cmcc
Centro Euro-Mediterraneo sui Cambiamenti Climatici

ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

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Oil Spill Modeling Mission

REMPEC: Second Coordination Meeting on the Mediterranean Strategy

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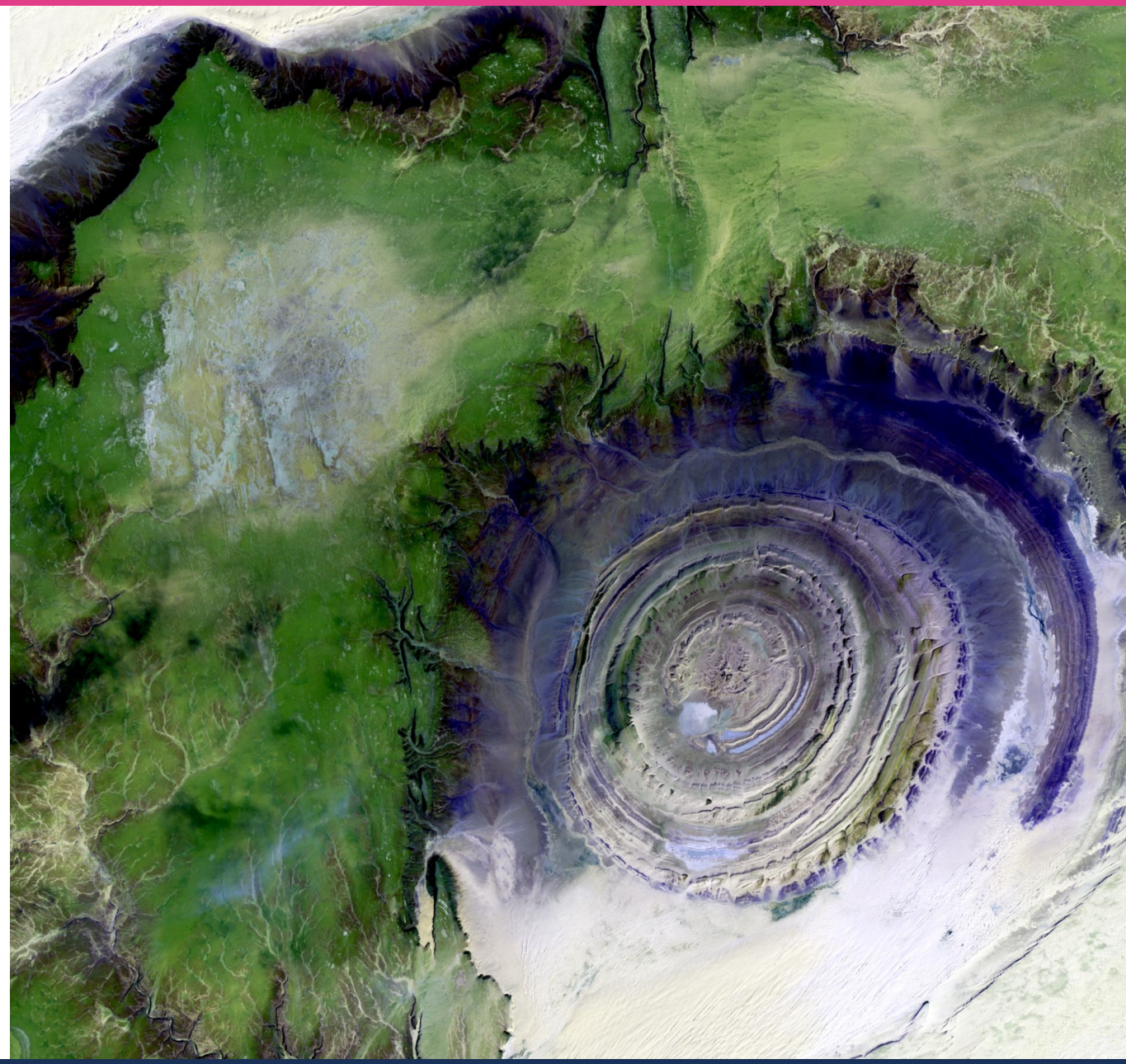
1 - CMCC Foundation – Euro-Mediterranean Center on Climate Change

2 - University of Bologna

MISSION

To investigate and model our climate system and its interactions with society to provide reliable, rigorous, and timely scientific results to stimulate sustainable growth, protect the environment and develop science driven adaptation and mitigation policies in a changing climate.
To develop foresights and quantitative analysis of our future planet and society.



THE RESEARCH INSTITUTES

Climate science and social science researchers from all over the world collaborate in a highly multidisciplinary environment enhanced by the organization into three Institutes that collaborate, exploiting the advanced technology of the CMCC's computing infrastructure.

THE SUPER COMPUTING CENTER (SCC)

Since 2008, the CMCC Supercomputing Center (SCC) is the most powerful computational facility in Italy and among the most advanced in Europe, fully dedicated to Climate Change research.

In 2022 the CMCC Supercomputing Center changed its location at the new CMCC headquarters in Lecce. This also includes the upgrading of the computing and storage facilities.

24,769 *cores*

2,400 *TFlops*

Theoretical peak performance
(1TFlop = 1,000 billion operations per second)

32 PetaBytes *over* Storage system capacity

40 PetaBytes Tape Library (archiving system)

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OFFICES

CMCC is organized in the form of a network distributed throughout Italy.

The network connects public and private entities working together on multidisciplinary studies concerning issues of interest to the climate sciences.

MEMBERS & INSTITUTIONAL PARTNERS

National Institute of Geophysics and Volcanology (INGV)

University of Salento

Ca' Foscari University Venice

University of Sassari

University of Tuscia

Polytechnic University of Milan

Resources for the Future (RFF)

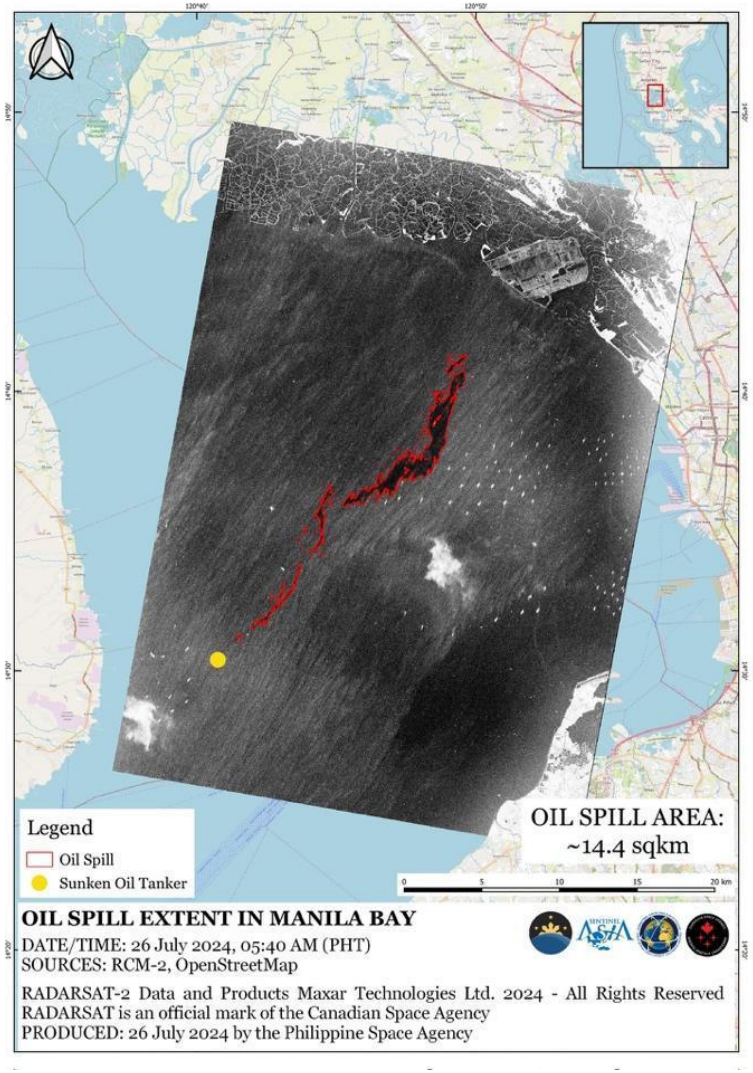
University of Bologna

Oil Spill modeling capabilities and services

Manila Oil Spill accident

Recent accident 25/07/2024

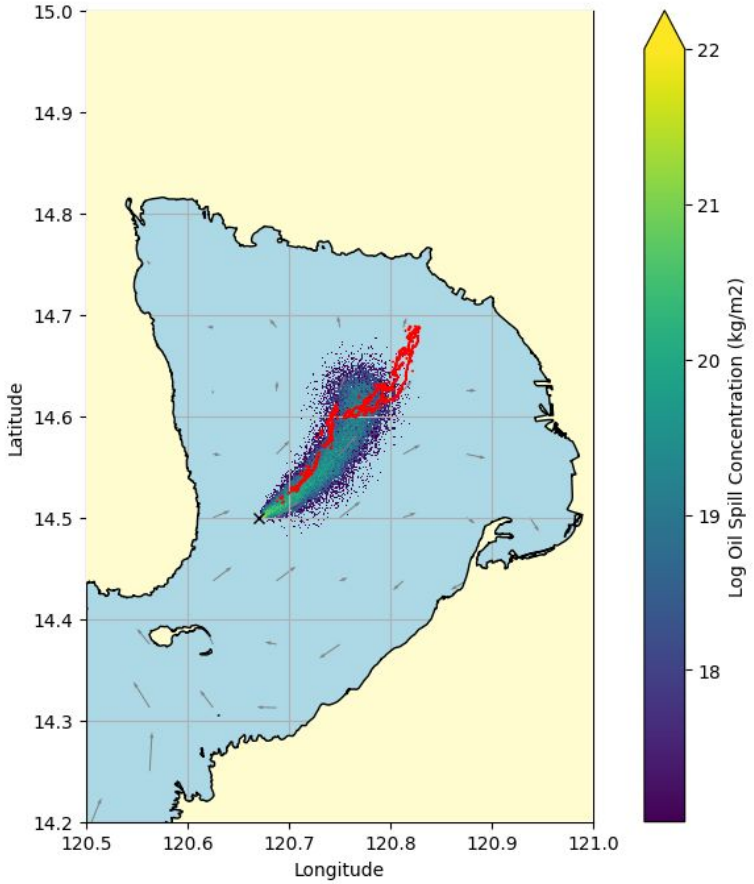
- Oil tanker sanked in Manila bay
  - MT Terra Nova (1.5 million literrs)
- Several Satellite Observations provided
  - Creation of initial conditions for WITOIL from these images
- Simulations
  - Testing with both Global CMEMS data and also SURF outputs



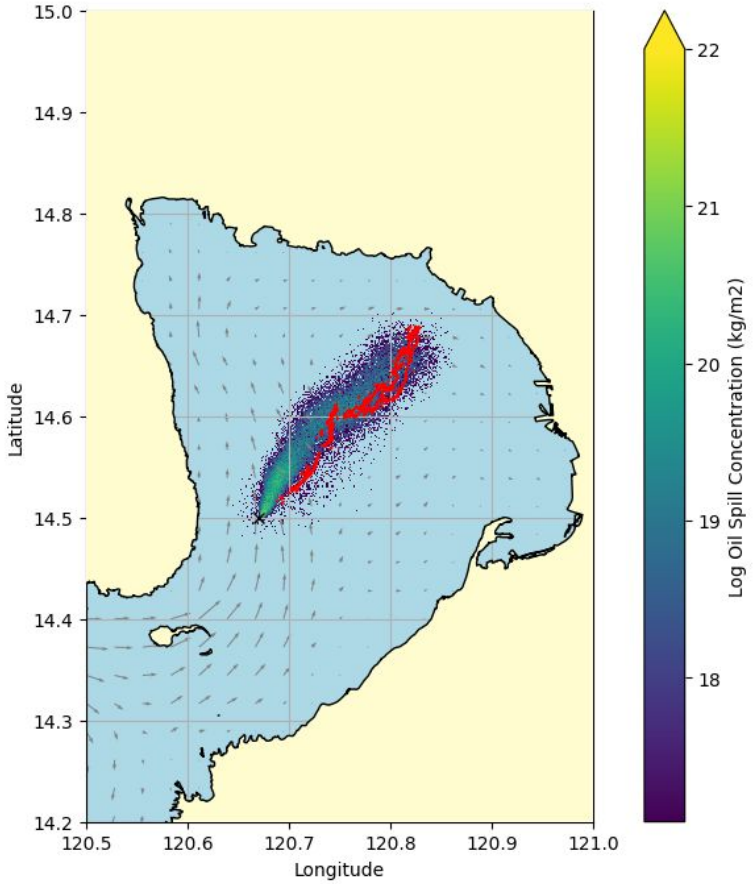
Manila Oil Spill accident

Models and observations on 26/07/2024 05:40 (PHT)

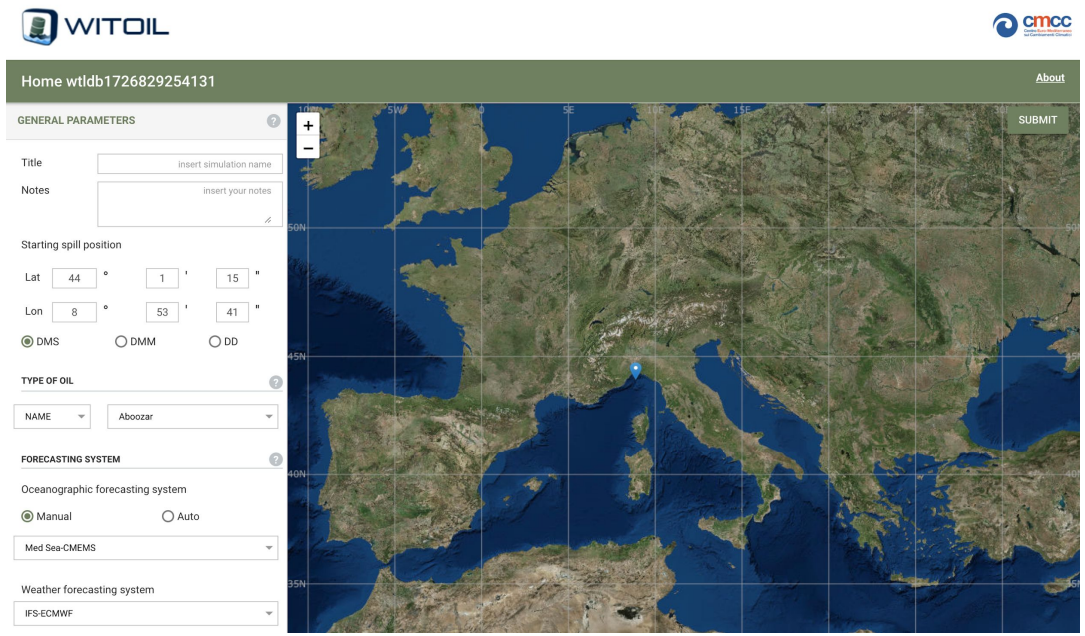
CMEMS-GLO (1/12 degree)



SURF (1/36 degree)



Witoil - Marine Oil Spill Simulation Operating System



- The user selects a location, a date and the conditions of the spill, which can be one-off or continuous
- Simulations can be launched anywhere in the world, using the numerical forecasts provided by Copernicus and ECMWF
- The results appear on the same platform, allowing the user to observe the dynamics of the spill without having to download the data and manage it locally
- The concept of the platform is to be a "low code" space, where stakeholders with different backgrounds can launch simulations of oil spills to understand hypothetical scenarios or real accidents

CMCC and UNIBO developments at

EDITO: Oil spill Hazard Mapping

Landing page and GUI

HAZARD MAPPING HOMEPAGE

HAZARD MAPPING RESULTS

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HAZARD MAPPING on the CLOUD

Oil pollution hazard mapping for the Mediterranean Sea

Oil pollution hazard mapping is conducted to manage and minimize the effects of oil spills on coastlines in the critical first hours following a detected release. The key question it addresses is: where is the oil likely to go, and how quickly? To answer this, hazard mapping uses a probabilistic approach with multi-model ensemble simulations, which account for uncertainties such as the exact timing, location, type of oil, and variability in ocean currents.

The Edito-Lab oil spill hazard mapping offers a product based on an initial methodology developed over the years in the Atlantic basin (Sepp-Neves et al., 2017, 2021). This approach simulates oil transport and transformation from multiple coastal release points over several years and calculates oil trajectories and beaching events.
The resulting ensemble of oil concentrations is used to create different hazard maps and indices.
These products can be used by a oil spill emergency response teams.

The following section presents two main outputs, both derived from a set of release points: first, oil concentration after 10 days of release from various points in 2022, and second, oil concentration at the coasts, followed by an oil spill hazard index for different coastal segments.

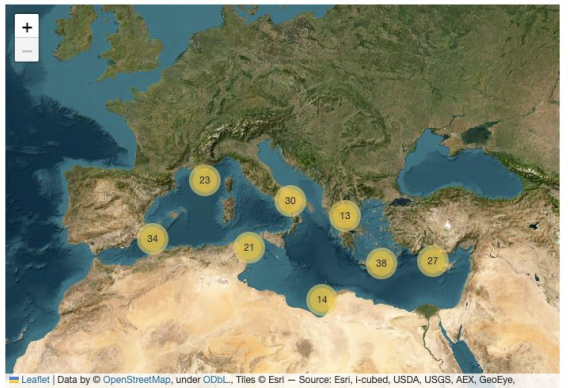
These products can be used by users (normally emergency management teams) as an interactively explorable database. It allows users to actively engage with data, enabling them to filter, search, visualize, and analyze information in real time.

HAZARD MAPPING HOMEPAGE

HAZARD MAPPING RESULTS

OIL HAZARD MAPPING

In the map the coastal release points used to estimate the oil hazard are shown



To visualize the oil hazard in your area of interest click on the nearby oil spill location on the map

EDITO: Oil spill Hazard Mapping

Release point and output selection

HAZARD MAPPING HOMEPAGE

HAZARD MAPPING RESULTS

OIL HAZARD MAPPING

In the map the coastal release points used to estimate the oil hazard are shown

To visualize the oil hazard in your area of interest click on the nearby oil spill location on the map

HAZARD MAPPING HOMEPAGE

HAZARD MAPPING RESULTS

OIL HAZARD MAPPING

In the map the coastal release points used to estimate the oil hazard are shown

To visualize the oil hazard in your area of interest click on the nearby oil spill location on the map

Selected Oil Spill Release Point

Latitude: 33.960404°

Longitude: 11.202642°

Please select the time interval or the climatology

Include years

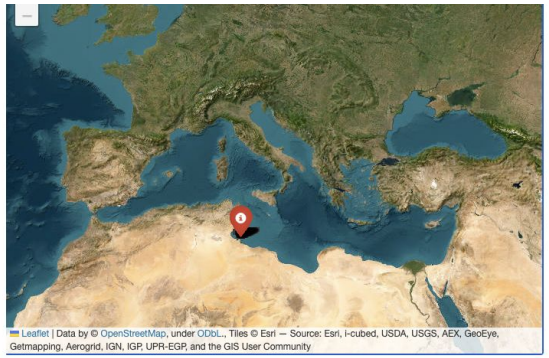
- Select All
- 2022
- 2021
- 2020
- 2019
- 2018

or Include specific seasons

- Summer
- Autumn
- Spring
- Winter

EDITO: Oil spill Hazard Mapping

Final products



Selected Oil Spill Release Point

Latitude: 33.960404° Longitude: 11.202642°

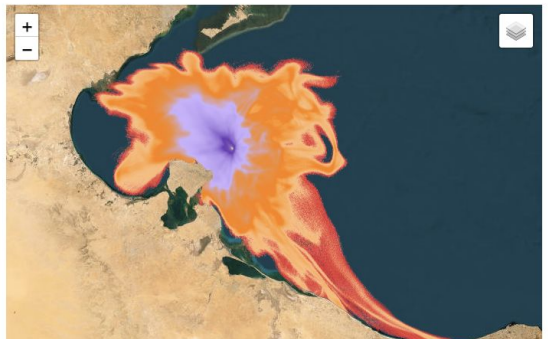
Selected time interval or climatology

Years: [2022]

Two main outputs are presented

Choose palette (for colorblind)

Average oil surface concentration in time



Years: [2022]

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Choose palette (for colorblind)

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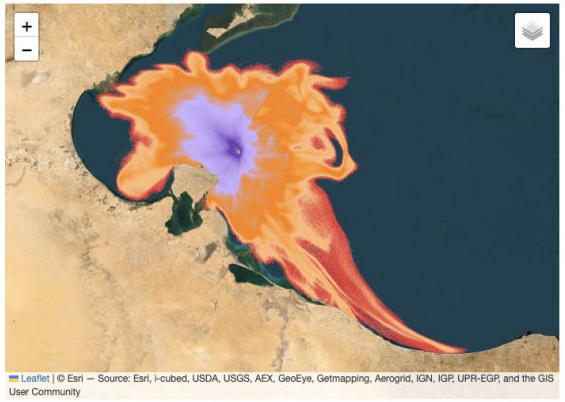
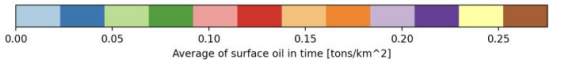
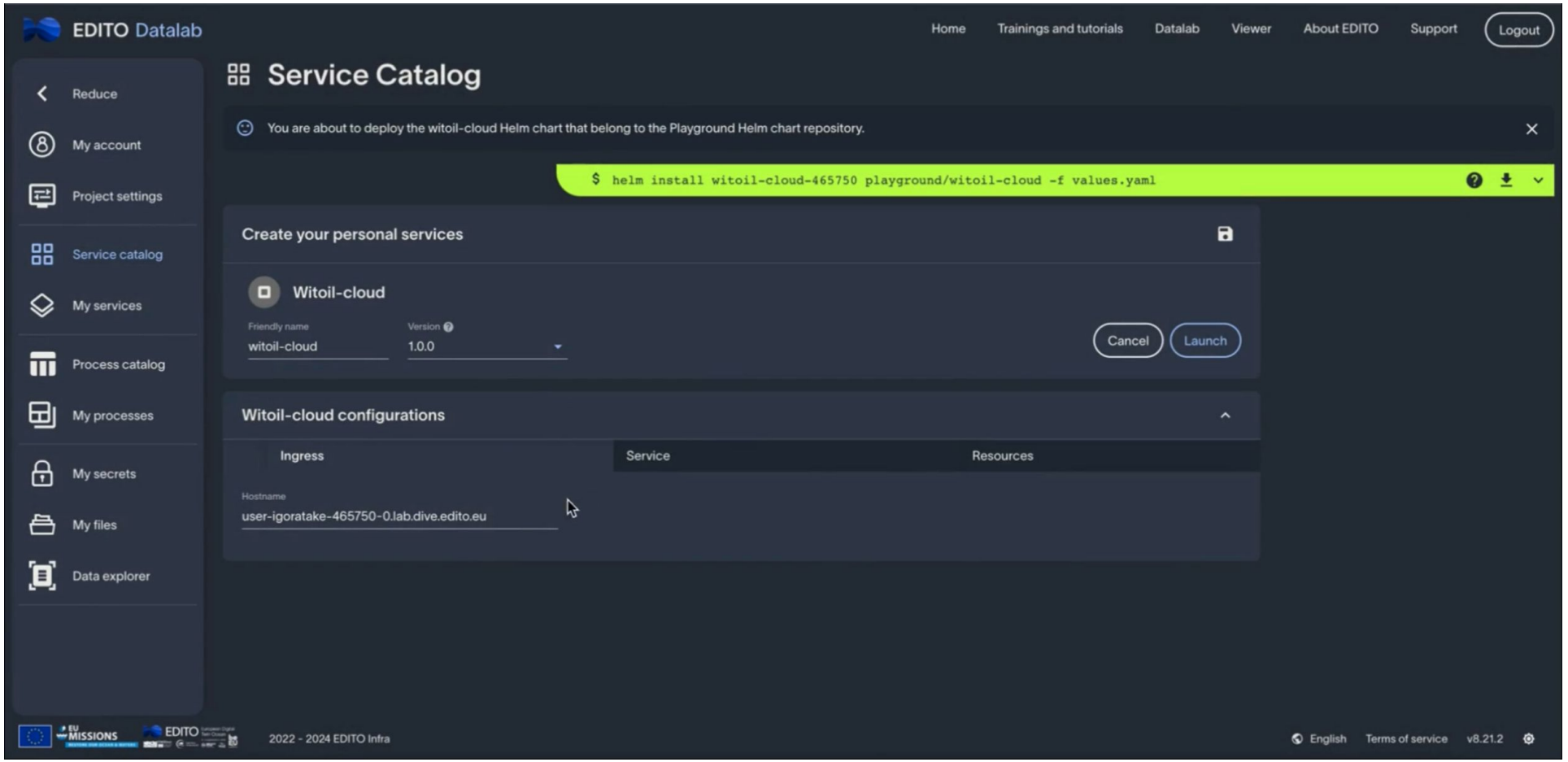




Hazard Index

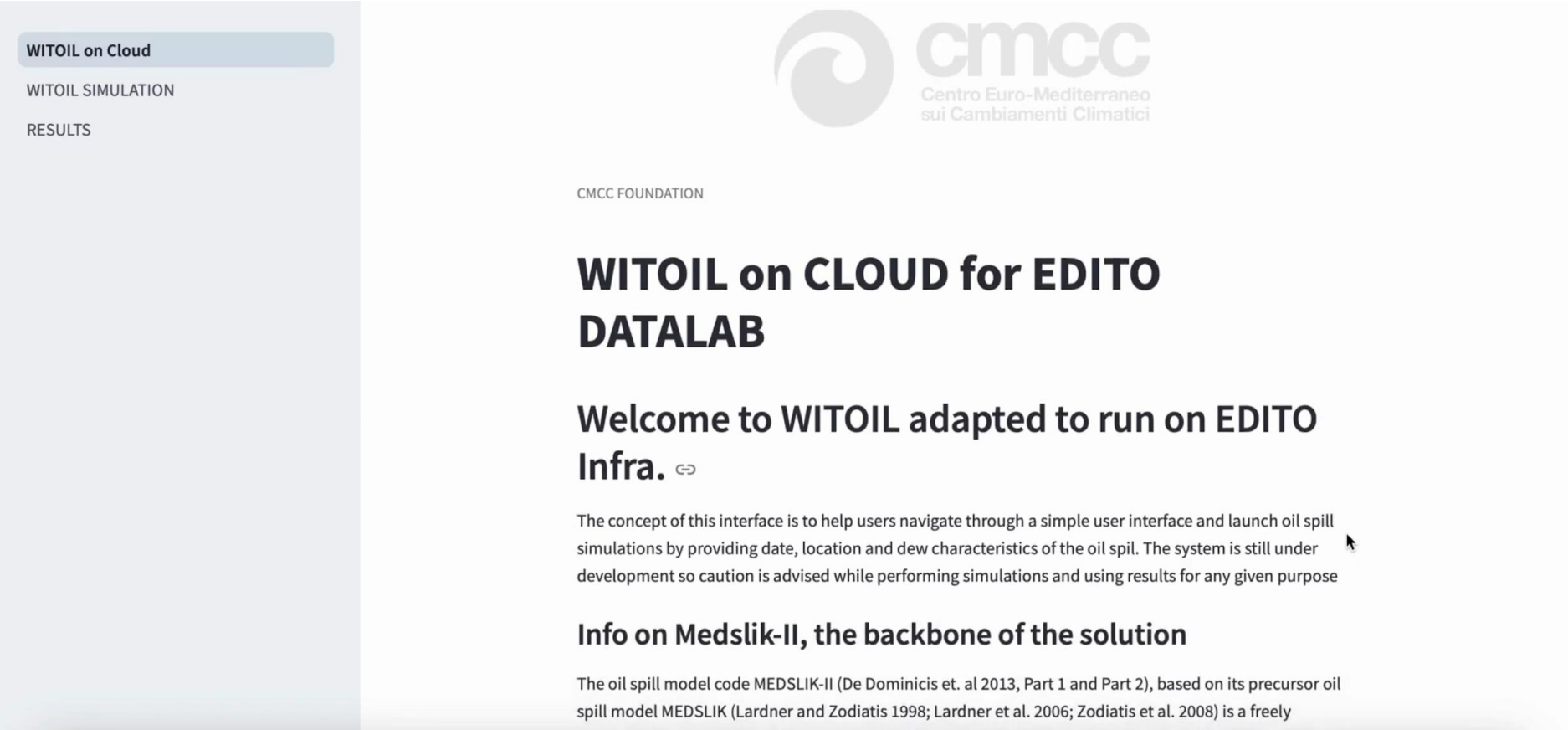
EDITO: WITOIL CLOUD

Using personal account to launch the service



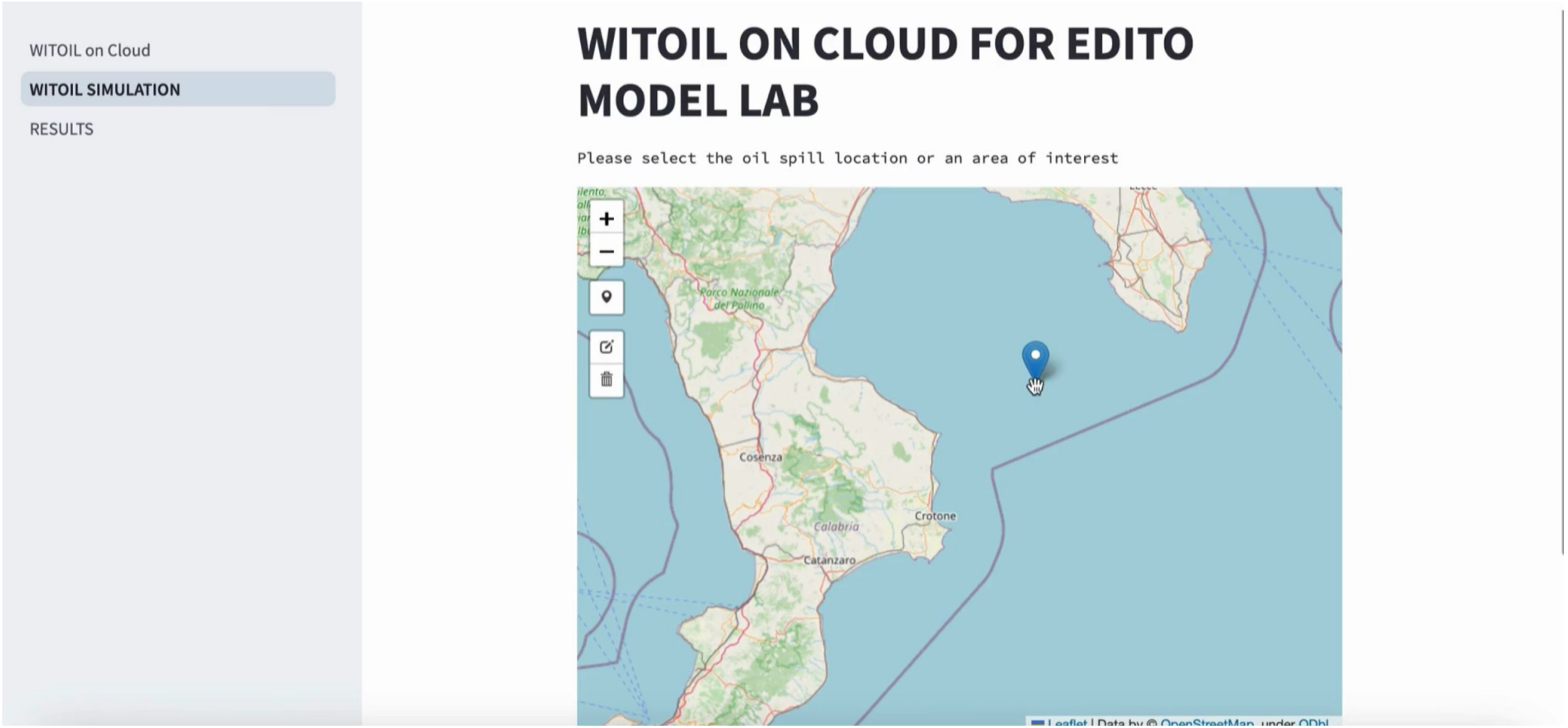
EDITO: WITOIL CLOUD

Landing Page



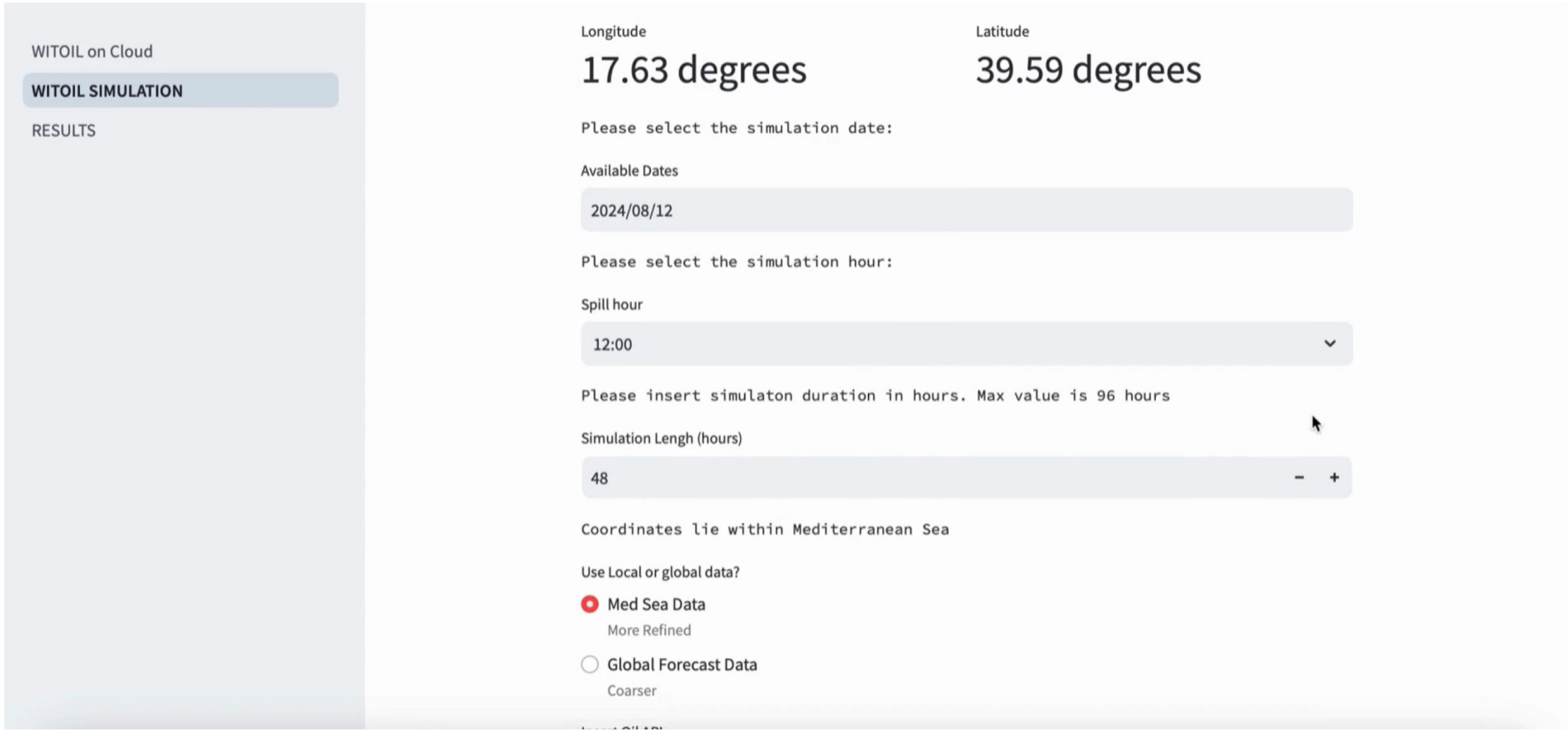
EDITO: WITOIL CLOUD

Spill Location selection



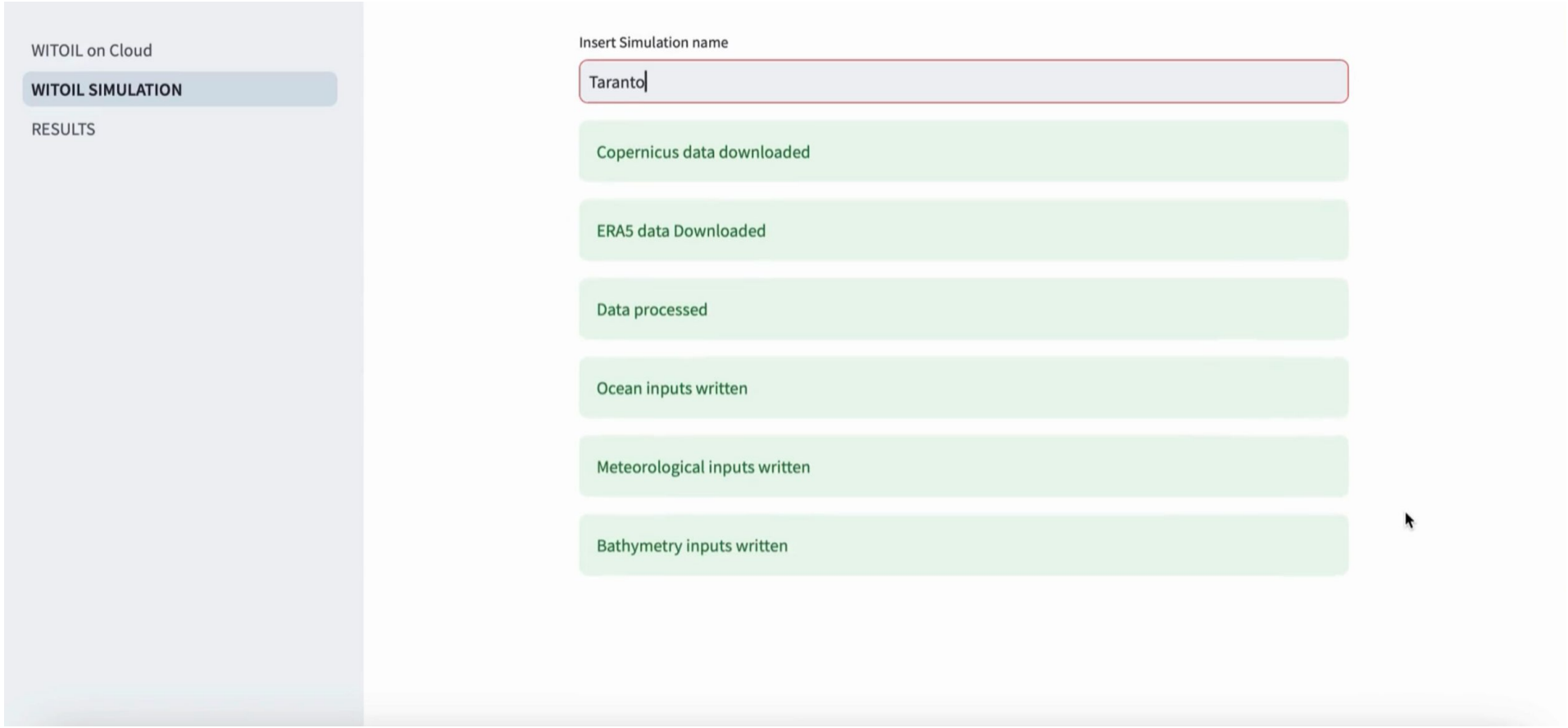
EDITO: WITOIL CLOUD

Spill characteristics



EDITO: WITOIL CLOUD

Follow up on simulation details



EDITO: WITOIL CLOUD

Interact with results

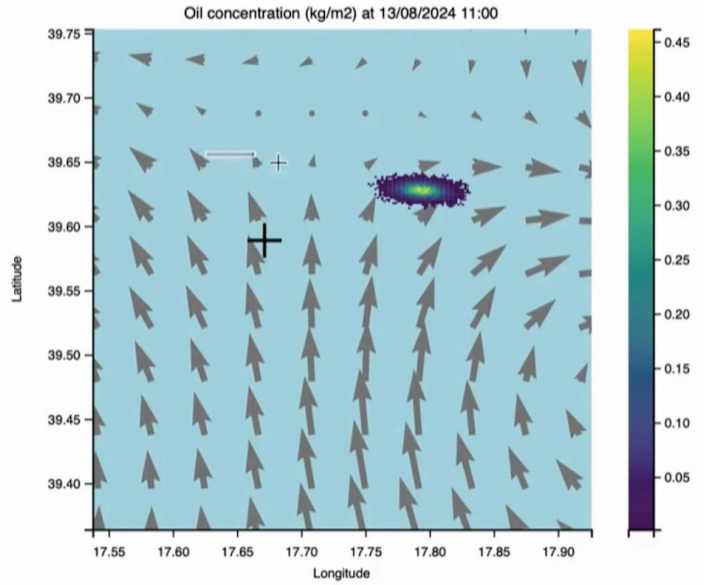
WITOIL on Cloud

WITOIL SIMULATION

RESULTS

0 23

Oil Spill on Surface



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focused on **understanding the interaction**
between **climate change and society.**

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