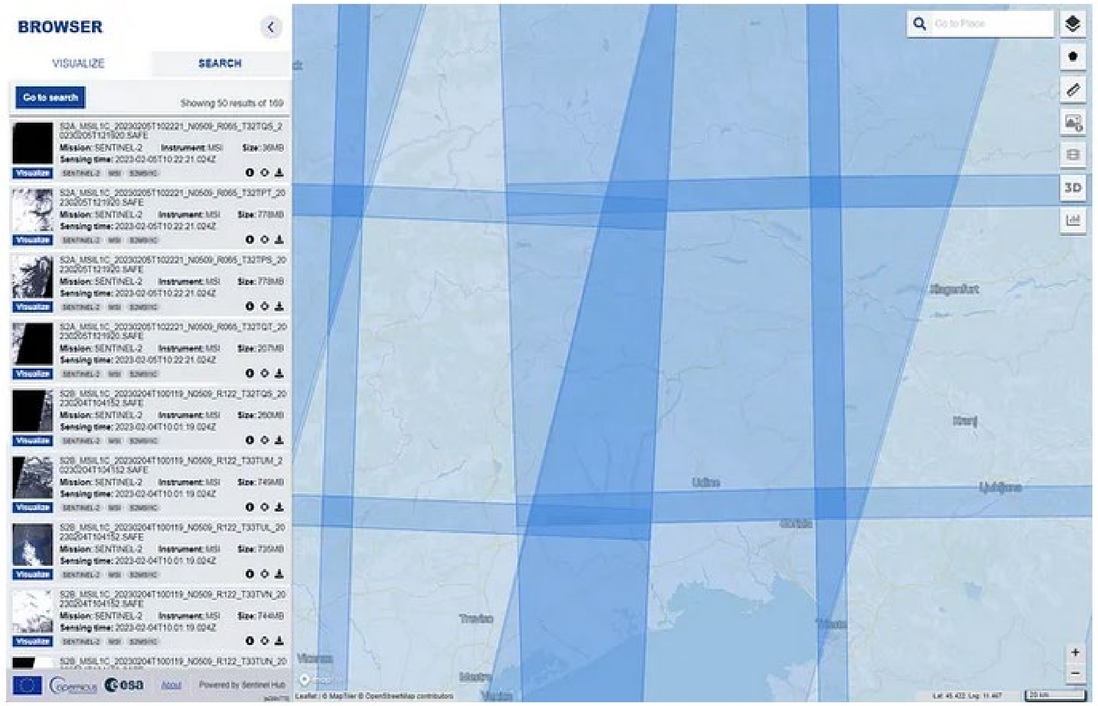
Traceability service

- Purpose: verification of origin to prevent manipulation
- Transparent insight in source of data from origin to delivery
    - Digitally signed product traces
    - Traces generated at each step of the process
- Verification service
- Extendable to user-generated data



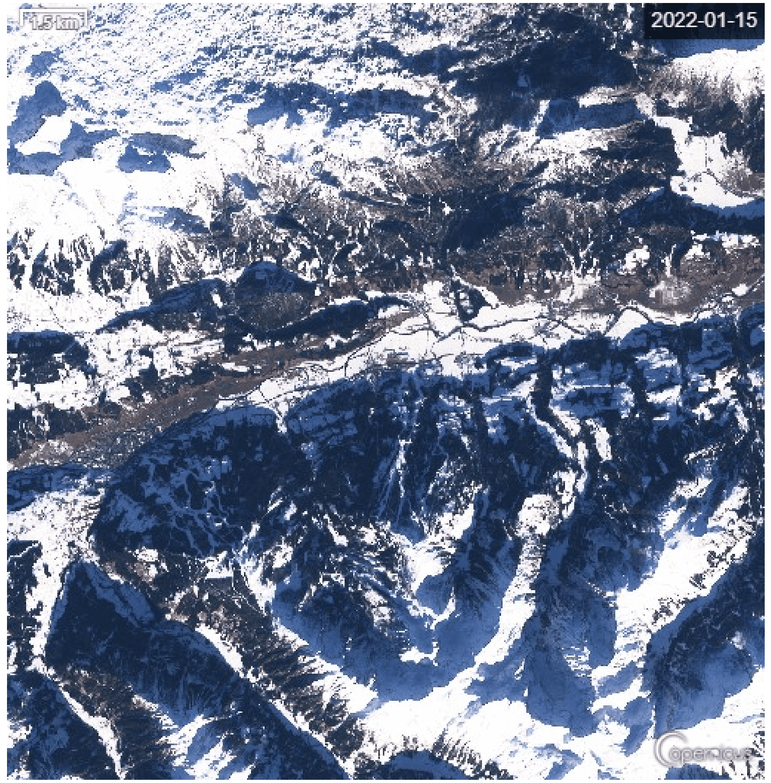
Traceability Service API endpoint:
https://trace.dataspace.copernicus.eu/api

Advanced data discovery and visualization



Copernicus Data Space Ecosystem browser.

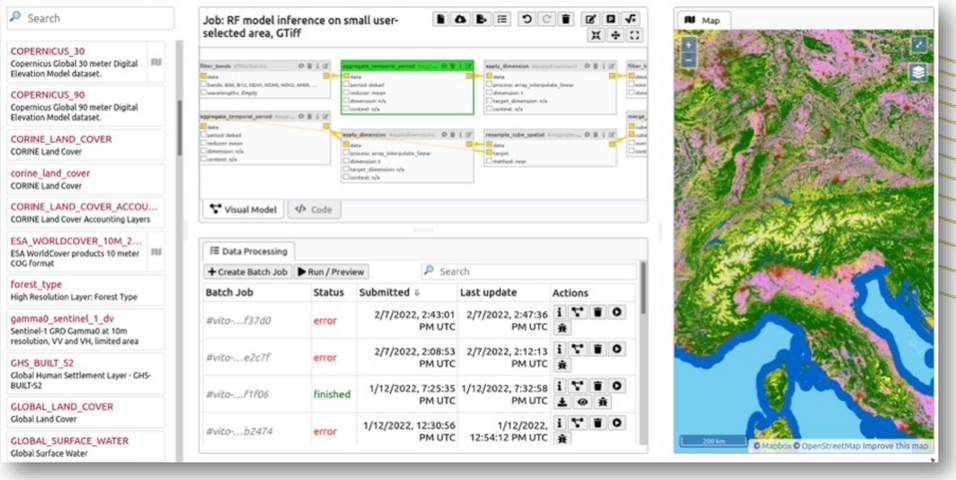
Timelapse videos and advanced 3D modelling

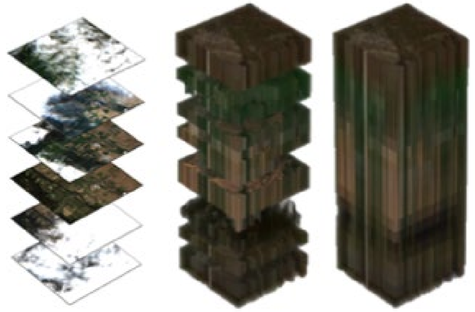


Copernicus Data Space Ecosystem browser.

Advanced data access and processing APIs

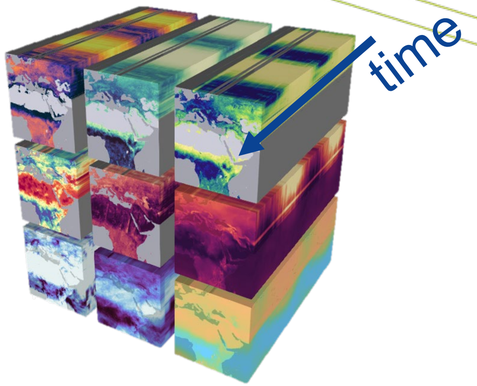
- **Discovery/catalogue** (STAC, OData, OpenSearch)
- **Download products** (S3, OData)
- **Streamlined access** (Sentinel Hub, openEO)
    - STAC Catalogue API
    - Visualisation (OGC)
    - Process (instant, batch)
    - Statistical (instant, batch)
    - Bring your own data (COG, Zarr)
- **SDK** (Phyton, JavaScript)
- **Clients** (JavaScript, Phyton, R)





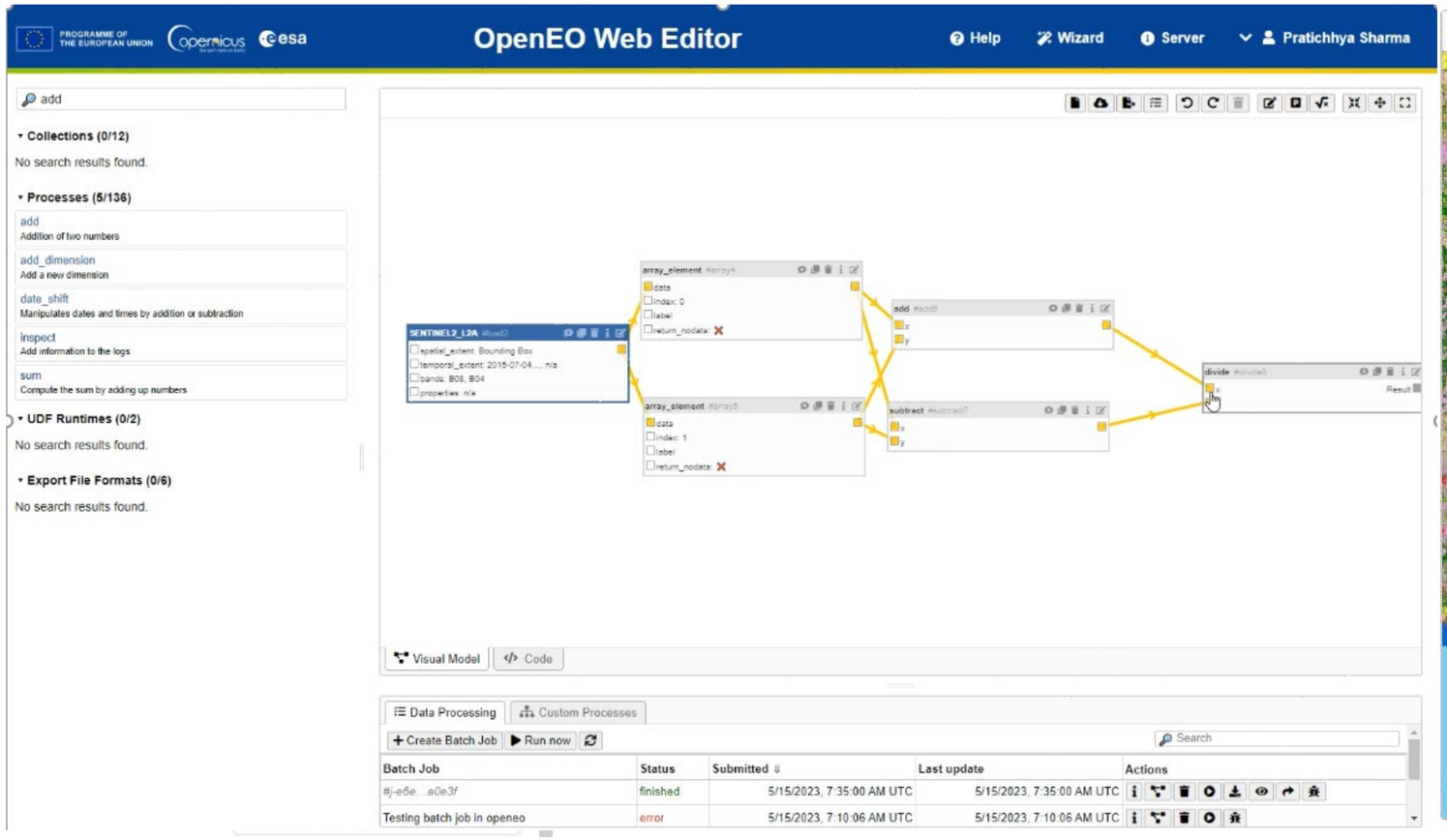
Why openEO?

To serve users with a **local to continental scale** Earth Observation data analytics solution allowing **simplification and unification**:



- To **run workflows** locally, in a browser, Notebook or Rstudio
- **Connection to cloud platforms** in a **technology agnostic** way
- Carrying out **discovery, composition and distributed processing**
- Showing **results** (low res) or download (high res)
- Inserting **custom** Python / R **scripts** to be executed close to the data (User defined functions)
- Community contributions through **Open Source**

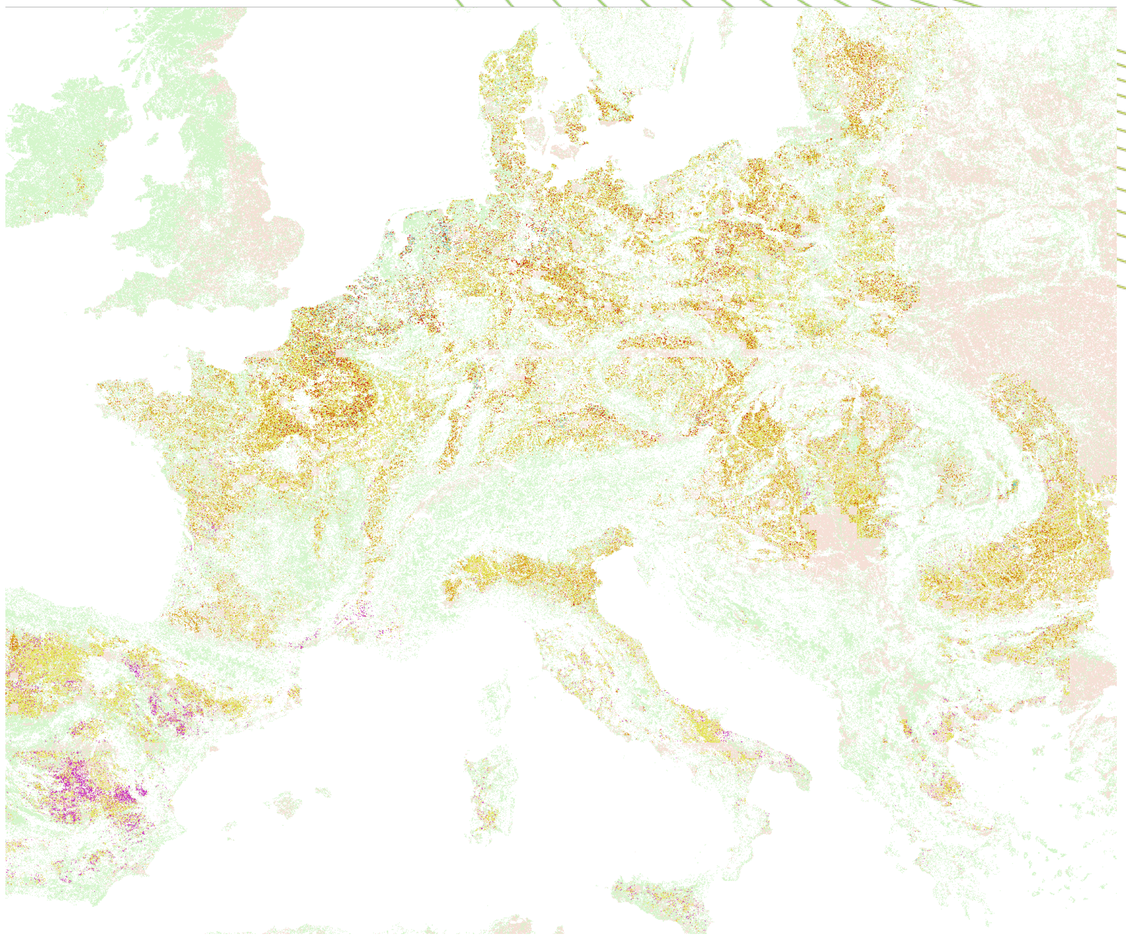
openEO Capabilities



- An interactive low-code and visual user interface for a block-based workflow editor.
- Get an overview of available data sets and processes or monitor the status of their processing workflows.

VITO example use case: EU27 crop map

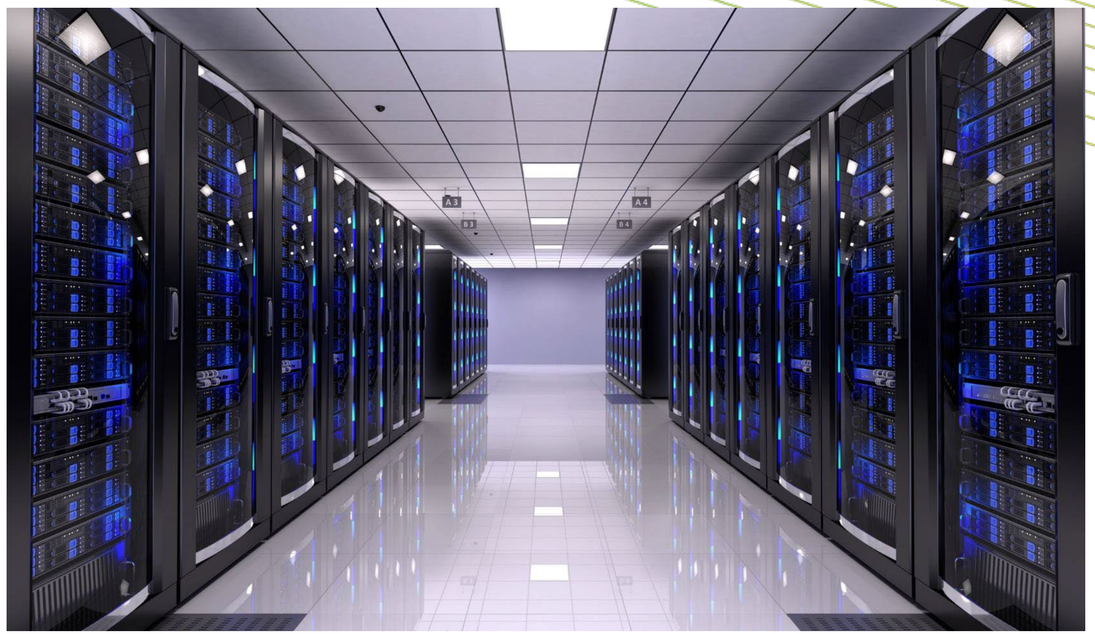
- Processed on data space infrastructure
- Based on:
  - Sentinel-2 L2A
  - Sentinel-1 GRD + on the fly backscatter
  - Copernicus 30m DEM
- Workflow game changer!
  - Federated archives
  - Removing back-end complexity



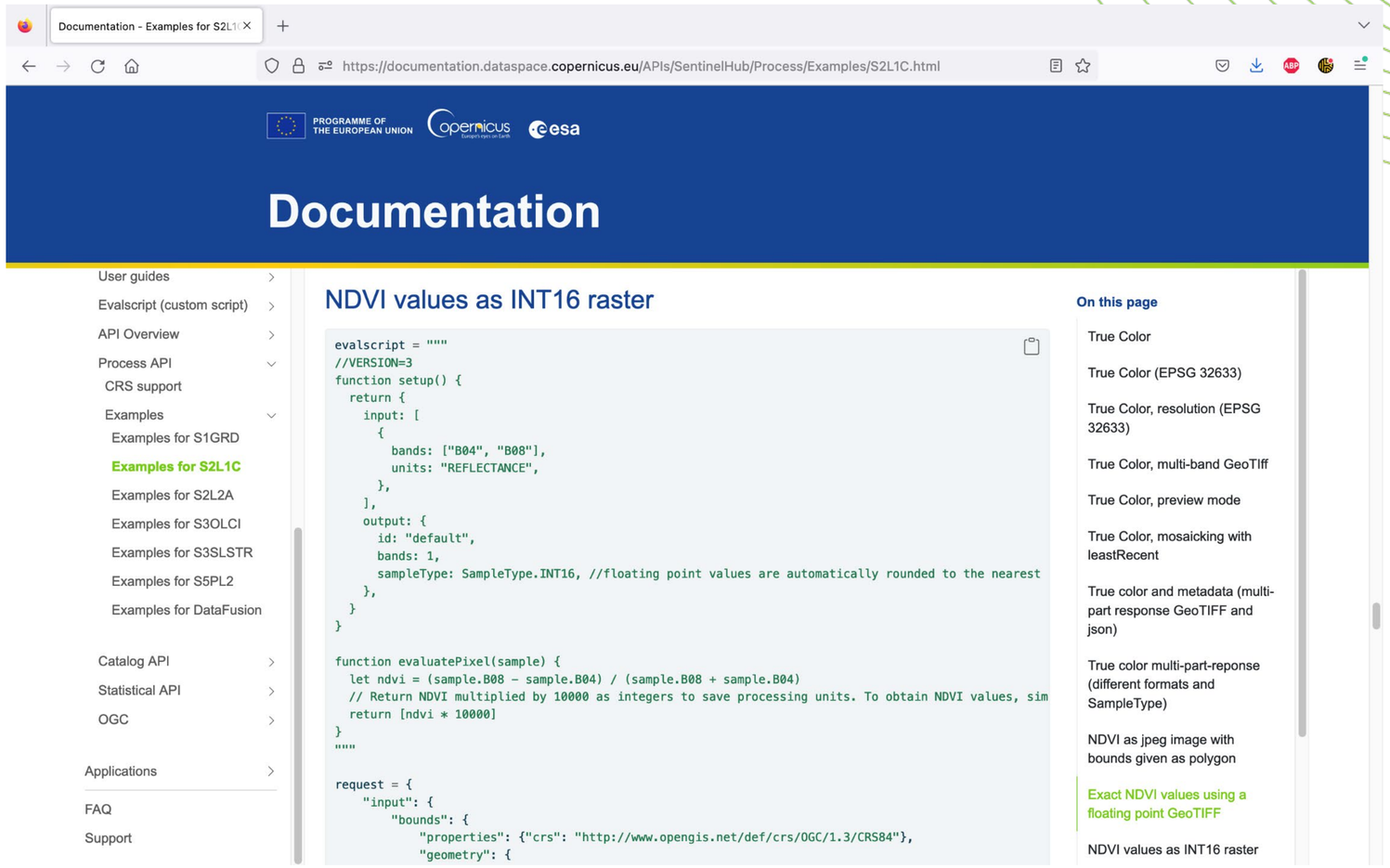
Infrastructure as a Service (IaaS) offered by CREODIAS

Cloud services provided by CloudFerro and Open Telekom Cloud:

- Virtual Machines (VM) with many flavours
- GPU accelerated for complex AI tasks
- Object Storage with S3 interface
- Flexible billing modes (Pay-As-You-Go)
- Long-term contracts with discounts
- Discounts for scientific users
- 24/7 support



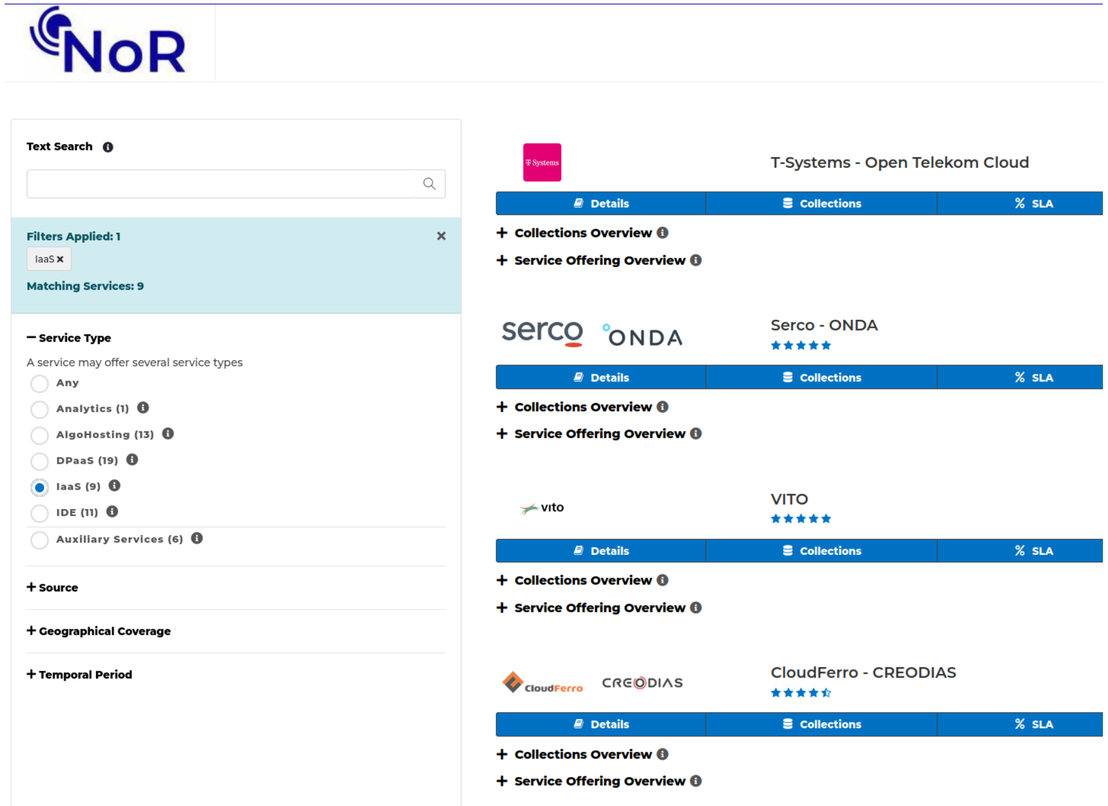
Documentation



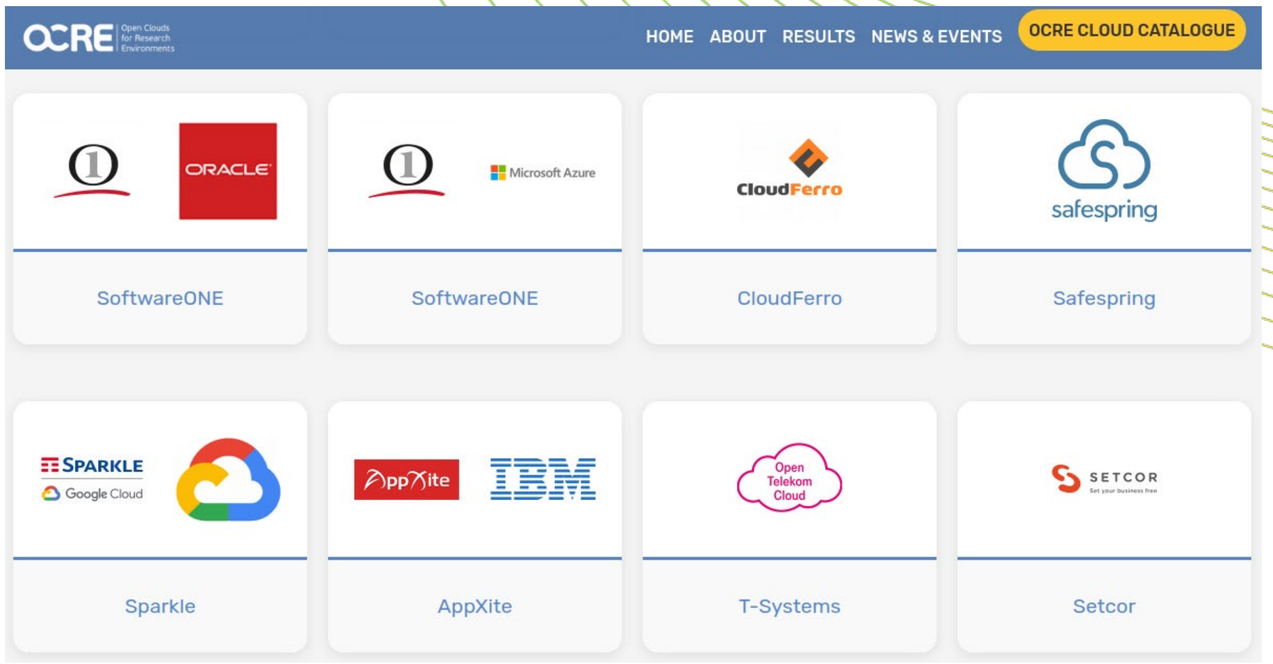
Service desk

- **User forum**
  - Peer to peer sharing of knowledge
  - Actively supported by helpdesk staff
- **Web form and email support**
  - Automatic suggested answers
  - FAQ
  - Documentation portal
- **(Video) Tutorials & code snippets**

Funding opportunities for commercial offering!



Network of Resources
https://nor-discover.cloudeo.group/



Open Clouds for Research Environments
https://www.ocre-project.eu/services/cloud-suppliers

Take home messages

- Copernicus Data Space Ecosystem grants free, immediate access to EO data.
- Along with data the Ecosystem offers powerful data discovery, visualization and processing tools & APIs.
- Free-public offering in complemented by commercial one for:
    - Cloud computing (virtual machines)
    - Very High Resolution (VHR) imagery
- Ecosystem is **OPEN** for **any entity** willing to federate, following new Data Space standards and EU Strategy for Data.
- Long term perspective for fruitful cooperation (6-10 years contract)!
- Copernicus Data Space Ecosystem is a joint European effort!!

Thank You!

PROGRAMME OF
THE EUROPEAN UNION