EPOS e-Infrastructure: Look into the future of Data Access and Management in Earth Sciences

Adelina Geyer Traver (GEO3BCN-CSIC)

EPOS-ES national node Coordinator

EPOS EUROPEANPLATEOBSERVINGSYSTEM www.epos-eu.org

EPOS - ES EUROPEANPLATEOBSERVINGSYSTEM SPAIN

Solid Earth Science is the key to decipher chemical and physical processes that trigger and control natural phenomena

Natural processes do not respect national boundaries
To be understood, they require cross-disciplinary approaches

Integrated, multidisciplinary research is <u>mandatory</u> to:

- understand the Earth's chemical and physical processes
- assess the hazard and mitigate the risk
- sustainably exploit geo-resources
- forecast the events

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The challenge is to make the enormous wealth of scientific data generated by many different scientific communities **universally and openly accessible**

EPOS: A long journey from conception to operation

Vision

To ensure sustainable and universal use and re-use of multidisciplinary solid Earth science data and products fostering state-of-the-art research and innovation

Vision:

*Bigger picture and future-oriented;
*Defines the end game.

EPOS: A long journey from conception to operation

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Mission

To establish a sustainable and long-term access to solid Earth science data and services integrating diverse European Research Infrastructures under a common federated framework

Mission:

*More immediately focused on the present;
*Road map that takes you to the vision.

EPOS: A long journey from conception to operation

Vision

To ensure **sustainable and universal use and re-use of multidisciplinary solid Earth science data and products fostering state-of-the-art research and innovation**

Mission

To **establish a sustainable and long-term access to solid Earth science data and services integrating diverse European Research Infrastructures under a common federated framework**

The EPOS Data Portal is now fully operational

a multi-domain portal that grants **open access to harmonized and interoperable scientific data and products** applying FAIR principles

The heterogenous EPOS landscape

EPOS brings together European nations and international organizations and combines hundreds of solid Earth science infrastructures and their capital of human expertise, scientific data and facilities into one integrated system.

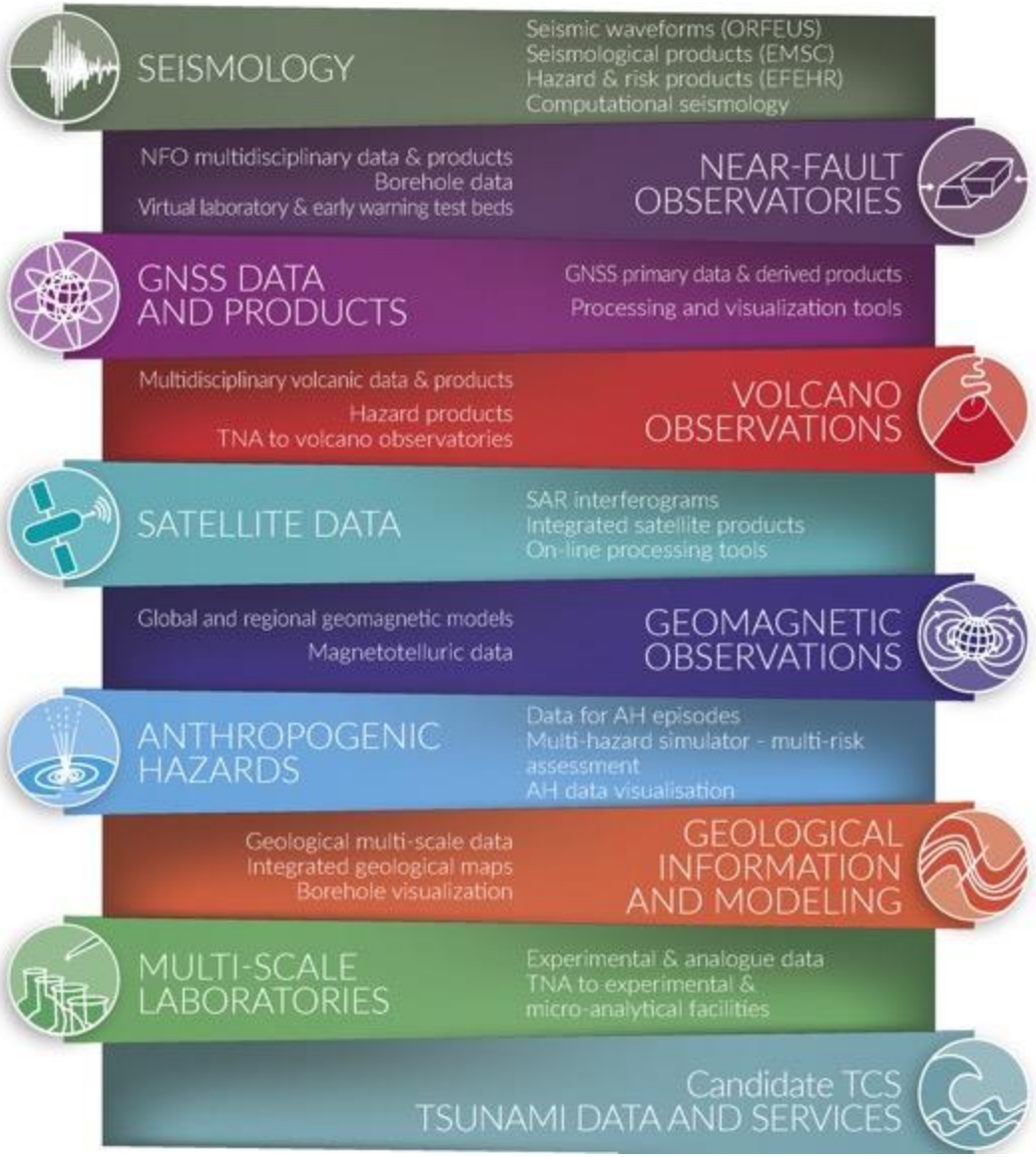
EPOS ERIC

- The ERIC, is the tool chosen by the Community to govern and operate EPOS.
- Currently EPOS ERIC is joined by 19 countries.
- The EPOS ERIC decision body is the **General Assembly**, composed of ministry representatives by all Members.
- The EPOS ERIC **legal seat** is in Italy (INGV, Rome), where the Executive Coordination Office is set.
- Overall, EPOS ERIC **ensures joint strategies** to achieve **scientific and technological innovation** across all stakeholders involved, and tackles the **sustainability** challenge with harmonized approaches.
- A **membership fee** is paid per country to allow the participation into the ERIC.

ERIC: European Research Infrastructure Consortium

In green country members (dark) and observers (light) of the ERIC
In red, countries not in the ERIC, but still participating to the EPOS Delivery Framework
CROATIA and BULGARIA WILL JOIN EPOS ERIC IN 2024

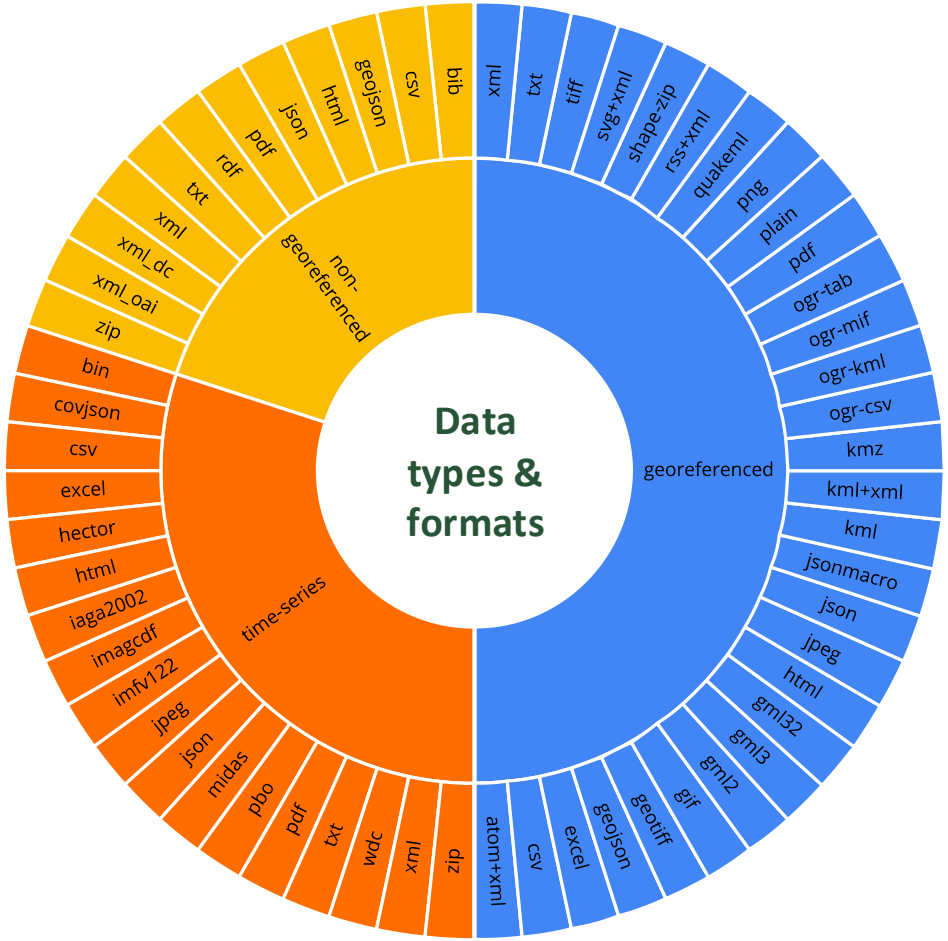
The heterogenous EPOS landscape (I): scientific domains

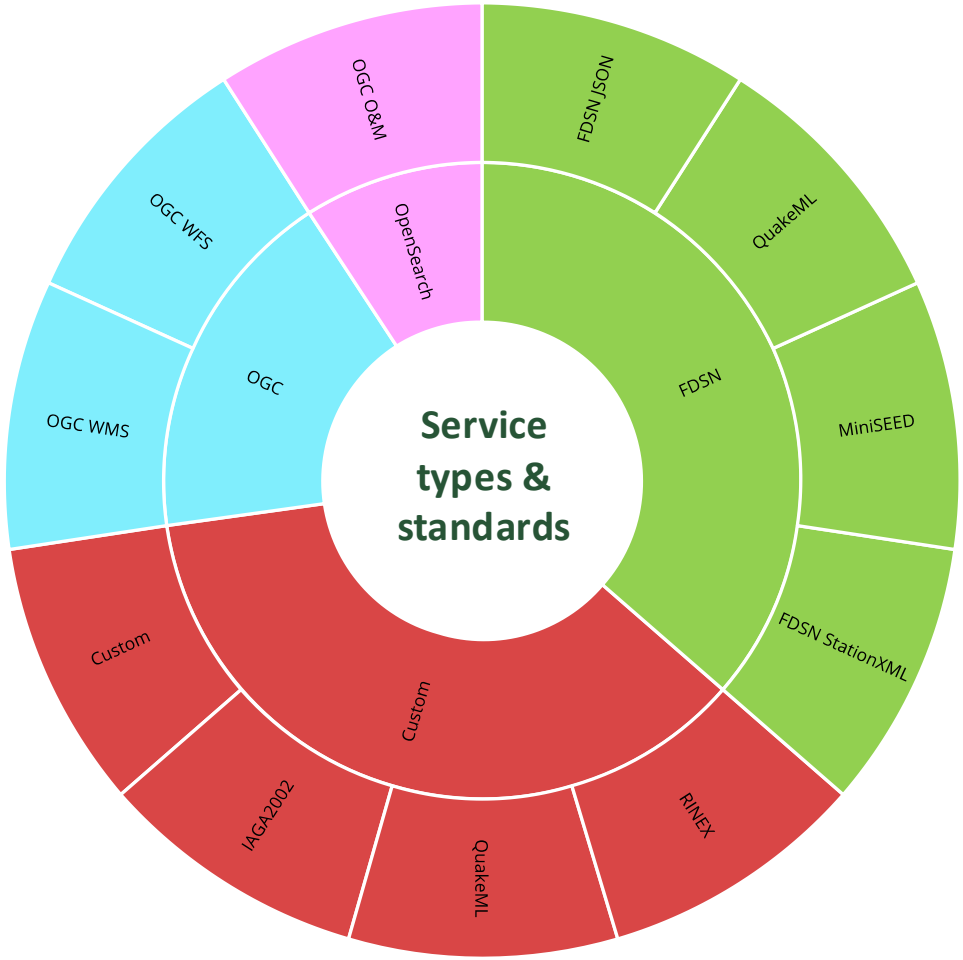


The Thematic Communities drive the evolution of EPOS

- Currently, **10 different solid Earth science domains** are harmonized across EPOS into the **Thematic Core Services (TCS).**
- Each TCS is established as a Consortium of research organisations across Europe (**Consortium Agreement**), with its own **governance.**
- TCS connote the **governance framework** to ensure the provision of multidisciplinary, high-quality, standardized data and services.
- TCS are represented in EPOS ERIC in the **Service Coordination Committee**, an advisory board to the Executive Director.

The heterogenous EPOS landscape (II): scientific data and services



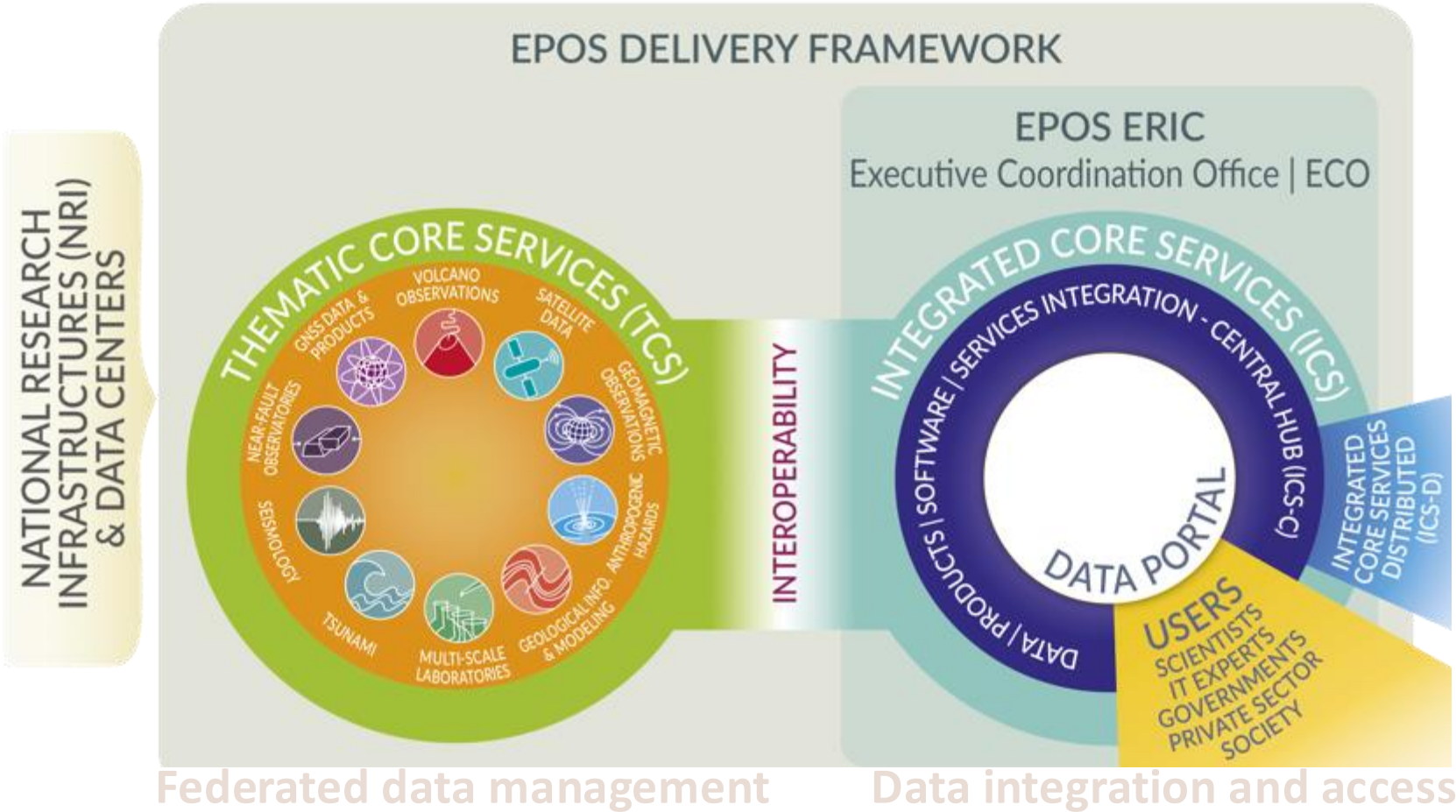


EPOS deals with data, products, and services, highly heterogeneous in terms of formats, vocabularies, standards and protocols.

The EPOS architecture

Data generation

EPOS has been designed and built by assembling distinctive elements to allow the whole system to work as a single, but distributed, research infrastructure



Federated data management

Data integration and access

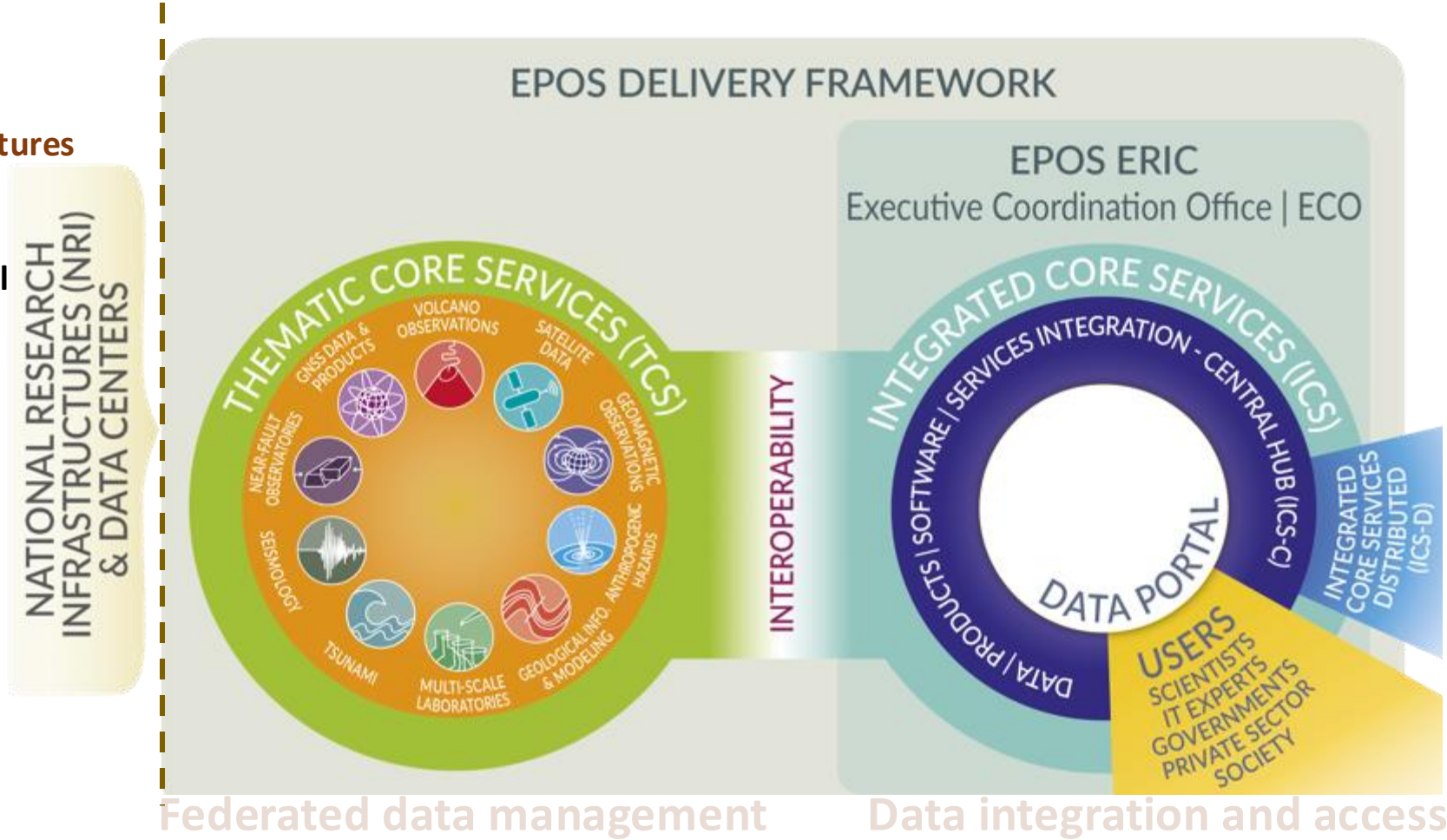
This peculiar architecture guarantees the effective engagement of all actors and stakeholders

The EPOS architecture

Data generation

National Research Infrastructures

- generate and manage data
- guarantee access to them
- **supported at national level**



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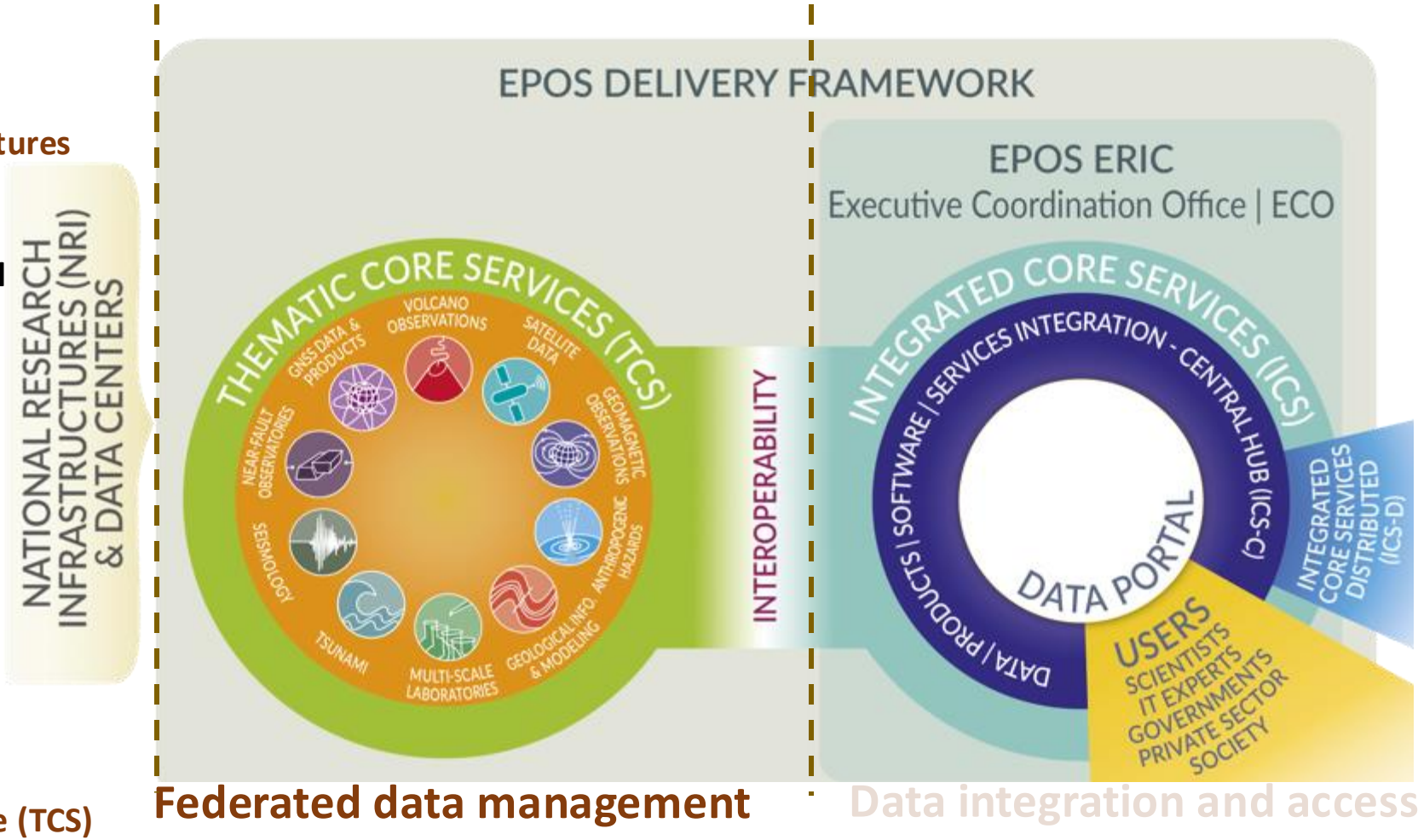

Thematic Core Service (TCS)

- the community governance-layer necessary to ensure effective management of community-specific data and services for their integration and provision within EPOS
- mostly supported in kind, partially through EPOS ERIC fees

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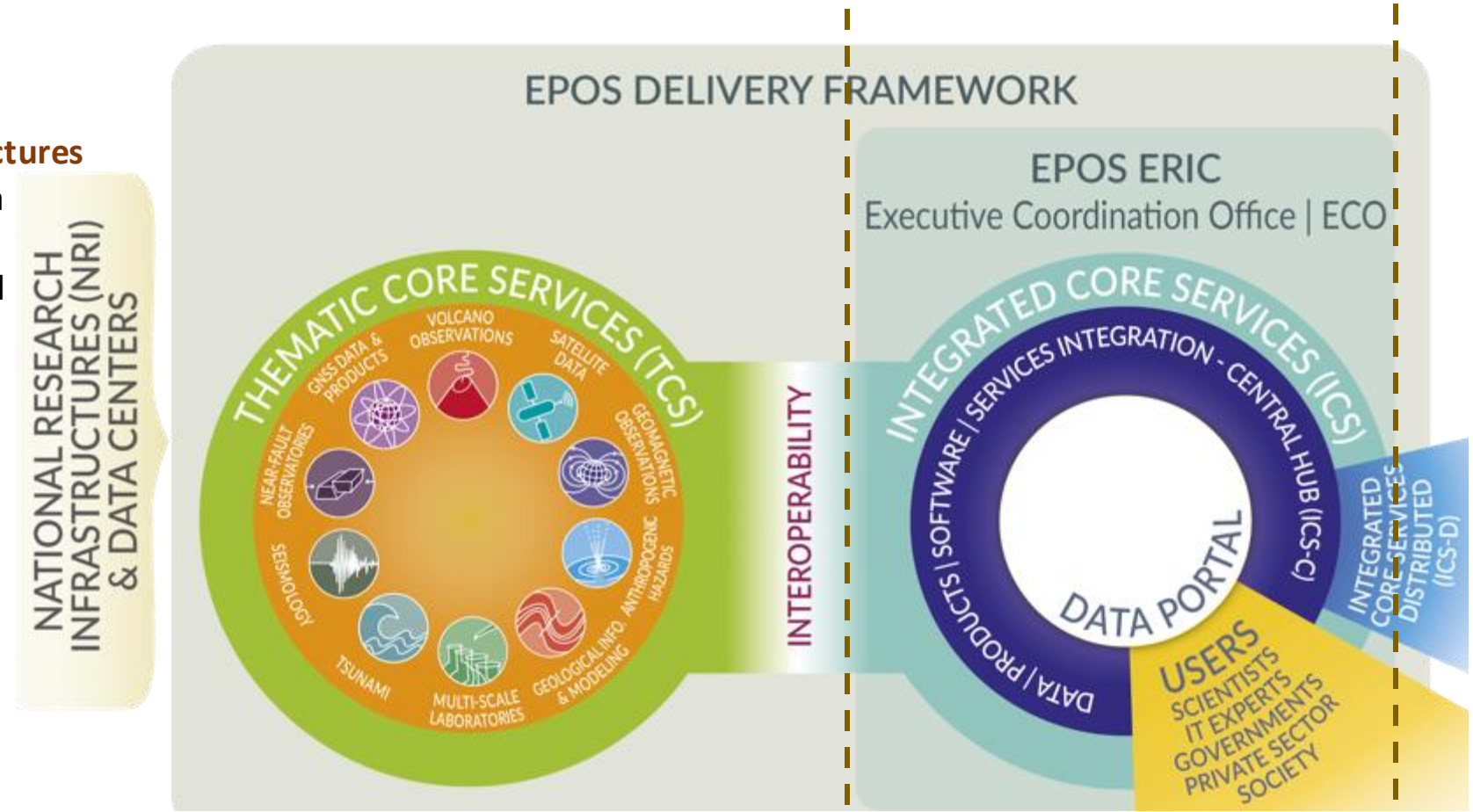

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Integrated Core Services (ICS) made of ICS-C and ICS-D

- e-infrastructure for data and services integration and accessibility through the EPOS Data Portal
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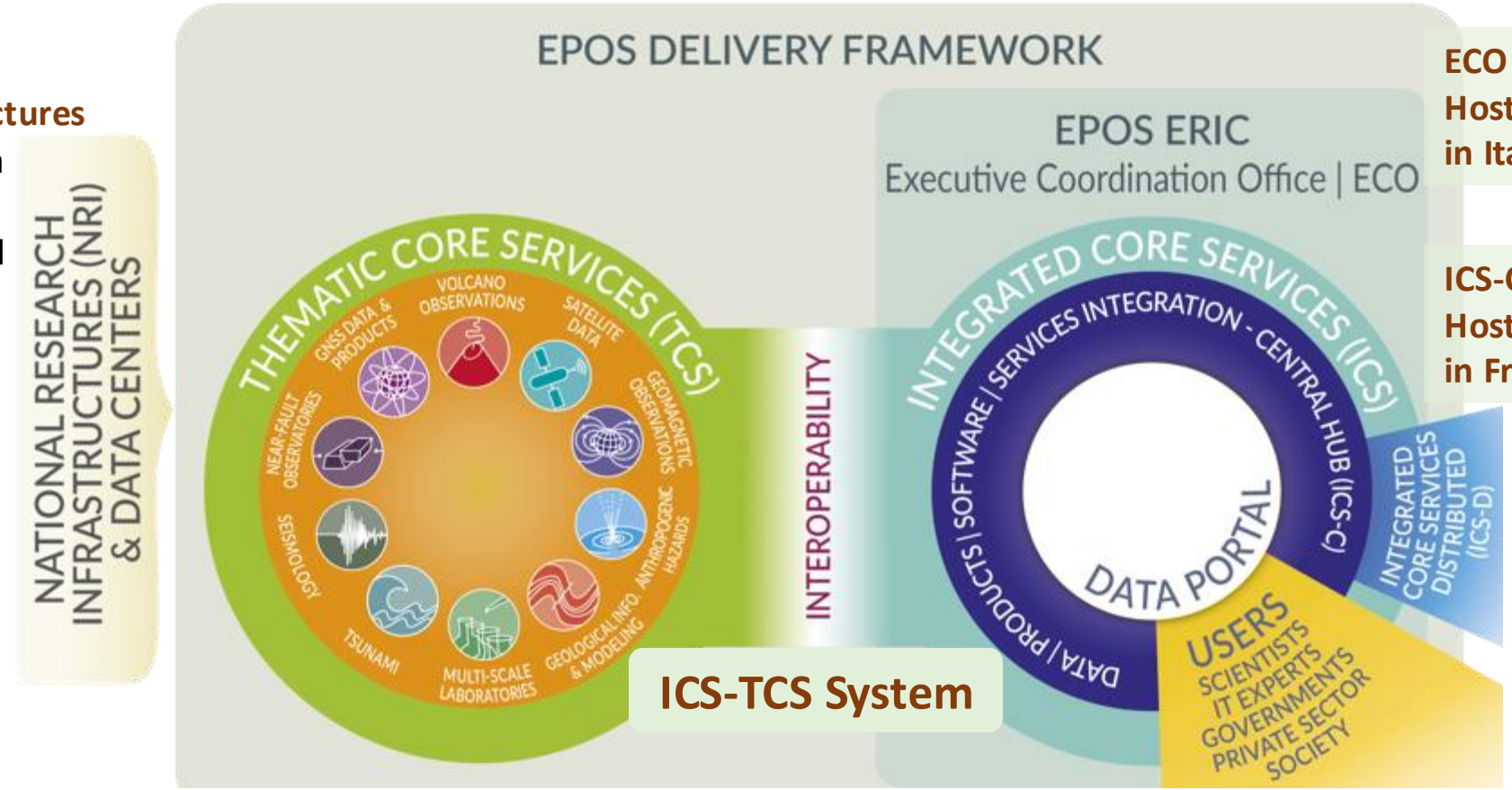

ECO
Hosted and operated in Italy (INGV)

ICS-Central Hub
Hosted and operated in France (BRGM)

Federated data management

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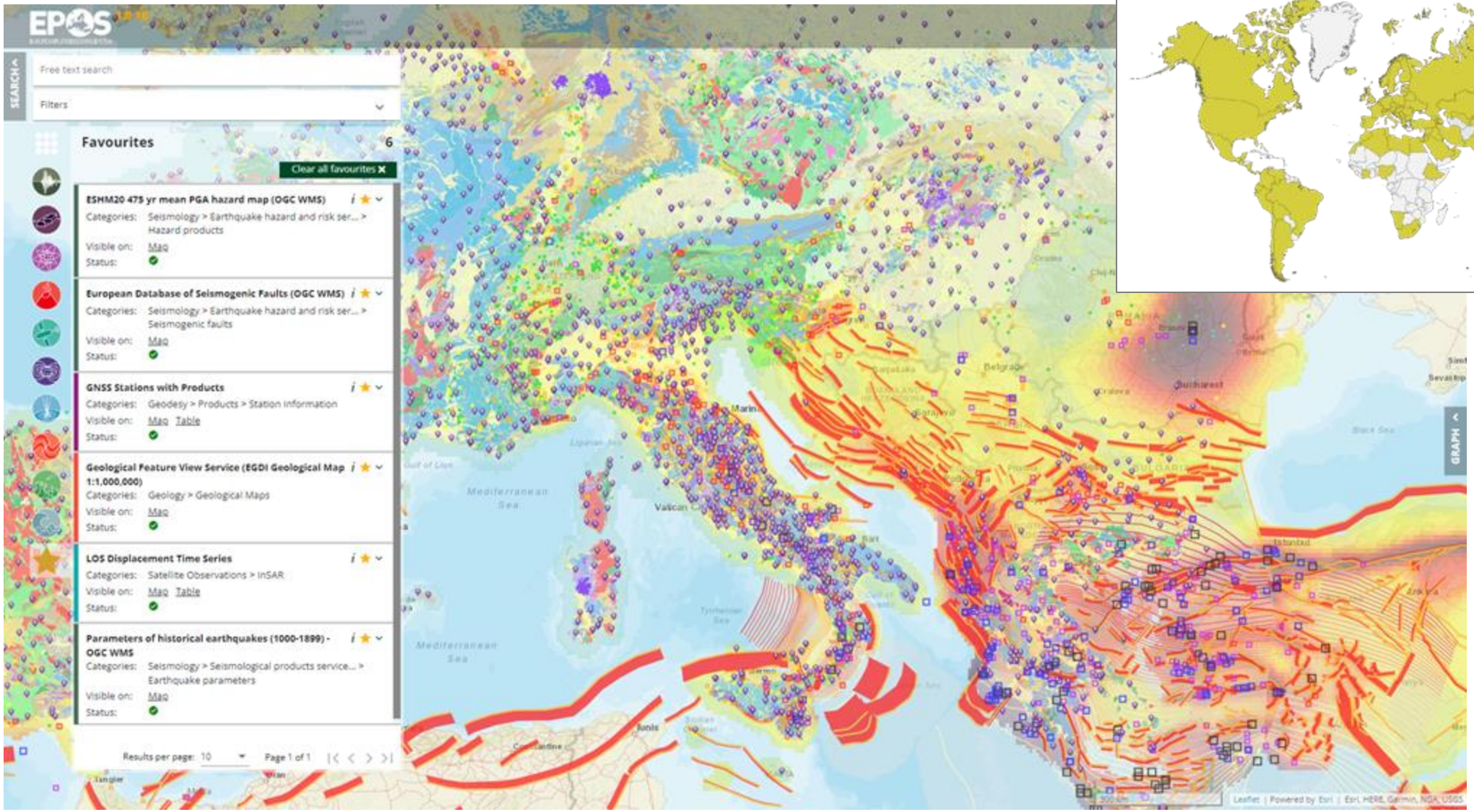
The EPOS approach for sharing data and services
&
EPOS added value

EPOS

- has been designed and implemented as a **pan-European research Infrastructure focused on solid Earth Science**
- is based on **a federated approach to data integration**: data, generated and stored at National Research Infrastructure level, are made available via TCS services and made accessible through the EPOS Data Portal where they can be visualized, combined and downloaded upon user query
- is a **community-driven effort**: scientists, IT experts, users and decision-makers participate in the infrastructure **co-design** and **co-development** since the conception phase
- **continuously interacts with scientific users**
- allows **optimizing resources** for data provision at national and EU level, avoiding fragmentation and duplications of efforts and resources
- increases opportunities for **leveraging funds** for national research communities at European level
- **links existing data sharing initiatives** to many disciplines in solid Earth science and beyond
- increases the **impact of the data** by making them globally accessible

The EPOS Data Portal is now fully operational



EPOS Data Portal Access Worldwide

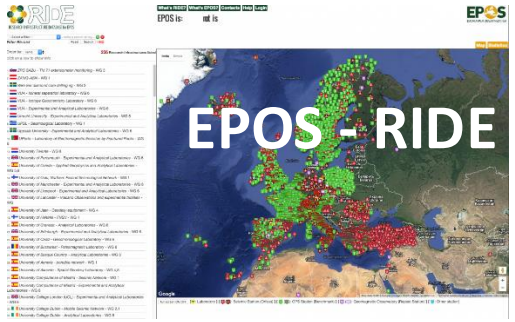
https://www.epos-eu.org/dataportal

EPOS - ES

EUROPEANPLATEOBSERVINGSYSTEM SPAIN

www.epos-es.org | info_eposes@geo3bcn.csic.es | @EPOS_ES

TRAJECTORY…



EPOS - PP

EPOS
Preparatory Phase

EPOS - IP

EPOS
Implementation Phase

EPOS - SP

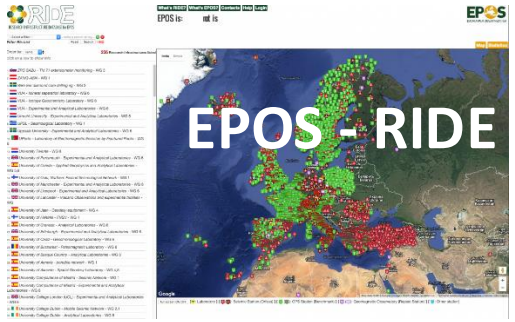
EPOS
Sustainability Phase

17 may

2008 **2011** **2014 / 2015** **2019 / 2020** **2023**

European Strategy Forum on
Research Infrastructures (**ESFRI**)

TRAJECTORY…



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EUROVOLC

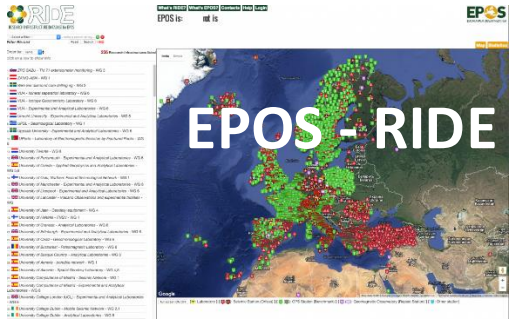
EUROPEAN FUNDING

DT-GEO

GEO-INQUIRE

Establish national collaboration network
(i.e. organization of meetings, coordination activities)

TRAJECTORY…



NATIONAL FUNDING

Thematic network
CGL2016-81965-REDT

18 keuros

CSIC Project calls for:
Large European Research Infrastructures

100 keuros

Thematic network
RED2022-134516-E

60 keuros

EPOS - PP
EPOS
Preparatory Phase

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EPOS
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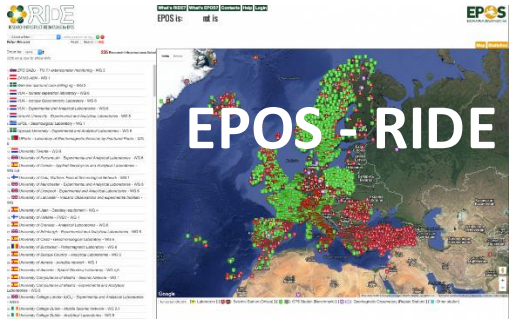

EPOS - PP

EPOS
Preparatory Phase

EPOS - IP

EPOS
Implementation Phase

EPOS - SP

EPOS
Sustainability Phase

EPOS-ES
Kick-off meeting
17 may

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EUROVOLC

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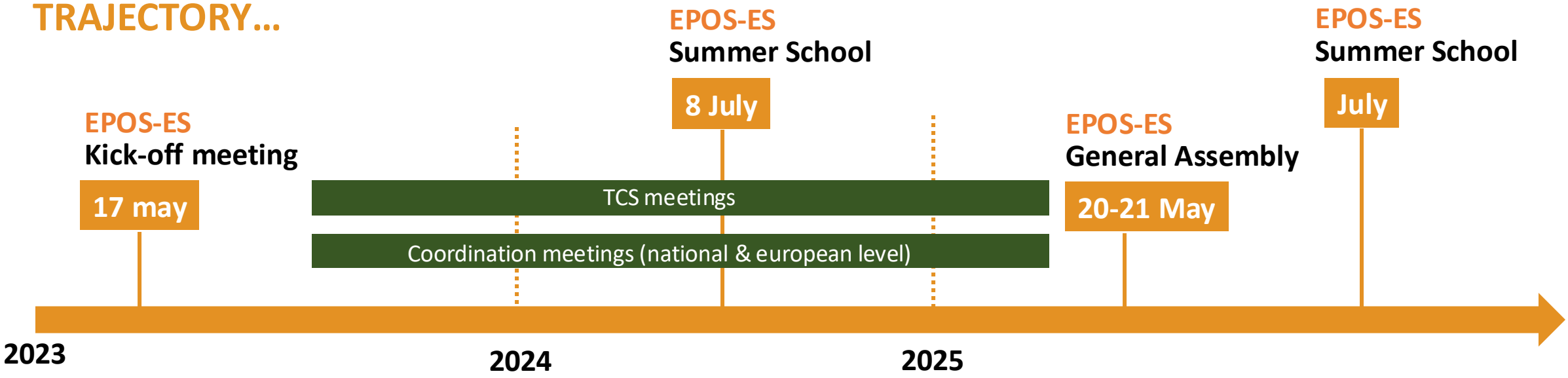

EPOS-ES
Kick-off meeting
17 may
EPOS-ES
Summer School
8 July
EPOS-ES
General Assembly
20-21 May
EPOS-ES
Summer School
July
TCS meetings
Coordination meetings (national & european level)
2023
2024
2025

Agreement for economic funding of membership fees and the participation of Spain in the ESFRI EPOS-ERIC (5 year credit renewal):

Ministerio de Ciencia, Innovación e Universidades (MICIU) –

former Ministerio de Ciencia e Innovación (MICINN)

Consejo Superior de Investigaciones científicas (CSIC)

Centro Nacional de Información Geográfica (CNIG) Instituto Geográfico Nacional (IGN)

Universidad de Granada (UGR)

Universidad de Alicante (UA)

Universidad de Salamanca (USAL)

Universidad de Barcelona (UB)

Spanish representation in EPOS-ERIC

Maria Vallejo Abascal (MICIU)
Adelina Geyer (CSIC)

Current Spanish ESFRI policy requires the membership fees to be covered by one (or more) institution(s). In case of EPOS-ERIC, the Ministry of Science and Innovation does not provide any economic support.

General Action Protocol (PGA) EPOS – Spain.
***Open document agreement* signed by :**

Ministerio de Ciencia e Innovación (MICINN)

Consejo Superior de Investigaciones científicas (CSIC)

Instituto Geográfico Nacional (IGN)

Universidad de Granada (UGR)

Universidad de Alicante (UA)

Universidad de Salamanca (USAL)

Universidad de Barcelona (UB)

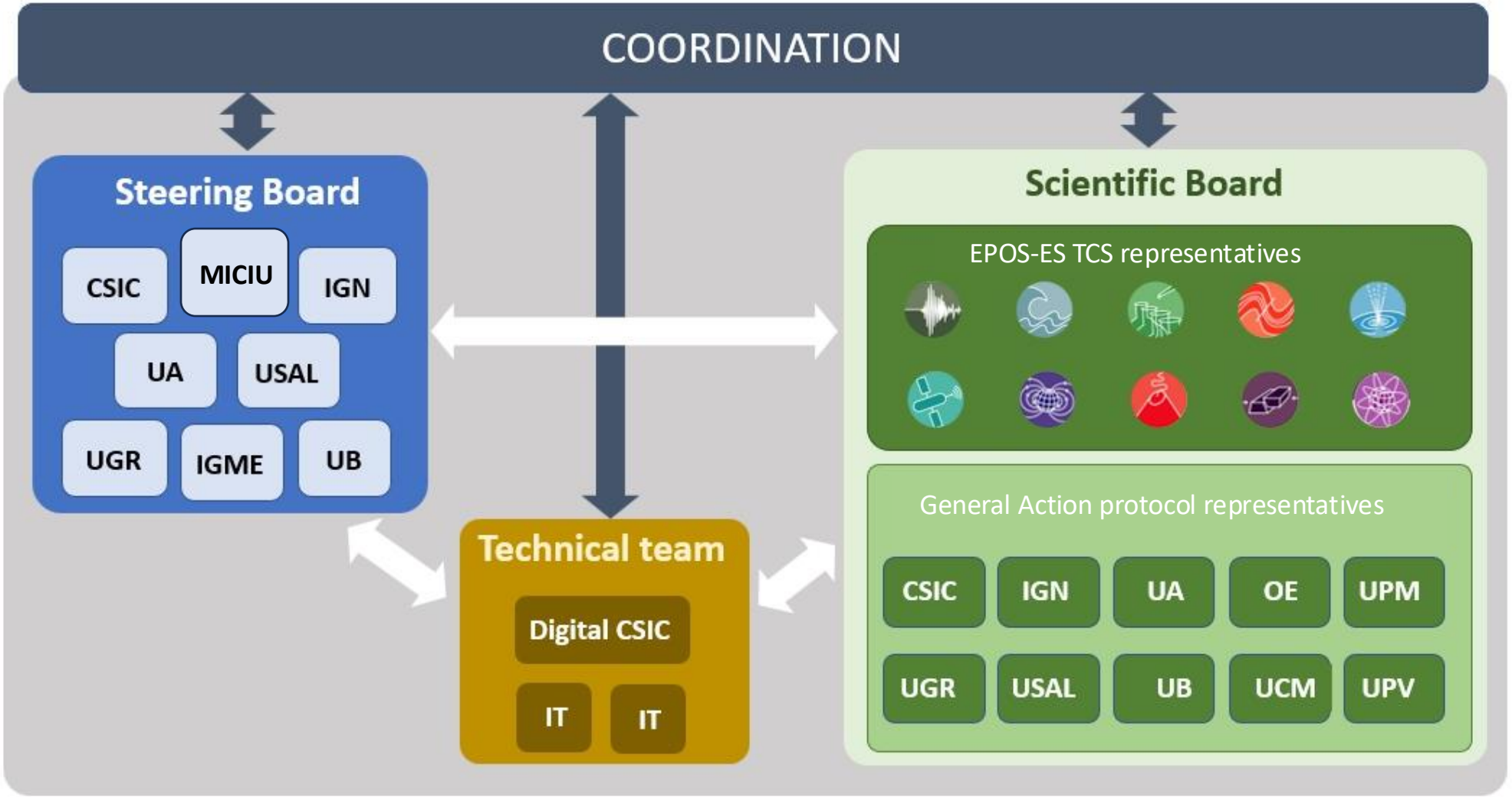
Observatorio del Ebro (OE)

Universidad Complutense de Madrid (UCM)

Universidad Politécnica de Madrid (UPM)

Universidad Politécnica de Valencia (UPV)

Model of Organization:



EPOS-ES Coordination

Adelina Geyer (CSIC)

Project Manager

Olaya Dorado (CSIC)

National Scientific Advisor for the Spanish Representative at the National Authorities Consultation Board

Adelina Geyer (CSIC)

- Coordinators and TCS representatives are envisaged to rotate among the different institutions signing the general agreement.

SEISMOLOGY

Juan Vicente Cantavella (IGN)

NEAR-FAULT OBSERVATORIES

Antonio Azor (UGR)

GNSS DATA AND PRODUCTS

José Antonio Sánchez (IGN)

VOLCANO OBSERVATIONS

Adelina Geyer (CSIC)
Itahiza Domínguez (IGN)

MULTI-SCALE LABORATORIES

José Luis Fernández (CSIC)

SATELLITE DATA

José Fernández (UCM – CSIC)

GEOMAGNETIC OBSERVATIONS

Juan José Curto (OE)

ANTHROPOGENIC HAZARDS

Diana Nuñez (UCM)

GEOLOGICAL INFORMATION AND MODELING

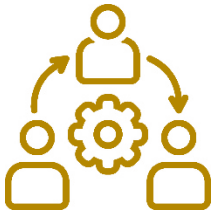
José Román Hernández (IGME)

TSUNAMI

Íñigo Aniel (UNICAN)
Jorge Macías (UM)

GOALS:

- **Establish an organized structure of EPOS-Spain** that allows coordinating the activities and initiatives and defining the roadmap of actions to be carried out in the short, medium, and long term.
- **Implement and develop the Spanish nodes of the 10 TCSs** and identify the DDSSs that can be integrated into EPOS and those services to be developed in the future.
- **Establish communication channels between TCSs and specialized groups,** to encourage the exchange of knowledge and information, and training in the use and possibilities of EPOS.



GOALS:

- **Strengthen relationships with other international organizations and programs** with converging and complementary objectives (e.g. EarthScope) in a coordinated manner and at the national level.

- **Act as a speaker and information point** for the rest of the national community in Earth Sciences, of the actions and initiatives that are being carried out at a European level, especially those directly related to EPOS.

- **Explore the generation of connections between** ICTSs and the Spanish nodes of other ESFRIs to expand the potential and use of EPOS (e.g. with EMSO).

GOALS:

- **Promote the use of EPOS** in national and international research programs and initiatives. In particular, explore the possibilities of developing research projects within the framework of European calls.
- **Strengthen the digital service base** of national institutions that contribute to EPOS with DDSSs.
- Pursue the establishment of **links with national HPC resources** (Red nacional de supercomputación)

ACTIVITIES 2023-2025:

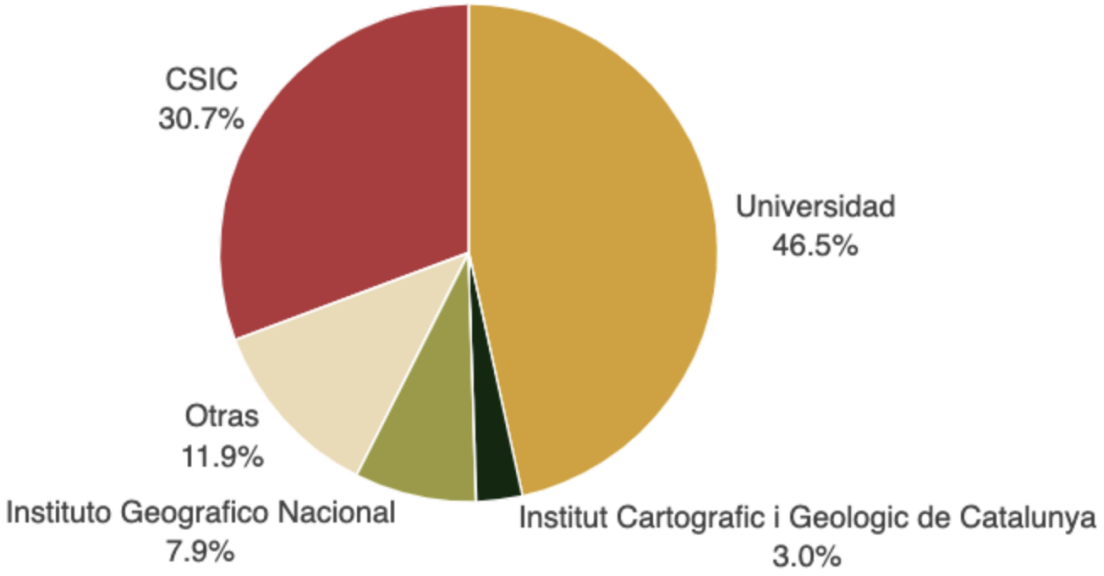
- **Database of specialists and working groups**
  - Expression of interest form
  - Specific mailing lists for each TCSs and also for the entire network

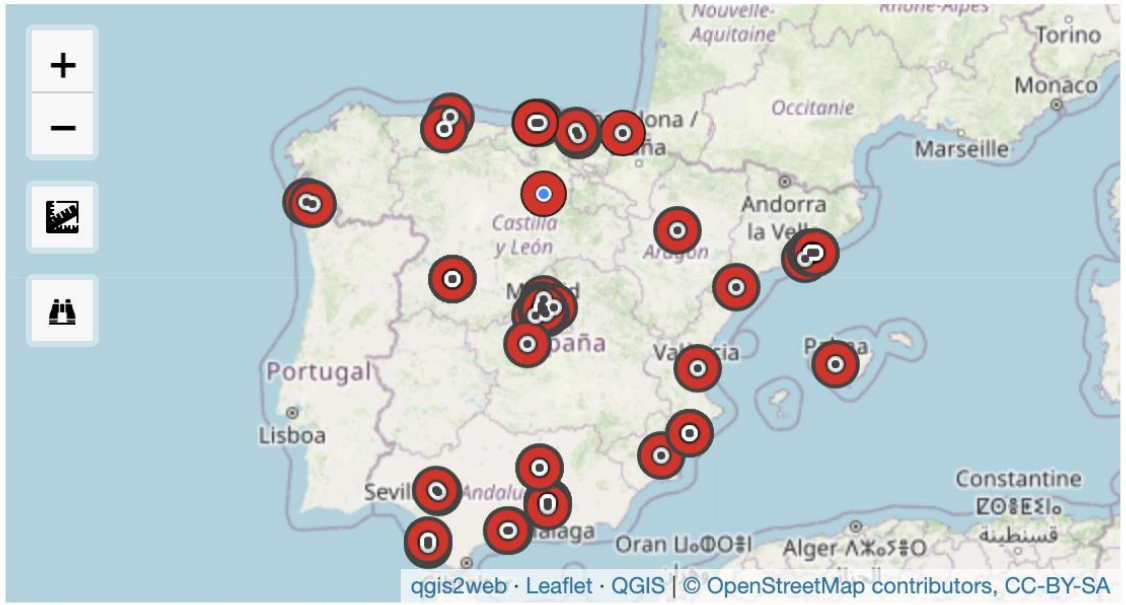
https://epos-es.org/

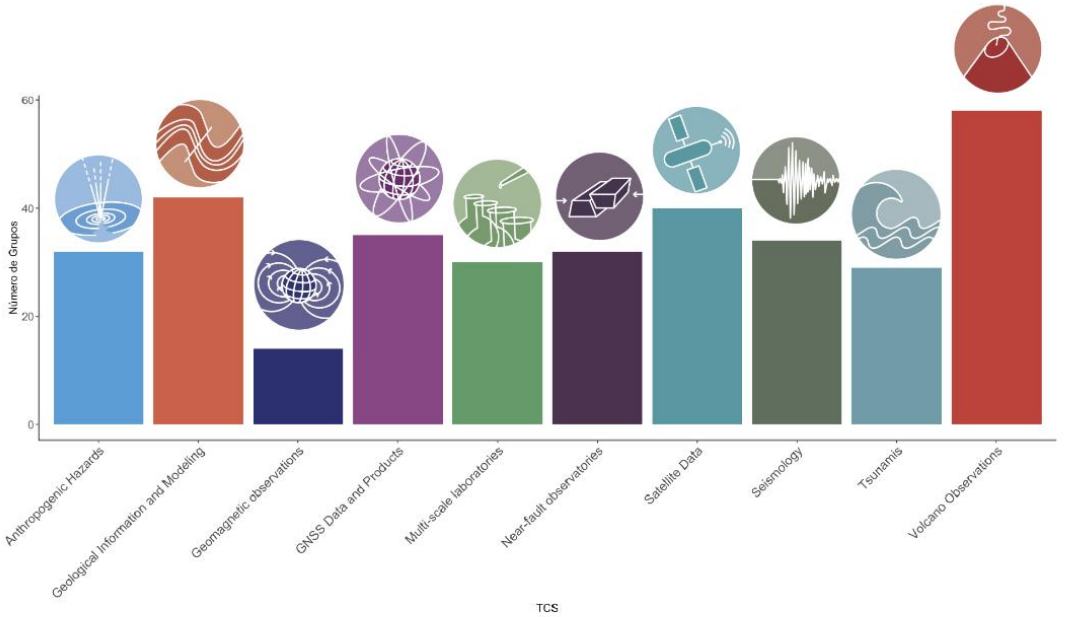
ACTIVITIES 2023-2025:

- **Database of specialists and working groups**

96 groups!

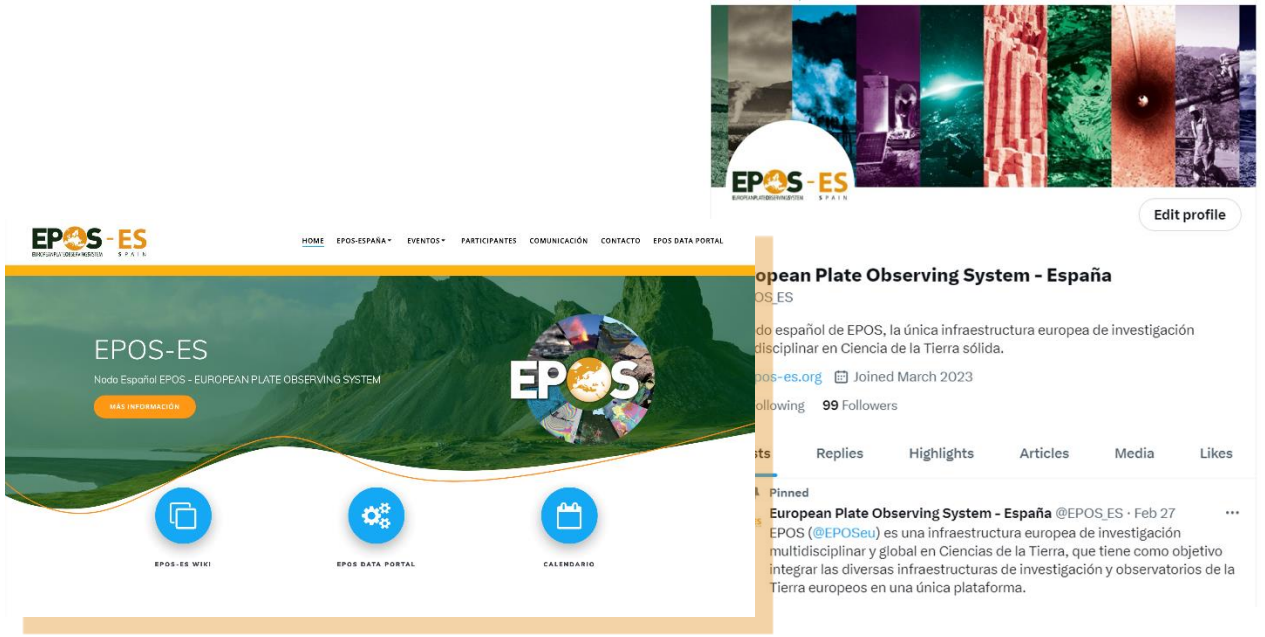






ACTIVITIES 2023-2025:

- **Dissemination plan of activities and results**
  - Web page
  - Presence in social medias
  - Preparation of press releases
  - Brochure and informative postcards
  - Short informative video for social medias
  - News bulletin



ACTIVITIES 2023-2025:

Plan the schedule of meetings to be organized and/or

- Organization of the General Assembly of EPOS-Spain
- Organization of internal meetings of each TCSs
- Participation of the Spanish TCSs coordinators in the meetings at the European level
- Attendance at international scientific conferences
- Internal network coordination meetings

ACTIVITIES 2023-2025:

- **Identification of potential DDSSs to integrate into EPOS**
  - Definition of the roadmap
  - Prioritization for its integration
  - List of in-house services to be developed in the future.

- **Extend and encourage the use of EPOS**
  - Within the framework of national research and training groups
  - In Master's and Doctorate programs, making available to research centers and academics a list of possible scientific projects to be carried out, based on the exploitation of the DDSSs accessible through EPOS.

ACTIVITIES 2023-2025:

- **Analyze the infrastructural needs of national Earth Science laboratories and research groups**
  - Identify the most appropriate calls and coordinate the submission of applications.

- **Coordinate with other international institutions that participate in EPOS, the design and drafting of proposals to the specific calls for HORIZON EUROPE infrastructure.**

ACTIVITIES 2023-2025:

Create a Summer School for

- Scientific staff in training and in the early stages of the research career to train in the use of the EPOS portal, explain the potential of the DDSSs integrated to date, and encourage interest in the development of interdisciplinary research.

2ª y 3ª Escuela de Verano EPOS-ES
July 2025

1ª Escuela de verano EPOS-ES: Geociencias en Abierto

Fecha: **8 de Julio de 2024**
Lugar: Facultad de Ciencias de la Universidad de Salamanca
Deadline inscripción: **15 de Junio de 2024**

REGISTRARSE

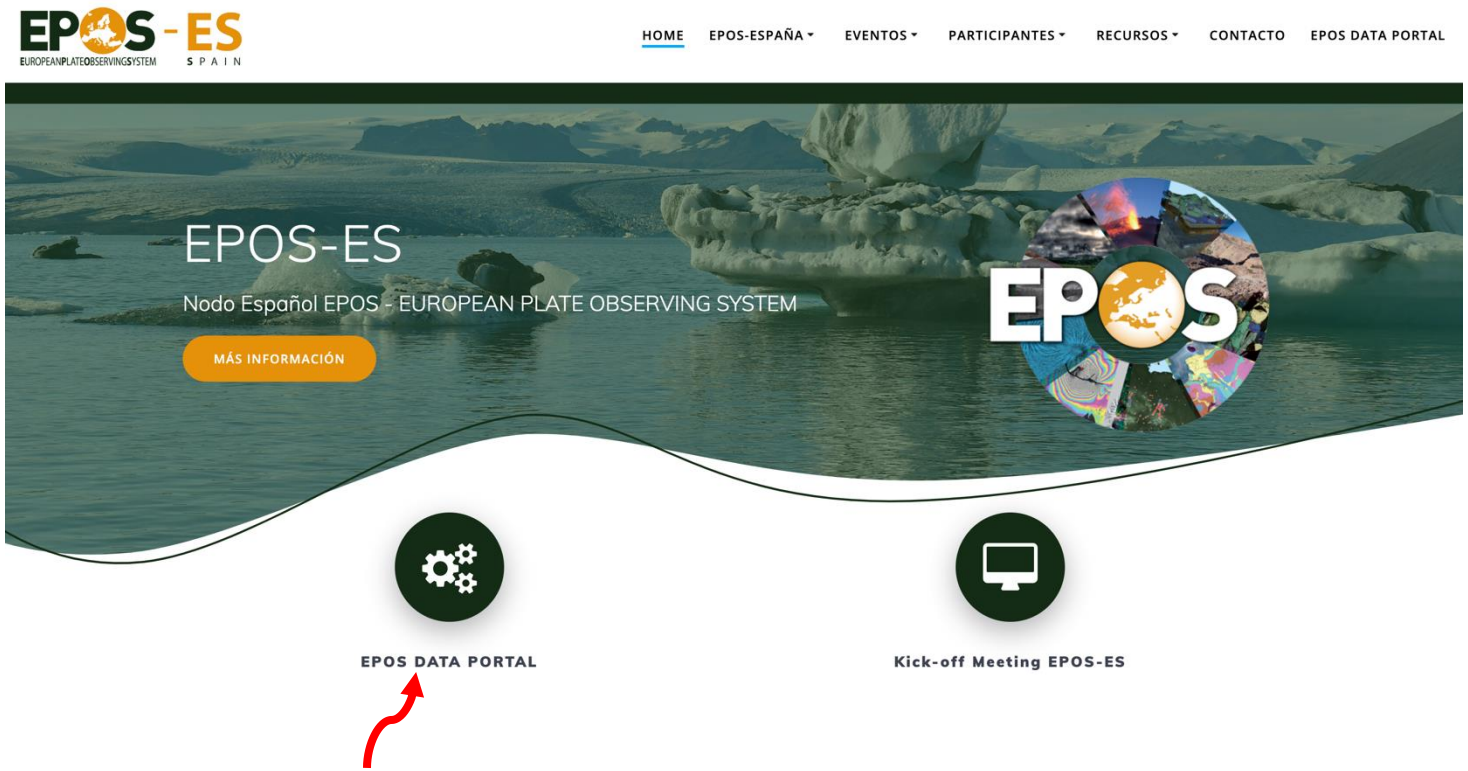
Agenda

10:00| 10:15	*Bienvenida*
10:15 | 11:00	Ciencia en abierto (EOSC; ESFRIS, principios FAIR)
11:00 | 11:30	Repositorios de acceso abierto para las Geociencias (Seanoe, Zenodo, etc)
11:30| 12:00	*Pausa café*
12:00 | 12:30	EPOS
12:30 | 13:00	Mesa redonda: Ciencia abierta ventajas y dificultades
14:00| 15:30	*Pausa para comer*
15:00 | 17:00	Sesión *hands on* EPOS
17:00 | 18:00	Divulgación en abierto: Comunicando las Geociencias a la sociedad
18:00	*Fin de la reunión*

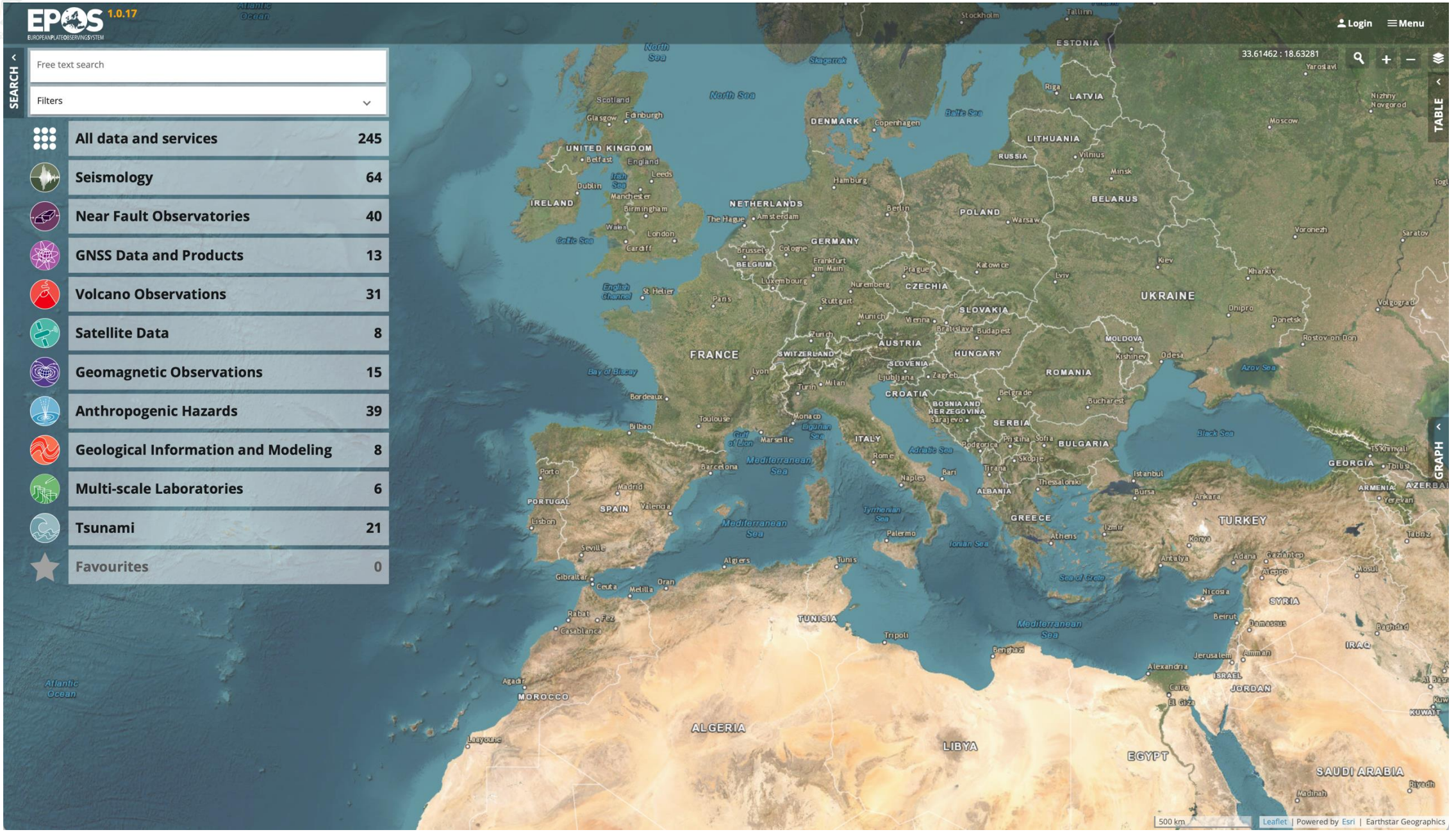
ACTIVITIES 2023-2025:

EPOS DATA PORTAL

https://epos-es.org



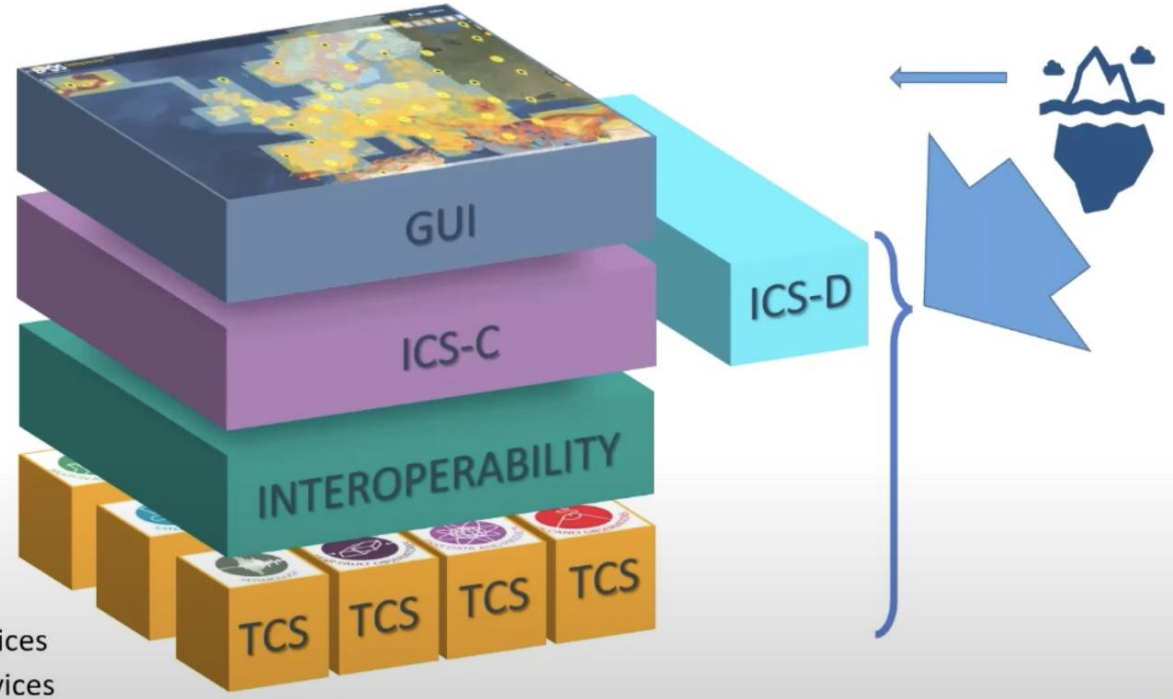
https://www.ics-c.epos-eu.org/


EPOS 1.0.17
EUROPEAN PLATE OBSERVING SYSTEM
Login
Menu
SEARCH
Free text search
Filters
All data and services 245
Seismology 64
Near Fault Observatories 40
GNSS Data and Products 13
Volcano Observations 31
Satellite Data 8
Geomagnetic Observations 15
Anthropogenic Hazards 39
Geological Information and Modeling 8
Multi-scale Laboratories 6
Tsunami 21
Favourites 0
33.61462 : 18.63281
TABLE
GRAPH
500 km
Leaflet | Powered by Esri | Earthstar Geographics

European level

EPOS Technical Architecture

How it works …

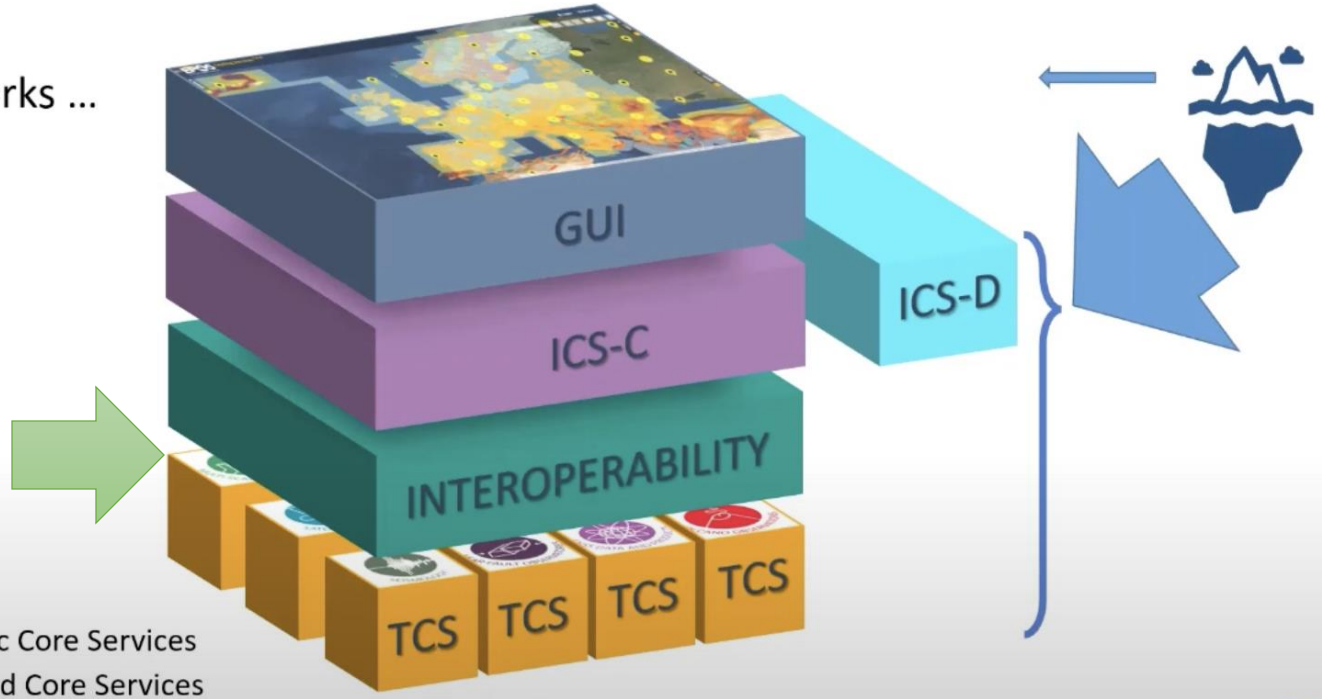


TCS … Thematic Core Services
ICS … Integrated Core Services

European level

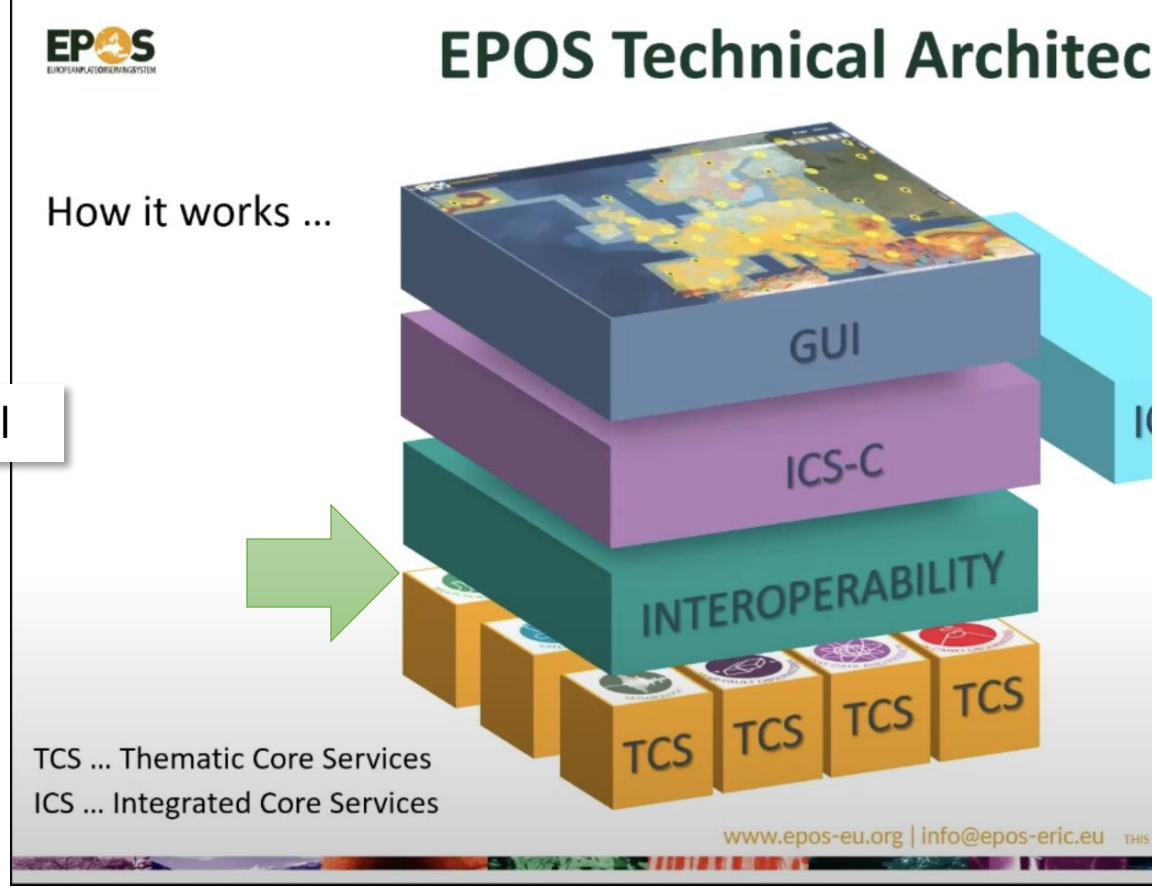
EPOS Technical Architecture

How it works …



TCS … Thematic Core Services
ICS … Integrated Core Services

European level

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@prefix adms: <http://www.w3.org/ns/adms#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix epos: <https://www.epos-eu.org/epos-dcat-ap#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix vcard: <http://www.w3.org/2006/vcard/ns#> .
@prefix hydra: <http://www.w3.org/ns/hydra/core#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix schema: <http://schema.org/> .
@prefix dcat: <http://www.w3.org/ns/dcat#> .
@prefix cnt: <http://www.w3.org/2011/content#> .
@prefix locn: <http://www.w3.org/ns/locn#> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix http: <http://www.w3.org/2006/http#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix gsp: <http://www.opengis.net/ont/geosparql#> .

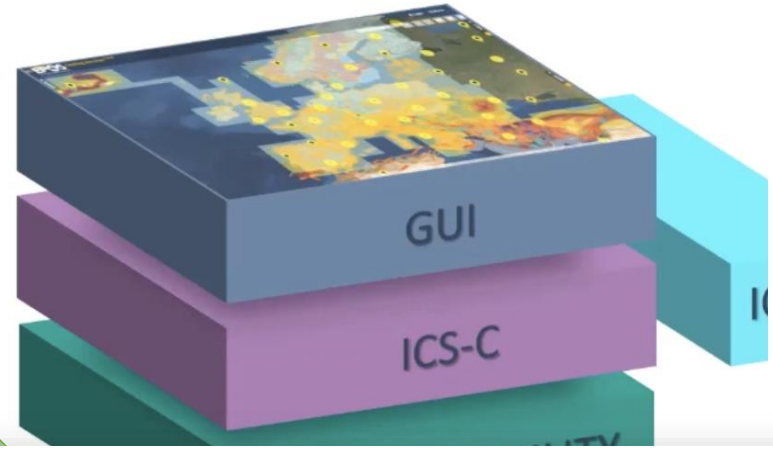

<http://orcid.org/0000-0002-8803-6504> a schema:Person;
        schema:identifier [ a schema:PropertyValue;
                schema:propertyID "orcid";
                schema:value "0000-0002-8803-6504";
        ];
        schema:familyName "Geyer Traver";
        schema:givenName "Adelina";
        schema:address [ a schema:PostalAddress;
                schema:streetAddress "Lluis Sole i Sabaris, s/n";
                schema:addressLocality "Barcelona";
                schema:postalCode "08028";
                schema:addressCountry "Spain";
        ];
        schema:email "ageyertraver@gmail.com";
        schema:telephone "+34 93 409 54 10";
        schema:url "http://orcid.org/0000-0002-8803-6504"^^xsd:anyURI;
        schema:qualifications "Researcher";
        schema:affiliation <http://isni.org/isni/0000000120976324>;
  schema:contactPoint <http://orcid.org/0000-0002-8803-6504/contactPoint> ;

.

<http://orcid.org/0000-0002-8803-6504/scientificContact> a schema:ContactPoint;
                schema:email "ageyertraver@gmail.com";
                schema:availableLanguage "en" ;
                schema:contactType "scientificContact" ;
.
<http://orcid.org/0000-0002-8803-6504/legalContact> a schema:ContactPoint;
                schema:email "ageyertraver@gmail.com";
                schema:availableLanguage "en" ;
                schema:contactType "legalContact" ;
.
<http://orcid.org/0000-0002-8803-6504/financialContact> a schema:ContactPoint;
                schema:email "ageyertraver@gmail.com";
                schema:availableLanguage "en" ;
                schema:contactType "financialContact" ;
```

EPOS Technical Architec

How it works …



European level

```
@prefix adms: <http://www.w3.org/ns/adms#> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix epos: <https://www.epos-eu.org/epos-dcat-ap#> .
@prefix dc: <http://purl.org/dc/elements/1.1/> .
@prefix dct: <http://purl.org/dc/terms/> .
@prefix vcard: <http://www.w3.org/2006/vcard/ns#> .
@prefix hydra: <http://www.w3.org/ns/hydra/core#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix schema: <http://schema.org/> .
@prefix dcat: <http://www.w3.org/ns/dcat#> .
@prefix cnt: <http://www.w3.org/2011/content#> .
@prefix locn: <http://www.w3.org/ns/locn#> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix http: <http://www.w3.org/2006/http#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
@prefix gsp: <http://www.opengis.net/ont/geosparql#> .


<http://orcid.org/0000-0002-8803-6504> a schema:Person;
                                       ma:PropertyValue;
                                       D "orcid";
                                       00-0002-8803-6504";

                                       yer Traver";
                                       lina";
                                       a:PostalAddress;
                                       ress "Lluis Sole i Sabaris, s/n";
                                       cality "Barcelona";
                                       le "08028";
                                       untry "Spain";

                                       ver@gmail.com";
                                       3 409 54 10";
                                       rg/0000-0002-8803-6504"^^xsd:anyURI;
                                       esearcher";
                                       /isni.org/isni/0000000120976324>;
                                       cid.org/0000-0002-8803-6504/contactPoint> ;



3-6504/scientificContact> a schema:ContactPoint;
eyertraver@gmail.com";
anguage "en" ;
pe "scientificContact" ;

3-6504/legalContact> a schema:ContactPoint;
eyertraver@gmail.com";
anguage "en" ;
pe "legalContact" ;

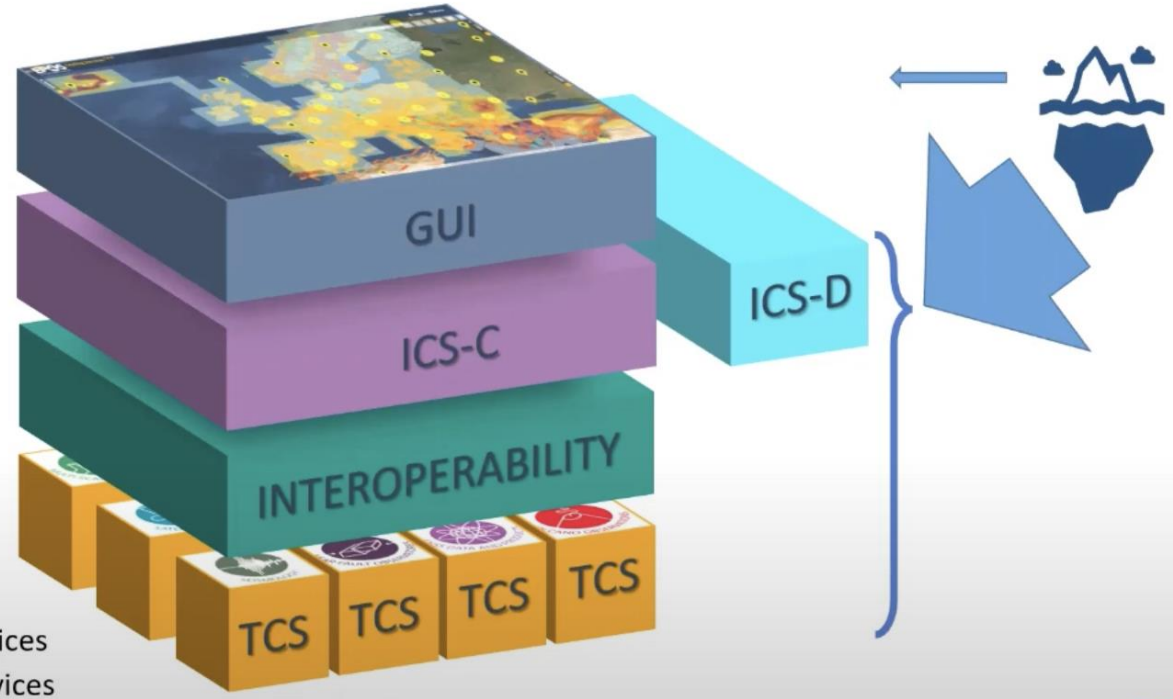
3-6504/financialContact> a schema:ContactPoint;
eyertraver@gmail.com";
anguage "en" ;
pe "financialContact" ;
```

```
<WP11/SusceptibilityMap> a dcat:Dataset;
    dct:title "Spatial probability analysis/maps of volcanic activity";
    dct:identifier "WP11/Susceptibility map";
    dct:description "Spatial probability analysis/maps of the probability of occurrence of a specific
area to host a future eruptive event. These maps are static and based on the geological record
including information about fractures, past eruptions, etc.";
    ## example of frequency using a controlled vocabulary
        dct:type "http://purl.org/dc/dcmitype/Collection"^^xsd:anyURI;
    dct:accrualPeriodicity "http://purl.org/cld/freq/irregular"^^xsd:anyURI;
    dct:created "2018-09-01"^^xsd:date;
dct:spatial [ a dct:Location ;
locn:geometry "POLYGON((180.0 -90.0, -180.0 -90.0, -180.0 90.0, 180.0 90.0, 180.0
-90.0))"^^gsp:wktLiteral ;
];
    dcat:theme <epos:SusceptibilityMap>;
    dcat:keyword "Spatial probability analysis", "Spatial probability maps", "volcanology", "hazard
assessment", "volcanic hazard";
    dcat:contactPoint <http://orcid.org/0000-0002-8803-6504/contactPoint>;
        dct:publisher <http://isni.org/isni/0000000122036192>;
```

European level

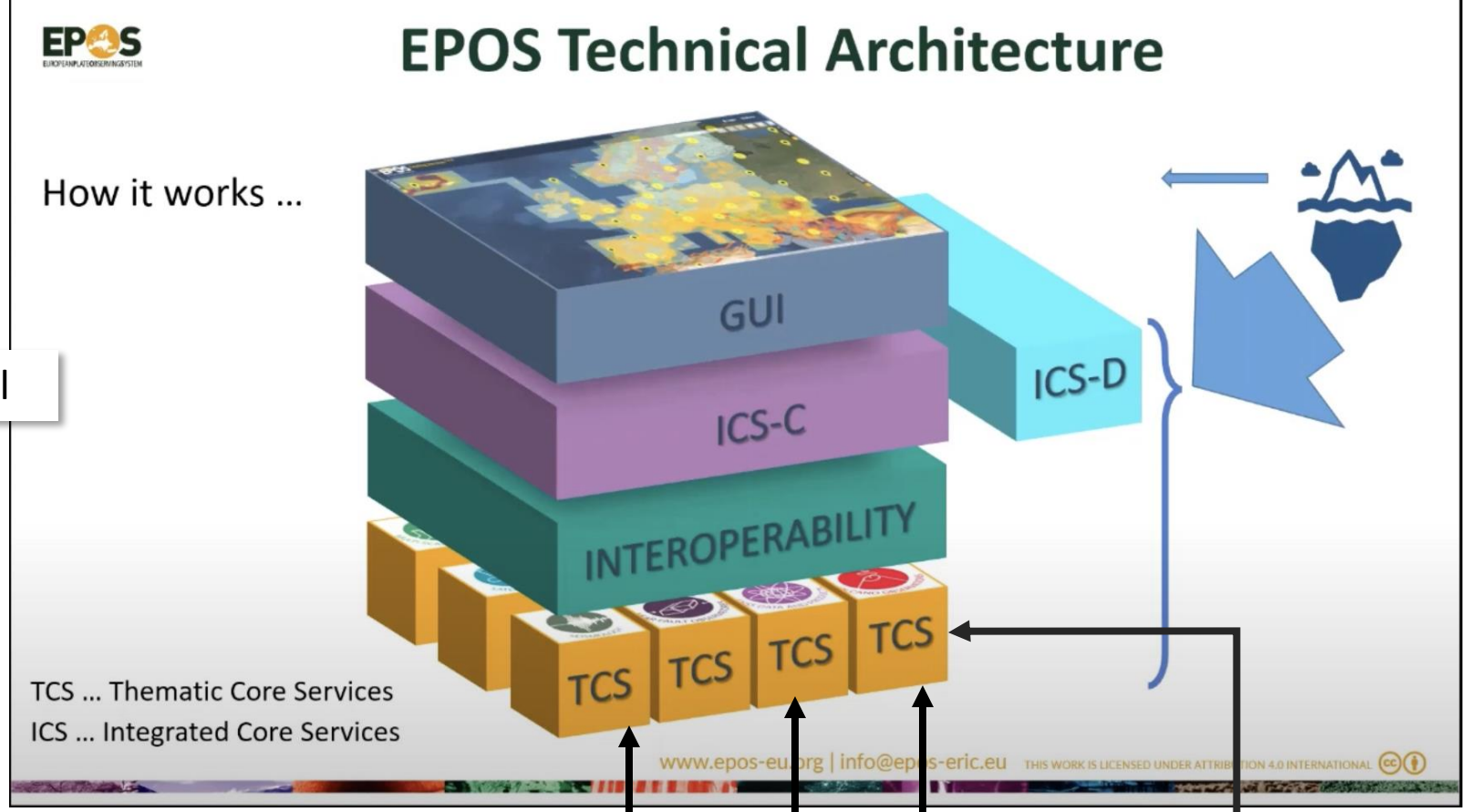
EPOS Technical Architecture

How it works …



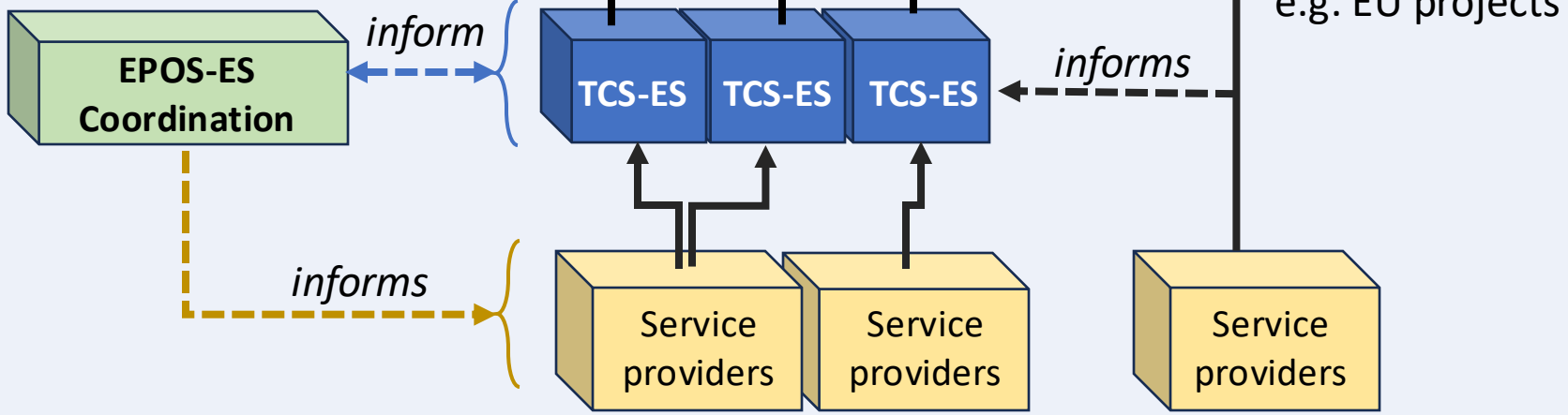
TCS … Thematic Core Services
ICS … Integrated Core Services

EPOS Technical Architecture

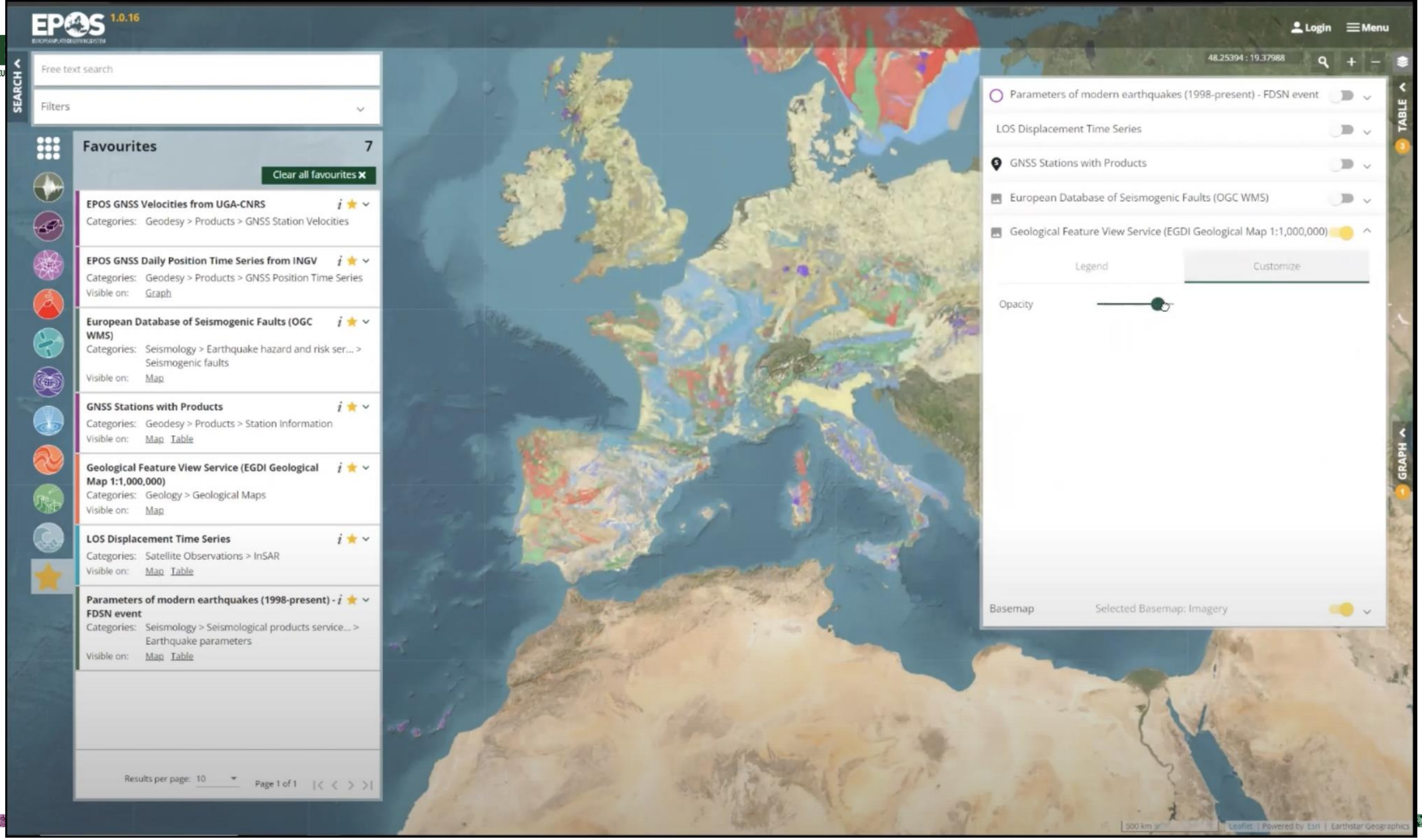


European level

National level




EPOS 1.0.16
Login
Menu
61.69821 : 52.04882
SEARCH
242
TABLE
3
GRAPH
1
Leaflet | Powered by Esri | Earthstar Geographics


EPOS 1.0.16
Login
Menu
SEARCH
Free text search
Filters
Favourites 7
Clear all favourites
EPOS GNSS Velocities from UGA-CNRS
Categories: Geodesy > Products > GNSS Station Velocities
EPOS GNSS Daily Position Time Series from INGV
Categories: Geodesy > Products > GNSS Position Time Series
Visible on: Graph
European Database of Seismogenic Faults (OGC WMS)
Categories: Seismology > Earthquake hazard and risk ser... > Seismogenic faults
Visible on: Map
GNSS Stations with Products
Categories: Geodesy > Products > Station Information
Visible on: Map Table
Geological Feature View Service (EGDI Geological Map 1:1,000,000)
Categories: Geology > Geological Maps
Visible on: Map
LOS Displacement Time Series
Categories: Satellite Observations > InSAR
Visible on: Map Table
Parameters of modern earthquakes (1998-present) - FDSN event
Categories: Seismology > Seismological products service... > Earthquake parameters
Visible on: Map Table
Results per page: 10
Page 1 of 1
48.25394 : 19.37988
Parameters of modern earthquakes (1998-present) - FDSN event
LOS Displacement Time Series
GNSS Stations with Products
European Database of Seismogenic Faults (OGC WMS)
Geological Feature View Service (EGDI Geological Map 1:1,000,000)
Legend
Customize
Opacity
Basemap
Selected Basemap: Imagery
TABLE
GRAPH
500 km
Leaflet | Powered by Esri | Earthstar Geographics

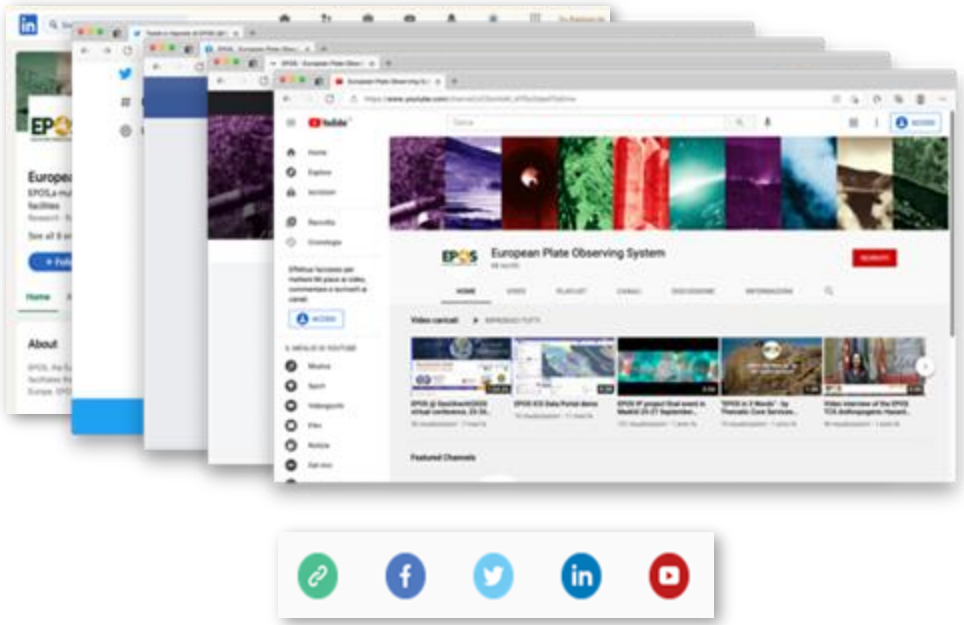
EPOS Web site

www.epos-eu.org

EPOS-ES Web site

www.epos-es.org

Social media



Thank You!

SES12-P05

EUROPEAN PLATE OBSERVING SYSTEM - NODO ESPAÑOL DE EPOS

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