
EPOS
EUROPEANPLATEOBSERVINGSYSTEM
Building the infrastructure
for solid Earth science
to support a safe and sustainable
European society

EPOS

Goals

Integrates national and transnational research infrastructures for solid Earth science	*for*	seamless access to pan-European data and services
Guarantees open access to multidisciplinary Research Infrastructures	*for*	cross-disciplinary and transnational research
Creates novel e-infrastructure and integrated core services	*for*	a multidisciplinary community of users
Fosters scientific, technological and ICT innovation	*for*	successfully addressing global Grand Challenges in Earth science
Improves geo-hazard assessment, risk mitigation, and sustainable management of georesources	*for*	a safe and prosperous society

What is EPOS?

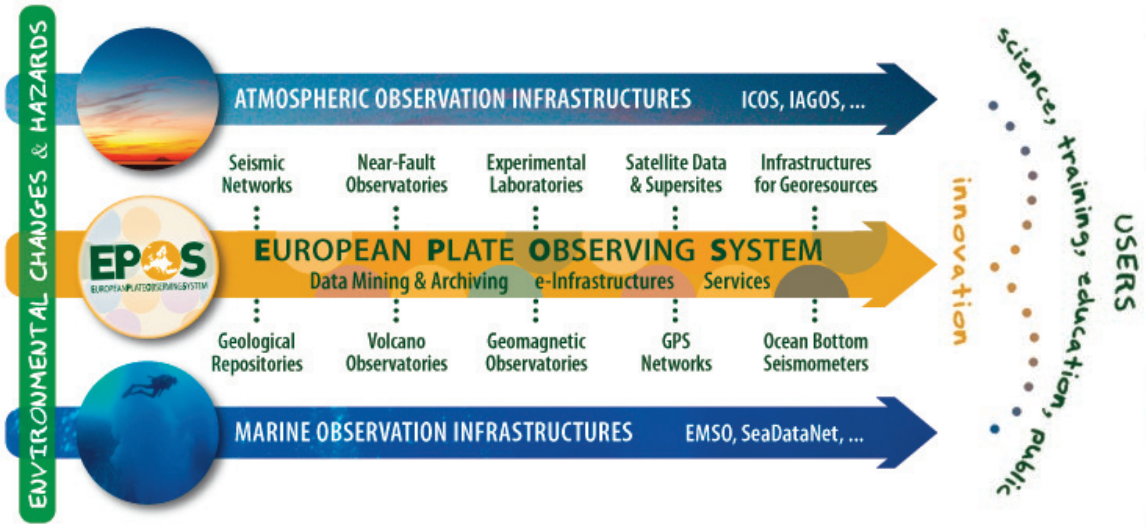
The European Plate Observing System (EPOS) is a planned research infrastructure for European solid Earth science, integrating existing research infrastructures to enable innovative multidisciplinary research, recently prioritised by the European Strategy Forum on Research Infrastructures (ESFRI) for implementation. By improving access to data and data products, EPOS will transform the European research landscape, driving discovery and developing solutions to the geo-hazards and geo-resources challenges facing European society.

The EPOS enterprise will facilitate the integration and use of solid Earth science data, data products, services and facilities, based on distributed national research infrastructures across Europe.

EPOS will develop a holistic, sustainable, multidisciplinary research platform that provides coordinated access to harmonized and quality controlled data from diverse Earth science disciplines, together with tools for their use in analysis and modelling.

This integrated platform will demand significant coordination between – among others – disciplinary (thematic) communities, national research infrastructures and the policies and initiatives they drive, geoscientists and information technologists.

Earth science serves society directly by ensuring a sustainable supply of resources – energy, water, raw materials – and the means of protection from the effects of geo-hazards. A complex web of interconnected physical and chemical processes control earthquakes, volcanoes, landslides, and floods, and drive tectonics and Earth surface dynamics. Unravelling them requires accessible harmonized data and new tools to foster innovative cross-disciplinary research.



EPOS will enable cross-disciplinary research and promote the development of new research concepts and tools

EPOS will provide accurate, lasting and sustainable answers to societal questions

EPOS will empower researchers to address geo-hazards and geo-resources challenges, safeguarding our environment and the welfare of our societies

Driving science

We can maintain and enhance the standard of living across Europe if we understand how our planet works. EPOS will accelerate this process, promoting effective use of data and the development of new ideas and new tools to test them. EPOS will drive innovation for science, adding value to existing national research investment.

In the middle of the twentieth century, new technology to observe the Earth spread across the world. The data that resulted from this technological innovation, on earthquake locations, seafloor magnetism and volcanic activity, for example, led to a new theory of the Earth, plate tectonics. Plate tectonics changed the way Earth scientists viewed the planet and led to a flowering of research that continues to this day, with considerable advances within disciplines such as geodesy, seismology, volcanology and geochemistry.

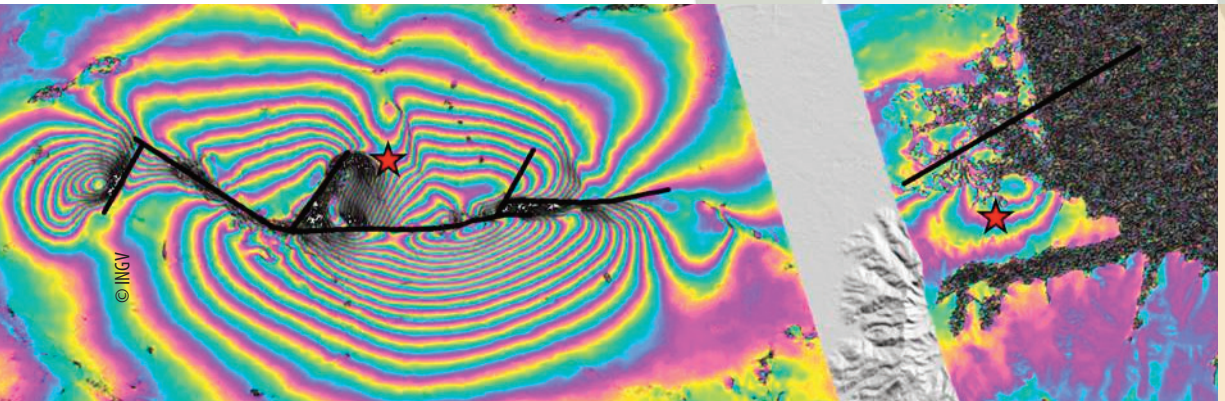
These advances, in turn, revealed the complexity of Earth systems, which researchers are now addressing in multi-disciplinary projects examining the origin of planet Earth, its magnetic field, composition and structure, and the evolution of Eurasia. Earth scientists know that it is important to consider both surface deformation and flows deep in the Earth's interior – and their interactions – in order to understand our planet. Global change highlights the impact on human society of long-term changes at the Earth's surface. The volume of data and breadth of physical, chemical and biological processes involved demand new integrated approaches to collaboration.

Considerable advances in information technology now make an integrated approach possible, easing access to the avalanche of data and products available across Earth science and related fields. Accessible datasets will bring novel cross-fertilization of ideas and leads to innovative research that is the key to future success.

EPOS will link research communities, including IT, through an efficient, multidisciplinary research platform

EPOS will provide new ways to access data, quality assured metadata and tools for analysis

EPOS will promote the development of new data products and services



The complex Earth system demands integrated solutions. EPOS will make data products more accessible. By combining satellite and in-situ Earth observations we can model surface deformations and tectonic processes causing earthquakes.

EPOS will harmonize data and metadata and ensure that new data products are accessible to both researchers and users across wider society.

Supporting society

Society needs resources to support home life, industry and business and it needs security in the face of natural hazards. Earth science underpins both these areas and EPOS will facilitate research innovation to support European society, now and in future.

Safety in the face of natural hazards is essential for society. Earth science explores the driving forces behind Europe's geo-hazards, such as earthquakes, volcanoes, landslides and floods. Earth scientists use natural and experimental data to model how geo-hazards arise and evolve. For example, combining data from volcanic structure, geochemical analysis, seismology and satellite geodesy allows researchers to track volcanic activity, giving societies at risk from eruptions a clearer idea of their potential exposure. Europe experiences rare but highly damaging events, including catastrophic volcanic eruptions and earthquakes. Combining a sound physical understanding of natural hazards with the means to monitor and predict their occurrence will mitigate their effects, as well as increasing public awareness, managing risks and decreasing deaths.

The secure and sustainable supply of natural resources – energy, water and raw materials – underpins strong economic growth. Successful societies depend on the science base to assess the genesis, extent and conservation of natural resources, in order to exploit them and discover new sources without detriment to our environment. Europe is experiencing increasing demand for resources, especially energy; whilst it has coal, oil and gas, and successful multinational companies that exploit them, there is also significant potential for unconventional sources such as shale gas. Developing energy resources and managing waste, safely and responsibly, will require multidisciplinary data and information.

Prosperity demands raw materials, energy and water. We need new sources of energy, including geothermal energy and we need minerals to support new technology. Finding valuable new deposits demands integrated laboratory and survey work, and new exploration models.

Geo-hazards can be global problems

In 2010, small volcanic eruptions at Eyjafjallajökull, Iceland, disrupted air travel worldwide, at an estimated cost of €1300 million. Understanding the circumstances that made this eruption so costly is involving not only researchers across diverse disciplines, but also civil authorities, aviation authorities, industry, and public all around Europe. The Eyjafjallajökull activity revealed our vulnerability and lack of scientific coordination across frontiers, making it clear that geo-hazards can affect environment and human welfare at regional to global scale. Hence, solutions need to be found at the same scale.

Tackling the complexity of geo-processes demands a diversity of competences, technologies, data and tools that must be harmonised and coordinated. EPOS is facing this challenge by improving interoperable, multidisciplinary access to data, data products, and tools (including facilities). Then, advanced IT methodologies and solutions will make datasets widely available from raw data, through data products, to integrated data products arising from complex analyses or wide community involvement, such as hazard maps suitable for various stakeholders such as civil authorities and the public.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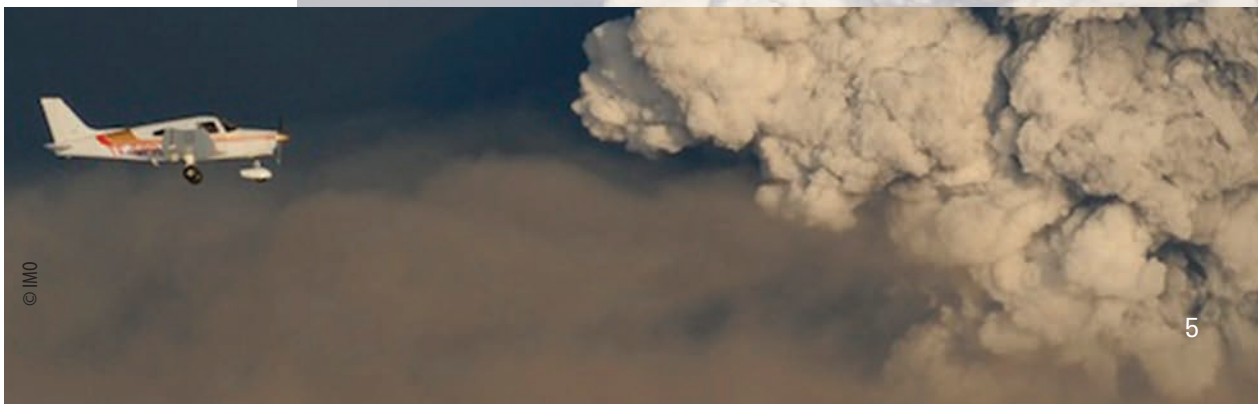
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The next generation

Integrated infrastructure for Earth science across Europe will bring scientific advances. Researchers will find new efficient ways of working and, in turn, will train the next generation of scientists to develop innovative models and methods to benefit society, in ways that are yet to be explored.

The study and understanding of the solid Earth are necessarily multidisciplinary, requiring data produced with varied formats and advanced techniques.
National research infrastructures and communities within disciplines will provide the foundations for this transnational and cross-disciplinary research infrastructure. Within this framework, the next generation of researchers must learn not only specialist skills, but also how to use multidisciplinary data and collaborate.
This is one of the key challenges for Earth and environmental sciences. EPOS will contribute to this challenge by simplifying and streamlining access to multidisciplinary data, products and services for solid Earth sciences. Easy-to-find data and data products as well as tools for visualization, processing and analysis provide the best way to sustain the integrated approach to research and drive the science forward, expanding the range of feasible research.
In order to build on this progress, the next generation of scientists must also be trained to develop data intensive applications and modelling. New opportunities provided by e-science innovation will be essential for future research progress. An integrated research infrastructure as a platform for discovery will facilitate collaborations between Earth and Information Technology scientists in particular. The perspectives guaranteed by this federated approach to science have global relevance and impact beyond the scientific communities involved.
Once the integrated services to be delivered by EPOS are fully operational, this new infrastructure will also enhance access to research outcomes. By linking data to publications, the infrastructure will provide better data traceability; by creating new data products, it will encourage scientists to share their research in ways that bring new applications for society.

EPOS will train the next generation of scientists in new ways of facing challenges

EPOS will improve the capability of society to understand scientific achievements and their use

EPOS will increase the resilience of society to natural hazard by facilitating preparedness and awareness


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Identifying potential downstream users. EPOS is developing and using a proper communication strategy to attract and interact diverse stakeholders. Dissemination channels such as the EPOS web site, newsletter, training courses, workshops, meetings, conferences and promotional materials will promote the enterprise and stimulate user feedback.


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How will EPOS work?

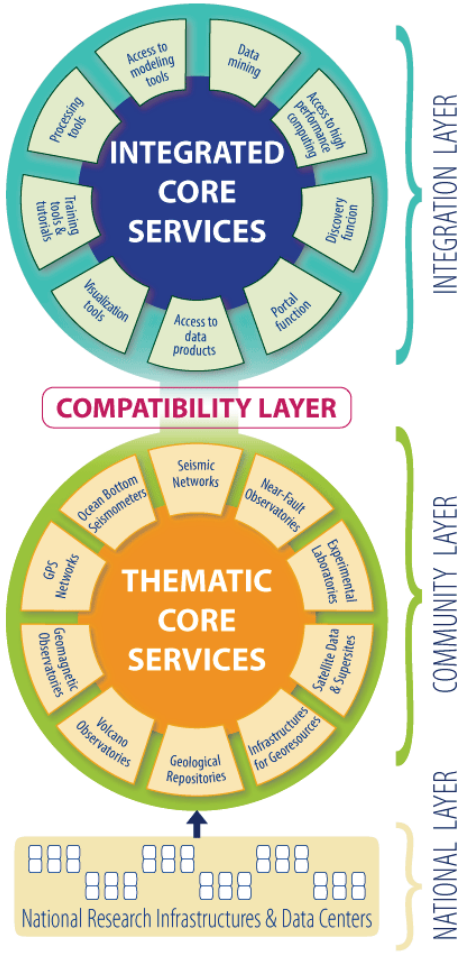
EPOS is integrating the diverse, but advanced, research infrastructures that exist for solid Earth Science in Europe; the programme will develop implementation plans and use new e-science opportunities to monitor and understand the dynamic and complex solid Earth system.

The EPOS architecture takes into account technical, governance, legal and financial issues and must make it possible for the enterprise to work as a single, but distributed, sustainable research infrastructure.

The European Research Infrastructure Consortium (ERIC) has been chosen by the Board of Governmental Representatives as the legal model for EPOS and used in designing the Governance Model. This includes a General Assembly of members and an Executive Director, supported by a Coordination Office. A Services Coordination Board representing the Thematic Core Services and the Integrated Core Services (see figure, right) will inform and assist the Executive Director in formulating and executing the EPOS work programme. The design of the Statutes is in progress.

The funding model as it has been designed will support the sustainable construction and operation of the whole EPOS enterprise. The model includes complementary funding sources for each of the key EPOS elements.

The Executive and Coordination Office (ECO) is the EPOS Headquarter and the legal seat of the distributed infrastructure governing the construction and operation of the Integrated Core Services and coordinating the implementation of the Thematic Core Services; the technical structure is described in detail by the figure on the right.



Technical structure

National Research Infrastructures (NRI); EPOS has as its foundations the existing NRI for solid Earth science across Europe. NRI generate data and information and manage the operation and maintenance of instrumentation in each country. National organisations will continue to own and manage the NRI and their data.

Thematic Core Services (TCS); they constitute the community-specific integration within EPOS. TCS bring together data and data products from NRI making them available to transnational thematic communities. Moreover, the TCS will provide access to new data products and services to the user community.

Integrated Core Services (ICS); they will provide access to multidisciplinary data, data products and simulations, and processing and visualization tools. The ICS will be composed of the ICS central hub and distributed computational resources. The interface between TCS and ICS is the **compatibility layer**, organizing communication and exchange of information. EPOS relies on open access principles.

EPOS Timeline. The EPOS Preparatory Phase ended October 31st, 2014. In the next step, the Implementation Phase, the EPOS-ERIC will be established, TCS implemented and ICS built. In 2019, EPOS will be operational...

23 Countries Involved

138 Institutions

250 National Research Infrastructures

4939 Seismic Stations

2272 GPS Receivers

464 Tb Seismic Data

118 Laboratories

828 Instruments

towards implementation phase

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