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From environmental data

to Galaxy for Earth System

eosc | FAIR-EASE

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Agenda

Fair-Ease an EOSC project

An Earth System Sandbox

An efficient cooperation

An earth-system.usegalaxy.eu

An Earth Analytical Lab

COFEST

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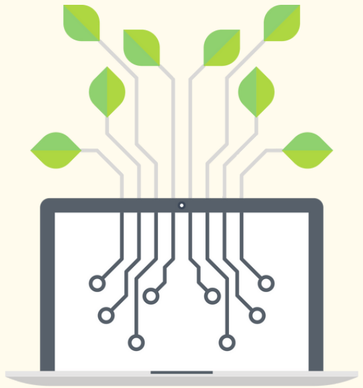
Fair-Ease Overview

SHORT BRIEF

Building an interdomain digital architecture for integrated use of environmental data



FAIR-EASE Data Discovery and Access Interdisciplinary Service

FAIR-EASE Earth Analytic Lab

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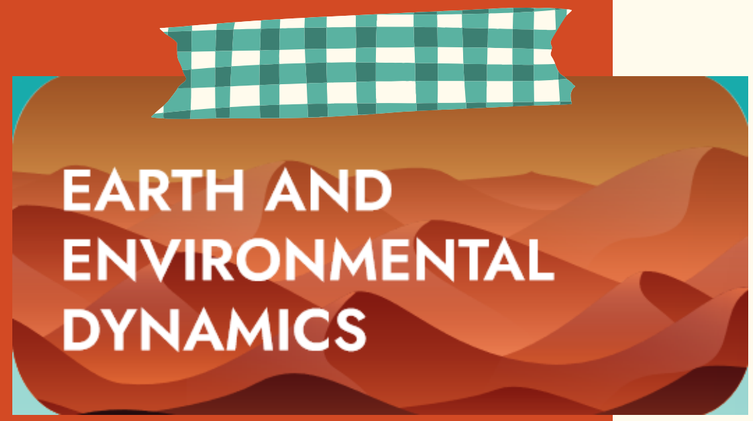
Fair-Ease

SHORT BRIEF

Overview

5 pilots to build this interdomain digital architecture for integrated use of environmental data
Galaxy as an important technical brick of the architecture



- Coastal Water Dynamics
- Earth Critical Zone
- Volcano

- Bio-GeoChemical observations

- Marine omics observations

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FE & ESG

2-days Galaxy training

Teach to Fair-Ease partners how and why use Galaxy with the help and experience of ESG collegues

A hands on day to integrate tools with the attendants

The collaboration of 2 EOSC projects to efficiently get cross-discipline workflows by creating sharing and re-using tools and workflows on Galaxy

Galaxy EUROPE

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Coastal Water Dynamics

Northern Adriatic / Po Estuary

Highly dynamic system, affected by variety of processes: river runoff, meteorology, ocean currents, marine bio-geochemical processes.

- Scientific and socio-economic impacts:
  a. Biological productivity and fish stocks
  b. Uptake of atmospheric CO2 and effect on marine carbon cycle
  c. Input and off-shore transport of suspended material and hazardous substances
- Well monitored

Improvement

- Correlate satellite chlorophyll data with Po river discharge
- Improve gridded climatologies by incorporating ocean circulation
- Facilitate model/data comparison and skill assessment

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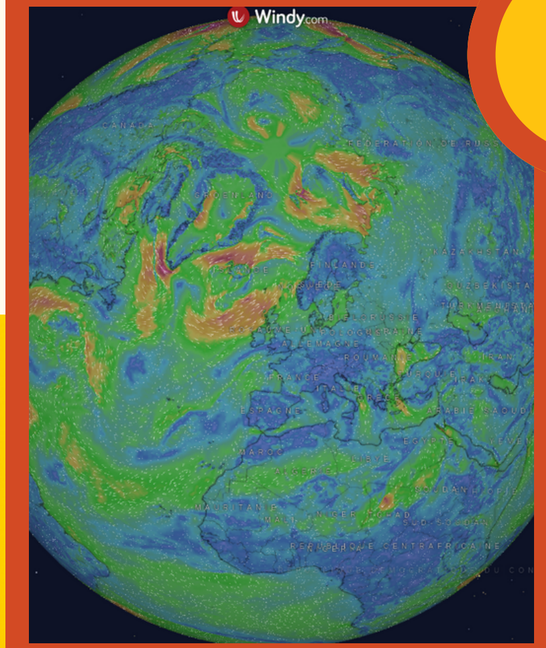
Combine 3 tools in anaytics workflows to have a complete overview

Coastal Water Dynamics

1

2

3



SOURCE

Calibrates and validates various ocean models within a selected spatial domain using in-situ observations.

ODV

Human-in-the-loop analysis and visualization of input and output coming from the two other tools

DIVAnd

Built new products as an n-dimensional variational analysis/gridding from arbitrarily located observations coming from tl two other tools

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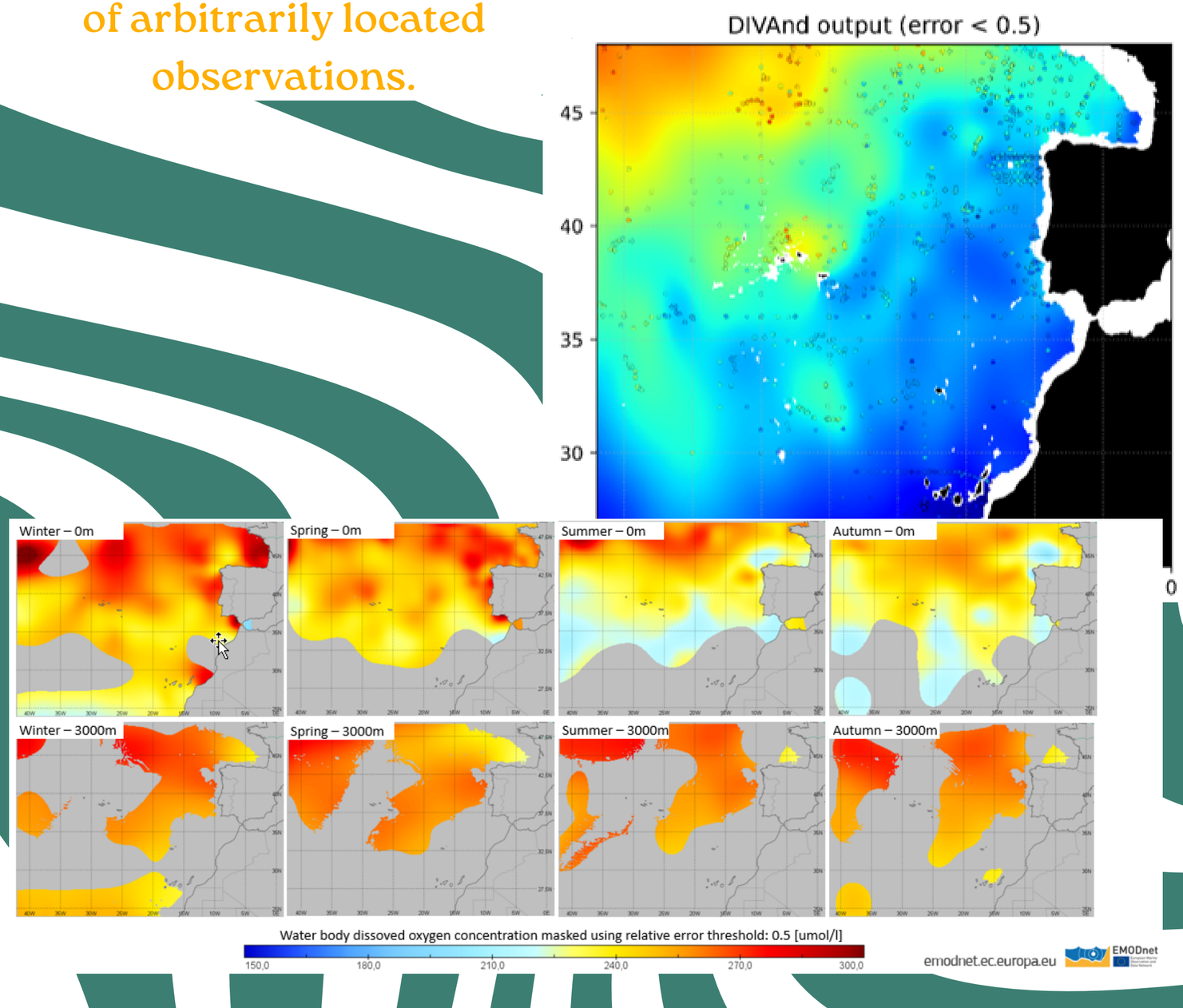
New tool on Galaxy Europe

DIVAnd

Performs an n-dimensional variational analysis/gridding of arbitrarily located observations.

Key Features

- Scattered data
- Noise allowed
- Physical and inequality constraints can be added
- Topological constraints are handled naturally (barriers, holes)
- Analysis error maps can be estimated
- Periodicity in selected directions can be enforced



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LIÈGE université

emodnet.ec.europa.eu EMODnet

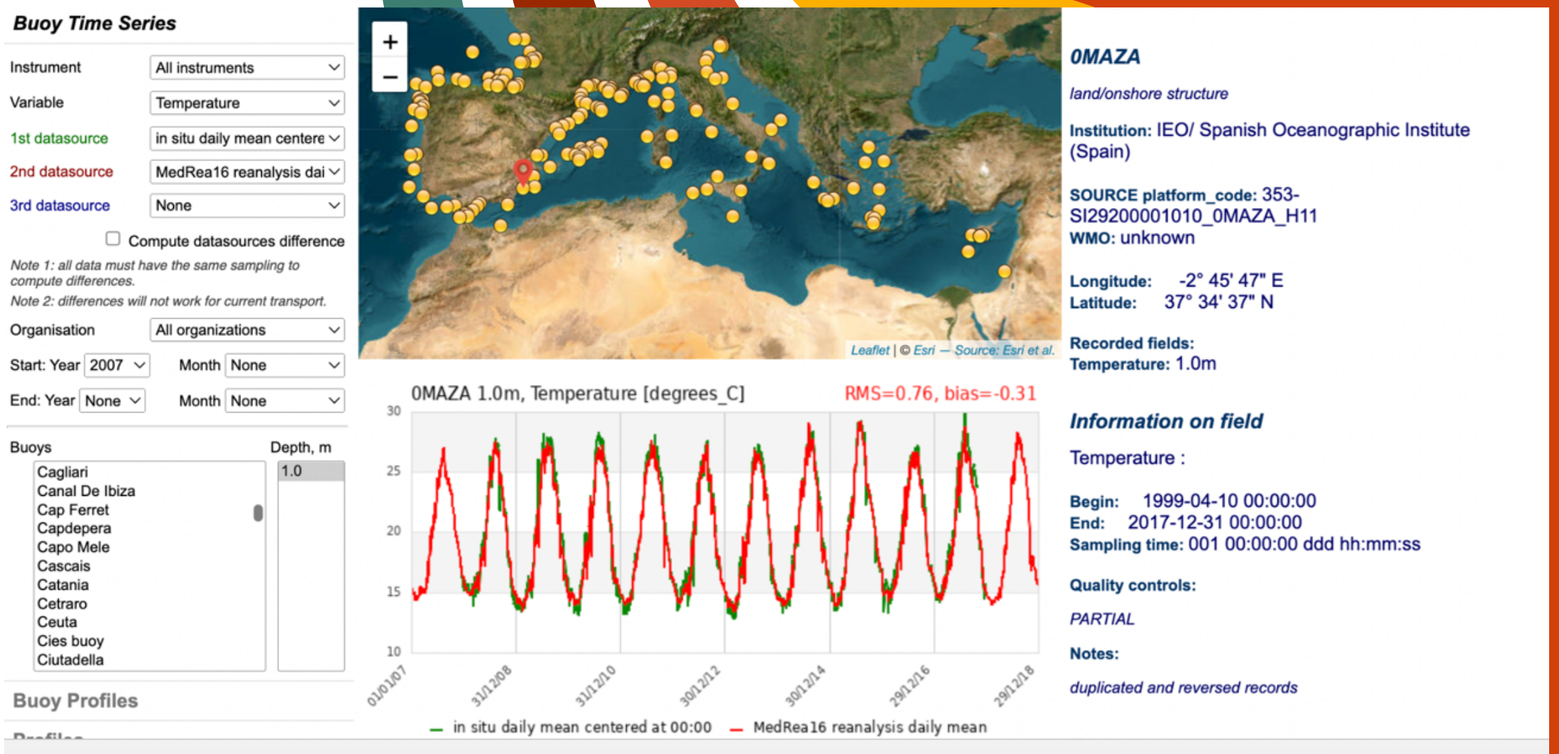
New tool on Galaxy Europe

SOURCE

Sea Observations Utility for Reprocessing, Calibration and Evaluation

Key Features

- Calibrates and validates ocean models within a selected spatial domain using in-situ observations
- Performs a secondary quality check
- Measure the ability of numerical models to reproduce observed Essential Ocean Variables (EOV)



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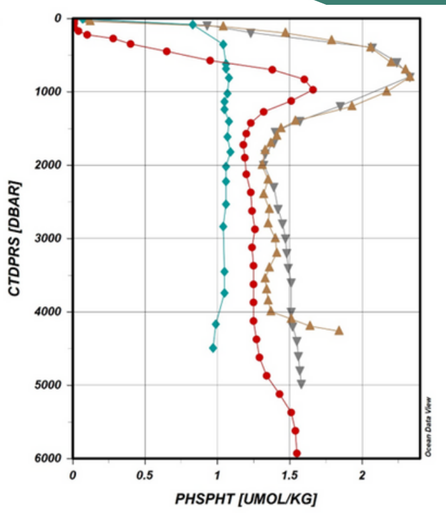
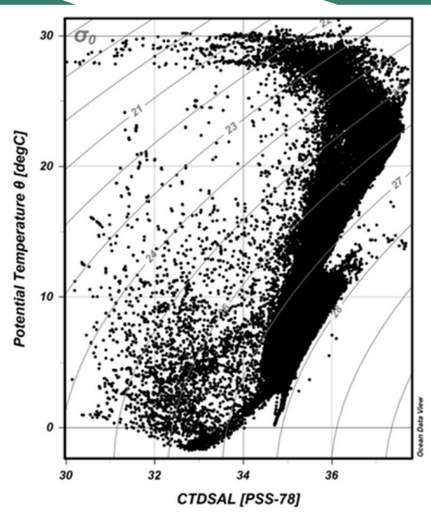
New tool on Galaxy Europe

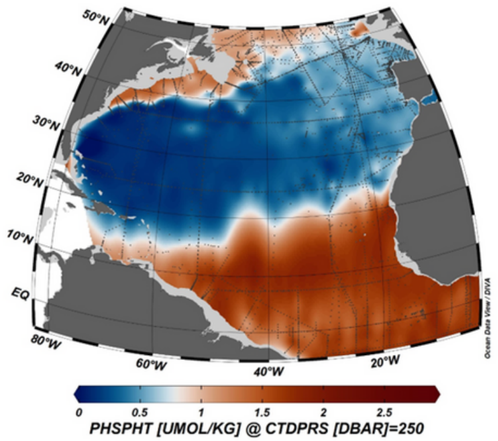
Ocean Data View

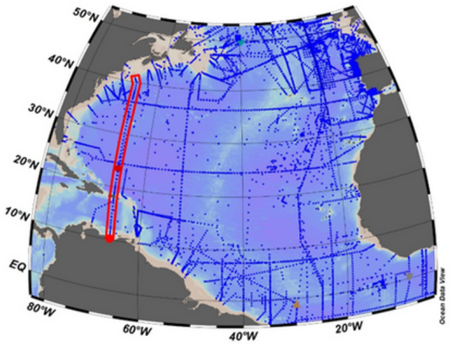
Key Features

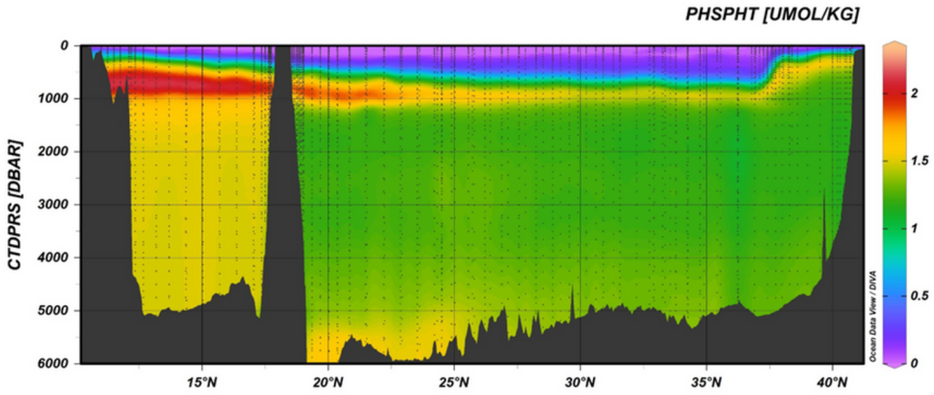
- Supports profile, time-series, trajectory and underway data (native ODV collection format and netCDF)
- Subsetting and filtering features; data export in various formats
- Calculated parameters (physical, chemical, carbon cylce, ...)
- Rich interactive feature set and variety of graphic types











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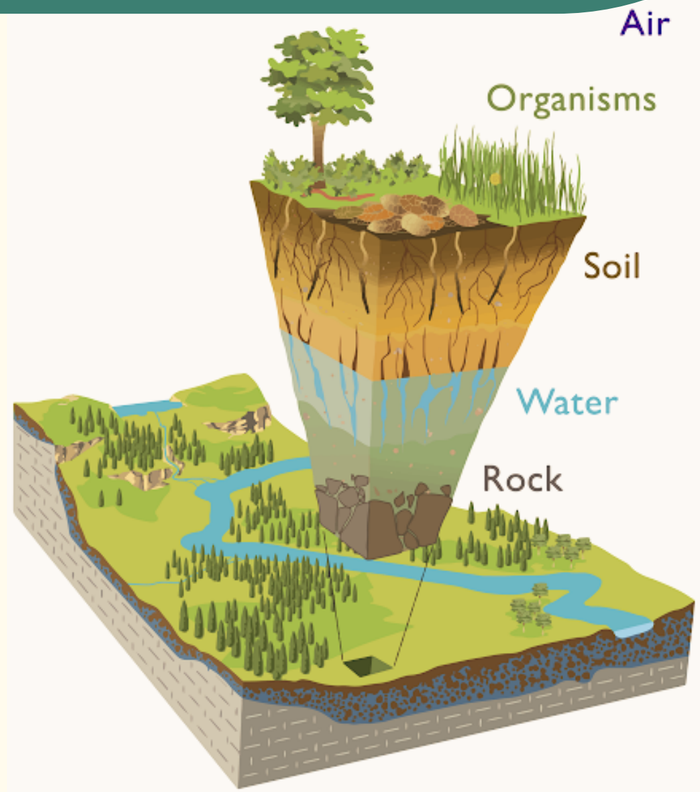
Earth Critical Zone

CONTEXT

Proportion of land that is degraded over total land area

Methodology proposed by UNCCD (United Nations Convention to Combat) provides three sub-indicators

- Land Cover/Land Use Change
- Soil Organic Carbon Status and Trends
- Land Productivity Status and Trends



The integration of these sub-indicators is done following the one-out all-out rule, this means that if an area was identified as potentially degraded by any of the sub-indicators, then that area will be considered potentially degraded for reporting purposes.

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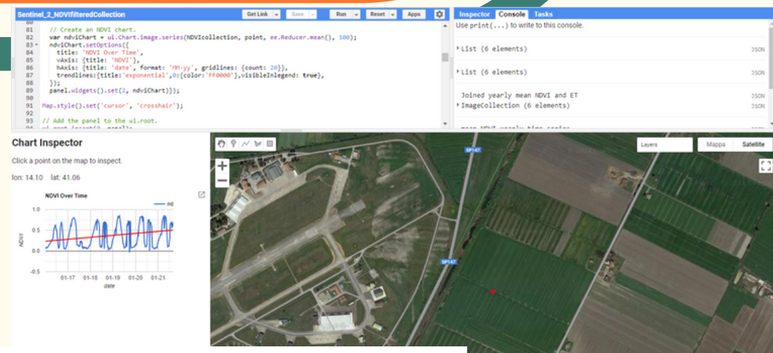
Earth Critical Zone

PURPOSE

Make outputs more representative of ground truth by:

- Implementing other indicators coming from remote sensing (leaf area index, soil moisture, water use efficiency, ...)
- Establishing new thresholds for determining degraded, stable or improving areas
- Enable sub-national scale calculations

Example from cropland



Aims :

- A new land degradation tool
- Enhanced access to data
- Efficient update of algorithms embedded in the geospatial modeling pipeline (change data and/or modify model code)

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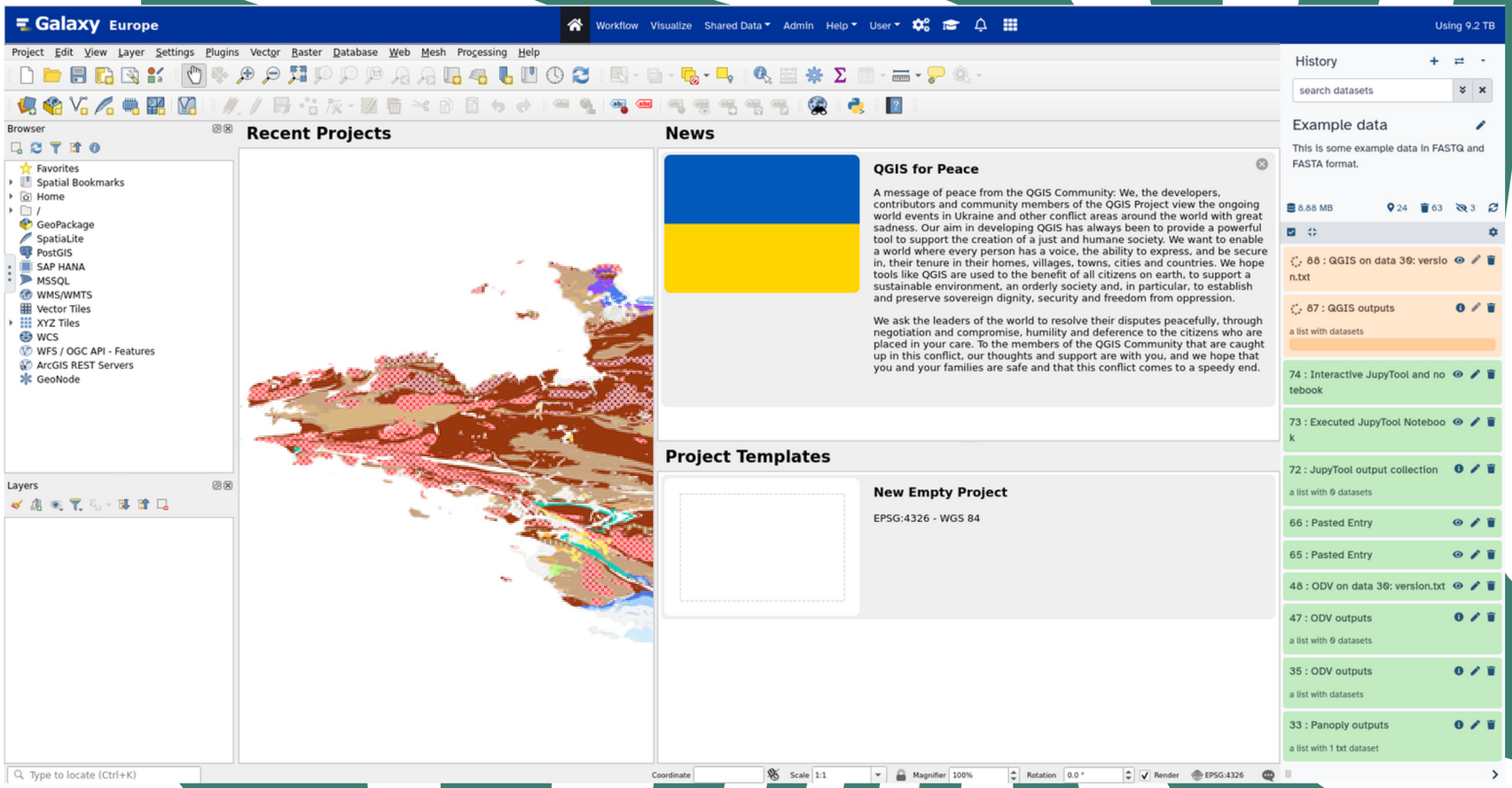
New tool on Galaxy Europe

QGIS

Geographic Information System software package.

Key Features

- provides a continuously growing number of capabilities provided by core functions and plugins.
- visualize, manage, edit, analyse data design maps.
- support for numerous file formats and databases as well as web services.



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Volcano purpose

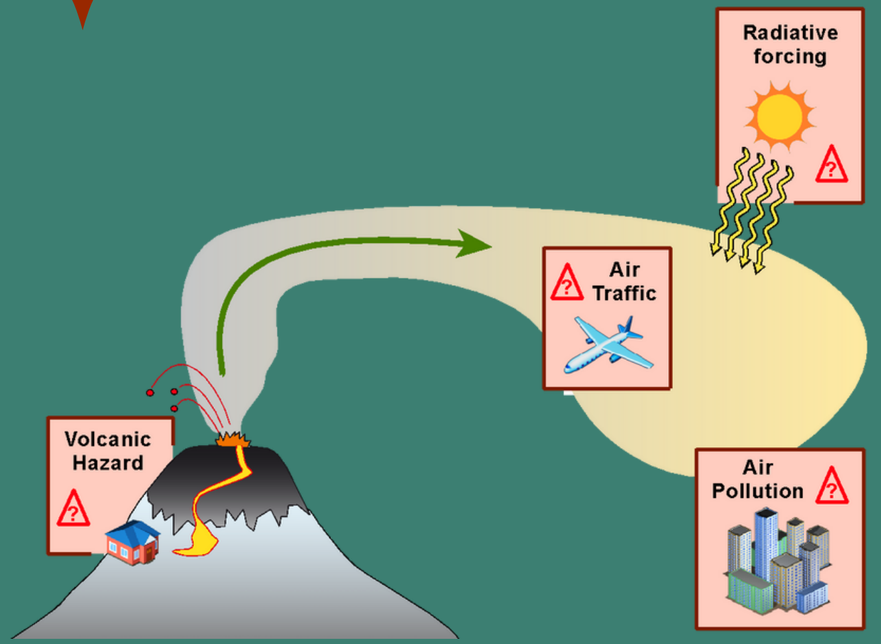
Provide tools for aggregating and jointly analysing satellite observations from Solid Earth and Atmospheric Science communities for the near-real-time monitoring of volcanic activity.

Explanation

Tools will be of interest for :

- **Scientists** by facilitating data exploration and analysis.
- **Volcano observatories** worldwide to help **hazard assessment,** especially during explosive eruptions that may destroy ground instruments

Schematics



Photo

Holuhraun eruption (Iceland)

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Volcano purpose

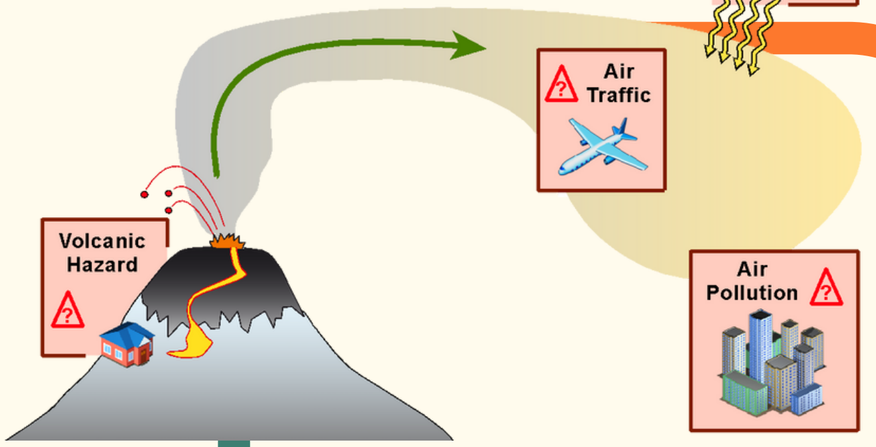
Aim:

coupling gas-particle emissions & ground deformation

Ground deformation

Access to:

- Transport & magma storage
- Volume budget

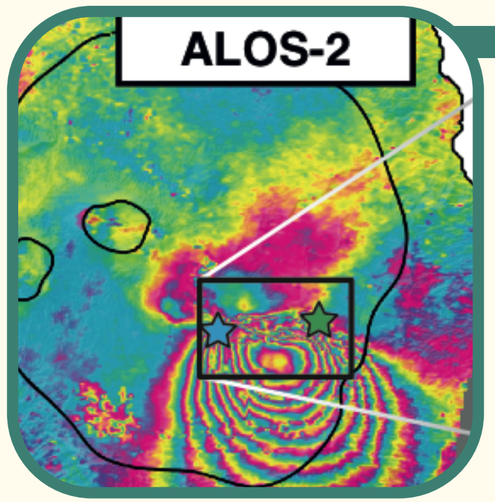


Gas-particle emissions

Access to:

- Magma composition, depth
- mass budget
- flux

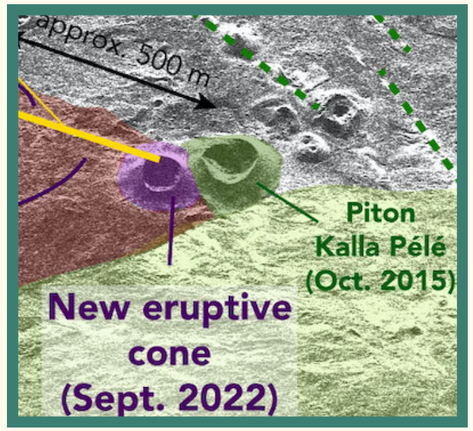
InSAR



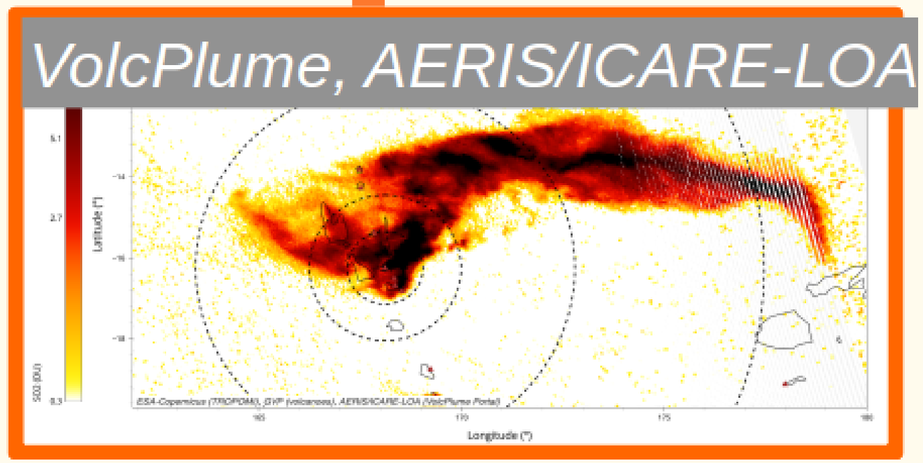
pixel size = 1–100 m

20 km

Topography



TROPOMI/IASI/OMPS – SO2



1000 km

pixel size = 5-25 km

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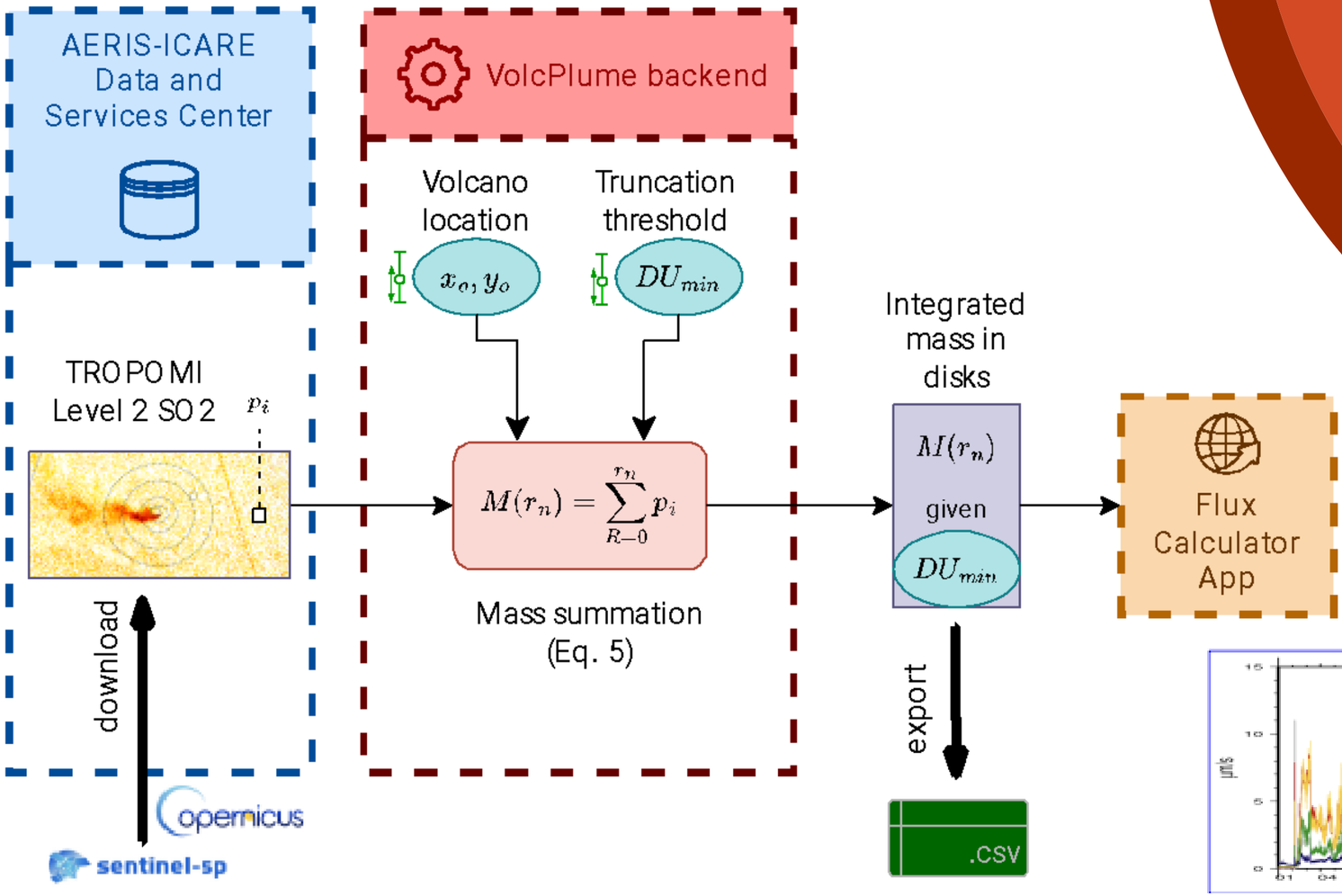
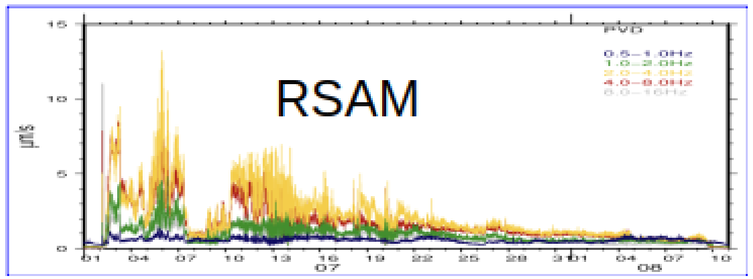
Revisit time: ~ 6 days

Revisit time: 12 or 24 hours (LEO) - 20 min (GEO)

Volcano Workflow





Timeseries of volcanic SO2 flux
at any degassing volcano in the world

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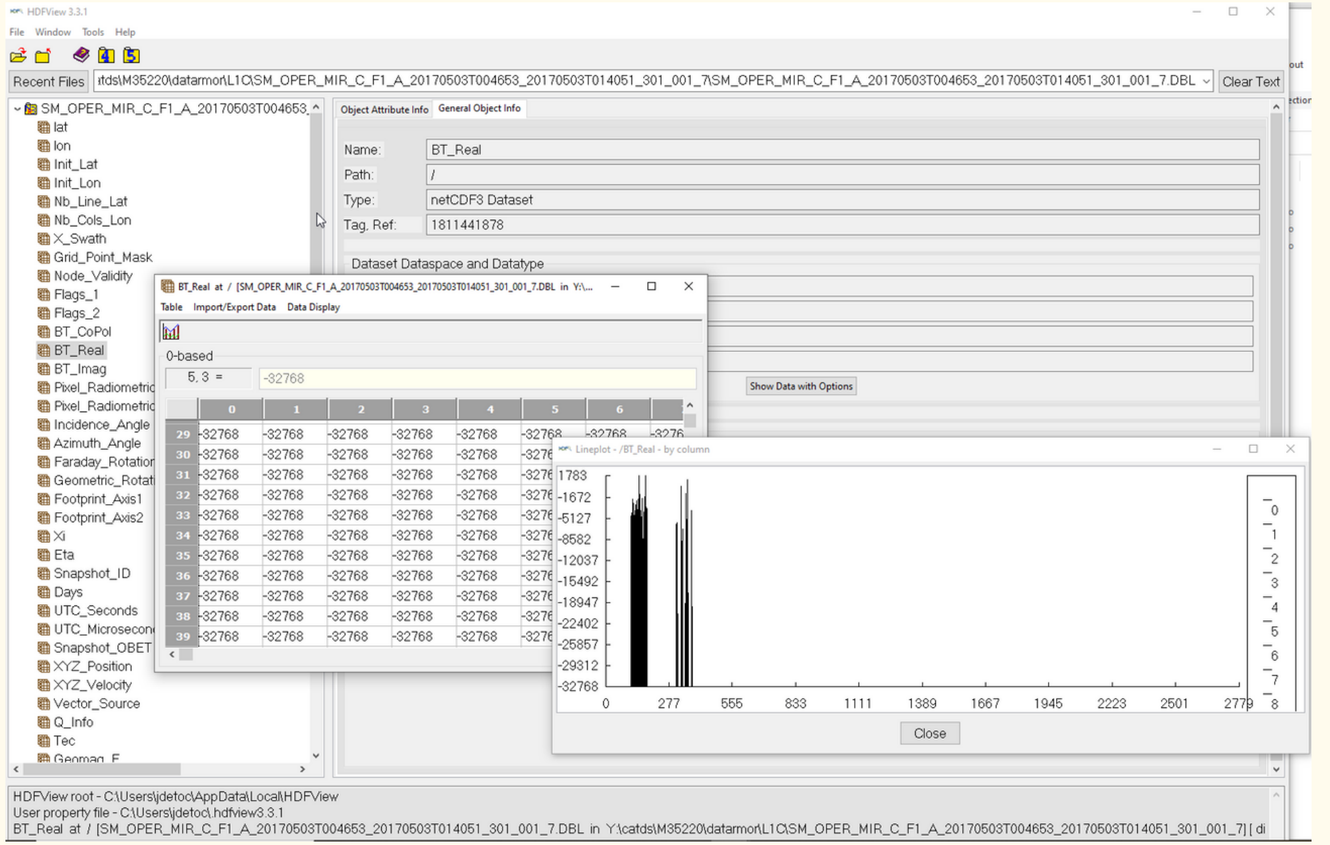
New tool on Galaxy Europe

HDFview

Interactive tool, suitable for browsing and editing Hierarchical Data Format

Key Features

- Manage HDF-4 and HDF-5
- Create new files, add or delete groups and datasets
- View and modify the content of a dataset
- Add, delete and modify attributes



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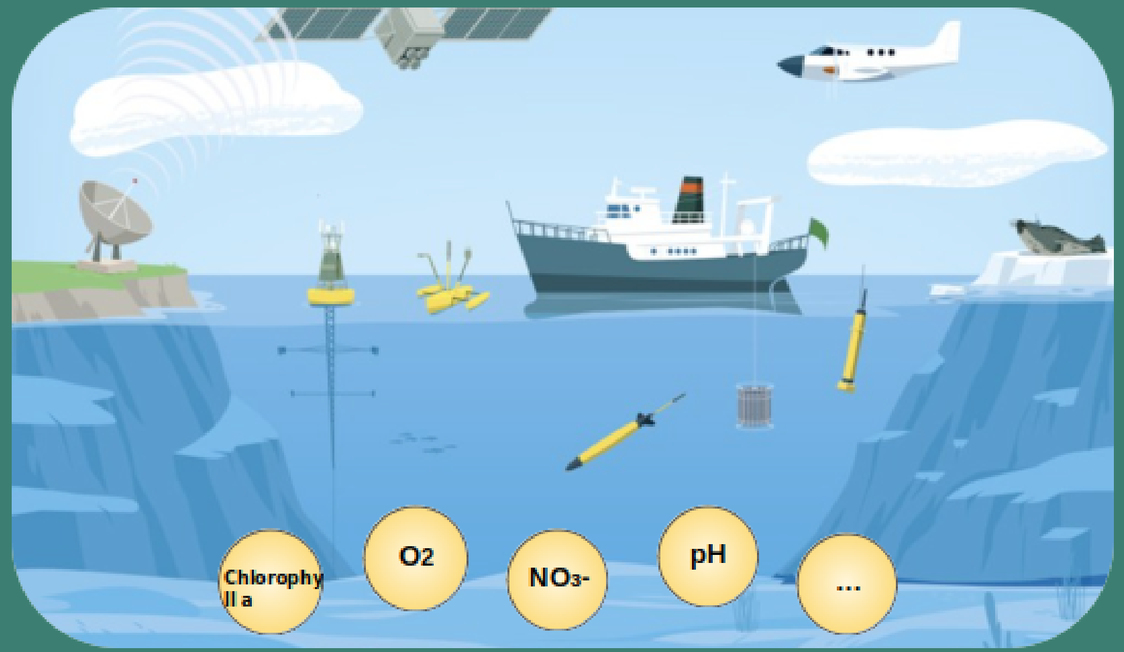
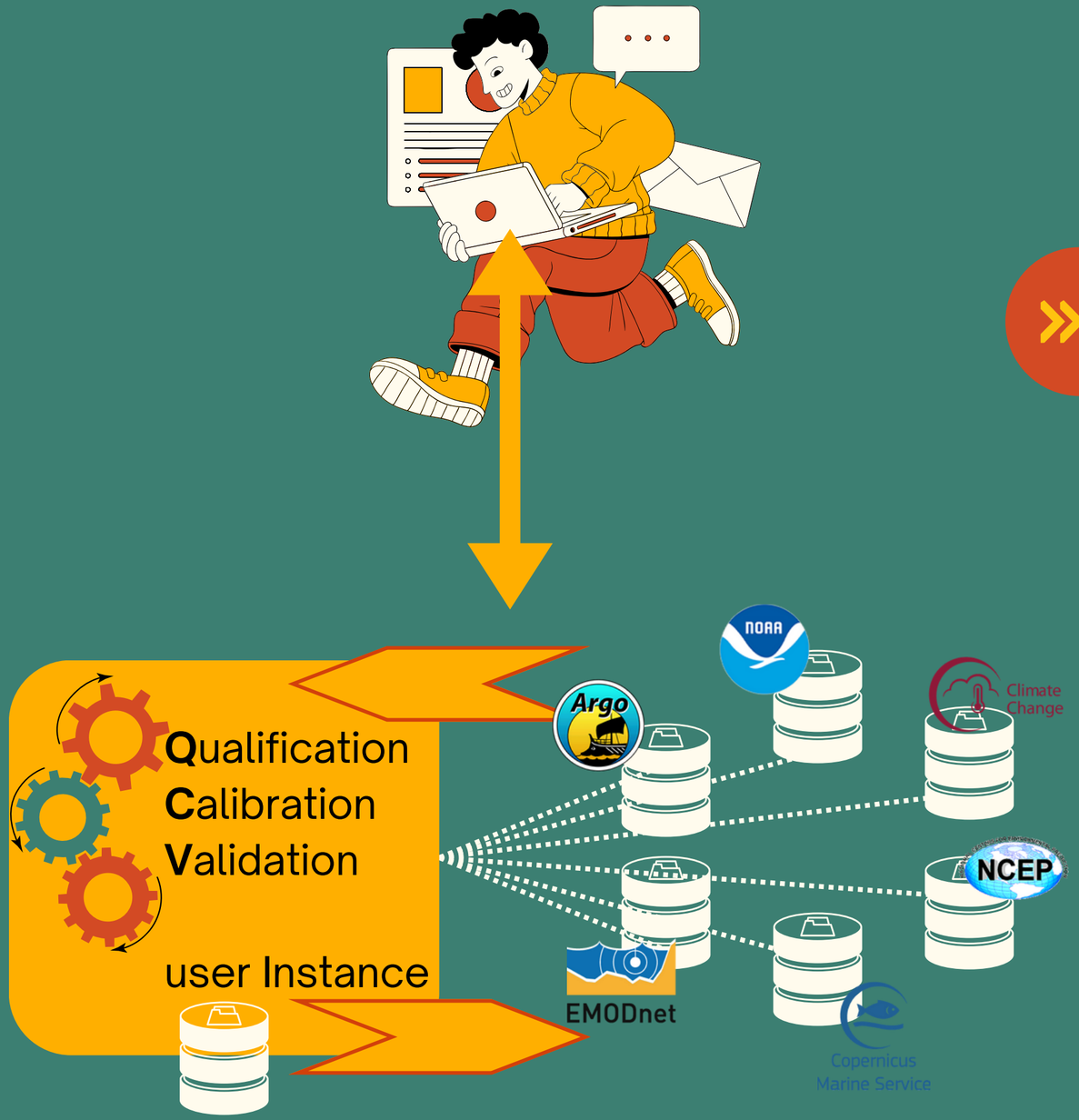
Bio-GeoChemical Goal

A single and efficient access to ancillary sources used by a series of common tools to help with delivering high qualified biogeochemical data that will be made FAIR.





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Bio-GeoChemical Workflow

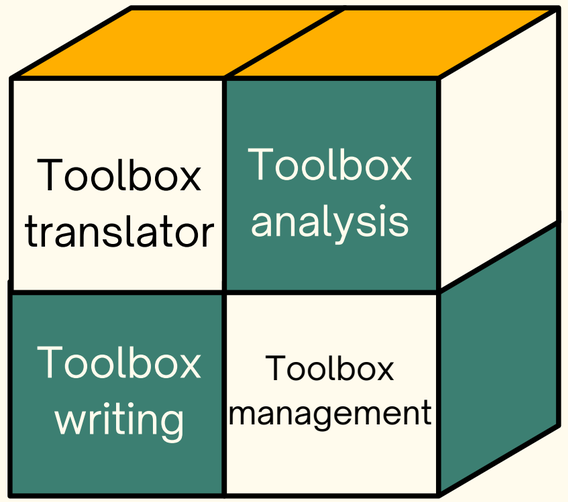
Argo, glider, sea-mammals

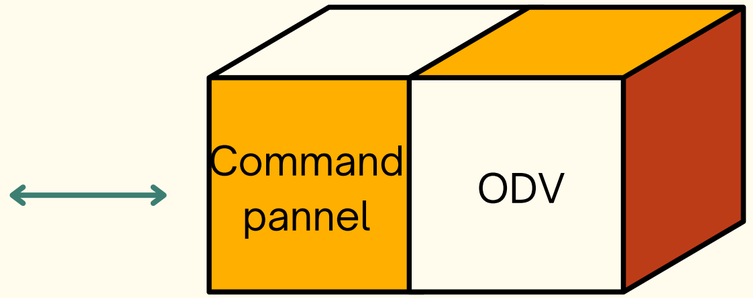
Copernicus, Emodnet Chemistry, Glodap, Seabass, Maredat, Carimed

Copernicus (Mairne), ERA (copernicus atmosphere), NCEP (noaa atmosphere)

GlobColour, OCCI (copernicus marine)

WOA & Glodab (ocean hydrology, chemistry), Gebco(bathymetry)





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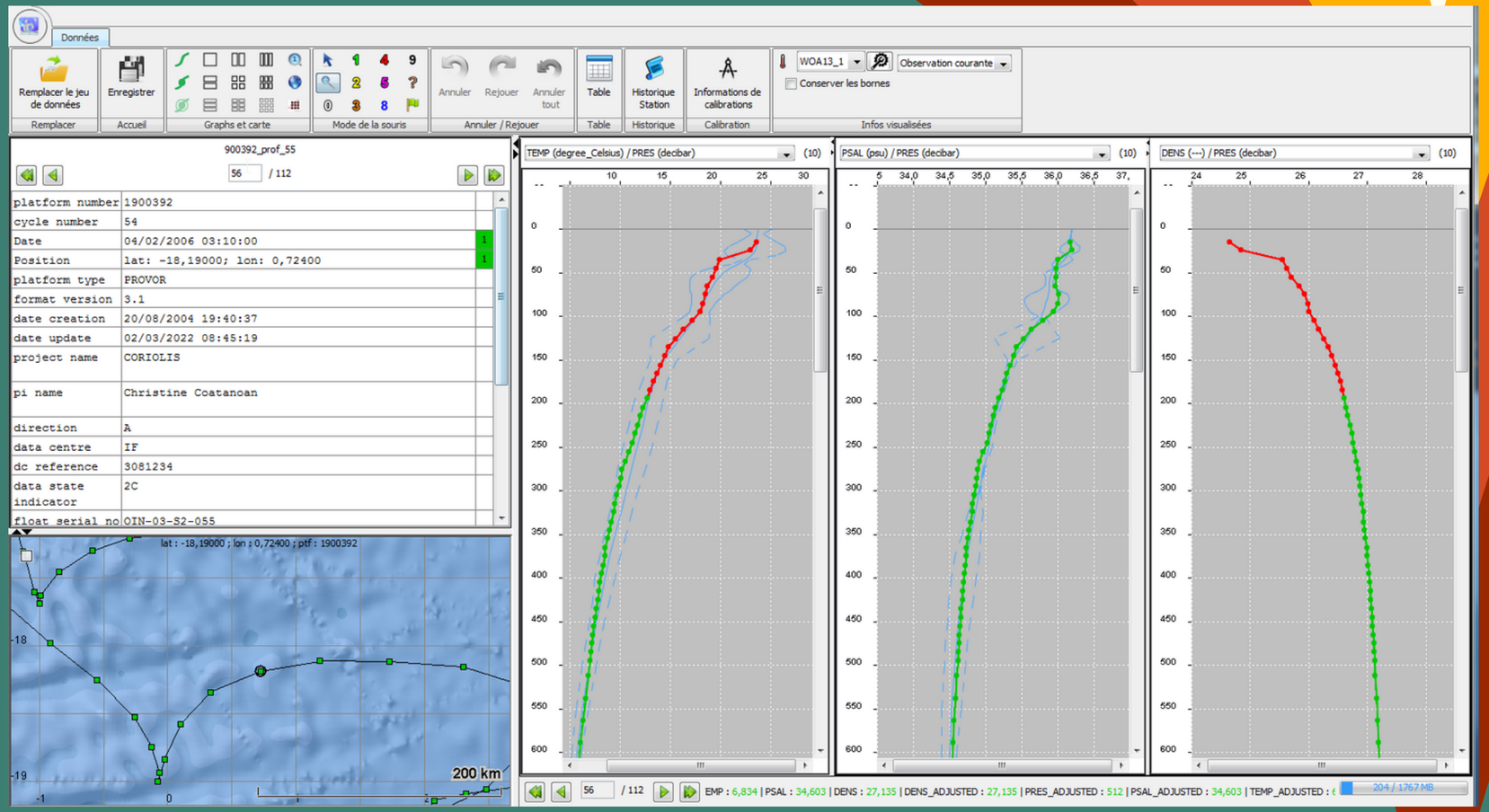
New tool on Galaxy Europe

Scoop Argo

Key features

- Vizualises a series of Argo floats NetCDF cycle files.
- The data are displayed in interactive graphics, with bathymetry, climatology and geographic maps environmental informations.
- Quality Control flags are graphically changed by the User.
- The history section is updated with the list of performed changes.



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Marine Omics

Understand how marine ecosystem services are supported by microorganisms

Available Data products: raw and assembled sequences, taxonomic inventories, and community gene function profiles

From samples of microbial marine biodiversity (eDNA) the pilot aims to implement computational workflows using/producing Essential Biodiversity Variables (EBV) and Essential Ocean Variables (EOV).

Workflows examples :

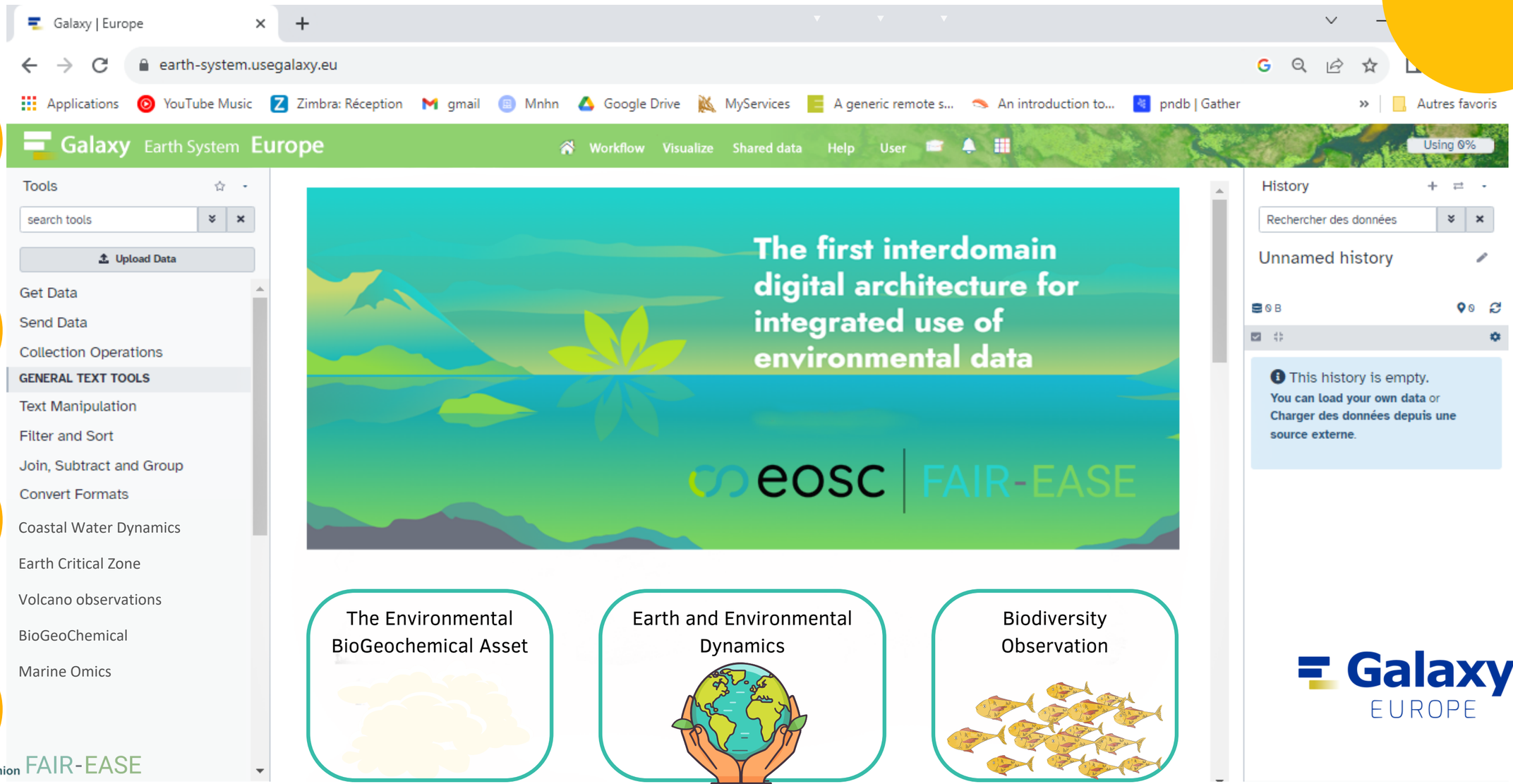
- Bioprospecting workflow (identifying and classifying biosynthetic gene clusters)

- Ecological strategies workflow (characterising ecological communities among marine environments)

A new sub-domain : Galaxy - Earth System

NEW TOOLS, NEW WORKFLOWS, NEW TUTORIALS AND NEW DATA ACCESS

An environment for each subject to access and process their data



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Galaxy EUROPE

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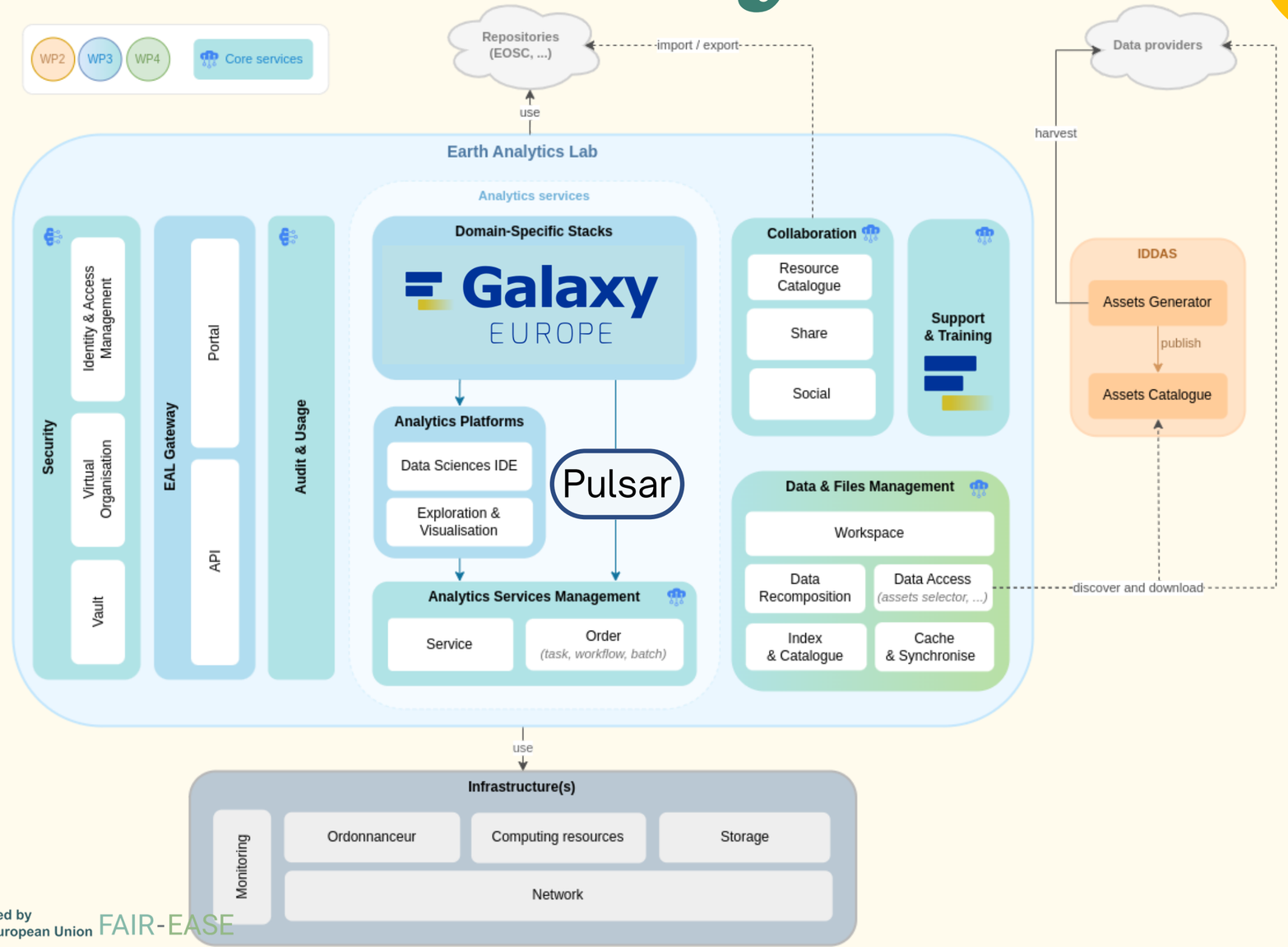
Earth Analytical Lab



- An easy way to visualise, analyse and process environmental and biodiversity data on-demand
- Improve data access both in terms of data harmonisation and in terms of technical efficiency of data access.
- Galaxy a main component of the EAL

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WIth environmental data build together

Galaxy for Earth System

COFEST

G **W**ater

A nalytics worflows for

L **A**tmosphere

A

Land

X

L

Yife

THANKS FOR YOUR ATTENTION DO YOU HAVE ANY QUESTIONS ?

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