



VLAB #1

Learn more about this Vlab



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THE COASTAL OCEAN CHALLENGE

Congregating a broad range of human activities and key ecosystems, bringing large human populations in direct contact with the ocean moods, coastal oceans are among the most important marine regions in the World.

Coastal oceans are characterized by a multitude of complex processes acting at many different spatial and temporal scales. Understanding and forecasting those processes requires the identification and integration of the relevant data (e.g. observations, model results) and the ability to extract from these datasets the relevant information.

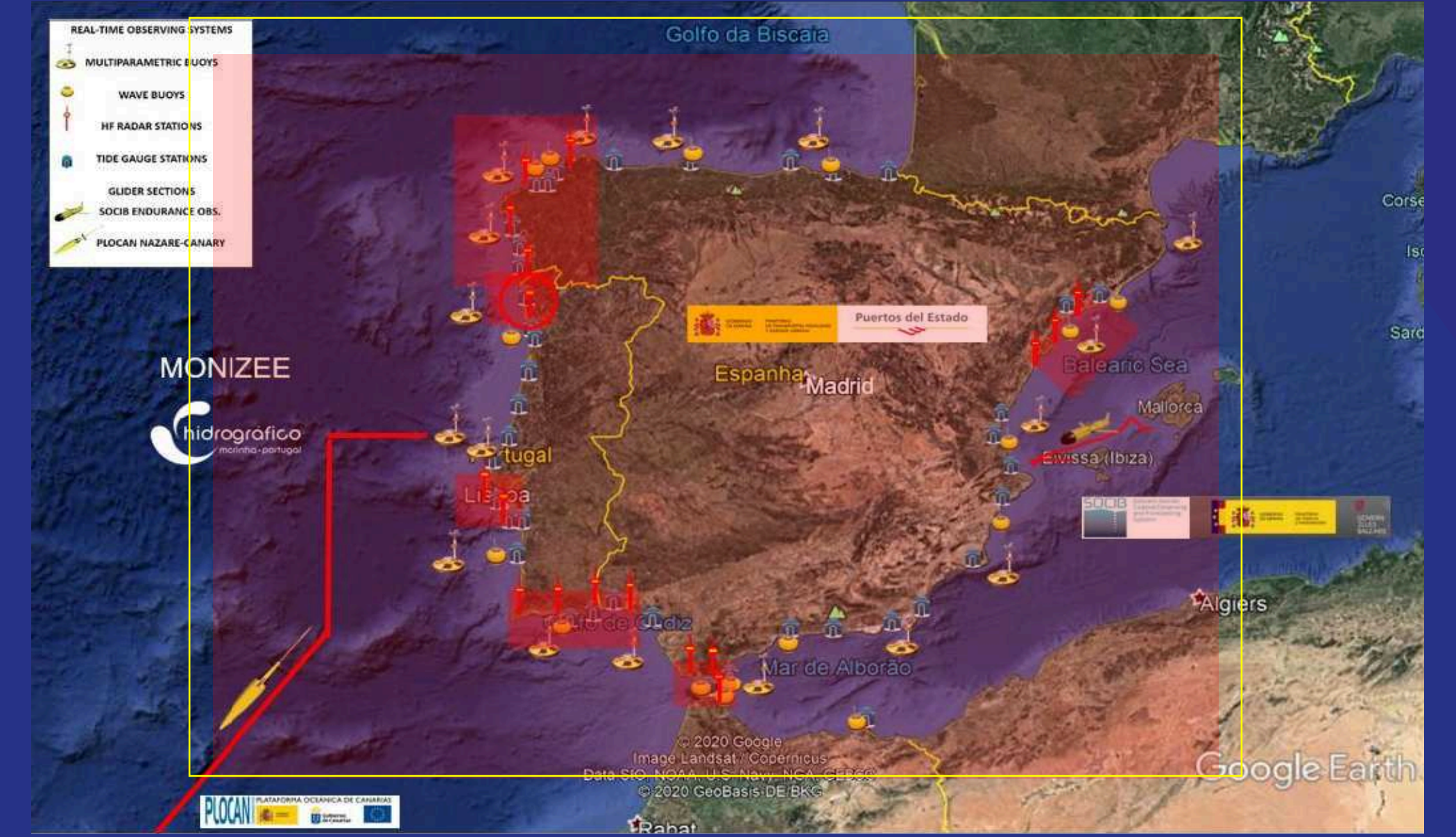
These tasks are frequently too complex and challenging for many users from the Research, Blue Economy or Service Providers communities

HOW IS VLAB#1 ADDRESSING THIS CHALLENGE?

By offering users a variety of FAIR oriented tools enabling to identify, process, explore, integrate and visualize coastal ocean observations and complementary data.

- 3 Thematic Services are proposed
- ICOOE VLab is running on D4Science in the Blue-Cloud VRE
- Demonstration Pilot focusing on the Iberian coastal ocean
- Support guidance provided in User Handbooks (Jan2025, Jan2026)ding to the future implementation over the Pan-European coastal ocean domain.

Geographical domain covered by the ICOOE VLab pilot demonstrator. The figure also shows some of the observing systems used or planned to be used by the Vlab, which are operated by partners of the Joint European Research Infrastructure for Coastal Observatories – JERICO.



THEMATIC SERVICE 1 - TRANSBOUNDARY TRANSPORT & CONNECTIVITY



Offering a suite of tools enabling the users towards advanced exploration of transboundary transport and connectivity processes impacting coastal ocean areas.

Strategy: Identify & provide user access to datasets in Data Aggregators.

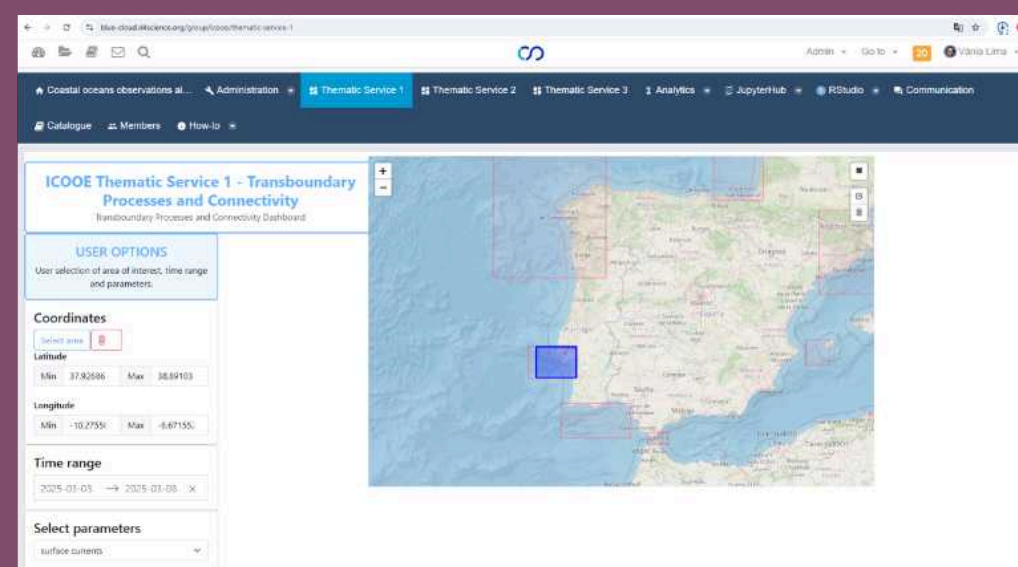
Datasets used in Pilot Demonstrator:

- Hourly Surface Currents from coastal HF radars provided by the European HFR node
- Daily mean surface currents from NEMO model provided by the Copernicus

USER SELECTION

Dashboard environment allowing user selection of geographic area of interest, time period of interest and variables of interest.

The Pilot Demonstrator is focused on Surface Currents (hourly data from HF radars and/or daily mean data from CMEMS NEMO model)



DATA ACCESS

Identification of the available datasets in the data aggregators meeting user requests and access to the datasets of interest

PREPROCESSING

If needed, the selected datasets are preprocessed to meet Thematic Service 1 requirements. This step is transparent to user.

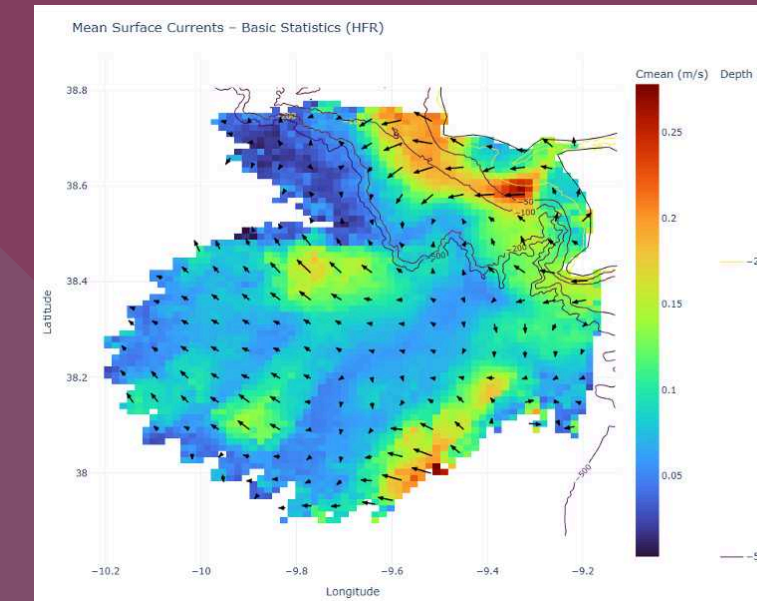
Thematic Service 1 is focused on subinertial processes, if needed data is low-pass filtered in this step.

EXPLORATION

Tools for analysis of individual datasets, from the ones selected by the user (HF currents and/or CMEMS NEMO surface currents) are provided in this option.

The Pilot Demonstrator allows for:

- Extraction and visualization of surface current time series at selected positions
- Extraction and visualization of surface current fields at selected times
- Calculation and visualization of basic scalar and vectorial statistics.



INTEGRATION

Tools for integration of the different datasets selected by the user are provided in this option.

The Pilot Demonstrator offers the calculus of trajectories followed by a passive surface tracer deployed at a user chosen position and during a period defined by the user, under the effect of:

- NEMO model mean daily currents
- HF radar hourly currents (low-pass filtered) complemented (for gaps or in areas or periods out coverage) by NEMO model daily currents.



THEMATIC SERVICE 2 - EXTREME EVENTS



Offering a suite of tools enabling the users to explore the impacts of extreme events affecting coastal ocean areas

Pilot Demonstrator with focus on Extreme Storms

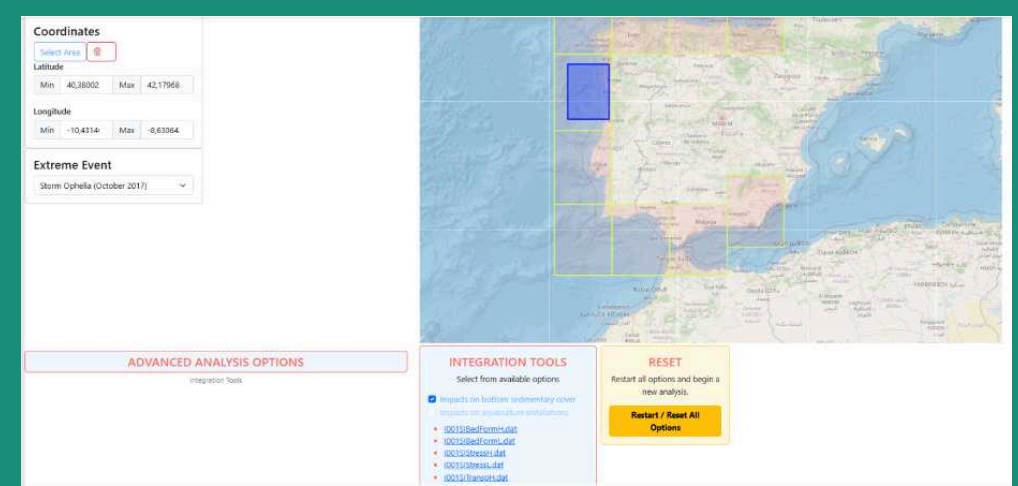
Strategy: Provide the Datasets of Interest for Selected Extreme Storm.

Datasets used in Pilot Demonstrator:

- EMODNET Digital Bathymetry (DTM2024)
- EMODNET Folk7 characterization of seabed substrate
- CMEMS WFWAM model hourly high resolution wave reanalysis (IBI_MULTIYEAR_WAV_005_006)
- CMEMS NEMO model hourly fields of barotropic current (IBI_MULTIYEAR_PHY_005_002)

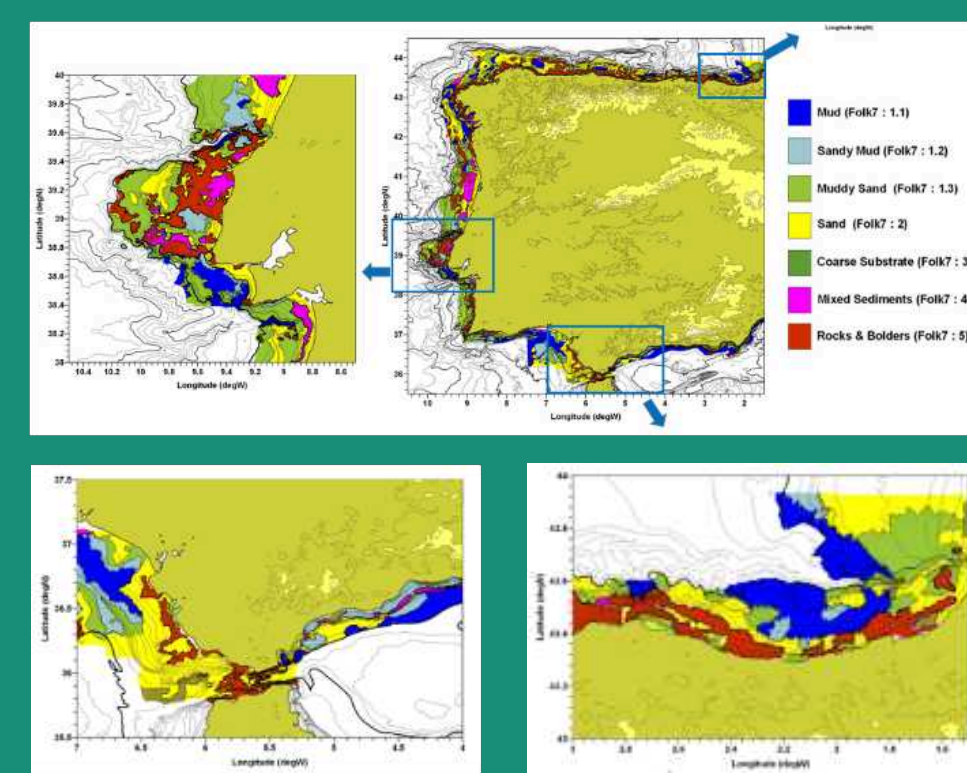
USER SELECTION

Dashboard environment allowing the user to select the geographical area of interest and the extreme storm event of interest



DATA ACCESS

The Pilot Demonstrator offers 3 options of extreme storms that affected the Iberian coastal ocean area, for which hourly values of wave parameters (CMEMS WF model) and 3D barotropic current (CMEMS NEMO model) are provided.



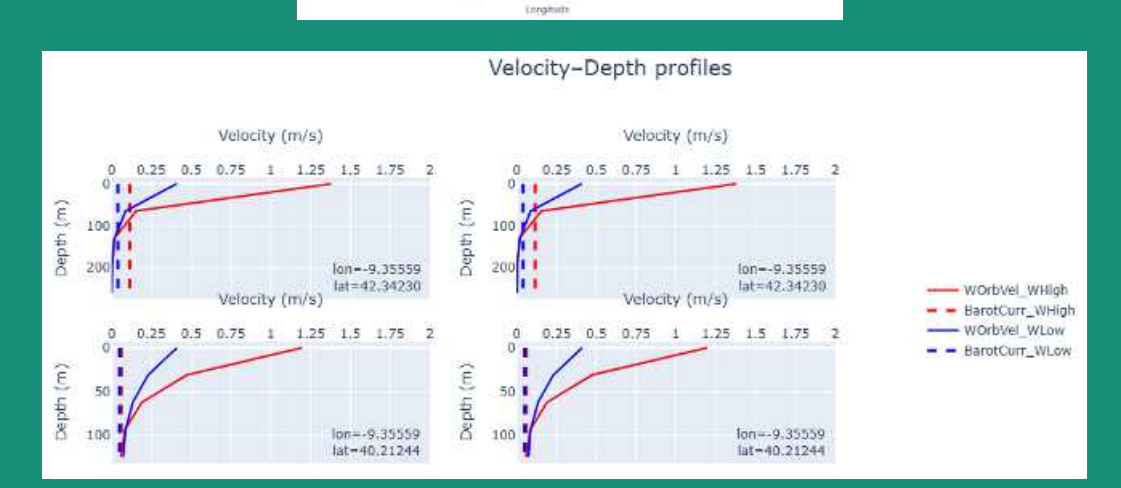
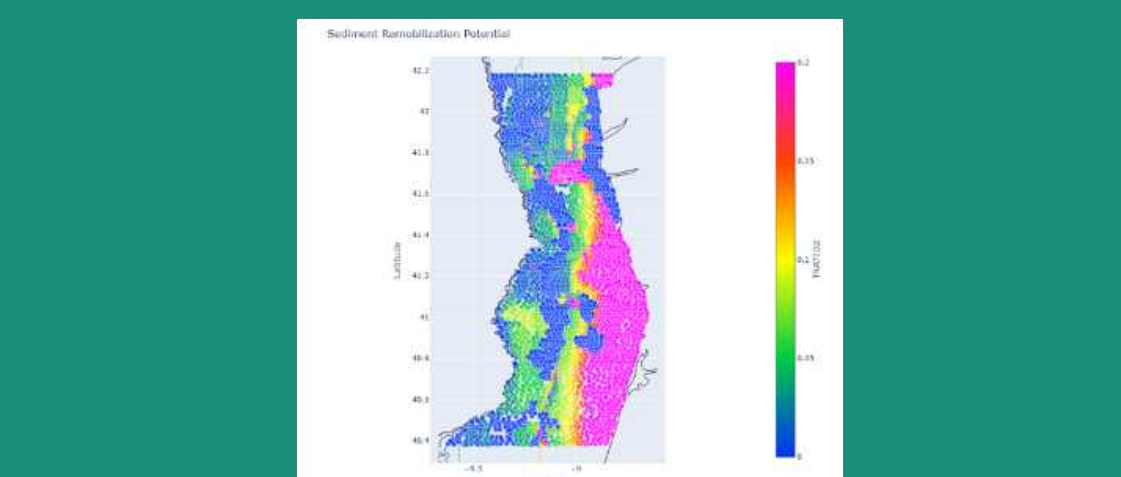
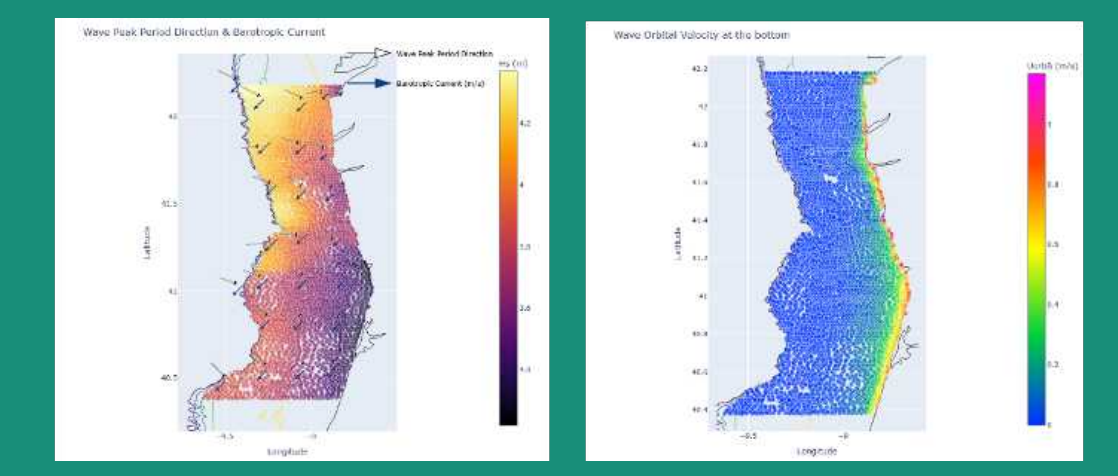
Global seabed substrate based on Folk7 classification provided by EMODNET

INTEGRATION

Tools for integration of the different datasets selected by the user are provided in this option.

The Pilot Demonstrator offers two integration products:

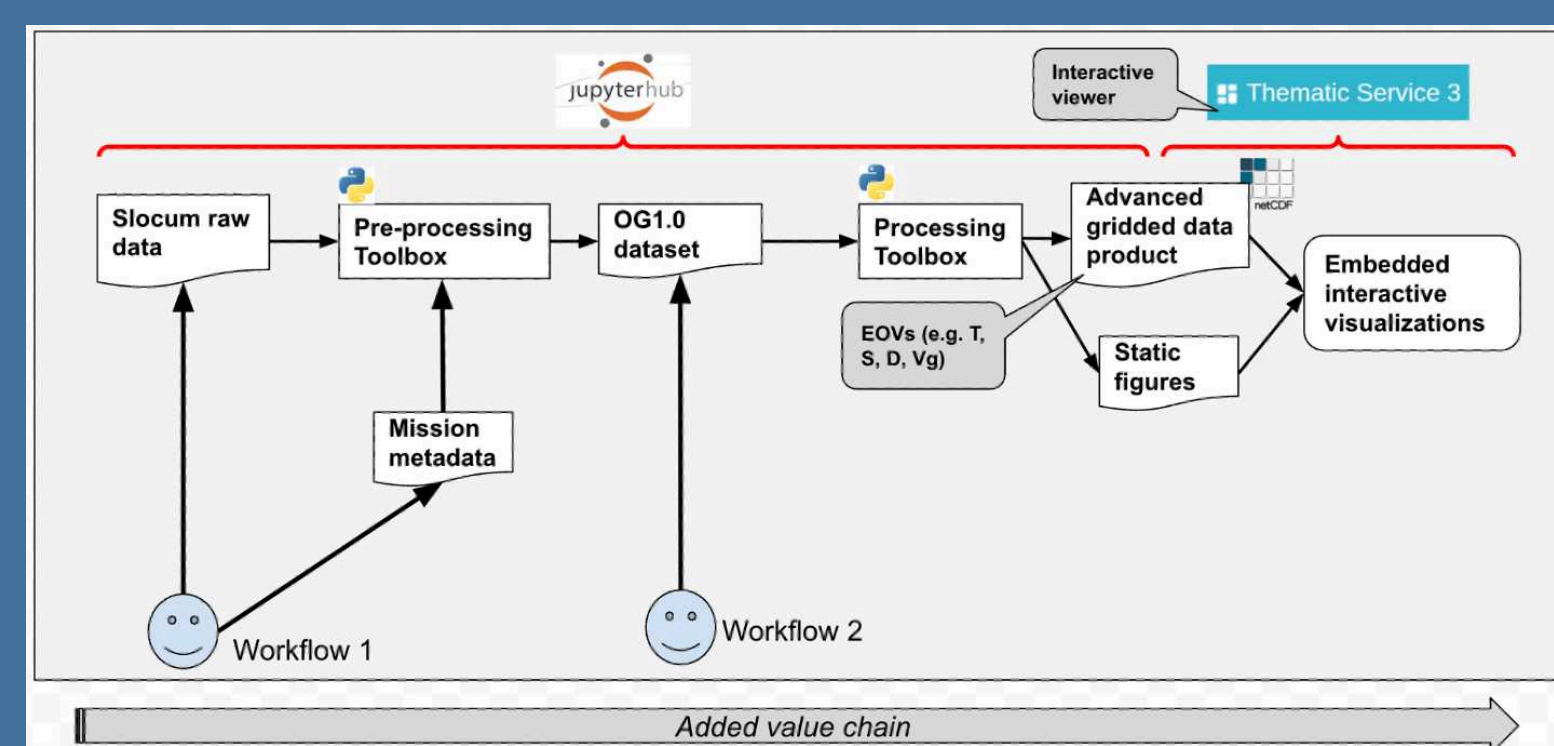
- **Extreme Storm Impacts on the Bottom Sedimentary cover**, combining EMODNET high resolution bathymetry and Folk7 substrate coverage with wave and barotropic current conditions from model results available at CMEMS to estimate impacts on the seafloor
- **Impacts on offshore structures**, combining EMODNET high resolution bathymetry with wave and barotropic current conditions from model results available at CMEMS to estimate conditions in the water column (e.g. wave orbital velocities from surface to bottom) potentially impacting offshore structures such as moorings or aquaculture installations.



THEMATIC SERVICE 3 - OCEAN GLIDER



Demonstrating the added value chain of glider missions from data acquisition to advanced products and visualisations for improved coastal information, integrating ocean state and variability derived from glider transects



- Workflow 1: Input data and metadata from any Slocum glider operator
- Workflow 2: Input dataset from any institution producing OG1.0 Format
- Advanced data product processing methodology: based on Juza et al. (2025).

Jupyter Notebooks enriched with custom glider processing libraries

```

# Input preparation
from glider_converter import Datafile, GliderProcessor, GliderType

def main():
    # Section name
    section_name = "Argelien"
    # Section coordinates
    lat_min=37.0, lat_max=37.5, lon_min=1.0, lon_max=1.5,
    # Section parameters
    standard_name = "Argelien",
    # Section description
    description = "Argelien basin characterization"
    # Section metadata
    metadata = {}

    # Section processing
    processor = GliderProcessor(
        section_name=section_name,
        lat_min=lat_min, lat_max=lat_max, lon_min=lon_min, lon_max=lon_max,
        standard_name=standard_name,
        description=description,
        metadata=metadata)

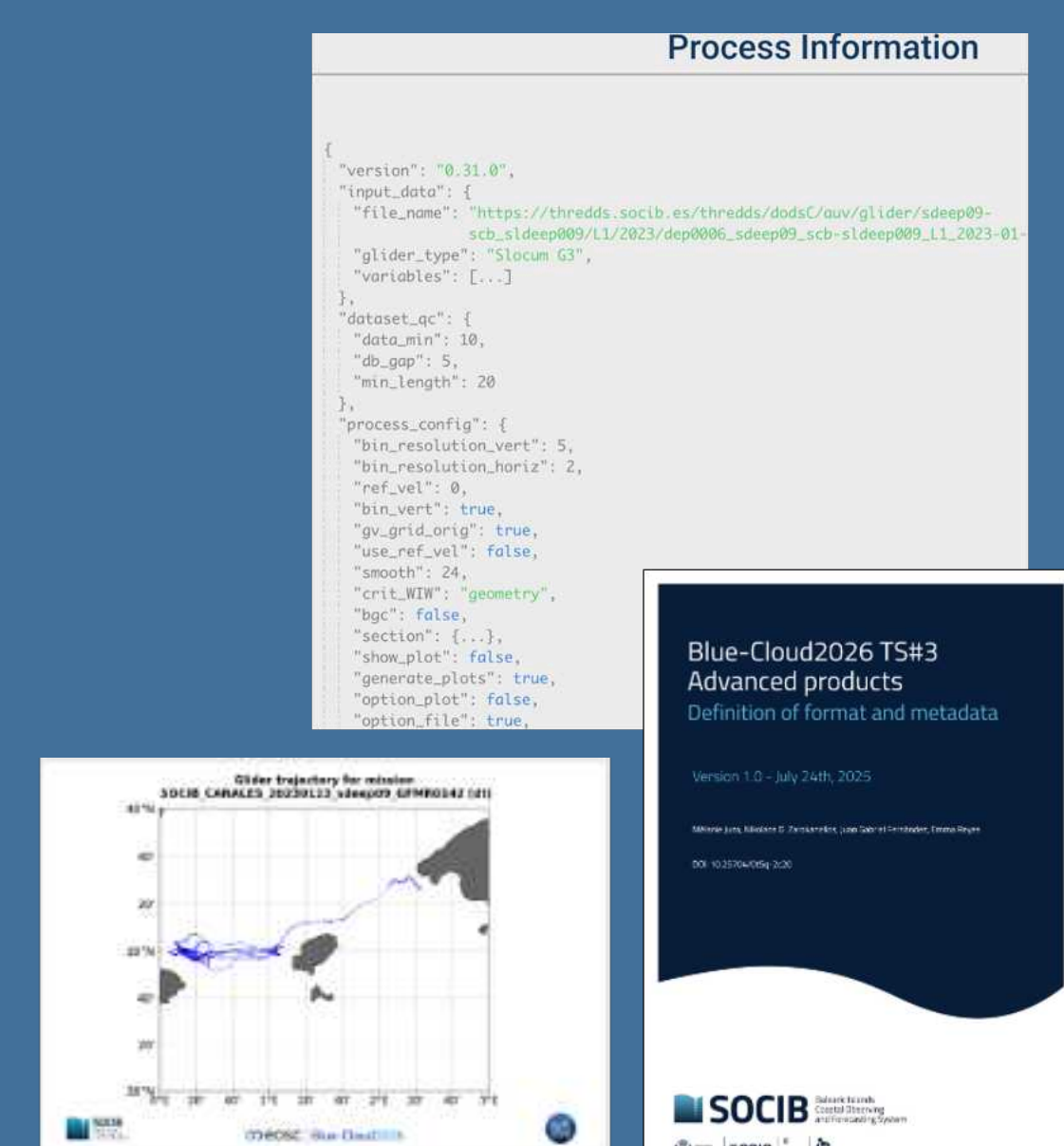
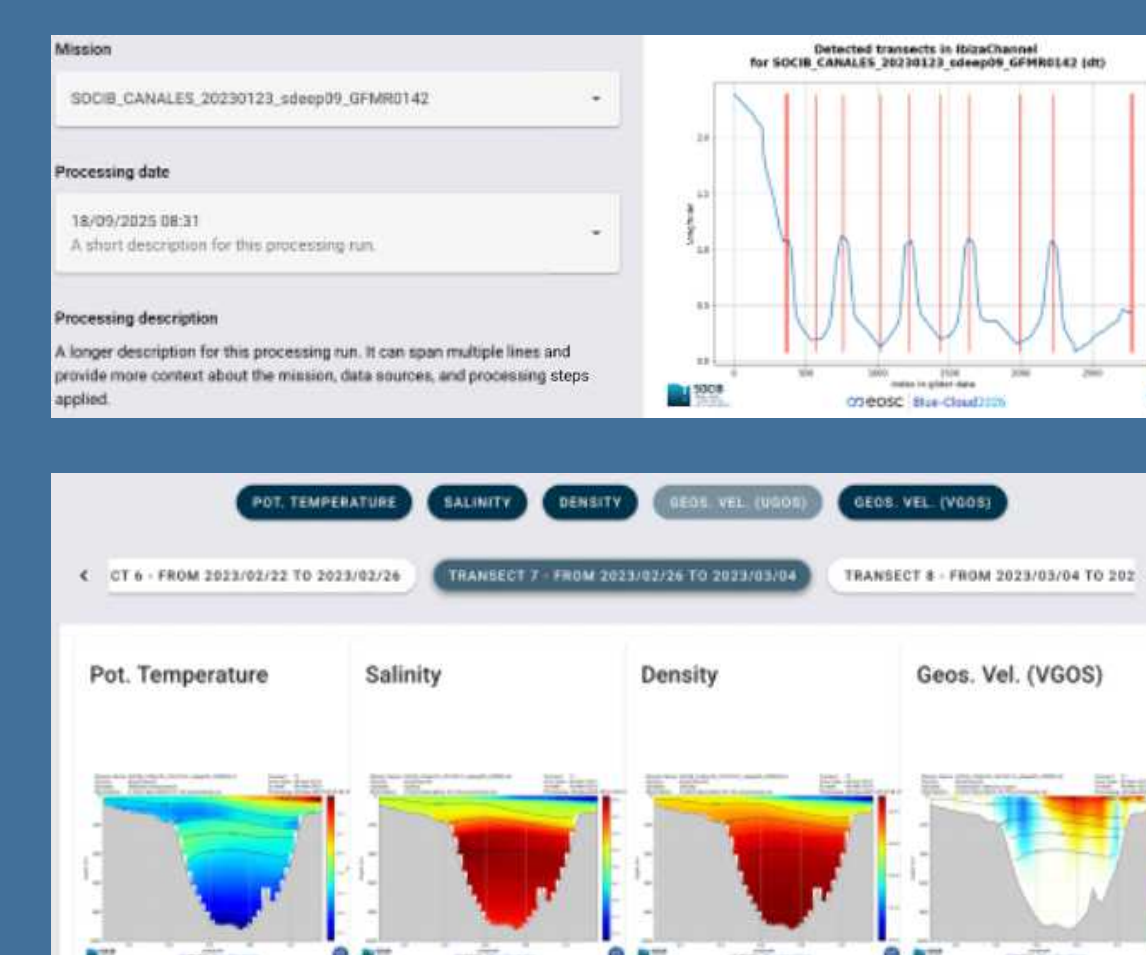
    # Section data
    data = processor.process_data()

    # Section visualization
    processor.plot_section()

    # Section export
    processor.export_data()

if __name__ == "__main__":
    main()
    
```

- Friendly UI: exploration, static figures and process information.
- Advanced data product: CF compliant and based on OG1.0



WATCH THE INTERVIEW!



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