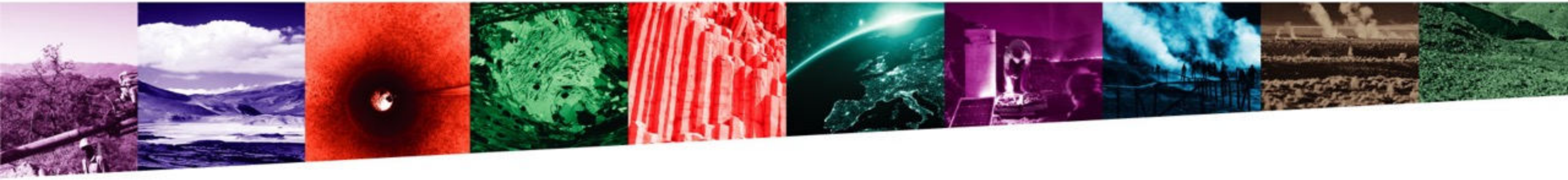


EPOS

a Novel Geoscience Open Data Platform for a better understanding of Planet Earth

Daniele Bailo, Rossana Paciello, Carmela Freda

EGU GIFT workshop | Vienna, 26th April 2023

EUROPEANPLATEOBSERVINGSYSTEM www.epos-eu.org

A unique Research Infrastructure for solid Earth science

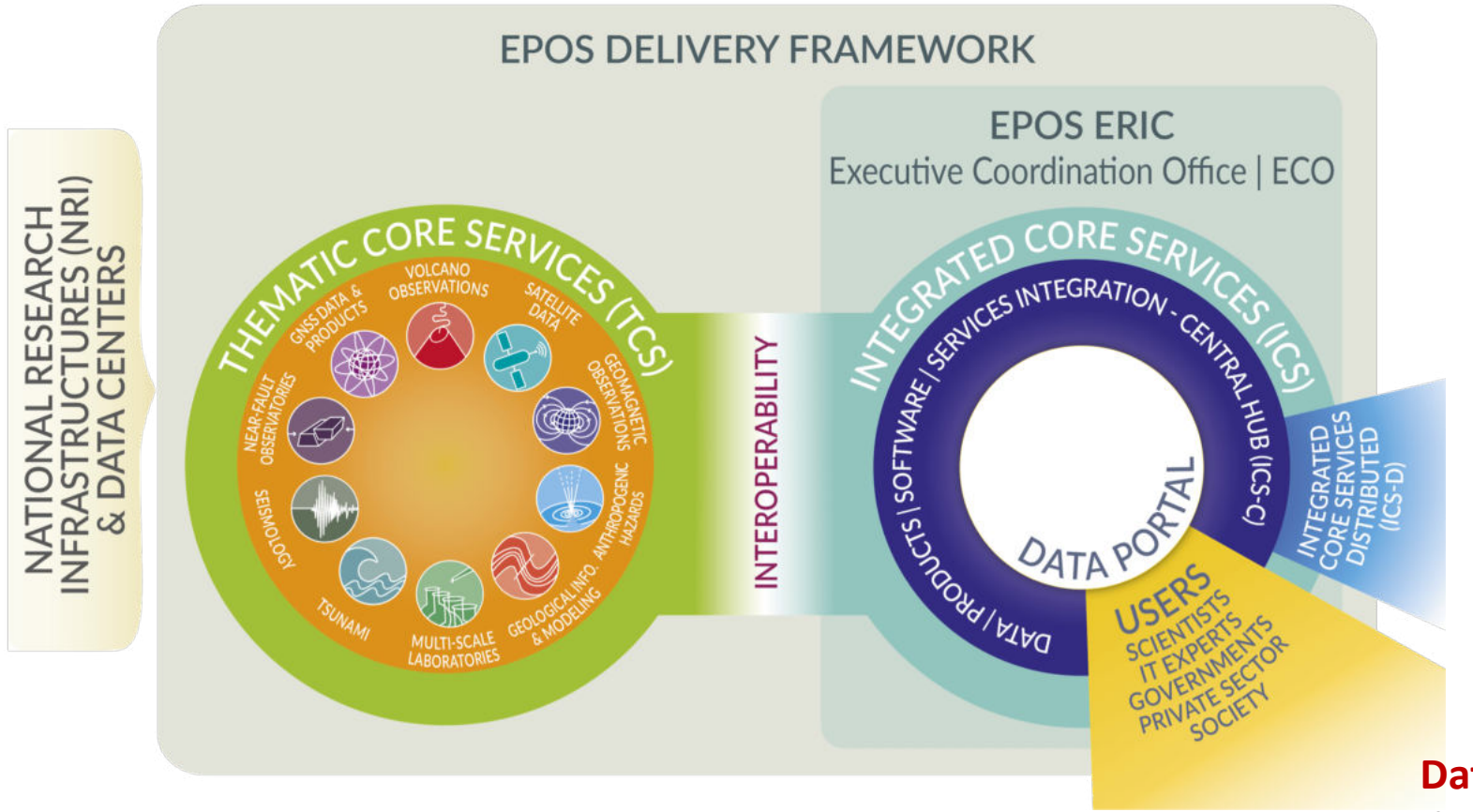
EPOS (European Plate Observing System) is the unique, distributed pan-European Research Infrastructure in the solid Earth domain.

EPOS is built for promoting collaboration, and harmonization of heterogeneous datasets, practices, and methods from different solid Earth communities.

How EPOS works

National Ris

generate data for science and society

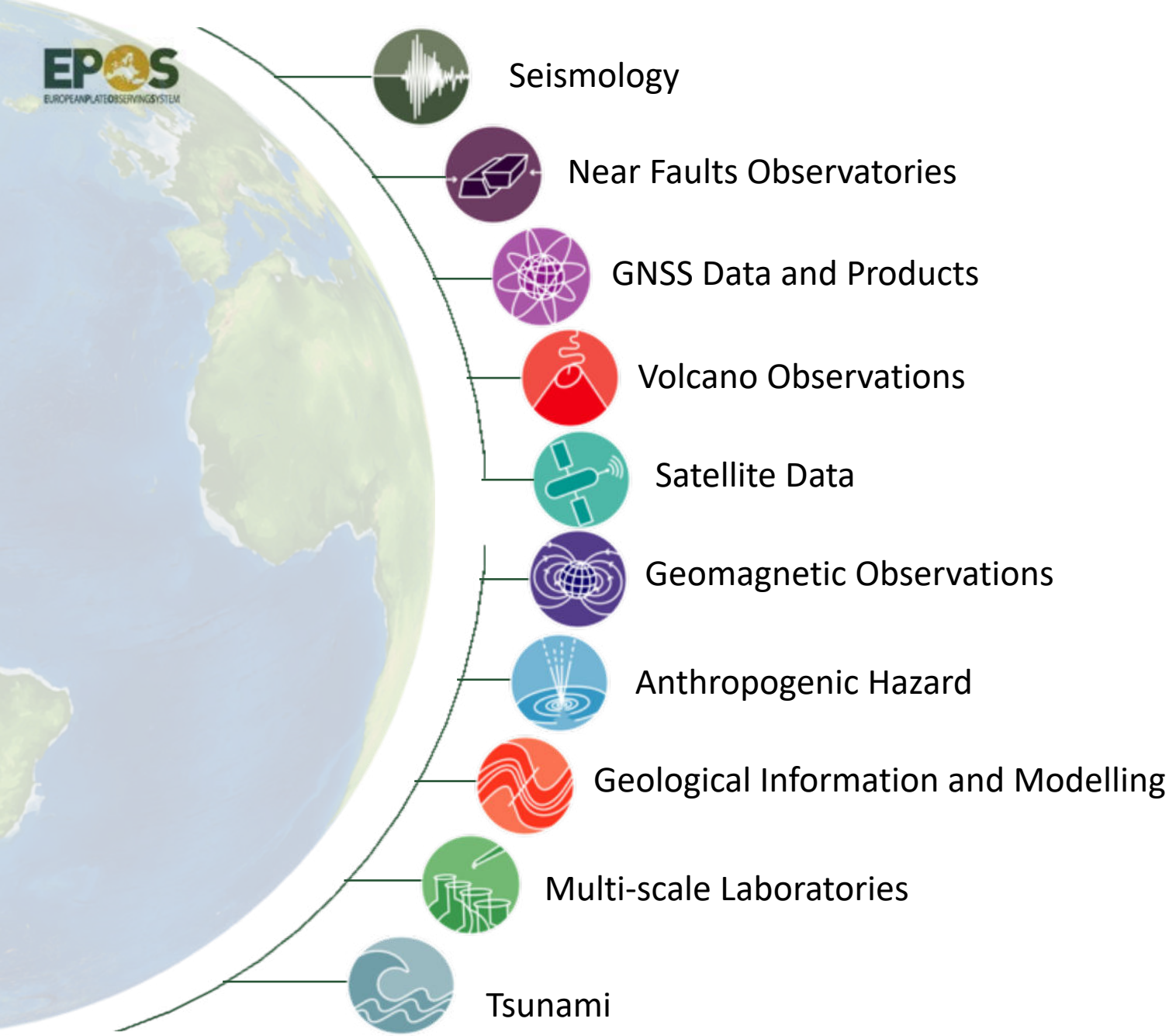


Integrated Core Services (ICS) represent the new interface that by adopting data access policies aligned to Open Science principles, provides data and products in a FAIR form for users

Each community integrates its own data and services into a **Thematic Core Service (TCS)**

TCS are responsible for integrating data, metadata and services from various infrastructures for each discipline and for guaranteeing access to standardized, quality-controlled data and services

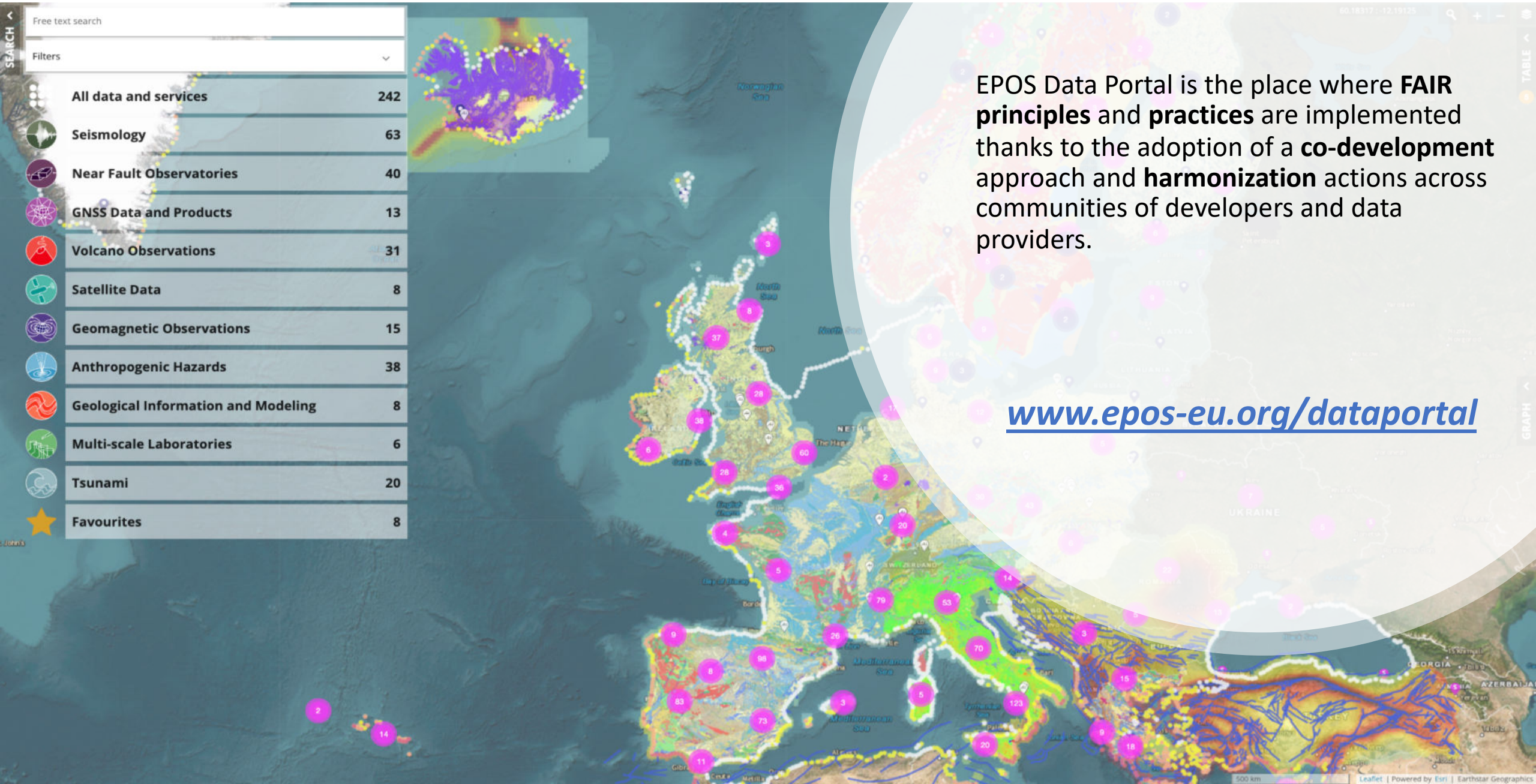
Data Portal allows the access to all data, products and services made available by the NRIs through the TCS for different users and stakeholders (including Society)



One-Stop *Shop*

One-stop shop portal that enables any user to access **Solid Earth data** in an **integrated way**

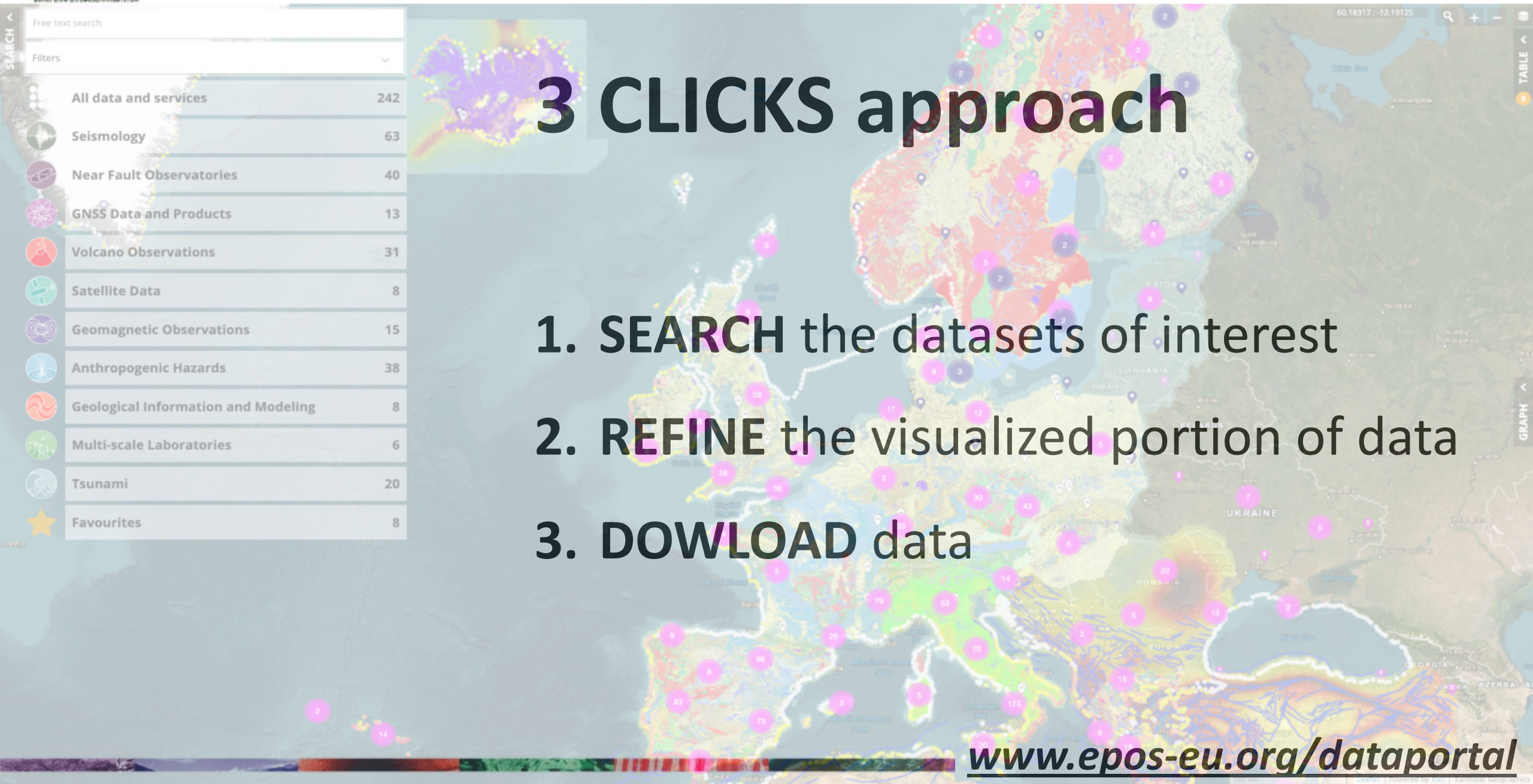
EPOS Data Portal



EPOS Data Portal is the place where **FAIR principles** and **practices** are implemented thanks to the adoption of a **co-development** approach and **harmonization** actions across communities of developers and data providers.

www.epos-eu.org/dataportal

EPOS Data Portal

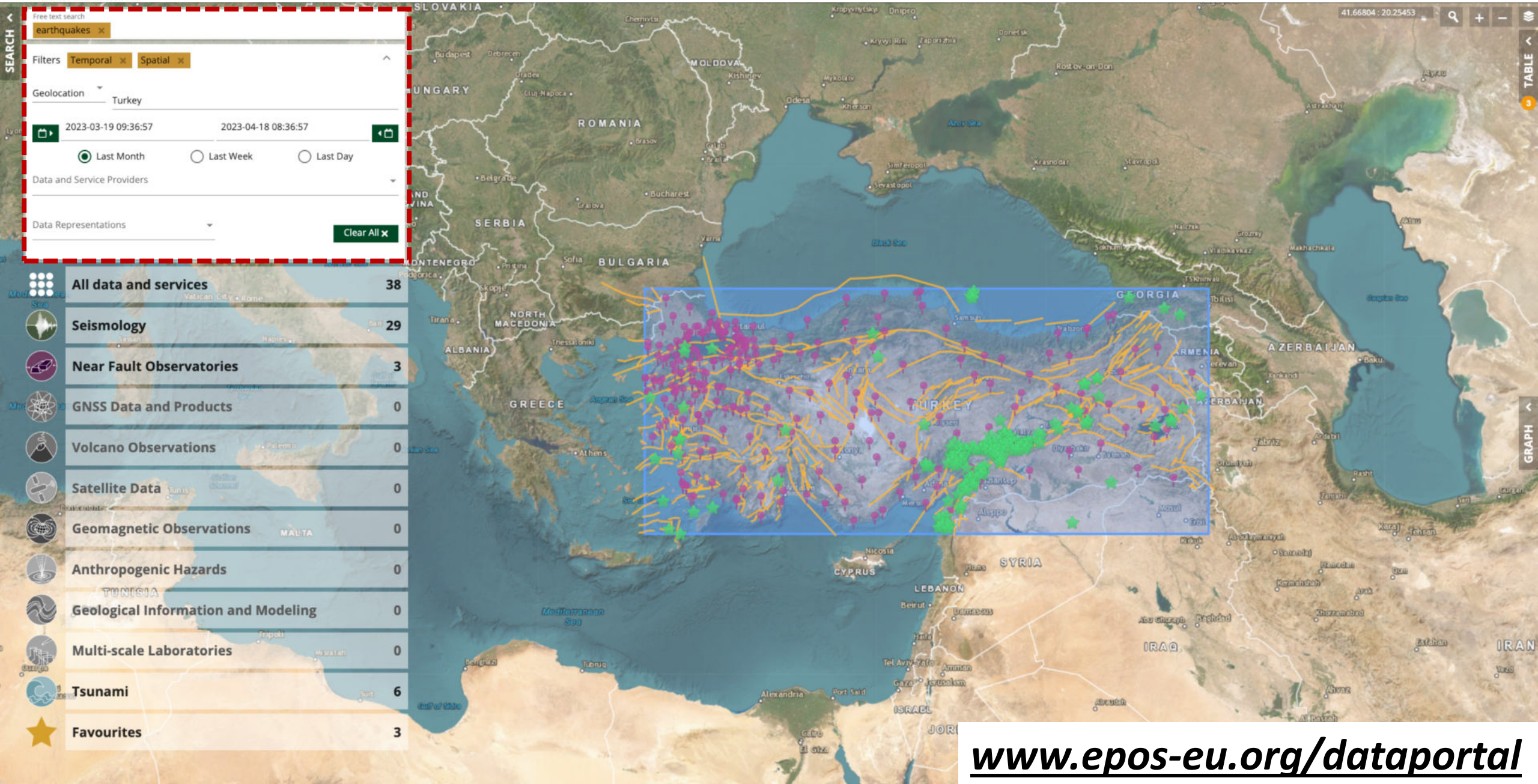


3 CLICKS approach

1. **SEARCH** the datasets of interest
2. **REFINE** the visualized portion of data
3. **DOWLOAD** data

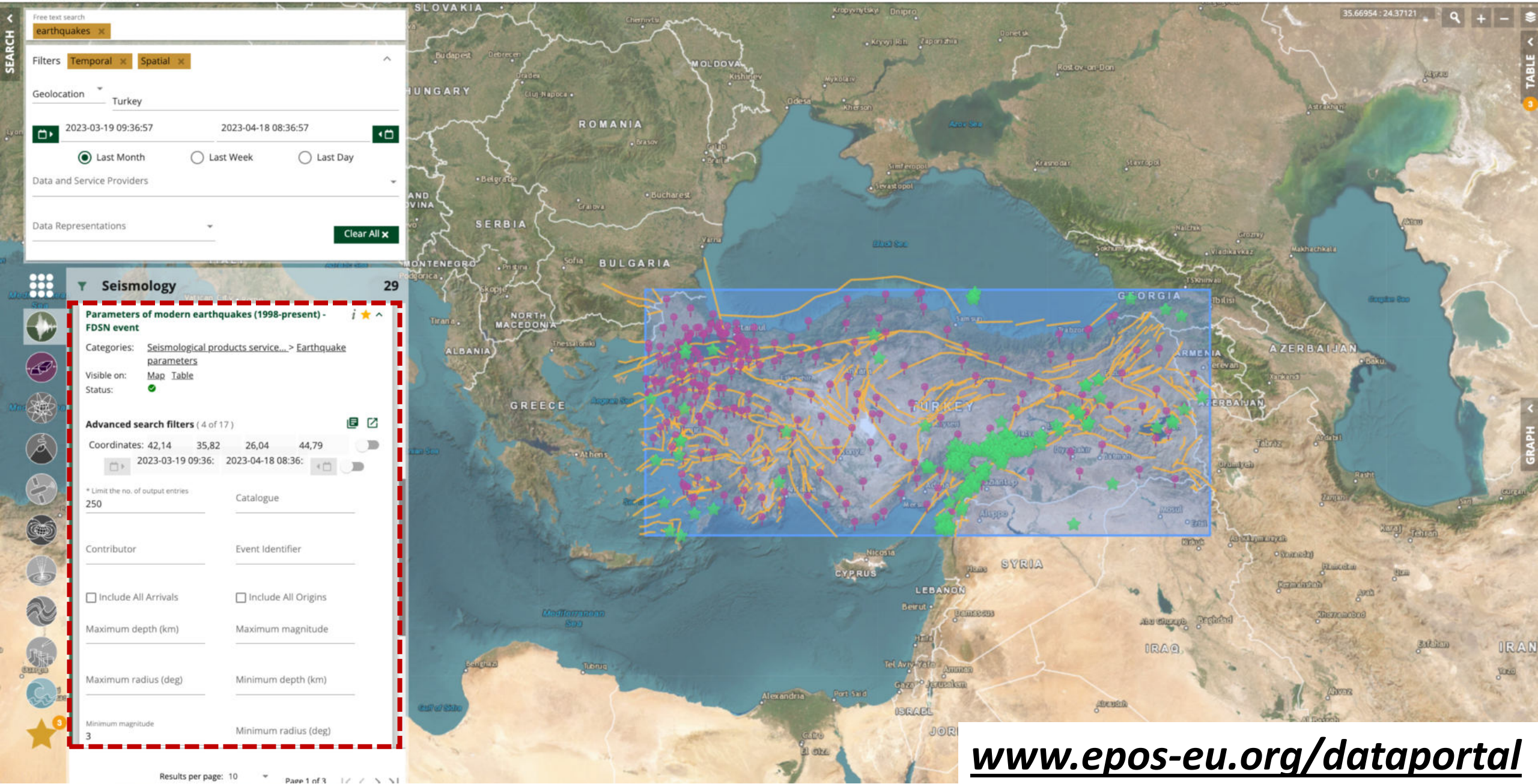
www.epos-eu.org/dataportal

EPOS Data Portal - SEARCH



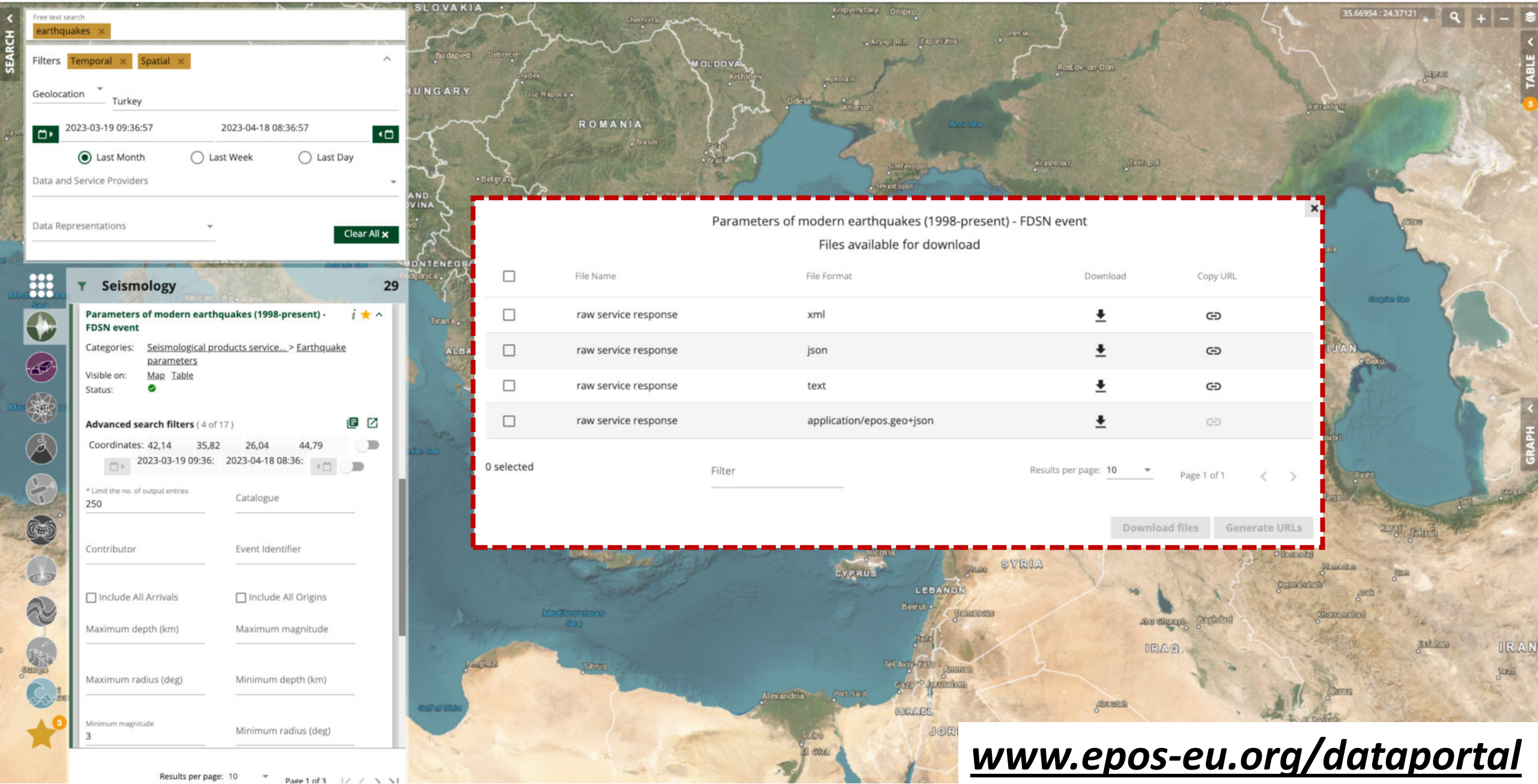
www.epos-eu.org/dataportal

EPOS Data Portal - REFINE



www.epos-eu.org/dataportal

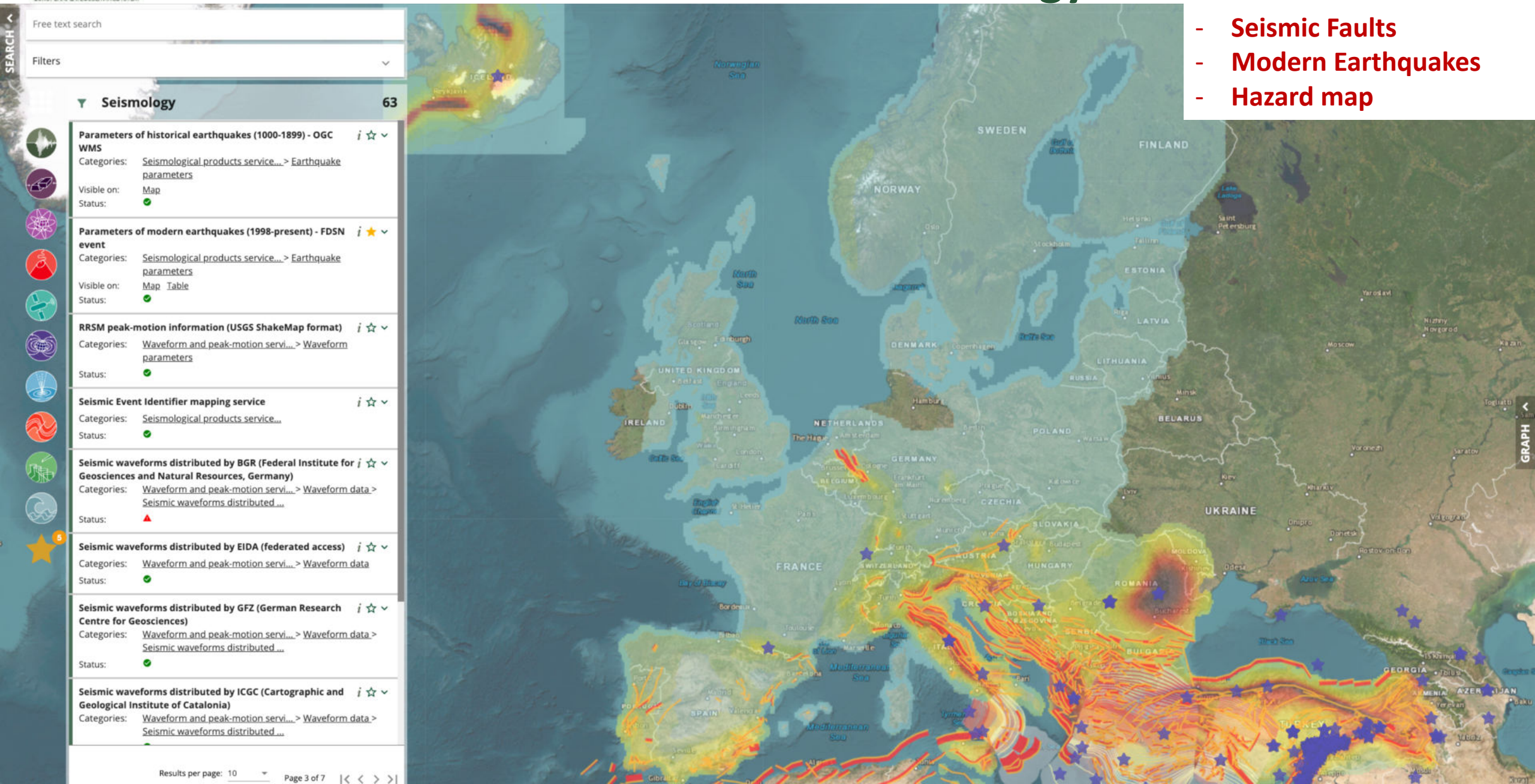
EPOS Data Portal - DOWNLOAD



www.epos-eu.org/dataportal

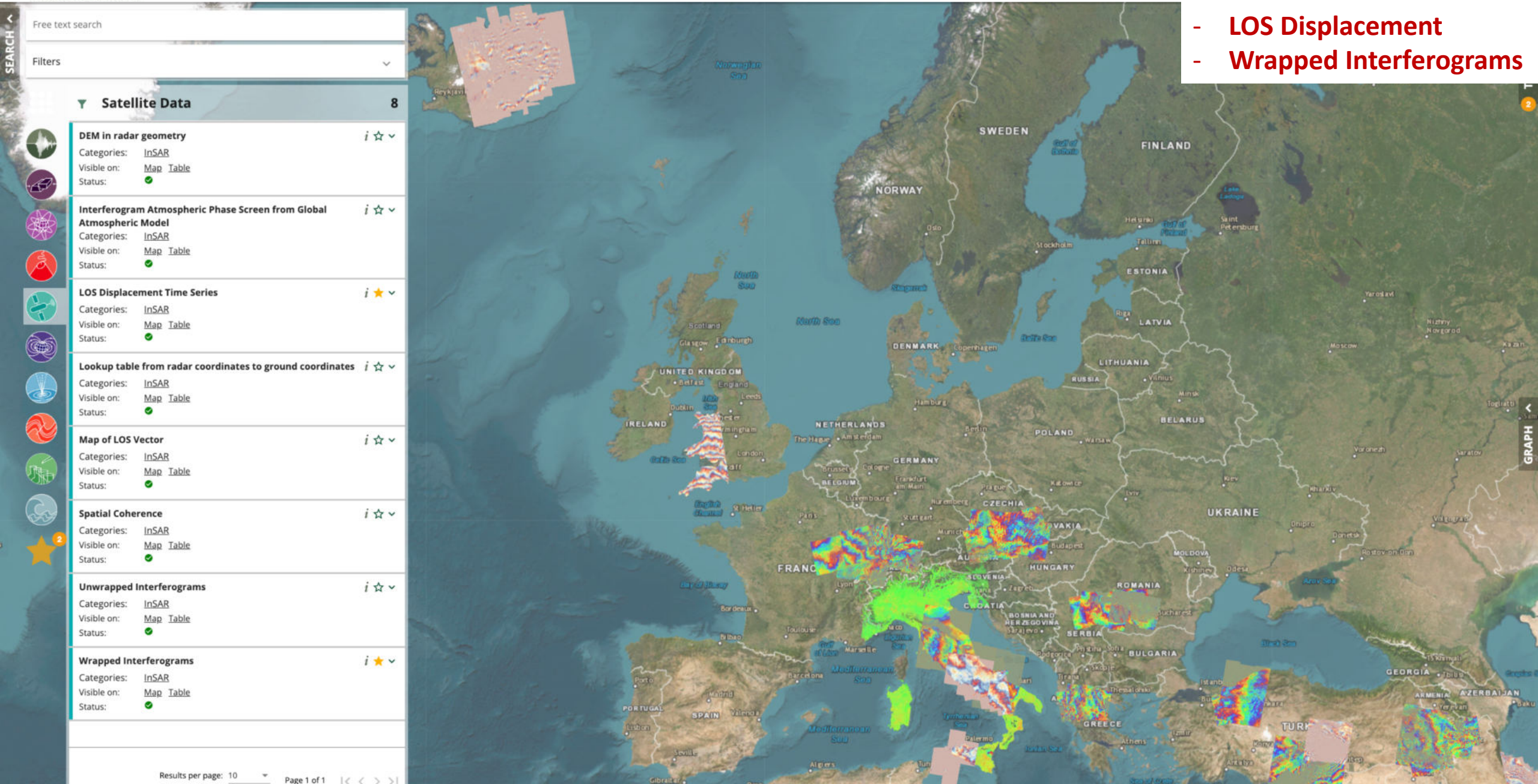
EPOS Data Portal - Seismology

- Seismic Faults
- Modern Earthquakes
- Hazard map



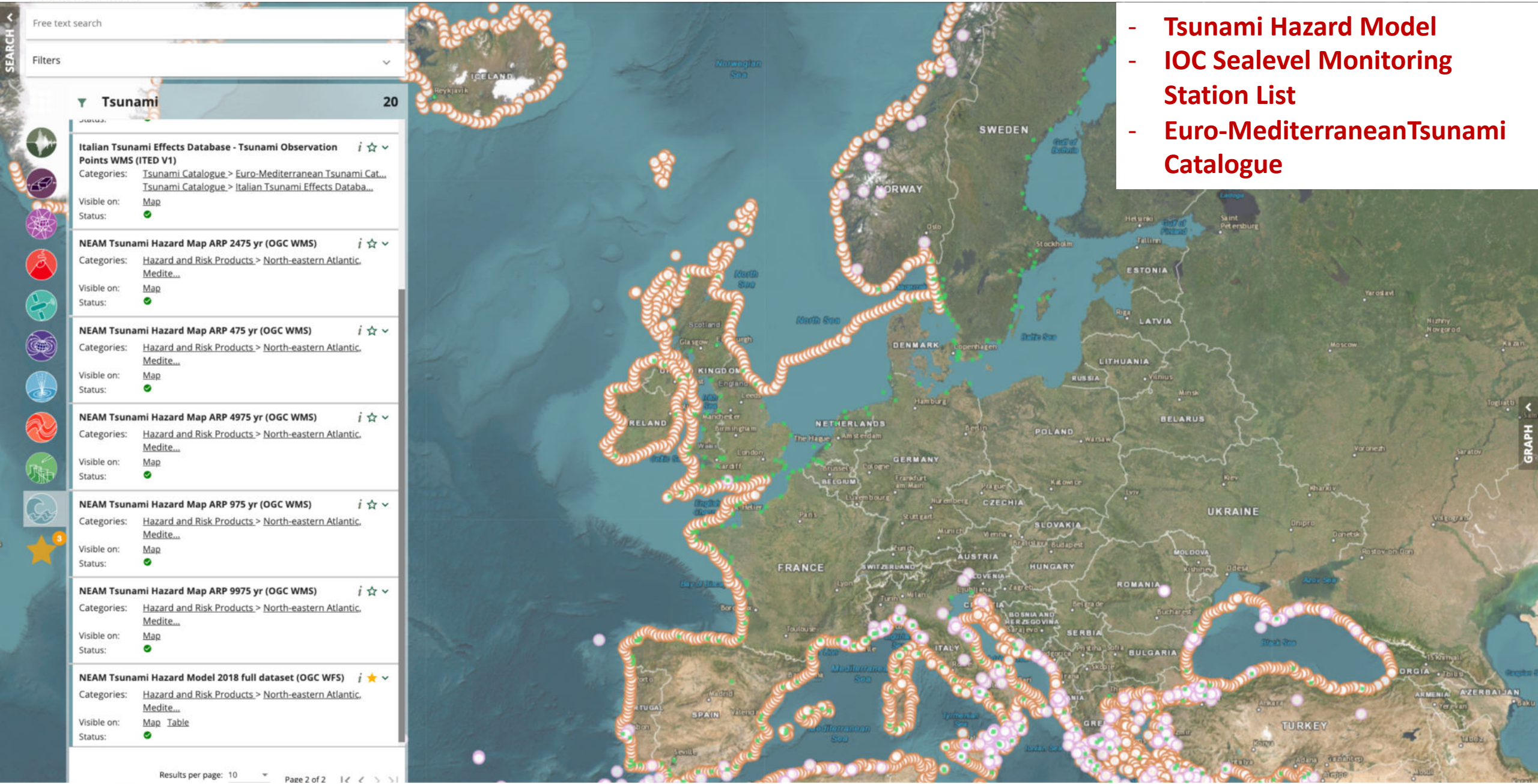
EPOS Data Portal – Satellite Data

- LOS Displacement
- Wrapped Interferograms



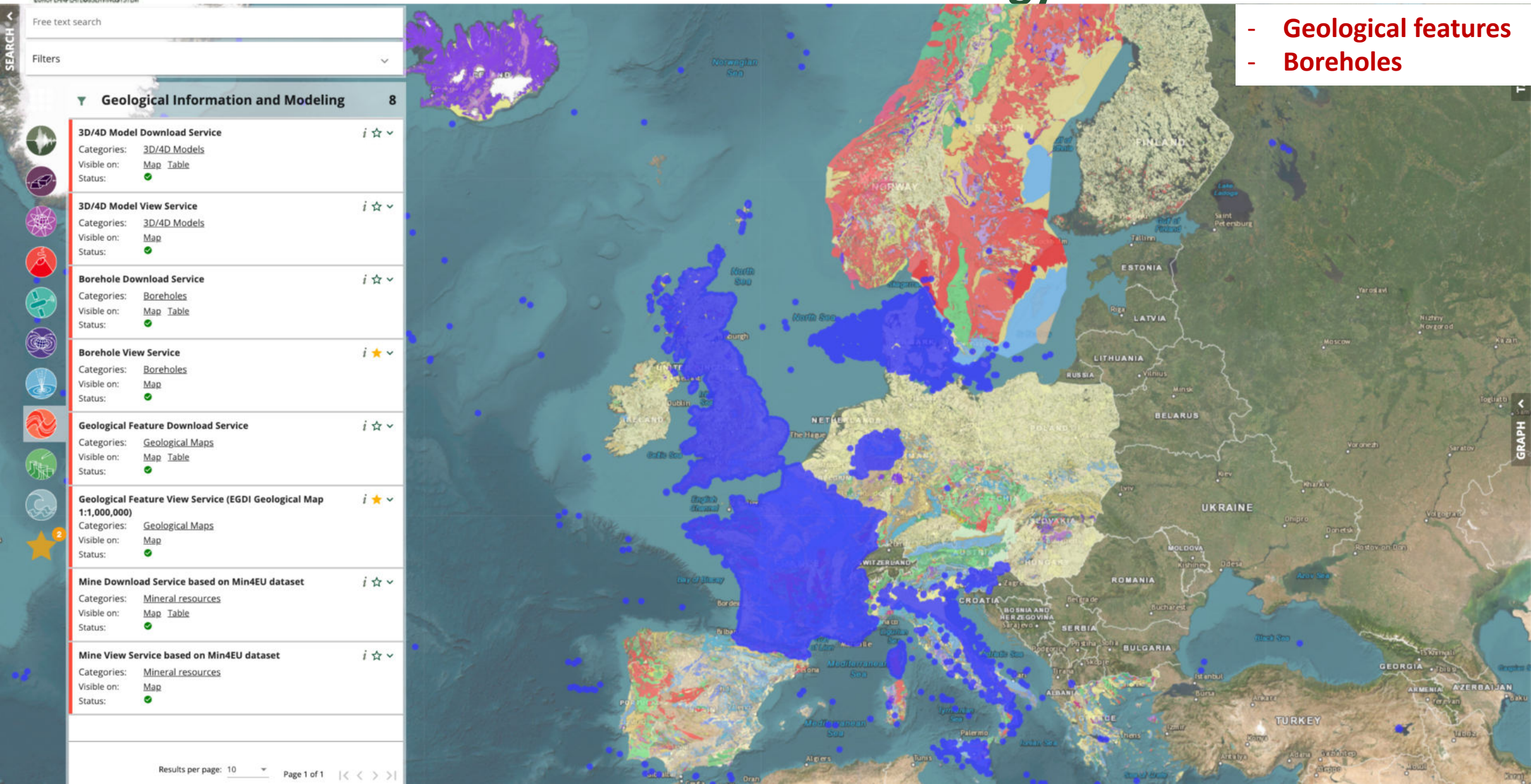
EPOS Data Portal – Tsunami

- Tsunami Hazard Model
- IOC Sealevel Monitoring Station List
- Euro-MediterraneanTsunami Catalogue



EPOS Data Portal – Geology

- Geological features
- Boreholes



EPOS Data Portal

Use case

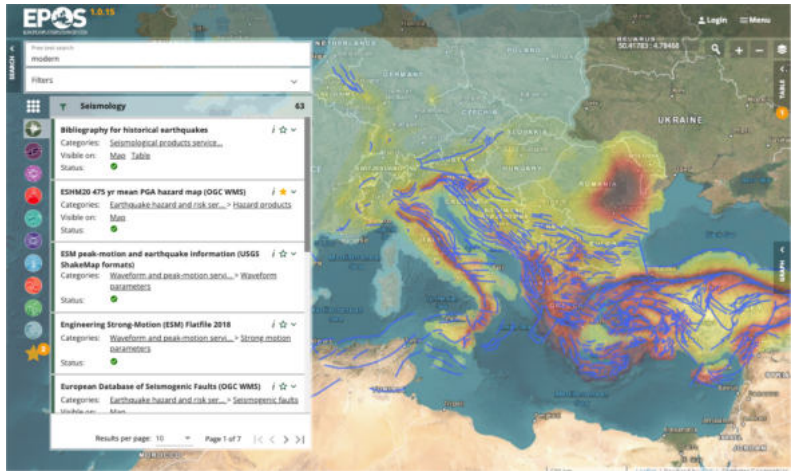
EPOS Data Portal – Usage in Teaching

Dr. Roberto Basili
Senior Researcher
(INGV-Roma1).
TCS Seismology
& TCS Tsunami

Teaching with the EPOS Data Portal

- In the framework of **Earth Sciences PhD courses** at **Sapienza University in Rome**
- Short course on “Building and using databases in Earth Sciences”.

- **Students familiarize with curiosity-driven data discovery, retrieval, and reuse in a multi-disciplinary environment**. Practical exercises focus on developing skills in using and querying data offered through web services, while exploring metadata to address critical issues with data reuse in scientific projects and publications (e.g., processing level, persistent identifiers, versioning, licensing, citation).

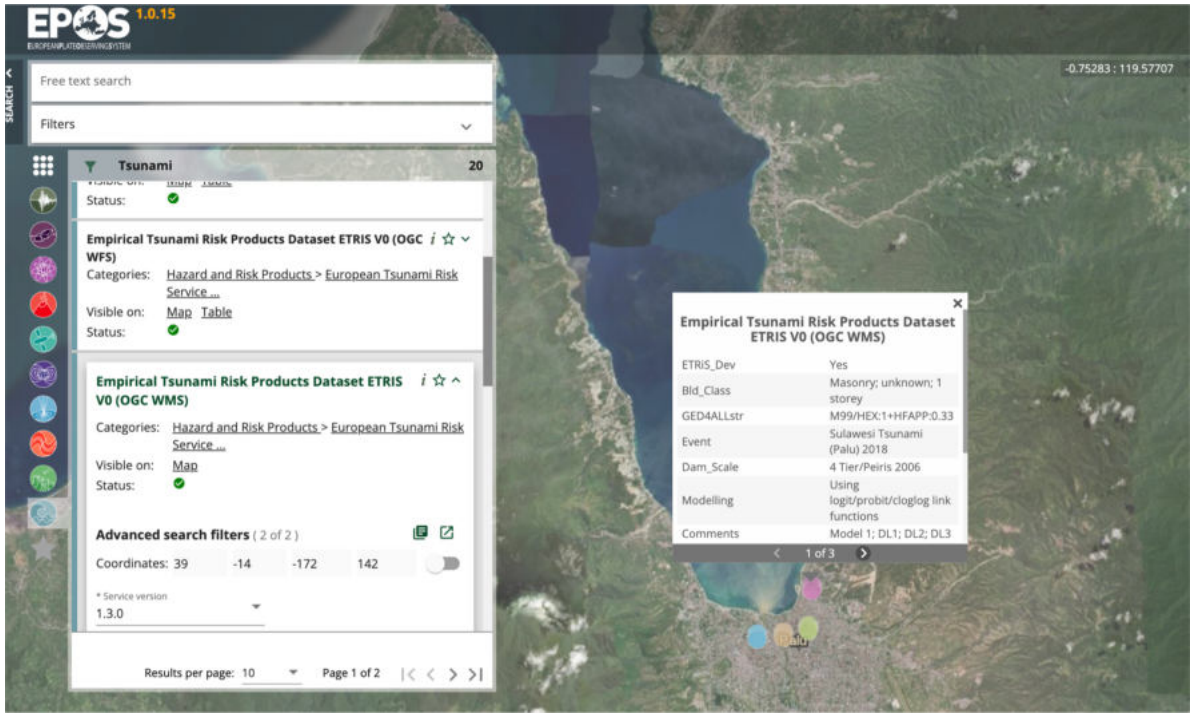


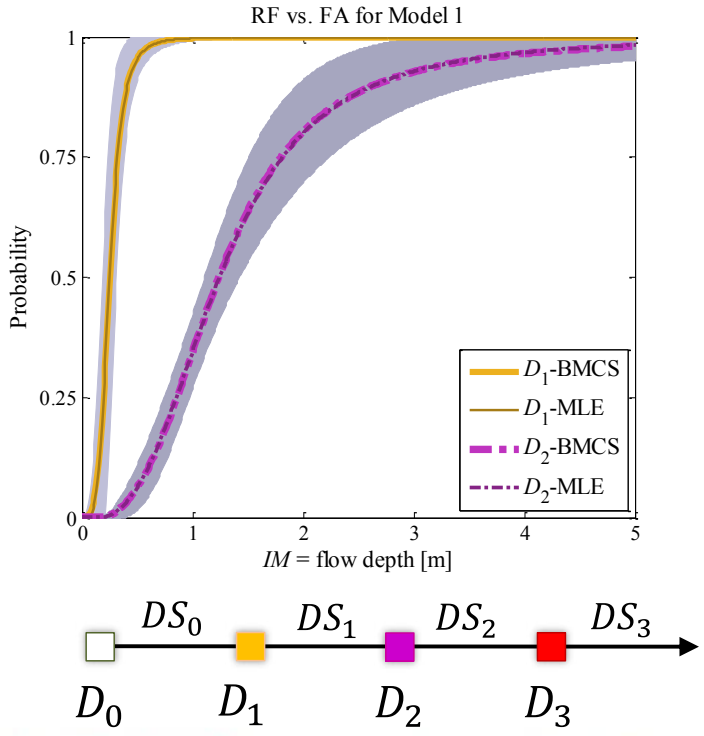
EPOS Data Portal – Usage in Teaching

Fatemeh Jalayer
Professor of Geophysical Hazard Risks
Institute for Risk and Disaster Reduction
University College London

Teaching to graduate students with the EPOS Data Portal…

- ✓ I am using EPOS Data portal for designing my new course (2024) **Statistical Modelling of Hazards and Risks,** Masters Program in Risk and Disaster Science.
- ✓ For example, I use the services in **TCS Tsunami**, **Seismology**, **Anthropogenic Hazards**, **Geological Modelling** to design hands-on practical sessions for the students.
- ✓ The portal is ideal for providing the students the possibility of working with and overlaying data across different hazards.



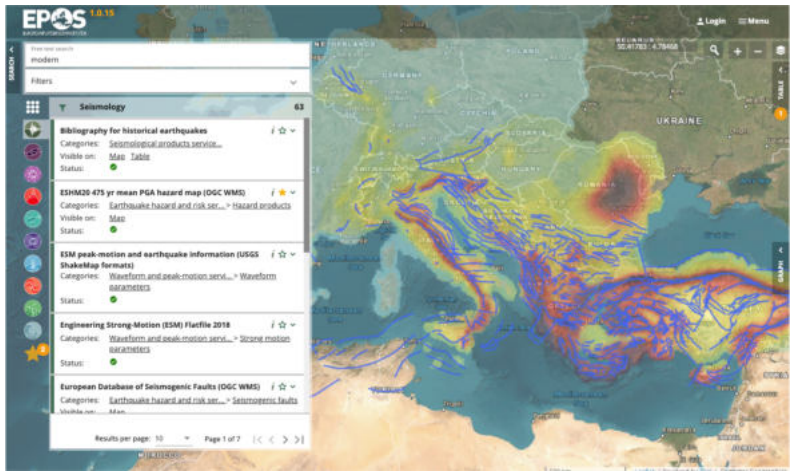


EPOS Data Portal – Usage in Teaching

Eng. Danilo Reitano
Senior Technologist
(INGV-OE).
TCS VO

Teaching with the EPOS Data Portal

- In the framework of **Erasmus Plus** - K2 3DTeLC project (https://www.3dtelc.com/) **Sicily Summer School** (held in Catania, 5th-14th May 2019), a lecture was based on EPOS Data Portal and its on going future developments.
- Next October 2023 the new **Sicily Summer School** will take place in Acitrezza (Catania-Italy) under the **Erasmus+ BridgET project:** *A European partnership to renew teaching in marine geosciences*. A specific task will teach students how to use the EPOS e-infrastructure Data Portal.



EPOS Data Portal – Usage for Natural Hazards Studies

istituto per il rilevamento elettromagnetico dell'ambiente

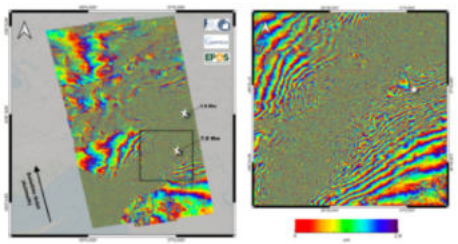
site map

Home | Institute | Research Topics | Projects | Scientific Production | People | Training | Resources / services | Events | Outreach and Press area

Home \ Outreach and Press area \ Outreach and Education \ News in evidence \

The seismic events in Turkey on February 6, 2023: first satellite radar analyses of ground deformations based on the automatic processing of Sentinel-1 images

font size | Print | Email



Following the two seismic events of February 6, 2023, that devastated South-East Turkey and Northern Syria and caused tens of thousands of victims and incalculable damage, a team of researchers from the **Institute for Electromagnetic Sensing of the Environment** of the National Research Council (IREA-CNR) has detected the surface deformation field induced by the considered seismic events by applying the **Differential SAR Interferometry (DInSAR)** technique. This result has been achieved thanks to a system developed by IREA-CNR as part of **EPOS (European Plate Observing System)** activities, the European research infrastructure for the solid Earth study. This system makes it possible to generate DInSAR products automatically, following particularly significant seismic events.

In particular, a co-seismic interferogram was generated (see Figure 1) by analyzing the radar images of the European Sentinel-1A sensor that operates at a wavelength of about 5.6 cm in the C-band of the microwaves. The images were acquired on January 28 and February 9, 2023. Each "fringe" of the interferogram in the Figure, i.e. each color cycle, corresponds to a shift in the sensor Line Of Sight (LOS) of about 2.8 cm, equal to half the wavelength used. The investigated area extends for 130,000 Km2, of which about 35,000 are affected by significant deformation phenomena testified by the presence of interferometric fringes that in many areas are very dense (see the zoom in Figure 1) due to the displacements, even of several meters, caused by seismic events.

New images of the Sentinel-1A sensor, taken from different orbits, are expected in the next few days and will allow further analyses. Furthermore, a series of acquisitions of radar images carried out by the radar sensors of the Argentine constellation SAOCOM-1, operating in the L-band of microwaves with about 23 cm of wavelength, have already been programmed in collaboration with the Italian and Argentine Space Agencies. They will further extend the results obtained thanks to the analysis based on Sentinel-1A data.

The generated results will be made available through the **EPOS portal**

Sentinel-1 data was provided through the **European Copernicus programme**

Figure 1: Sentinel-1 co-seismic interferogram relating to the acquisitions of January 28 and February 9, 2023, carried out along ascending orbits. The image on the right shows a zoom relative to the area corresponding to the black box. The white stars indicate the position of the epicenters of the two seismic events of magnitude 7.8 and 7.5 that occurred on February 6, 2023.

Abstract EGU23-17628

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EGU23-17628
https://doi.org/10.5194/egusphere-egu23-17628
EGU General Assembly 2023

Surface deformation retrieval of the February 2023 South-East Turkeyand Northern Syria Mw 7.8 and Mw 7.5 seismic events through Sentinel-1and SAOCOM-1 co-seismic SAR image analysis

Francesco Casu[1], Fernando Monterroso[1], Yenni Lorena Belen Roa[1], Pasquale Striano[1], Simone Atzori[2], Manuela Bonano[1], Claudio De Luca[1], Marianna Franzese[1], Michele Manunta[1], Giovanni Onorato[1], Muhammad Yasir[1,3], Ivana Zinno[1], and Riccardo Lanari[1]

[1]Institute for Electromagnetic Sensing of the Environment (IREA) - National Research Council (CNR), Italy
[2]National Institute of Geophysics and Volcanology (INGV), Italy
[3]Department of Engineering (DI), Università degli Studi di Napoli "Parthenope", Italy

On 6 February 2023 two Mw 7.8 and Mw 7.5 seismic events struck the South-East Turkey and Northern Syria regions, close to the cities of Gaziantep and Ekinözü, causing more than 50 thousands of fatalities and above 120 thousands of injured, with incalculable, widespread damage to the surrounding villages. Such earthquakes are related to the main geodynamic regime controlled by the triple junction between the Anatolian, Arabian and African Plates, and by the tectonic context associated with a shallow strike-slip faulting, including the East Anatolian Fault zone and the Dead Sea Transform. Immediately after the occurrence of these earthquakes, we started investigating the surface deformation field induced by the considered seismic events by applying the Differential SAR Interferometry (DInSAR) and the Pixel Offset (PO) techniques, within the framework of EPOS (European Plate Observing System), which is the European research infrastructure for the study of the solid Earth.

To this aim, we exploited several co-seismic SAR data pairs that have been collected by different satellite constellations. First of all, we exploited C-band (5.6 cm of wavelength) SAR data acquired by the Sentinel-1A sensor of the European Copernicus program from both ascending (Track 14) and descending (Track 94 and 21) orbits. Moreover, we benefited from the availability of a number of L-band (23 cm of wavelength) SAR images acquired by the twin satellites of the Argentine SAOCOM-1 constellation, programmed in collaboration with the Italian and Argentine Space Agencies.

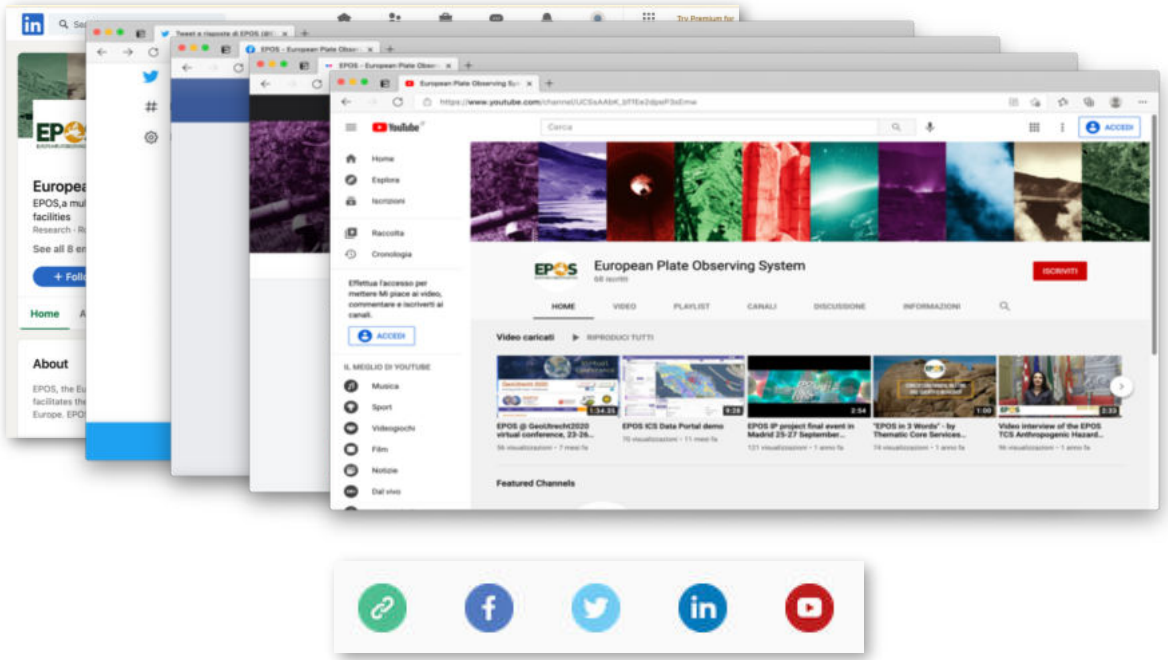
The main focus of this work regards the joint exploitation of the Sentinel-1 and SAOCOM-1 SAR products to retrieve the 3D co-seismic deformation field. Further analysis is envisaged in order to model the co-seismic sources.

This work is supported by: the 2022-2024 IREA-CNR and Italian Civil Protection Department agreement, and by the H2020 EPOS-SP (GA 871121) and Geo-INQUIRE (GA 101058518) projects. The authors also acknowledge ASI for providing the SAOCOM data under the ASI-CONAE SAOCOM License to Use Agreement. Sentinel-1 data were provided through the European Copernicus program.

Web site

www.epos-eu.org

Social media

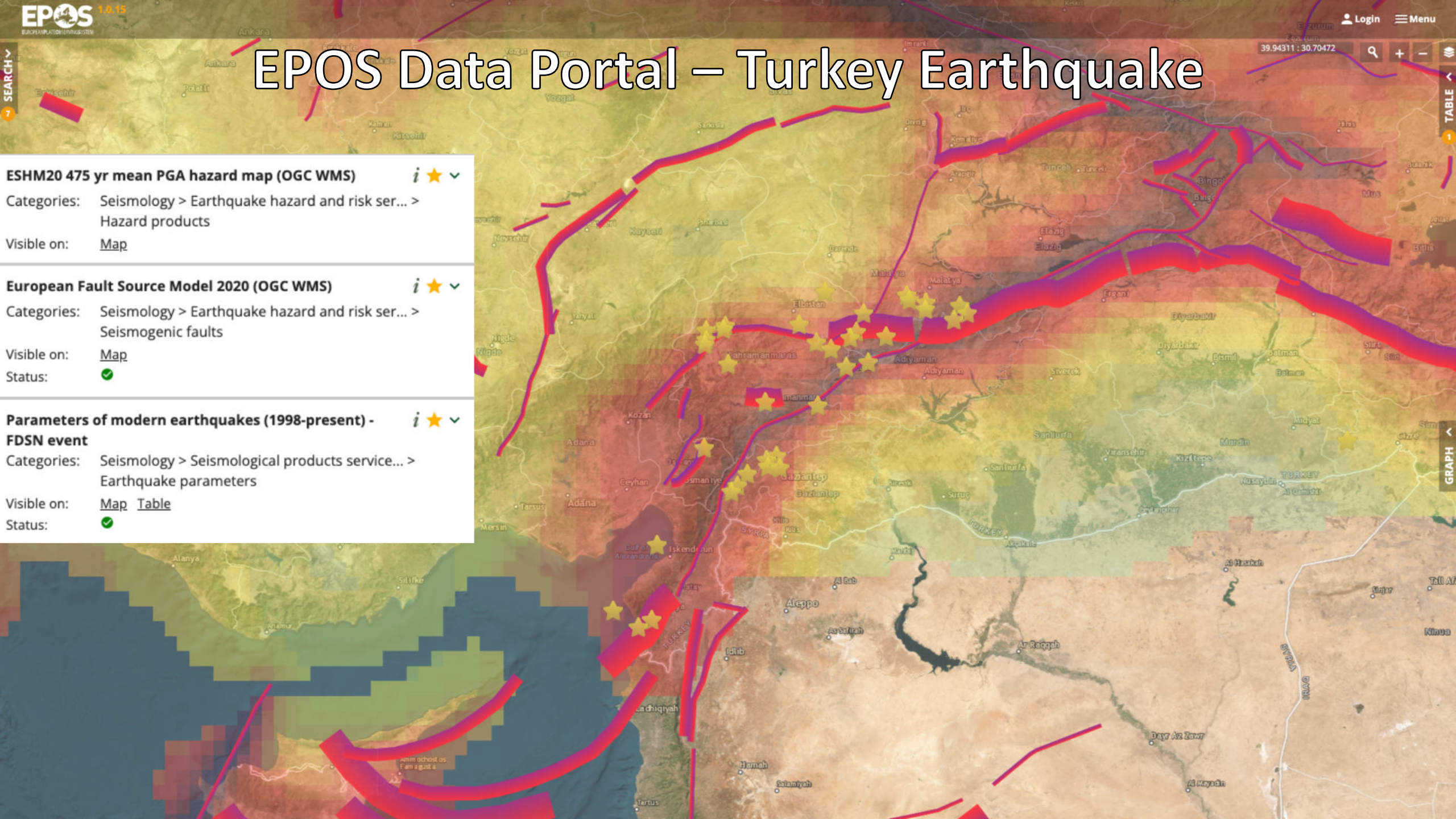


Thank You!

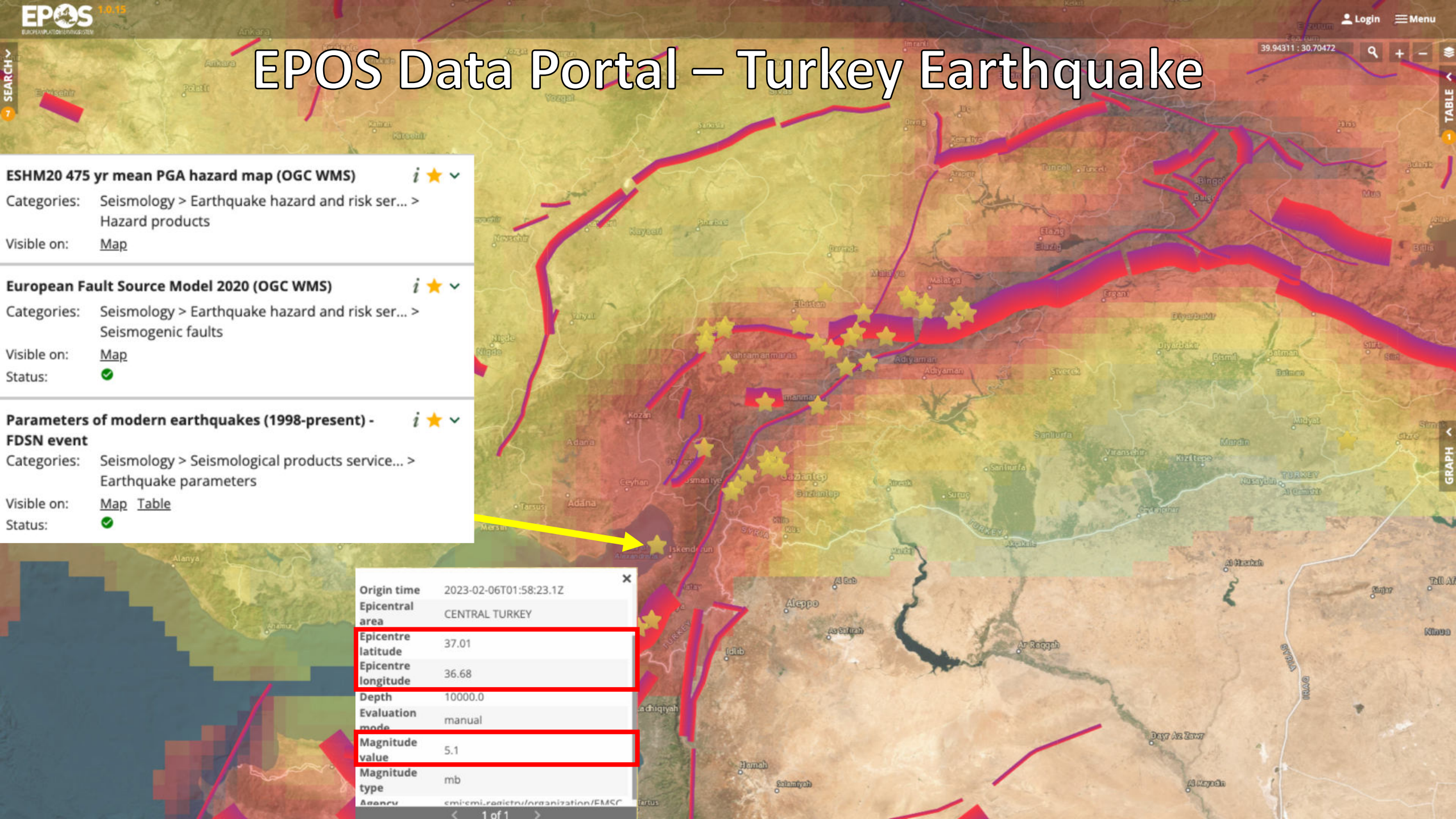
EPOS Data Portal – Use case

Turkey earthquake
6 February 2023

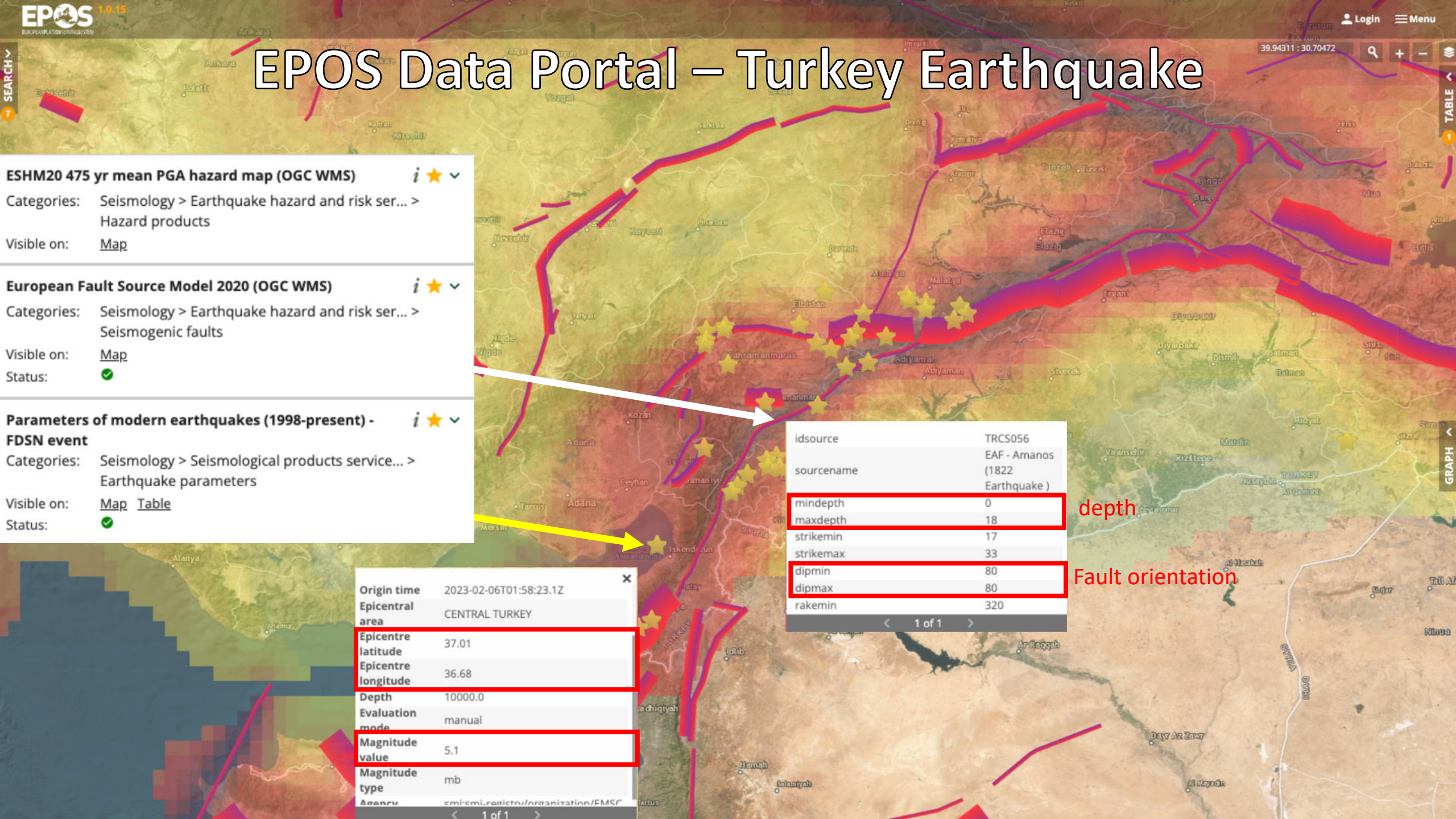
EPOS Data Portal – Turkey Earthquake



EPOS Data Portal – Turkey Earthquake



EPOS Data Portal – Turkey Earthquake



EPOS Data Portal – Turkey Earthquake

Likelihood of an earthquake of a certain intensity occurring in a specific area, based on historical data

ESHM20 475 yr mean PGA hazard map (OGC WMS)

Categories: Seismology > Earthquake hazard and risk ser... > Hazard products

Visible on: Map

European Fault Source Model 2020 (OGC WMS)

Categories: Seismology > Earthquake hazard and risk ser... > Seismogenic faults

Visible on: Map

Status: ✔

Parameters of modern earthquakes (1998-present) - FDSN event

Categories: Seismology > Seismological products service... > Earthquake parameters

Visible on: Map Table

Status: ✔

idsource	TRCS056
sourcename	EAF - Amanos (1822 Earthquake)
mindepth	0
maxdepth	18
strikemin	17
strikemax	33
dipmin	80
dipmax	80
rakemin	320

1 of 1

depth

Fault orientation

Origin time	2023-02-06T01:58:23.1Z
Epicentral area	CENTRAL TURKEY
Epicentre latitude	37.01
Epicentre longitude	36.68
Depth	10000.0
Evaluation mode	manual
Magnitude value	5.1
Magnitude type	mb
Agency	smi:smi-registry/organization/EMSC

1 of 1

EPOS Data Portal – Turkey Earthquake

Likelihood of an earthquake of a certain intensity occurring in a specific area, based on historical data

ESHM20 475 yr mean PGA hazard map (OGC WMS)
Categories: Seismology > Earthquake hazard and risk ser... > Hazard products
Visible on: Map

European Fault Source Model 2020 (OGC WMS)
Categories: Seismology > Earthquake hazard and risk ser... > Seismogenic faults
Visible on: Map
Status:

Parameters of modern earthquakes (1998-present) - FDSN event
Categories: Seismology > Seismological products service... > Earthquake parameters
Visible on: Map Table
Status:

European Exposure Model - Admin 1 Level Data
Categories: Seismology > Earthquake hazard and risk ser... > Exposure models
Visible on: Map
Status:

idsource	TRCS056
sourcename	EAF - Amanos (1822 Earthquake)
mindepth	0
maxdepth	18
strikemin	17
strikemax	33
dipmin	80
dipmax	80
rakemin	320

1 of 1

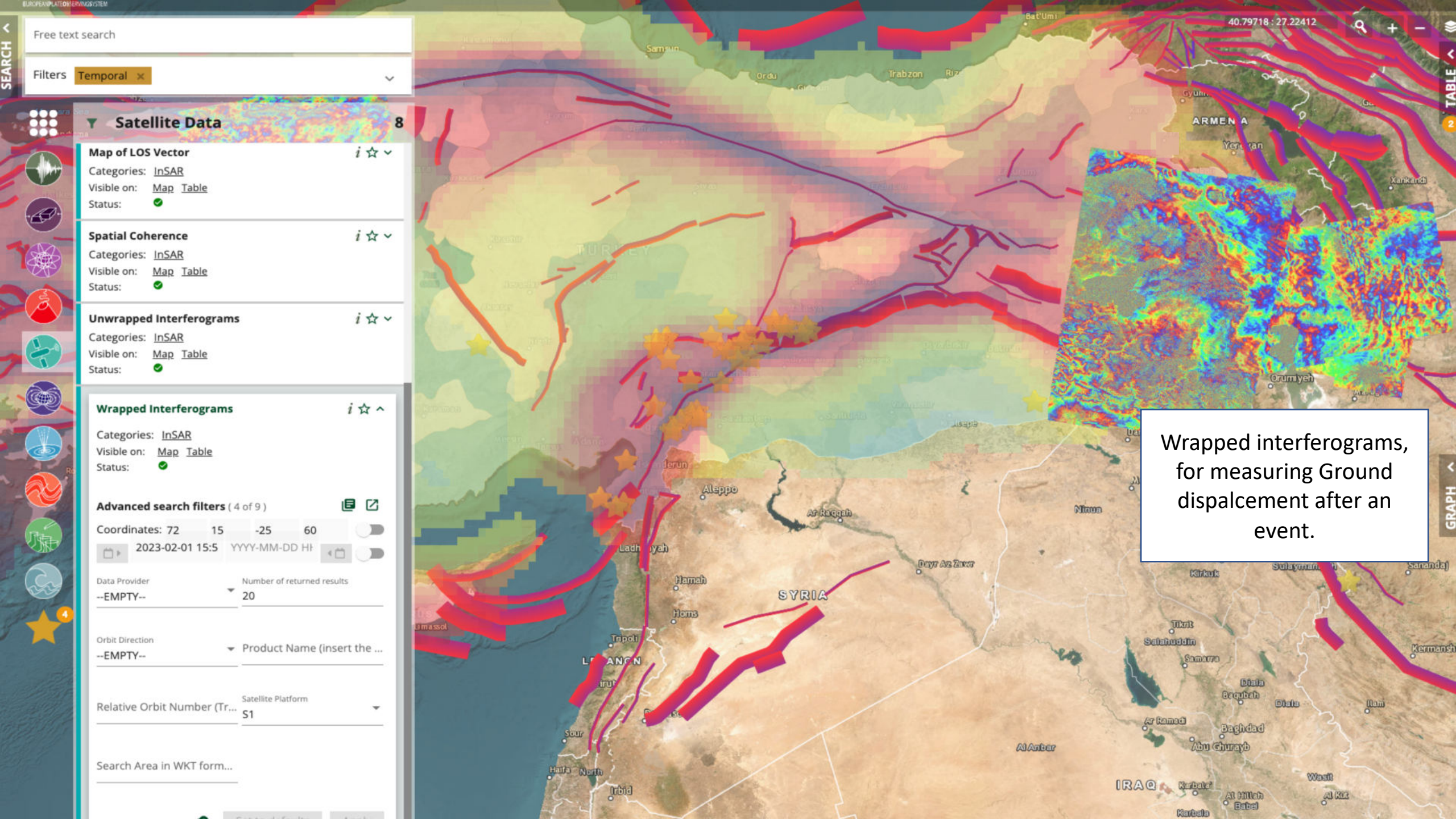
depth

Fault orientation

Depth	10000.0
Evaluation mode	manual
Magnitude value	5.1
Magnitude type	mb

1 of 1

Administrative level (admin 1) distribution of population, helpful to assess potential impact of hazards on population


Free text search
Filters
Temporal
Satellite Data
8
Map of LOS Vector
Categories: InSAR
Visible on: Map Table
Status:
Spatial Coherence
Categories: InSAR
Visible on: Map Table
Status:
Unwrapped Interferograms
Categories: InSAR
Visible on: Map Table
Status:
Wrapped Interferograms
Categories: InSAR
Visible on: Map Table
Status:
Advanced search filters (4 of 9)
Coordinates: 72 15 -25 60
2023-02-01 15:5
YYYY-MM-DD HH
Data Provider
--EMPTY--
Number of returned results
20
Orbit Direction
--EMPTY--
Product Name (insert the ...
Relative Orbit Number (Tr...
Satellite Platform
S1
Search Area in WKT form...
40.79718 : 27.22412
Wrapped interferograms, for measuring Ground dispalcement after an event.

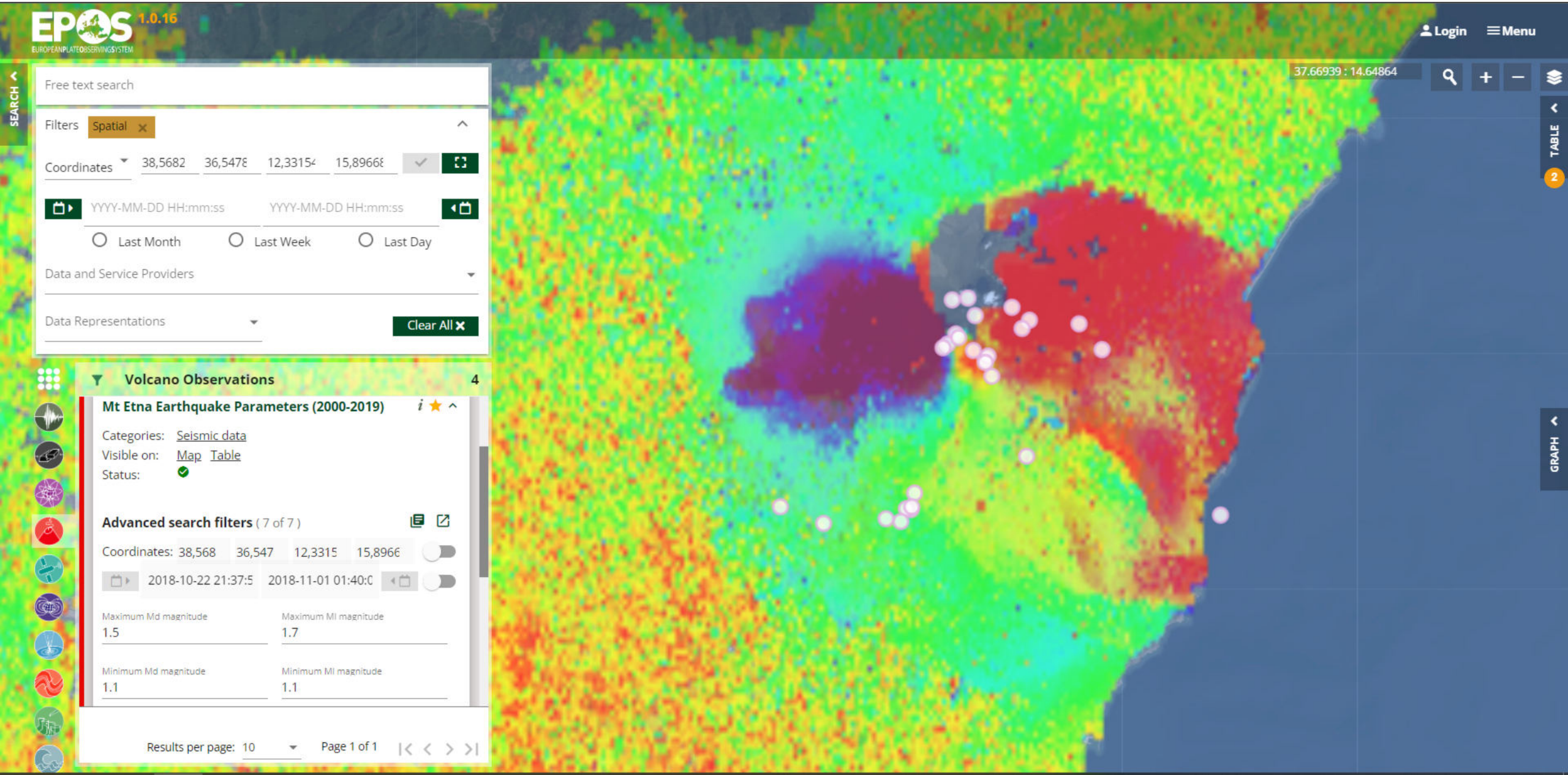
EPOS Data Portal Training

By: Harald Nedrebø,

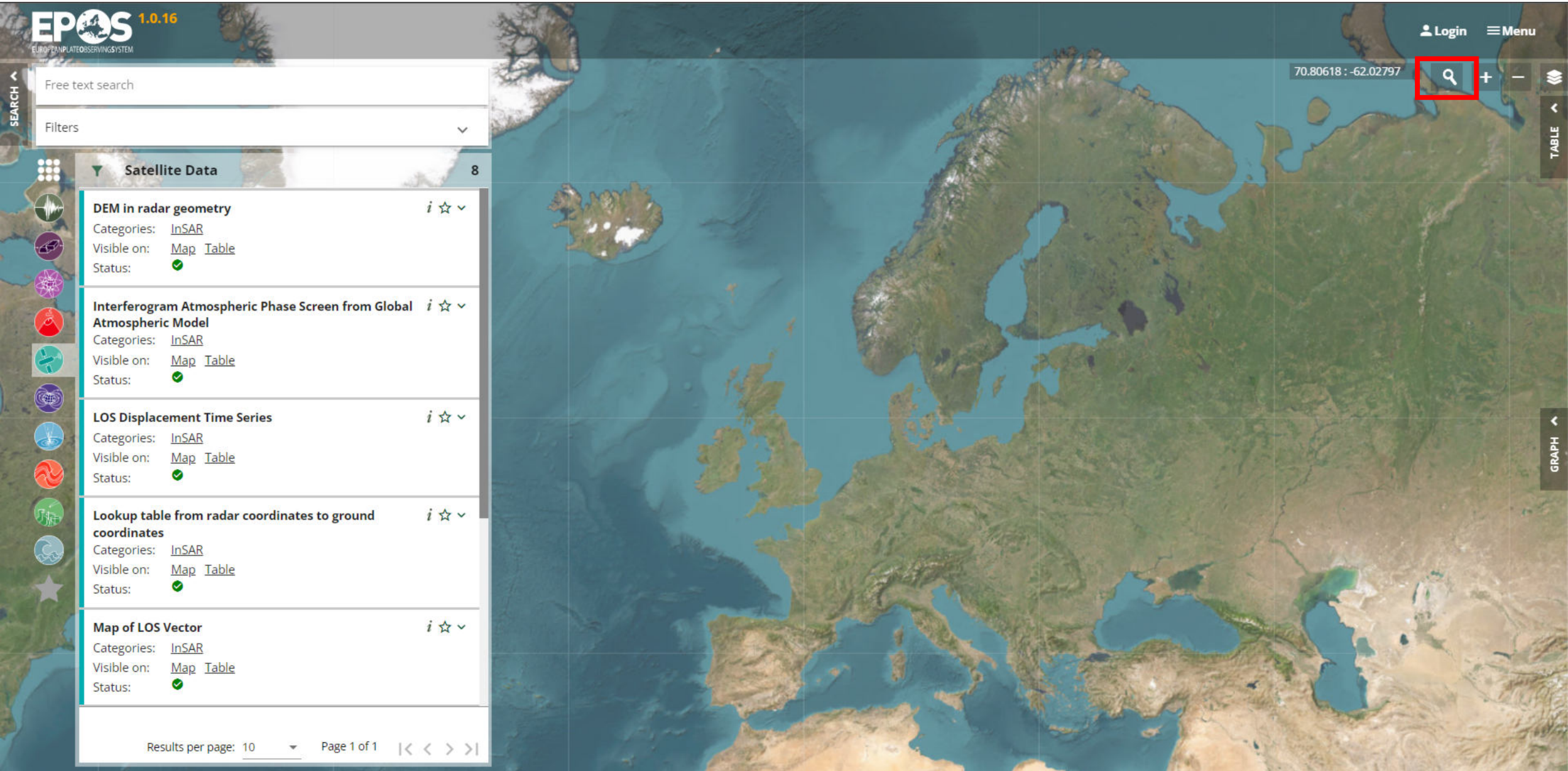
EPOS,

University of Bergen

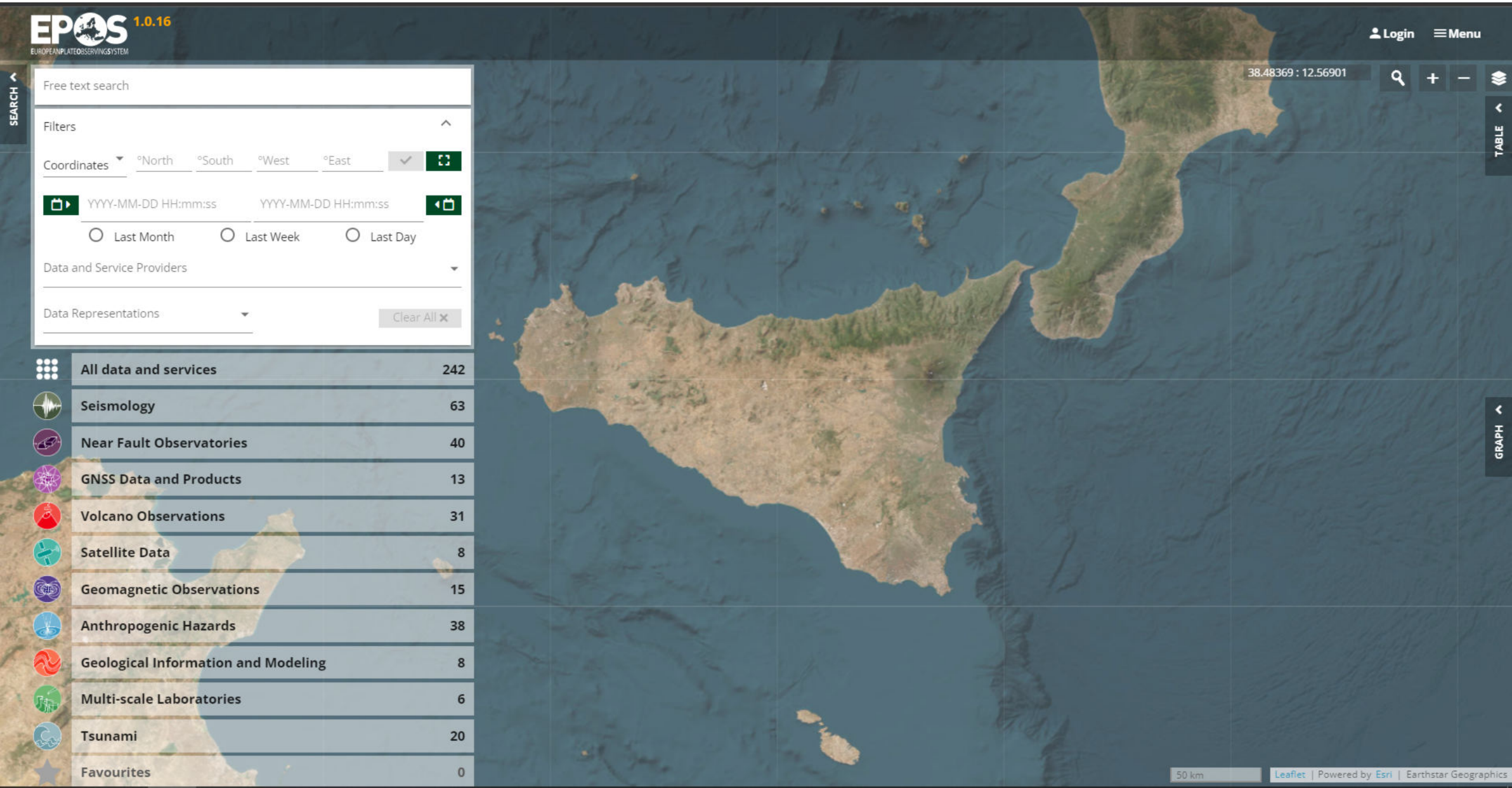
Use case for Volcanism and earthquakes for Etna, Italy



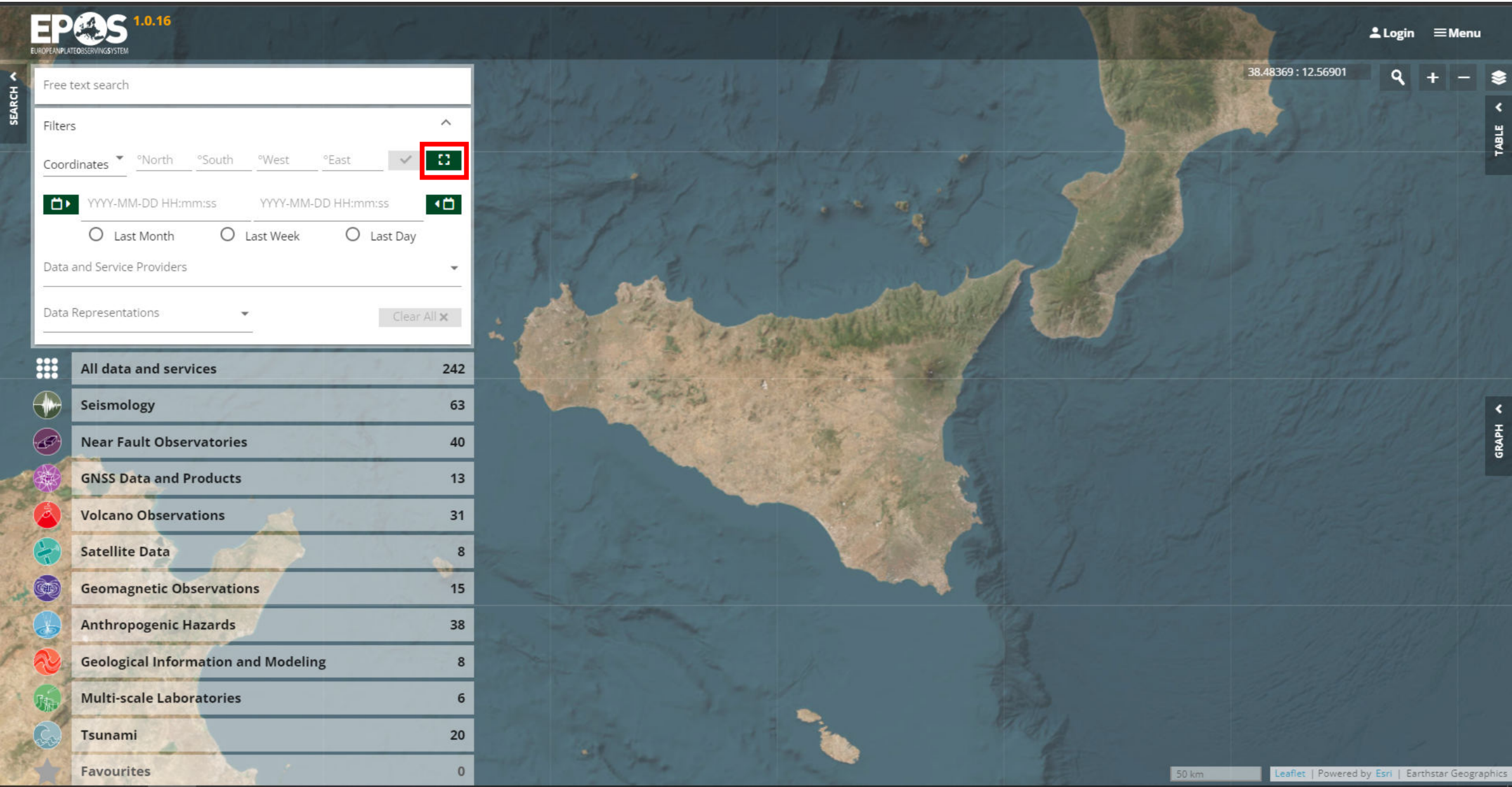
Use the magnifying glass to search for «Sicily»



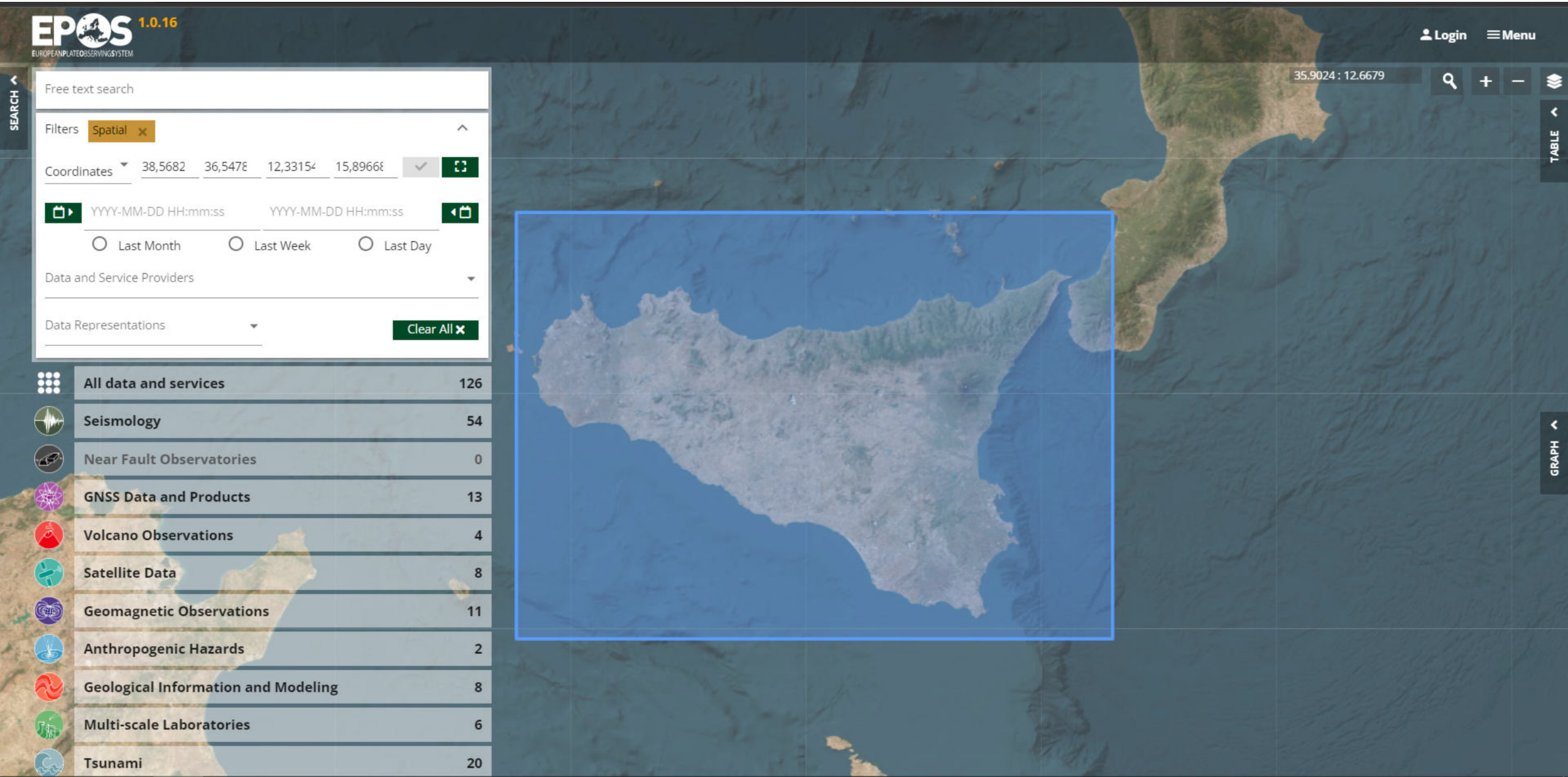
The map will zoom to the location around Sicily.



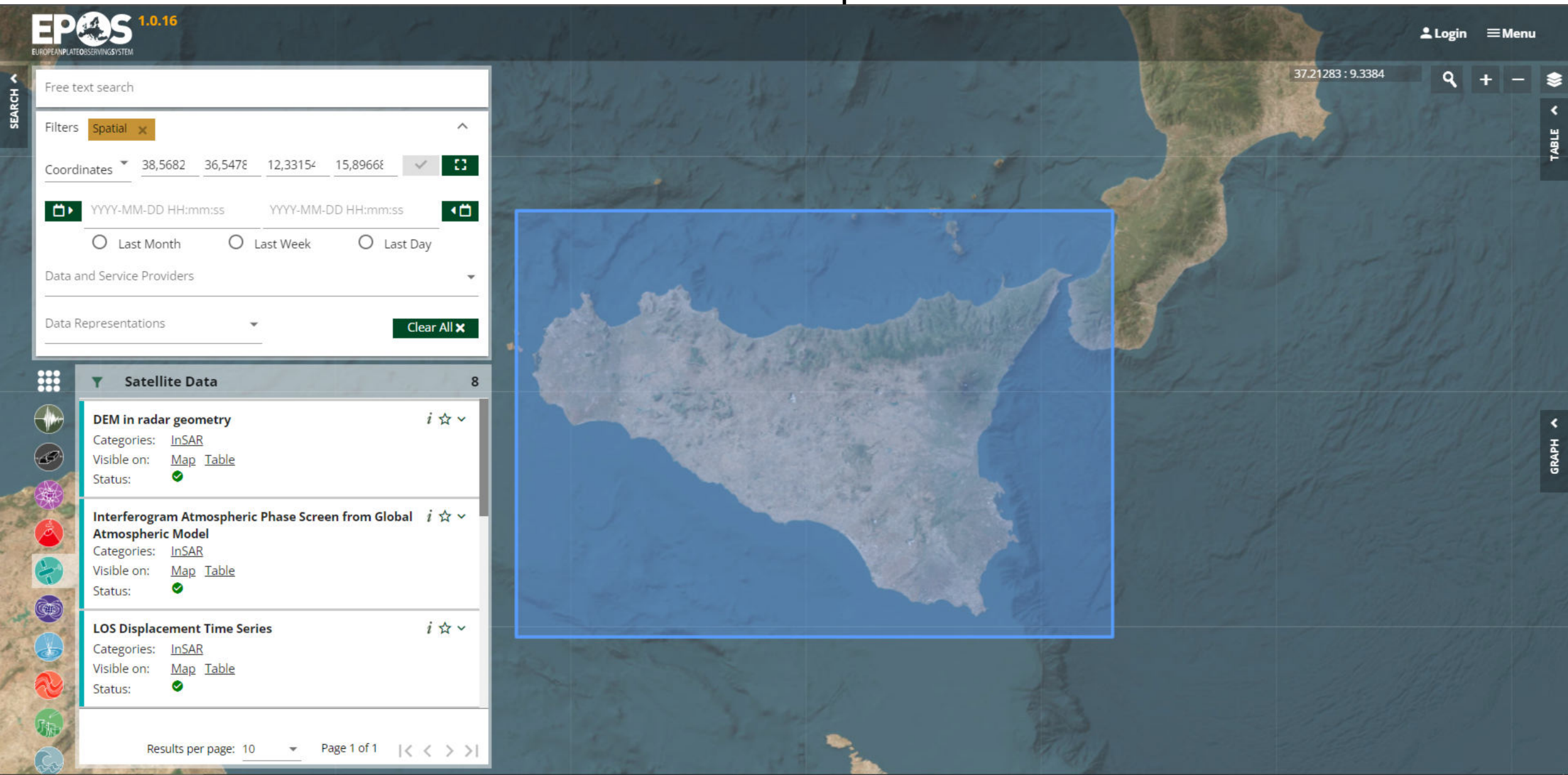
Select the rectangular section to refine the services in the area



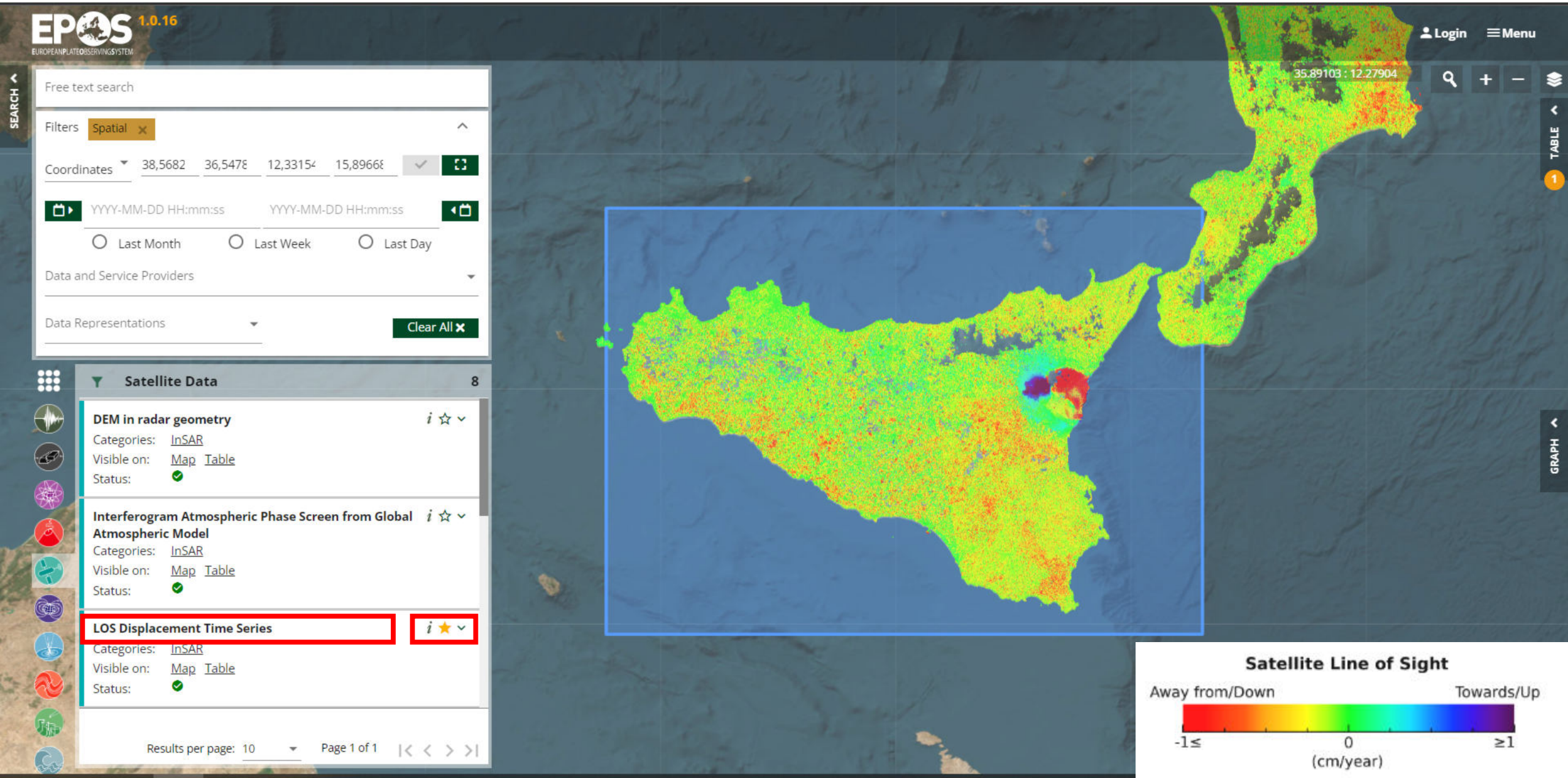
Notice the services in the left menu is reduced



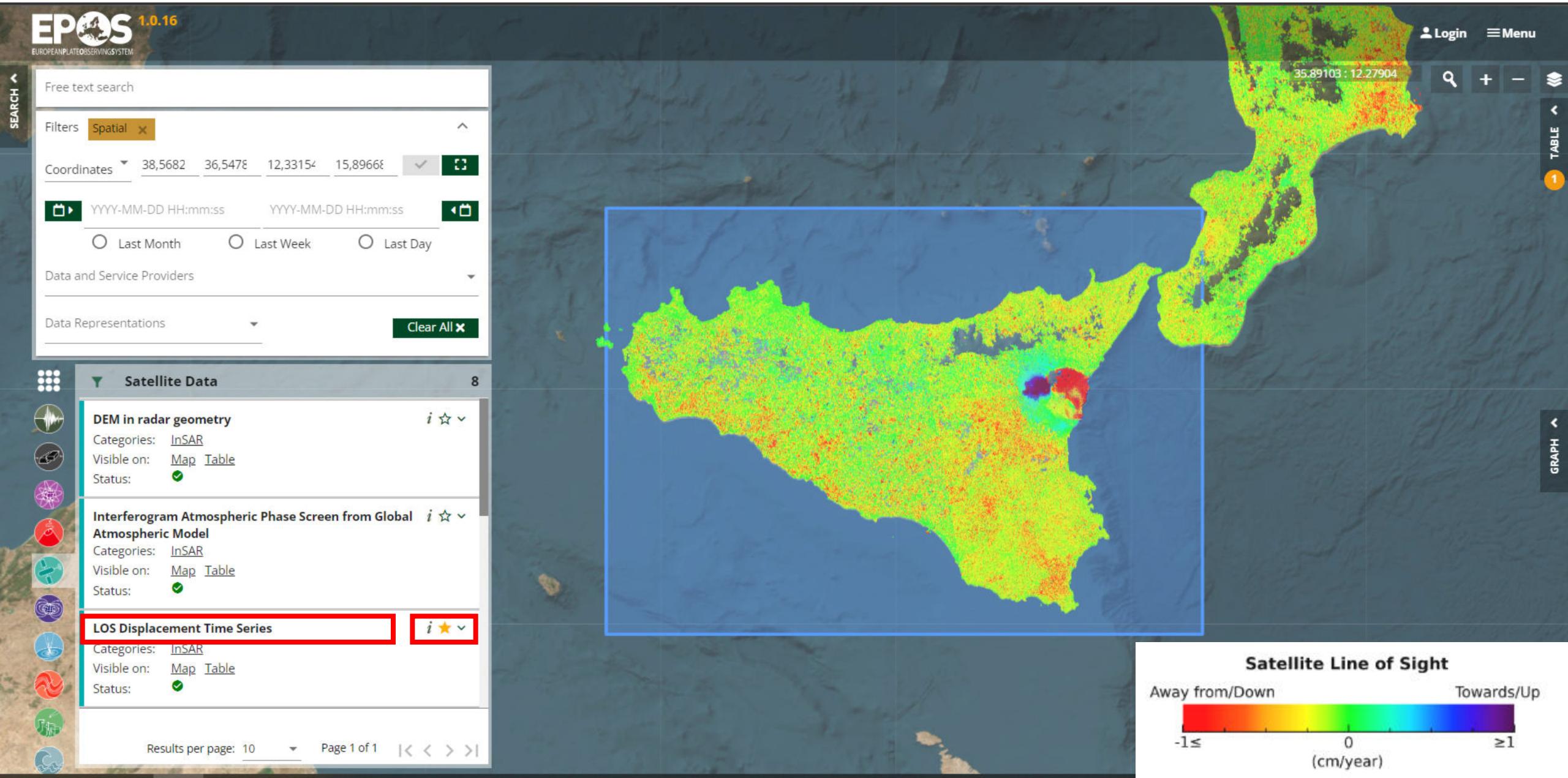
Select Sattelite Data - «LOS Displacement Time Series»



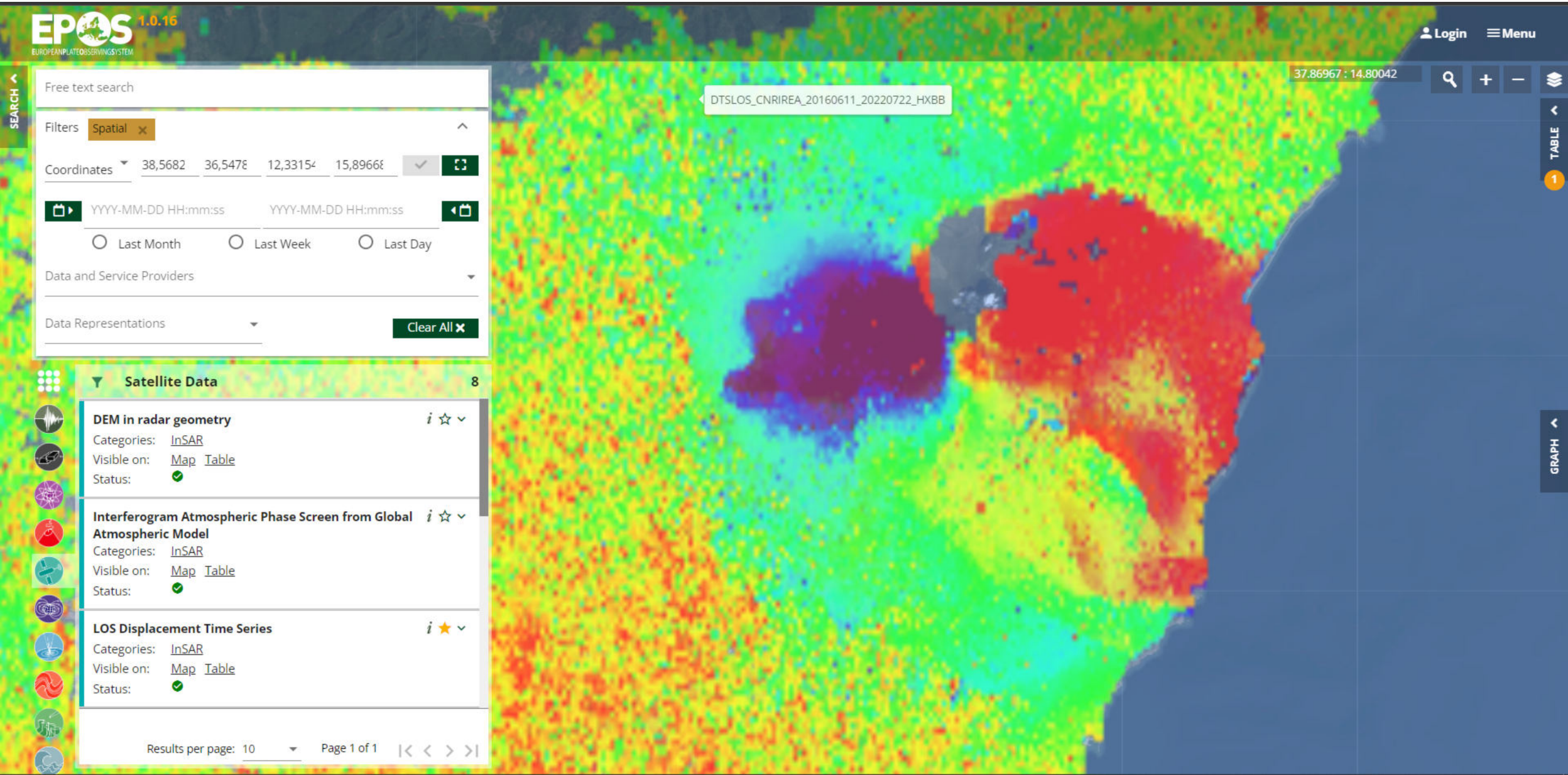
This will provide INSAR Sattelite images



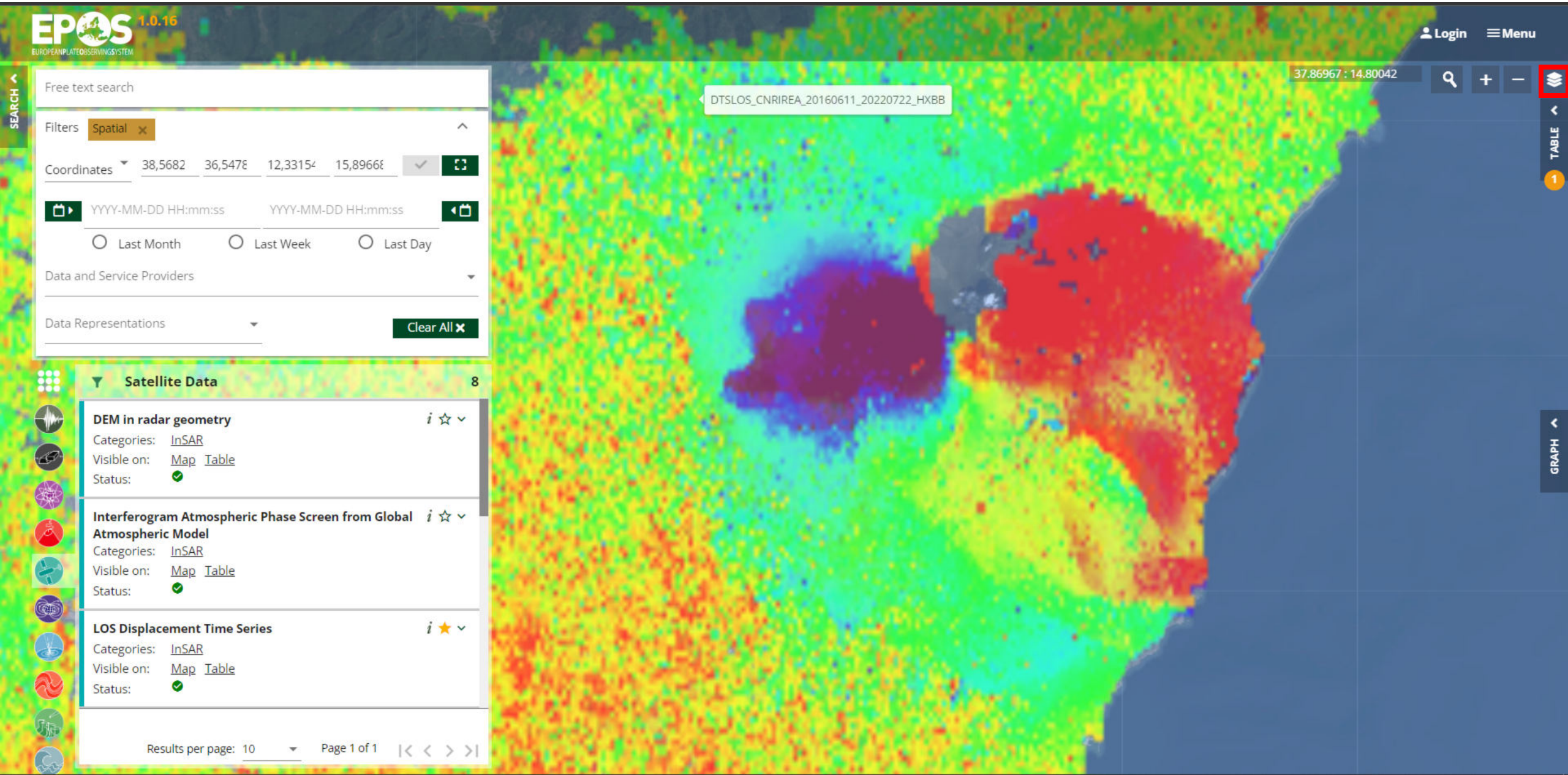
Notice the areas that has high uplift and sinking



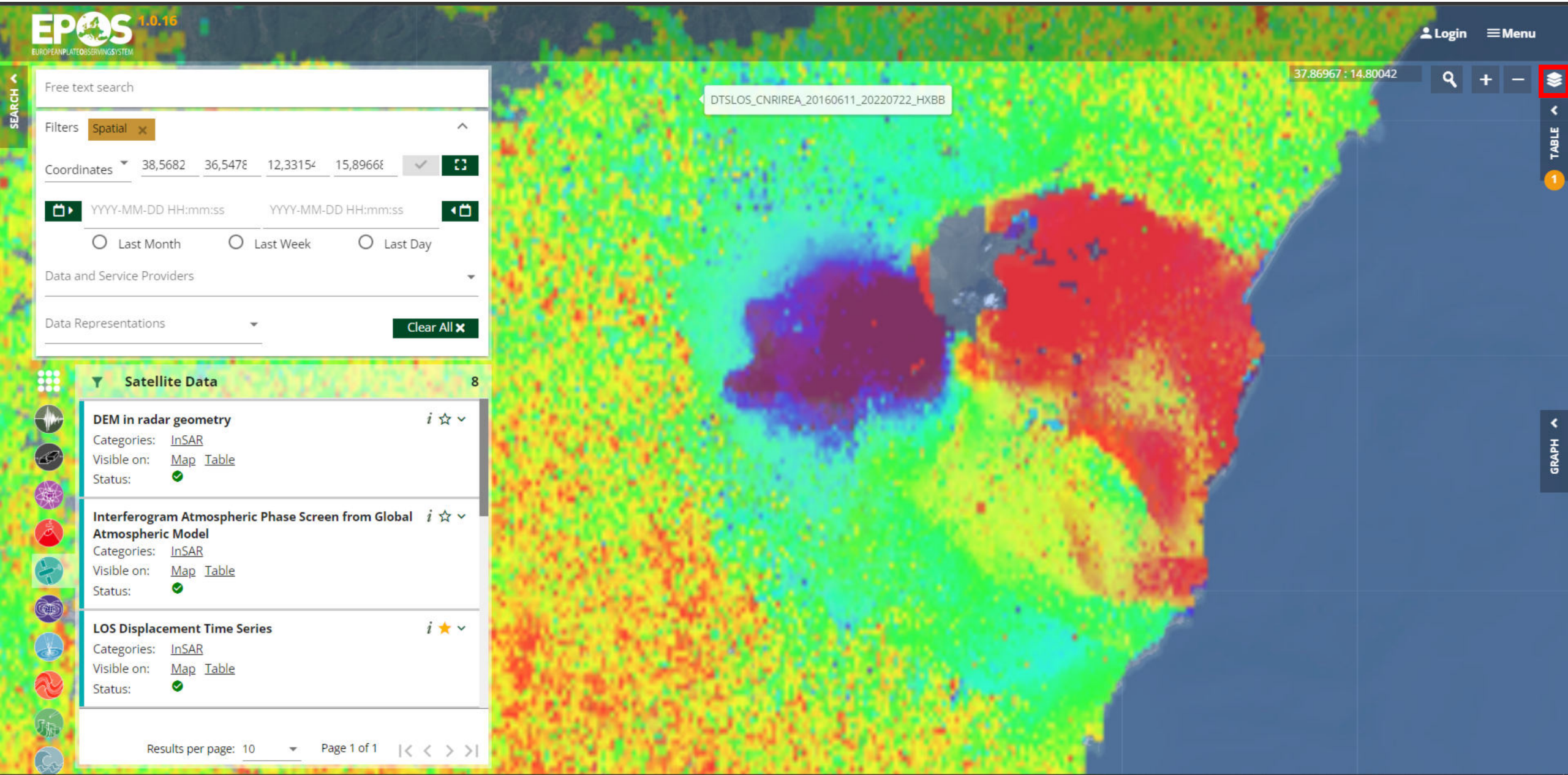
Zooming further in provide more detail



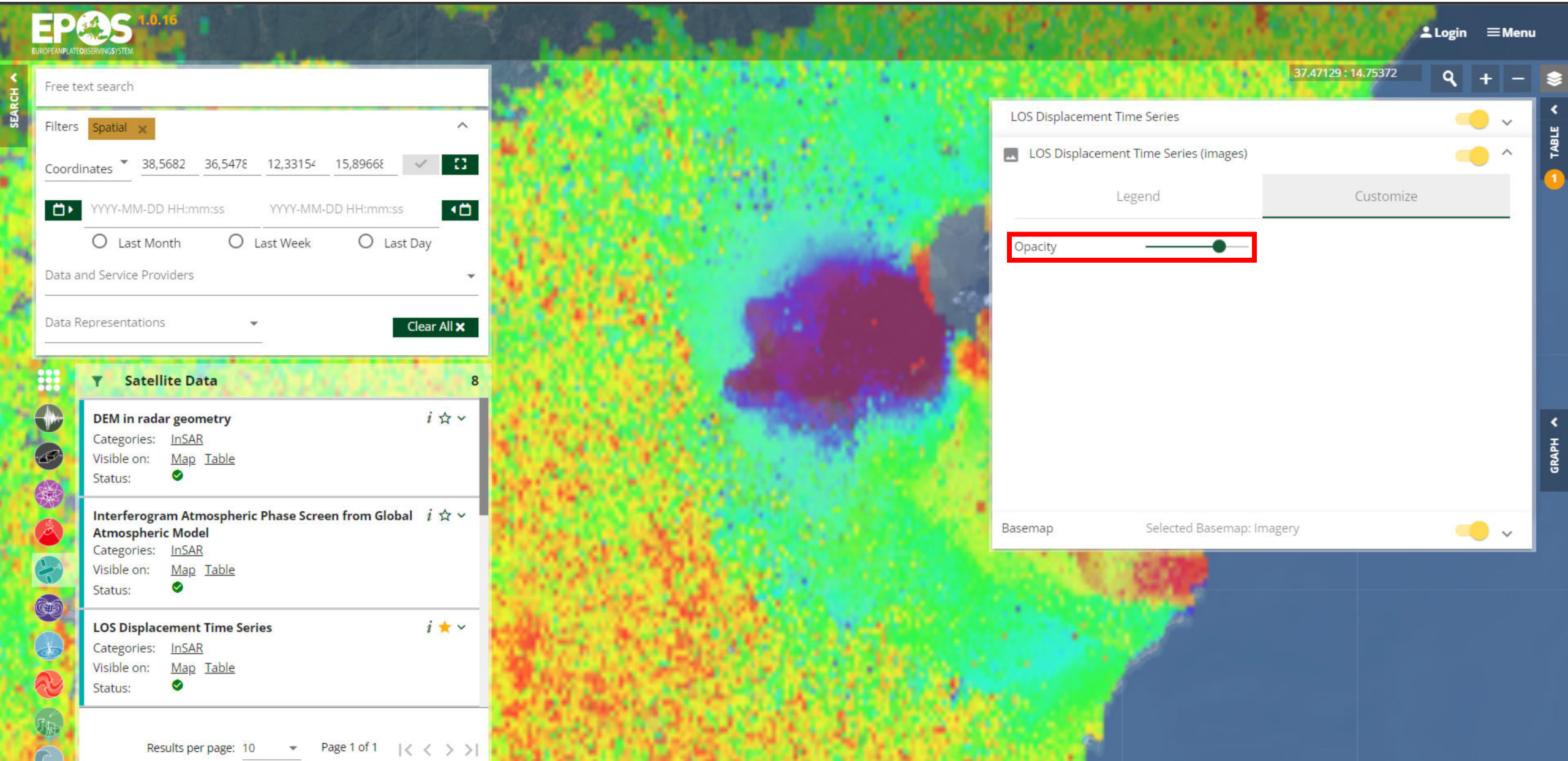
You can change opacity in the layer/legend tool



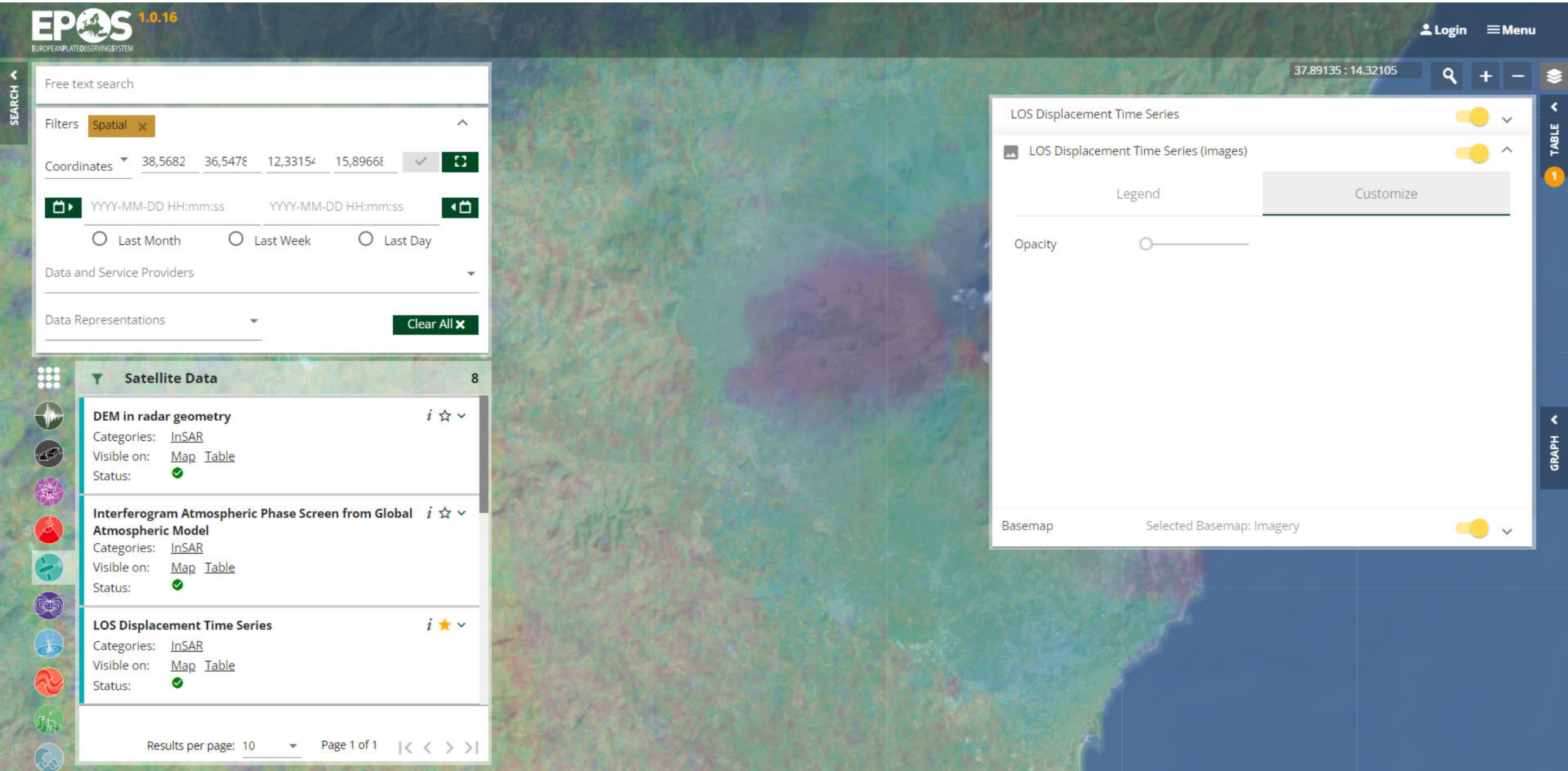
You can change opacity in the layer/legend tool



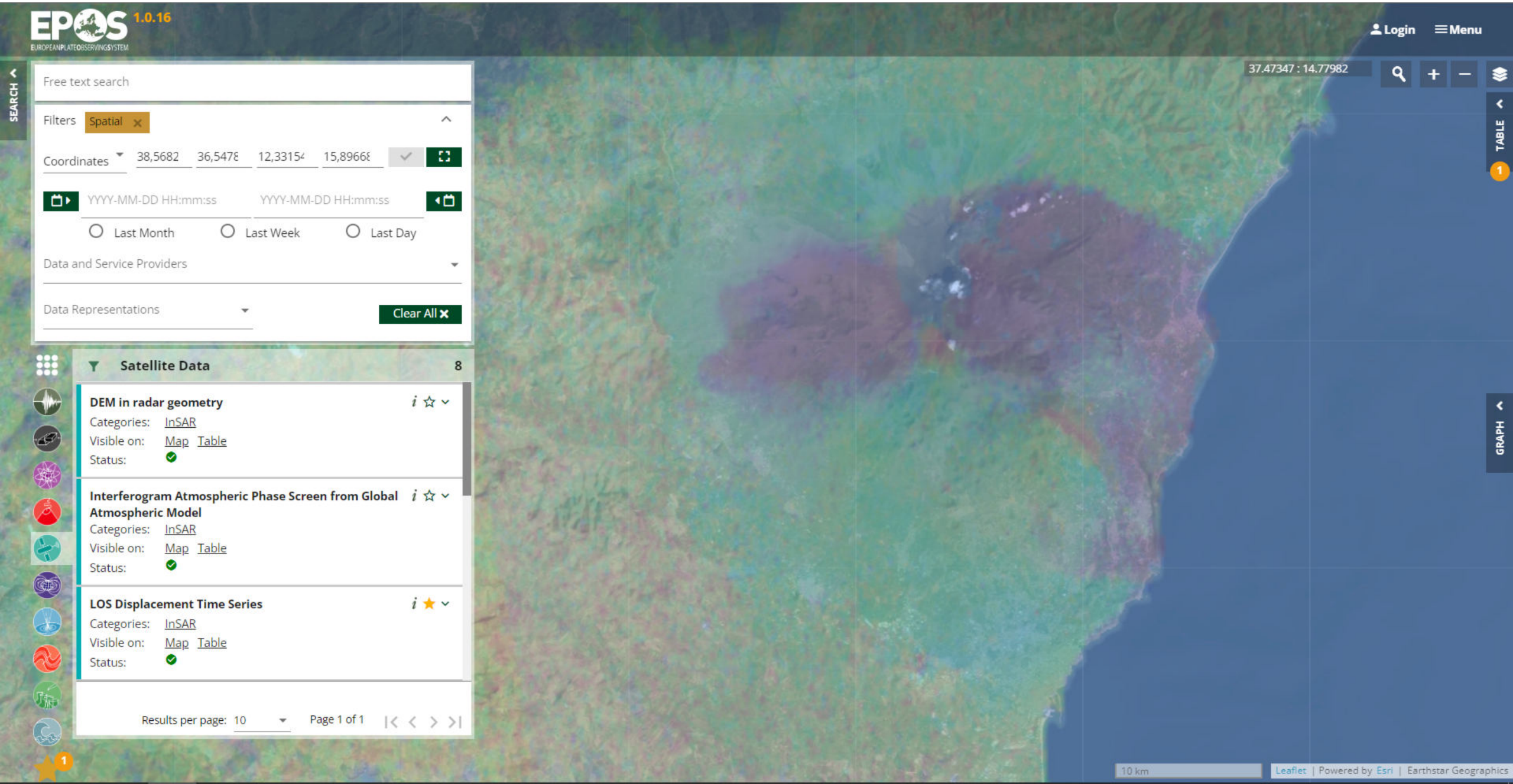
You can change opacity in the layer/legend tool



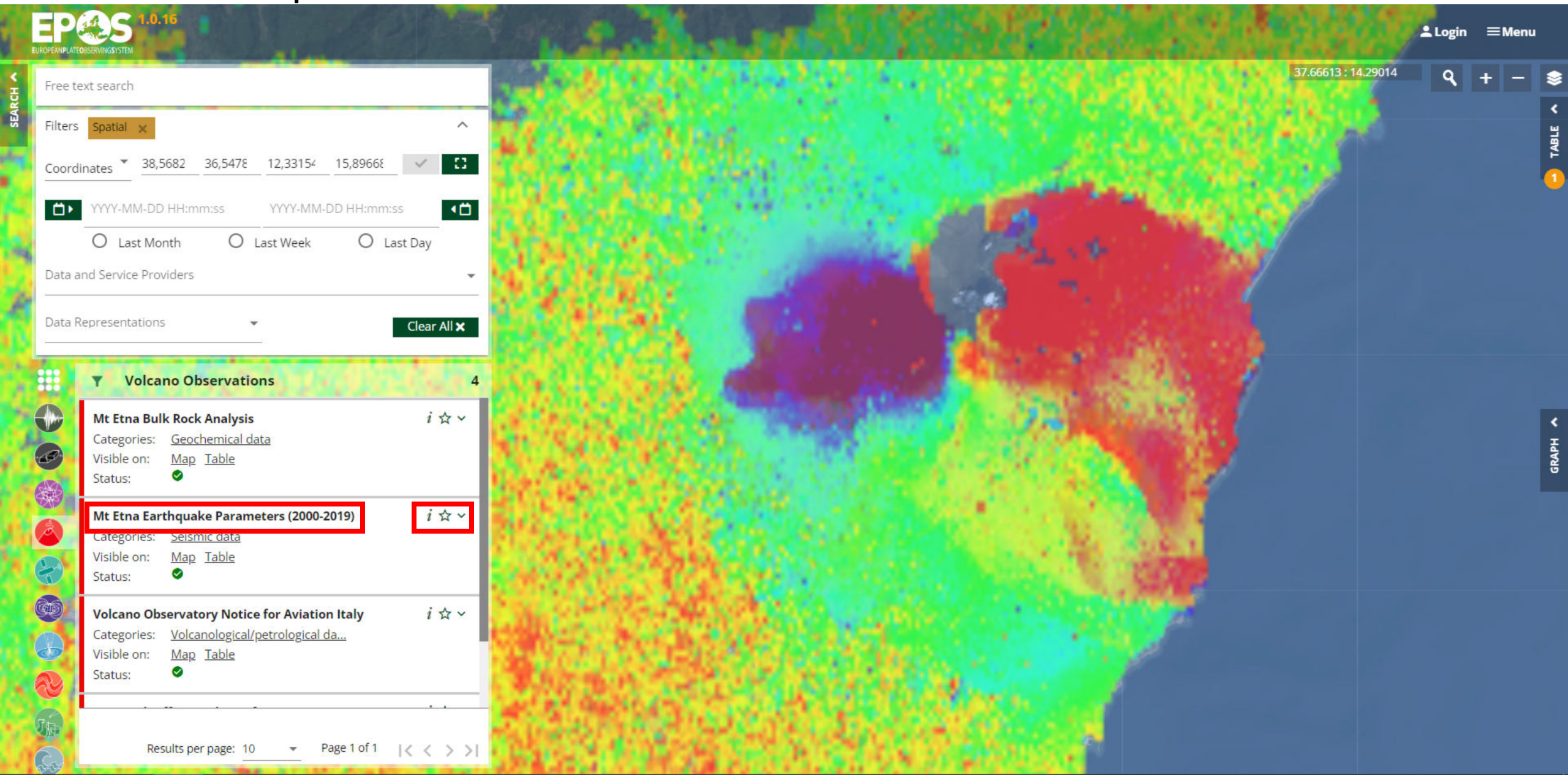
To see how it corresponds with the map image



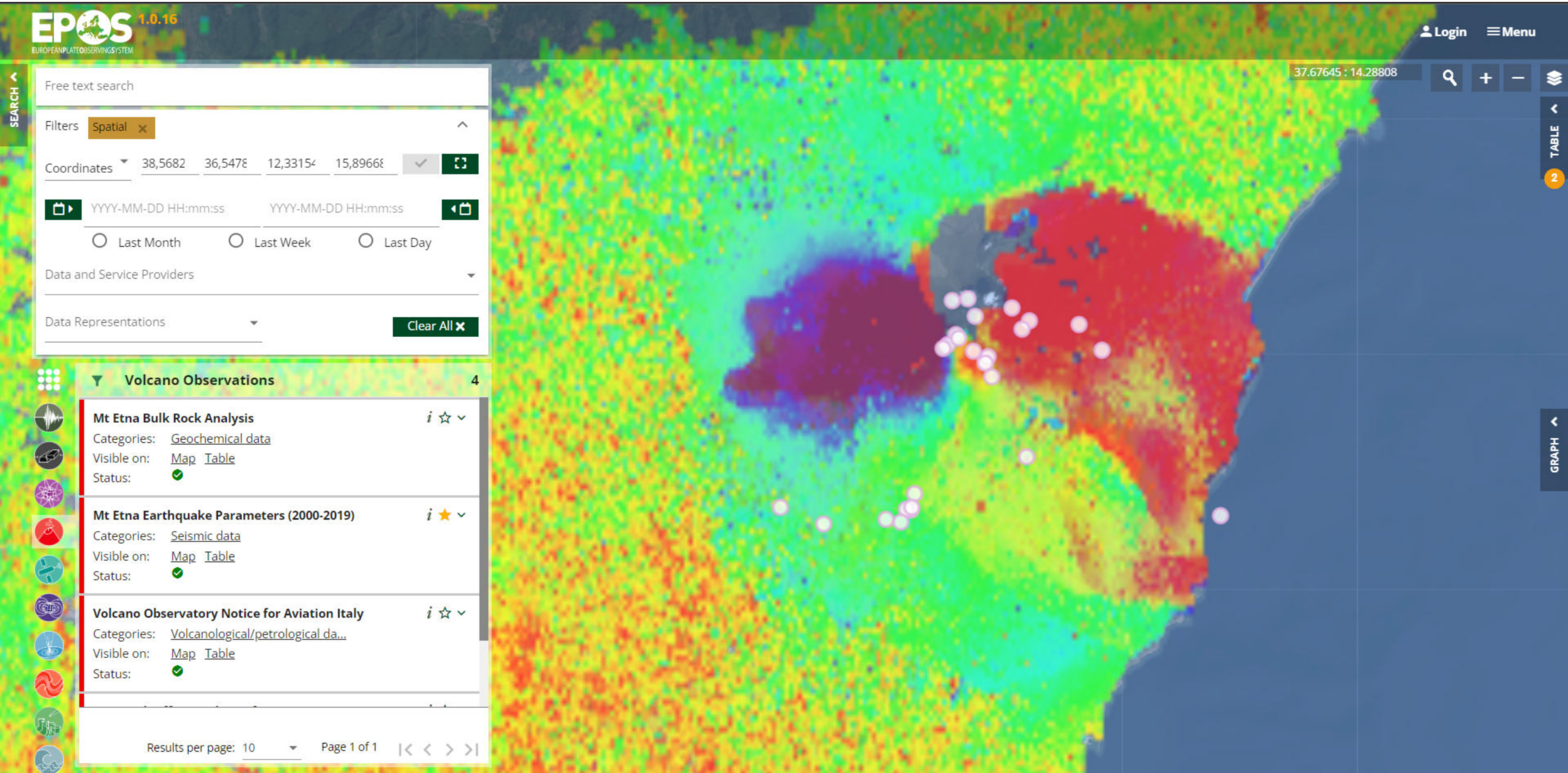
To see the effect for Etna volcano



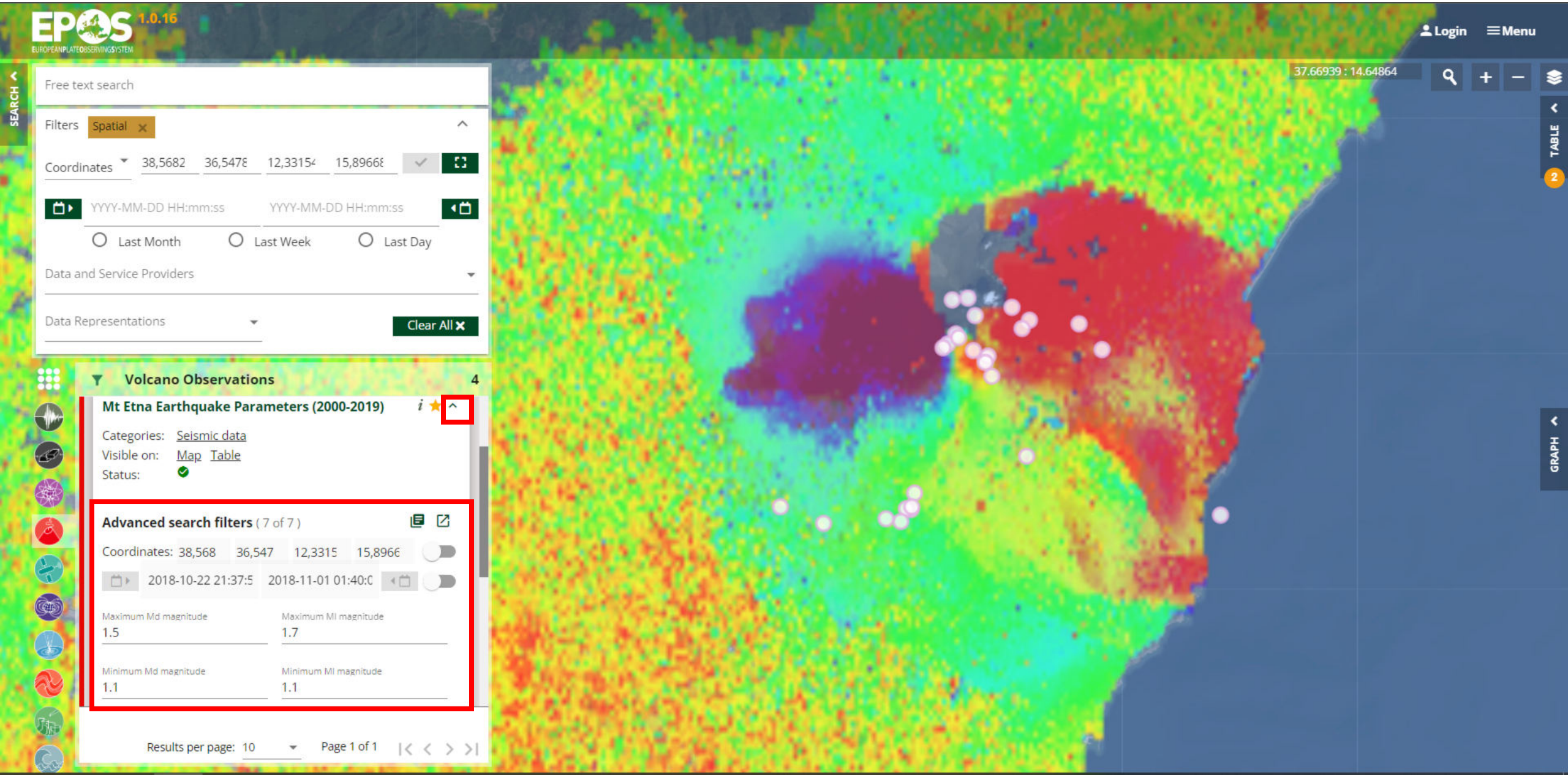
Select Volcano **Observations** – Mt. Etna Earthquakes



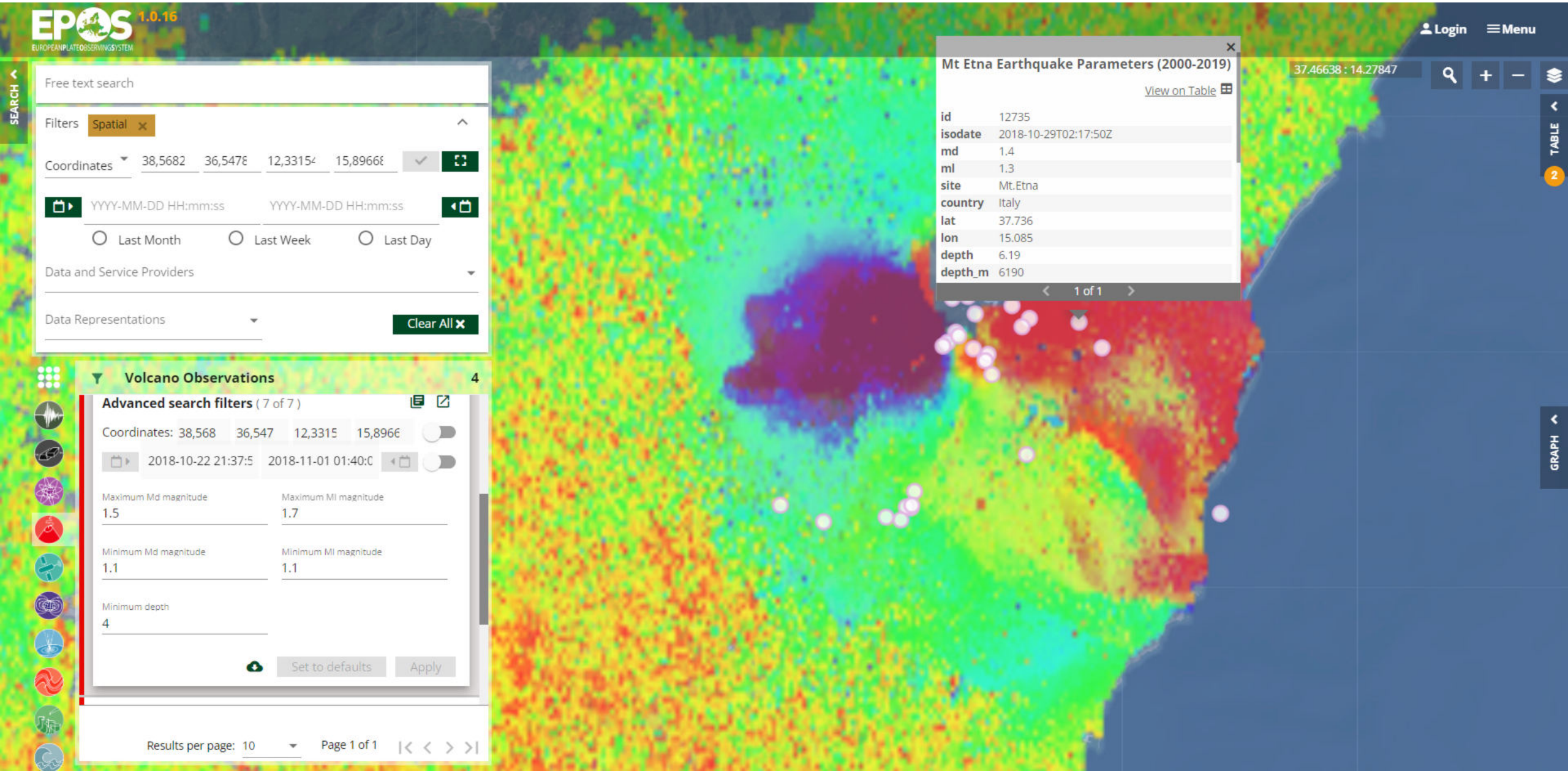
Earthquakes related to the volcano is displayed in circles



Parameters for space, time and magnitude can be changed



By pressing the circles, you see the metadata



There is also an option to see eartquakes in table view