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The ESA atmospheric Validation Data Centre (EVDC): Overview and new applications for EarthCARE

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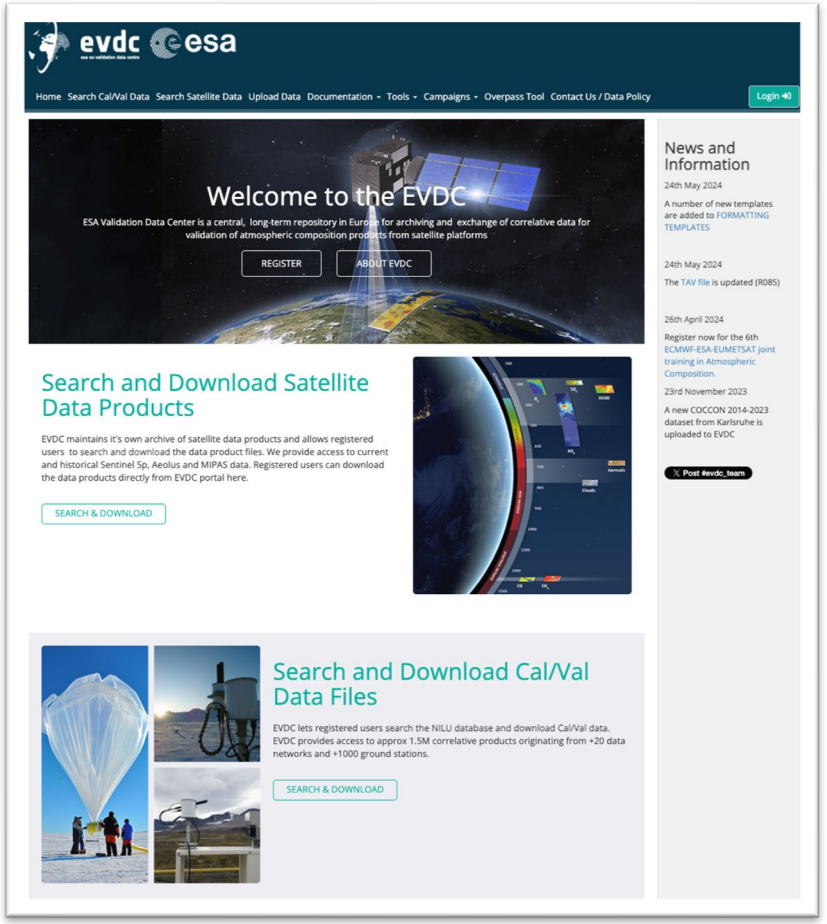
https://evdc.esa.int



EVDC Overview

The ESA atmospheric Validation Data Centre (EVDC) is the official ESA repository for correlative data in the atmospheric domain . It provides access to:

- Groundbased, aircraft and balloon Cal/Val files and **Fiducial Reference Measurements (FRMs)**
- Complete and up-to-date access of Sentinel 5P, Aeolus, MIPAS and the forthcoming **EarthCARE products**
- Tools, processes and documentation for data submitters (**GEOMS** standarization activities, data sharing agreements)
- Tools for data collection campaign planning (**Orbit Prediction and Overpass Tool - OPOT**)
- **Collocation Reference Database**
- Tools for processing data in the cloud (subsetting, merging, visualisation etc)
- CWL Based processing system with visual workflow builder, including EarthCARE tools (e.g.: CIS, MSI, Lidar, Radar tools)

EVDC and EarthCARE mission

As a main European source of correlative data and supporting tools for atmospheric composition products, the EVDC team is actively involved in the EarthCARE mission support. It has been working closely with the EarthCARE Validation Team and liaising with the groups tasked with the development of processing tools for EarthCARE products validation.

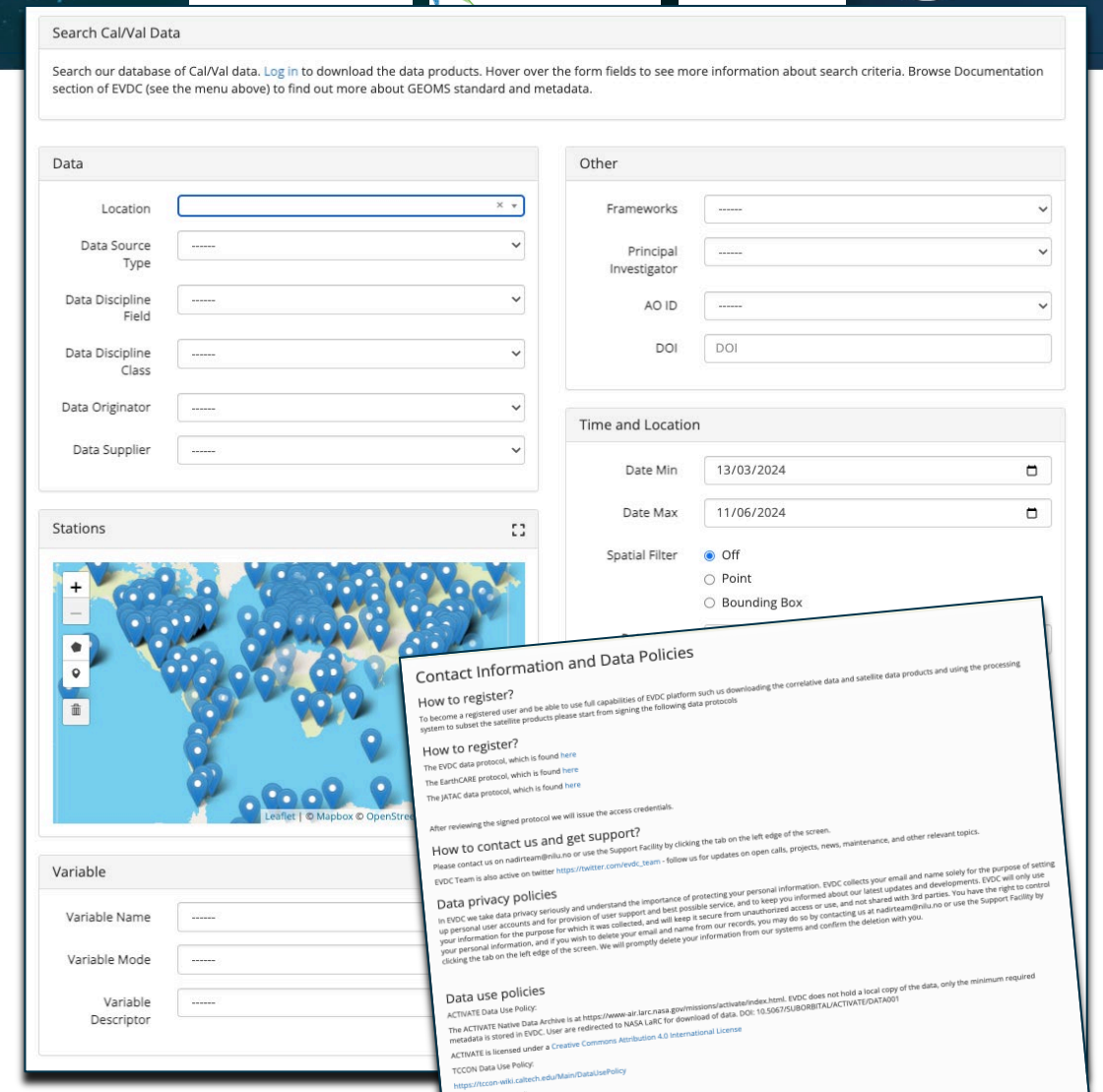
The involvement focuses on:

- Providing access to the correlative data sets
- Providing access to the EarthCARE products (including pre-operational data)
- Liaising with PIs and data submitters
- Supporting data submission process and data formatting to GEOMS standard
- Tools and support for data submitters
- Data Center Interoperability and specifically metadata harvesting for correlative products
- DOI support via EVDC
- Providing Cloud Processing capabilities for EarthCARE products and correlative data
- Providing platform tools for subsetting, binning and collocating the data (Collocation Reference Database)
- Providing a Workflow Builder to test and run Users Processing (Cal/Val modules)
- Providing services, supporting materials and training to the users, PIs and data submitters

EVDC Cal/Val Database

ESA atmospheric Validation Data Center (EVDC), ESAs in-house Cal/Val database covering:

- Data from historical and ongoing campaigns
- Remote sensing and in-situ measurements from ground-based and airborne stationary and mobile platforms (aircraft, balloon, bouy, drone, ship)
- Operational data in near-real-time from research infrastructures in Europe and America such as ACTRIS (CloudNet, EARLINET), TOLNet, MPLNet, Pandonia Global Network.
- Links to other data archives and network e.g. AVDC, NDACC
- Data from 1965 until present
- More than 1400 users where more than 200 for EarthCARE Cal/Val



Cal/Val search UI

Data Protocols

EVDC Cal/Val Database

EVDC for EarthCARE PIs

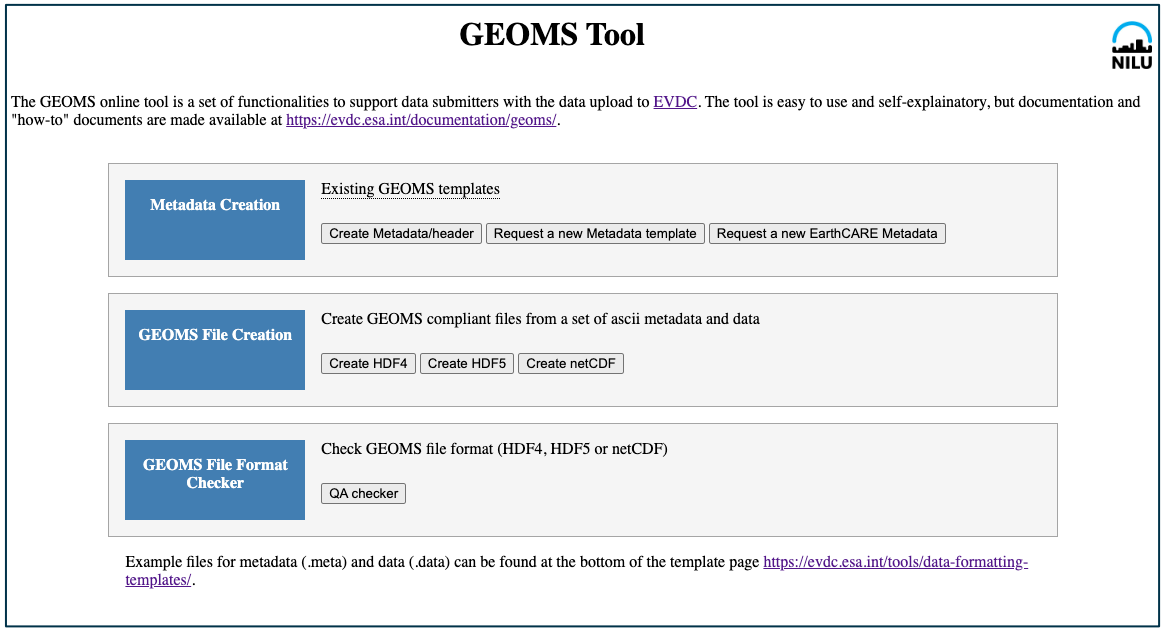
All PIs are asked to establish contact with EVDC: nadirteam@nilu.no

Access to databases, preliminary Cal/Val data from the (EarthCARE Validation Team) ECVT, and EVDC tools is only granted to those who have signed the data protocol.

ECVT members are requested to read, sign the EarthCARE data protocol, and make use of this correlative data repository by sharing their data (upload) and working with others' data (download).

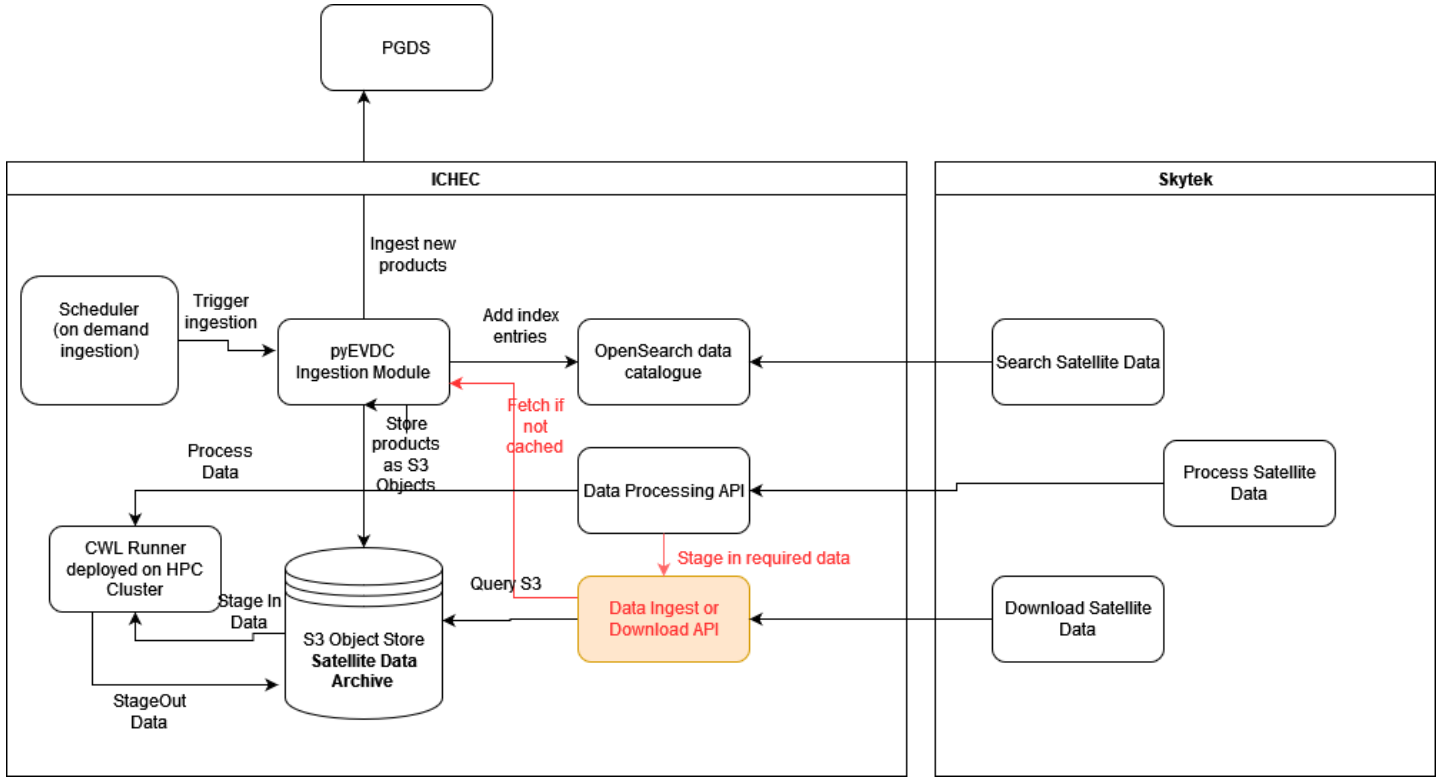
ECVT members are expected to standardise the metadata of their measurements according to **GEOMS (Generic Earth Observations Metadata Standard)**. To support the standardization, there are **GEOMS tools** and **templates** available and **support from the EVDC team.**

EVDC GEOMS Tool : https://geoms-tool.nilu.no/



Current status at:
https://ecvt.csde.esa.int/confluence/display/ECAOPI/EVDC+GEOMS+METADATA

Satellite Element

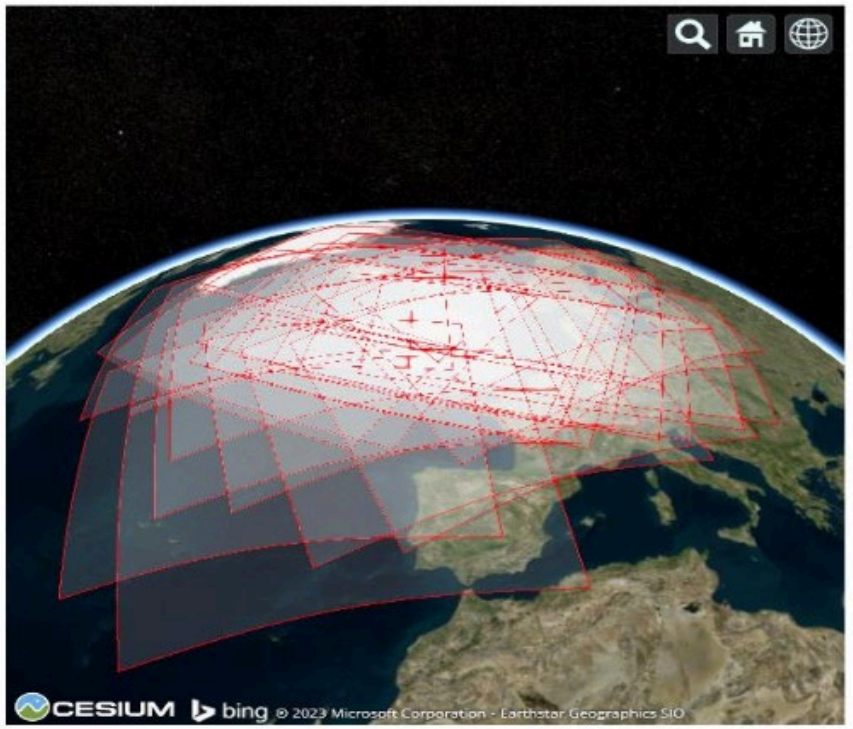


The EVDC system also provides access to satellite data for specific missions, namely Sentinel-5P, Aeolus, ENVISAT/MIPAS and soon, EarthCARE.

The access to the EarthCARE data on the EVDC platform will be provisioned by direct link to the primary data source (PDGS) and all users provided with access to pre-operational data would be able to access the data also via EVDC platform to use EVDC tools according to their permissions.

EVDC – Satellite Data Search UI

World View of Search Results



Satellite Search Form

Satellite	Sentinel-5p
Instrument	TROPOMI
Timeliness	---------
roduct Type	S5P_NRTI_L2__O3____
Processor Version	---------
Start date	01 / 01 / 2023
End date	27 / 06 / 2023
Longitude	-7.107275,-5.238902,-5.249893,-7.085294
Latitude	53.842481,53.842481,52.898631,52.739285

★ Submit

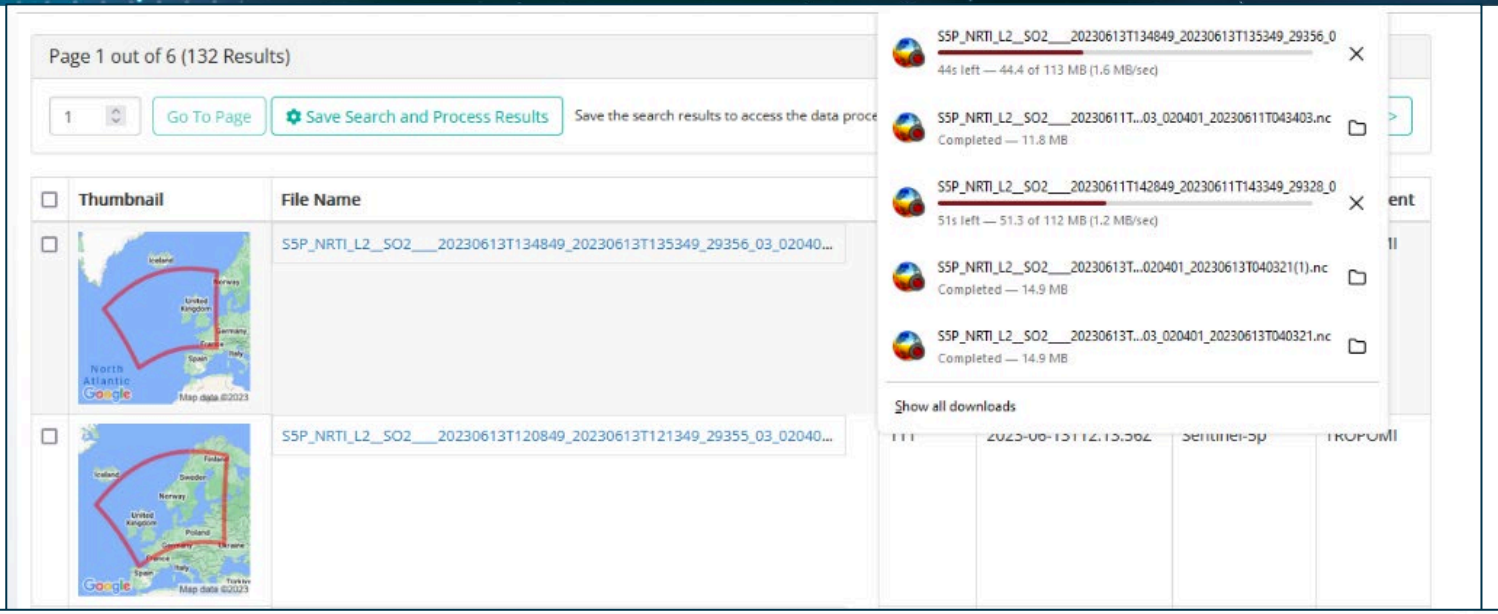
Select Point or Polygon

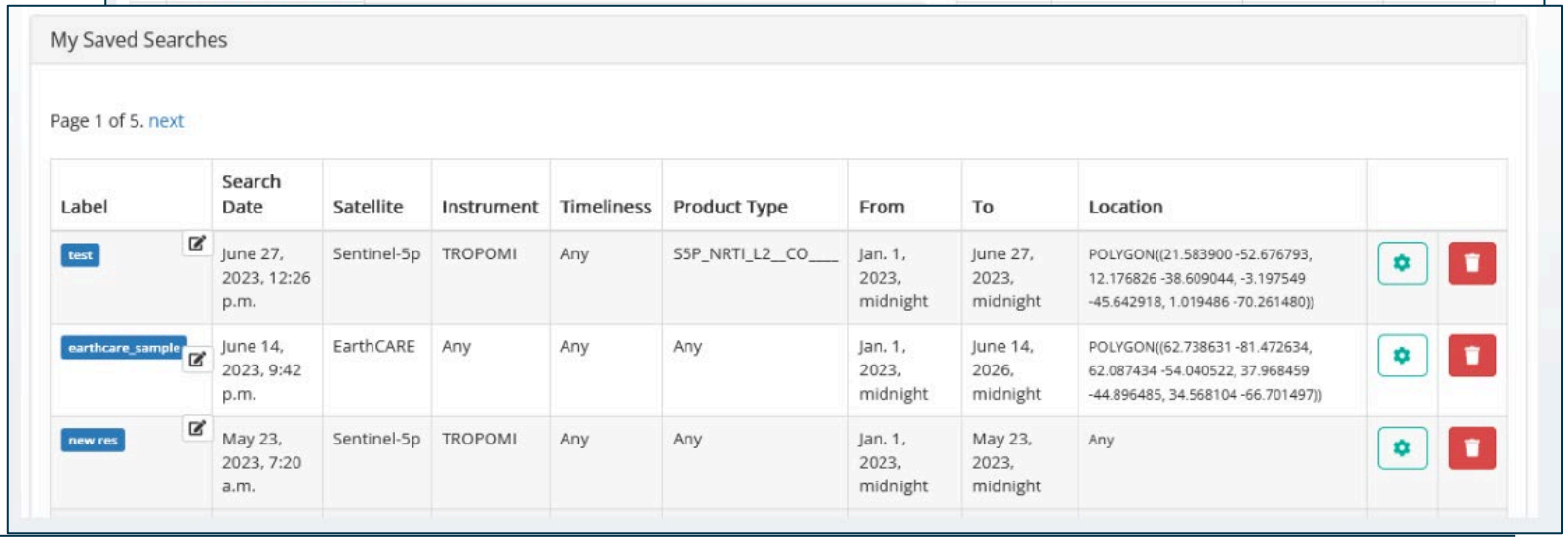
Satellite Element and processing

A set of basic operations are allowed over the satellite product: **visualization, selection, download**…and processing as **subsetting** and **merging.**

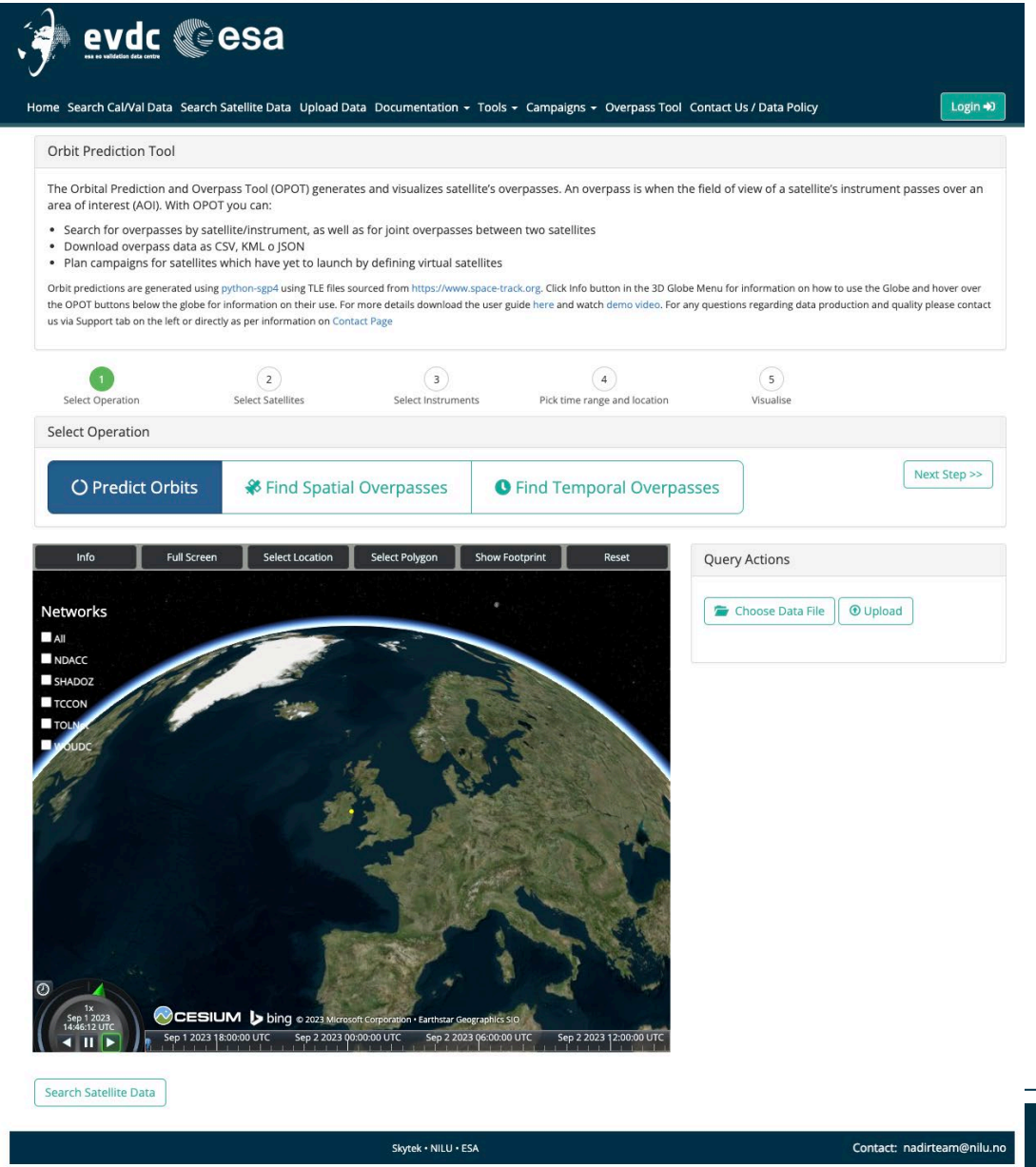
Saving files – a mechanism for grouping and tagging the files for futher processing.

The processing system is deployed on **High-Performance-Computing** infrastructure supplied by ICHEC.





OPOT: Orbit Prediction and Overpass Tool

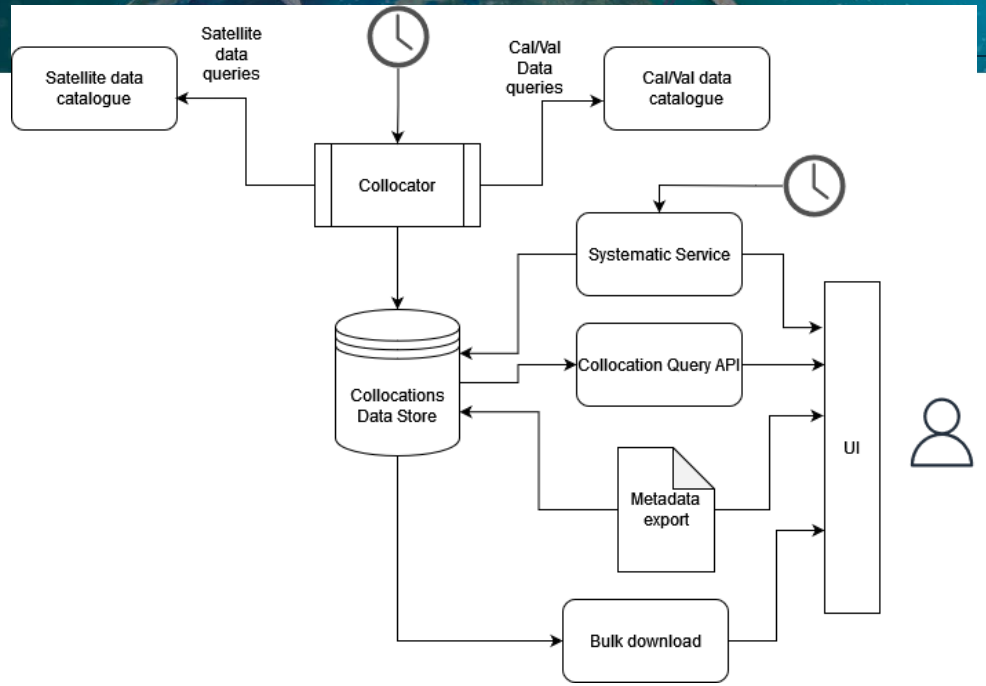


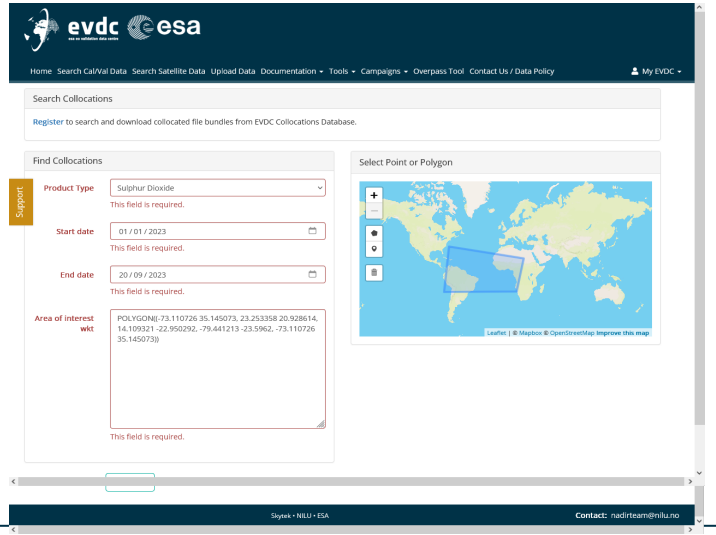
The Orbital Prediction and Overpass Tool (OPOT) generates and visualizes satellite's spatial overpasses. An overpass is when the field of view of a satellite's instrument passes over an area of interest (AOI). With OPOT you can:

- Predict Orbits
- Search for spatial overpasses by satellite/instrument (in a time range)
- Temporal Overpasses: i.e. joint overpasses between two satellites
- Download overpass data as CSV, KML o JSON
- Cal/Val Networks overlay and info
- Plan campaigns for satellites which have yet to launch by defining virtual satellites

Demo available =>https://evdc.esa.int/orbit/

Collocation Reference Database





The Goal:

- Automate the collection of broad collocations between satellite and correlative products
- Provide users with tools to interact with the archive of pre-collocated data
- Allow automated data deliveries based on custom (narrower) collocation criteria

The Architecture:

- Collocator as a scheduled service searching for new collocations daily
- Data store holding indexed metadata fields of both files (sat and cal/val file)
- Query service for interacting with collocation data store

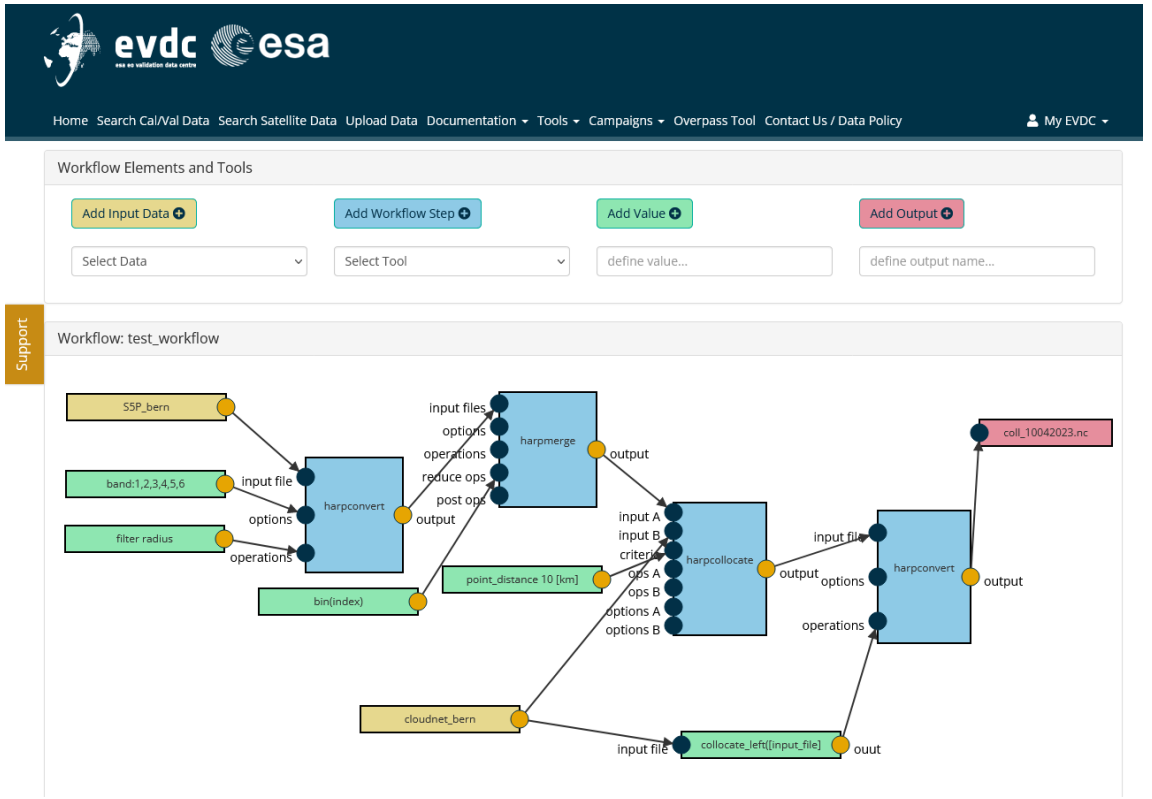
Configuration, variable mapping

- Manual config for referencing satellite product variables to correlative variables
- Common naming
- Possible to configure more detailed mapping details (units, scaling, conversion formulas

Collocation Query API

- The purpose is to filter the broad collocations to stricter collocation criteria.
- It exposes a few endpoints: product type, start and end date, area of interest (e.g. polygon), max time difference (minutes)

Workflow Builder



Example of workflow visualization: several modules for **EarthCARE cal/val activities** are available (e.g.: CIS, MSI, Lidar, Radar tools)

The **Workflow Builder** module allows creating processing graphs out of processing modules available in the system. Users can exploit a workspace for defining the connections between inputs and outputs of the modules or steps of the workflow. The module specifically allows users to:

- Create/Save new workflow and export it as CWL script
- View the list of available processing modules
- Add workflow steps based on either processing modules or ad-hoc python or javascript scripts.
- Add input data blocks based on saved search results
- Add value blocks that set statically or dynamically the value of input parameters
- Define outputs
- Draw connections between inputs and outputs of processing modules
- Select from product inputs available in the system by assessing:
  - Satellite query results, Cal/Val query results
  - Specified locations in the User File Storage
- Specify locations of final outputs as locations in User File Storage
- Test running individual components with provided inputs
- Test running the processing workflow on singular inputs
- Schedule operational processing workflow run – either as once off run or as a scheduled service.

Services and supporting materials

DOI and Landing Pages

The EVDC team has developed a new API that allows users to get a DOI for data made available in the data centre. This API generates landing pages automatically from xml input. Landing pages are essential for coining DOIs.

To coin a DOI for your dataset and to learn how to use the API, please contact the EVDC team at nadirteam@nilu.no. The EVDC team will assist you with the coining process and support you with setting up the landing pages.

Training Materials (pdf)	Video Tutorials
Introduction to the EVDC Cal/Val database Data Formatting and Data Submission to EVDC EVDC For EarthCARE. Processing tools for Cal/Val. Webinar slides Data Search, Workflow Processing system, Collocation Database. Tutorials	A set of video tutorials that cover most important functionalities and workflows in the EVDC platform: • EVDC Platform overview • How to search for Cal/Val data? • How to search and process the satellite data? • How to use Orbit Prediction Tool? • How to format Cal/Val Data? Tutorials on using orbit tool and satellite data search based on real-life scenarios: • Exploring Sentinel 5P and Aeolus data covering US west coast wildfires in 2020. • Exploring Sentinel 5P SO2 data for Fuego volcano eruption