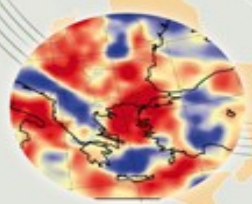
EUROPEANPLATEOBSERVINGSYSTEM



European Plate Observing System: Getting ready for EPOS construction

Massimo Cocco & EPOS PP Team

INGV

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Research Infrastructure and e-science for Data and Observatories on
Earthquakes, Volcanoes, Surface Dynamics and Tectonics

EPOS a long term integration plan of research infrastructures for solid Earth Science in Europe

Preparatory Phase Project

www.epos-eu.org

EPOS
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Adding scientific and socio-economic value in Europe by
integrating solid Earth Science Infrastructures

Mission Statement

EPOS will integrate the diverse, but advanced European Research Infrastructures for solid Earth Science, and will build on new e-science opportunities to monitor and understand the dynamic and complex solid-Earth System. EPOS will identify existing gaps and promote implementation plans with other disciplines of environmental science to help solve the grand challenges facing the Earth and its people.

What is EPOS ?

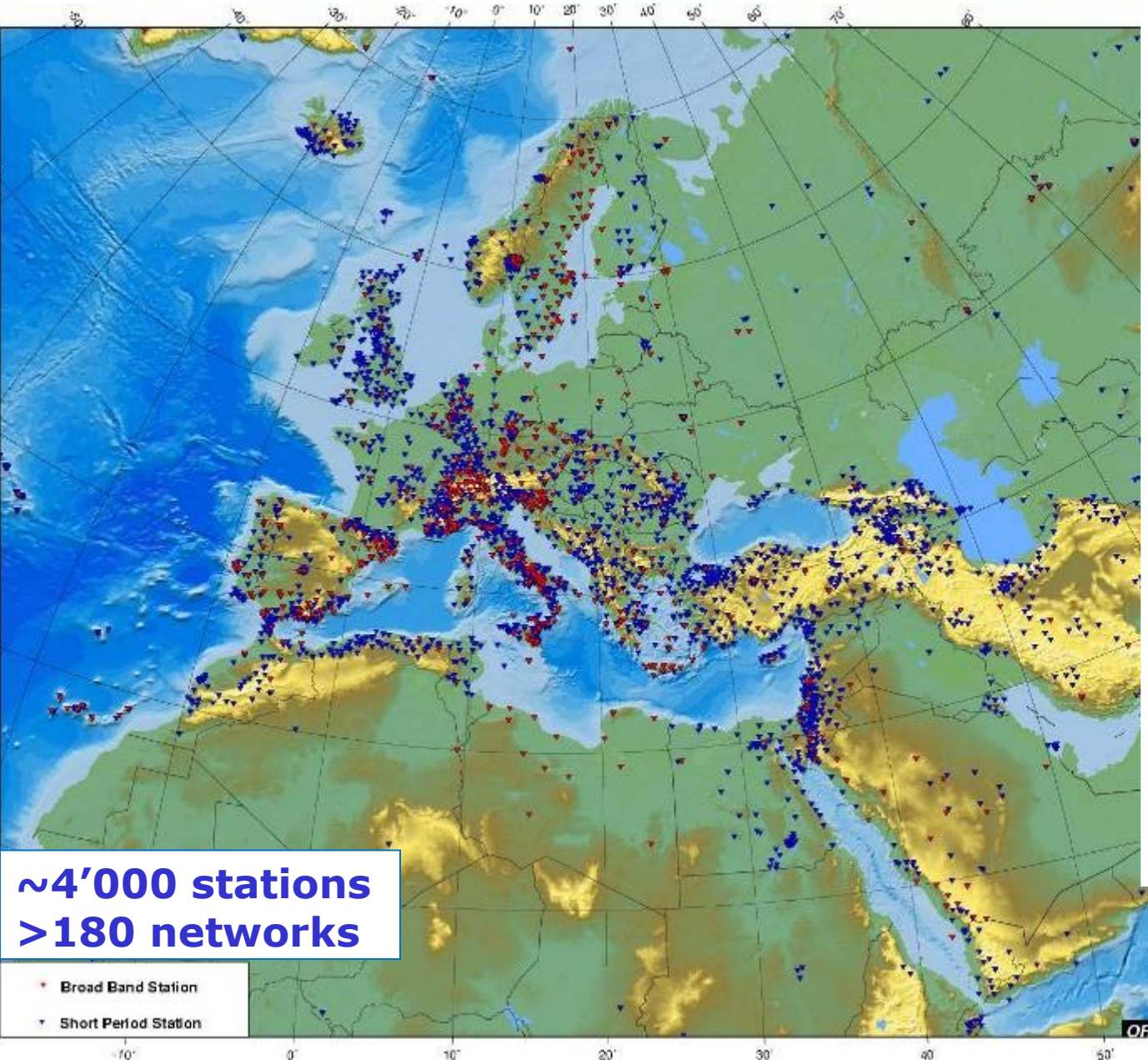
EPOS is a long-term integration plan that aims to create a single sustainable, permanent and distributed infrastructure that includes:

- geophysical monitoring networks
- local observatories (including permanent in-situ and volcano observatories)
- experimental & analogue laboratories in Europe

EPOS will give open access to geophysical and geological data and modelling tools, enabling a step change in multidisciplinary scientific research into different areas

seismic hazard map

Monitoring infrastructure: seismological networks



Data ownership:
National monitoring interests (hazard, warning, etc)

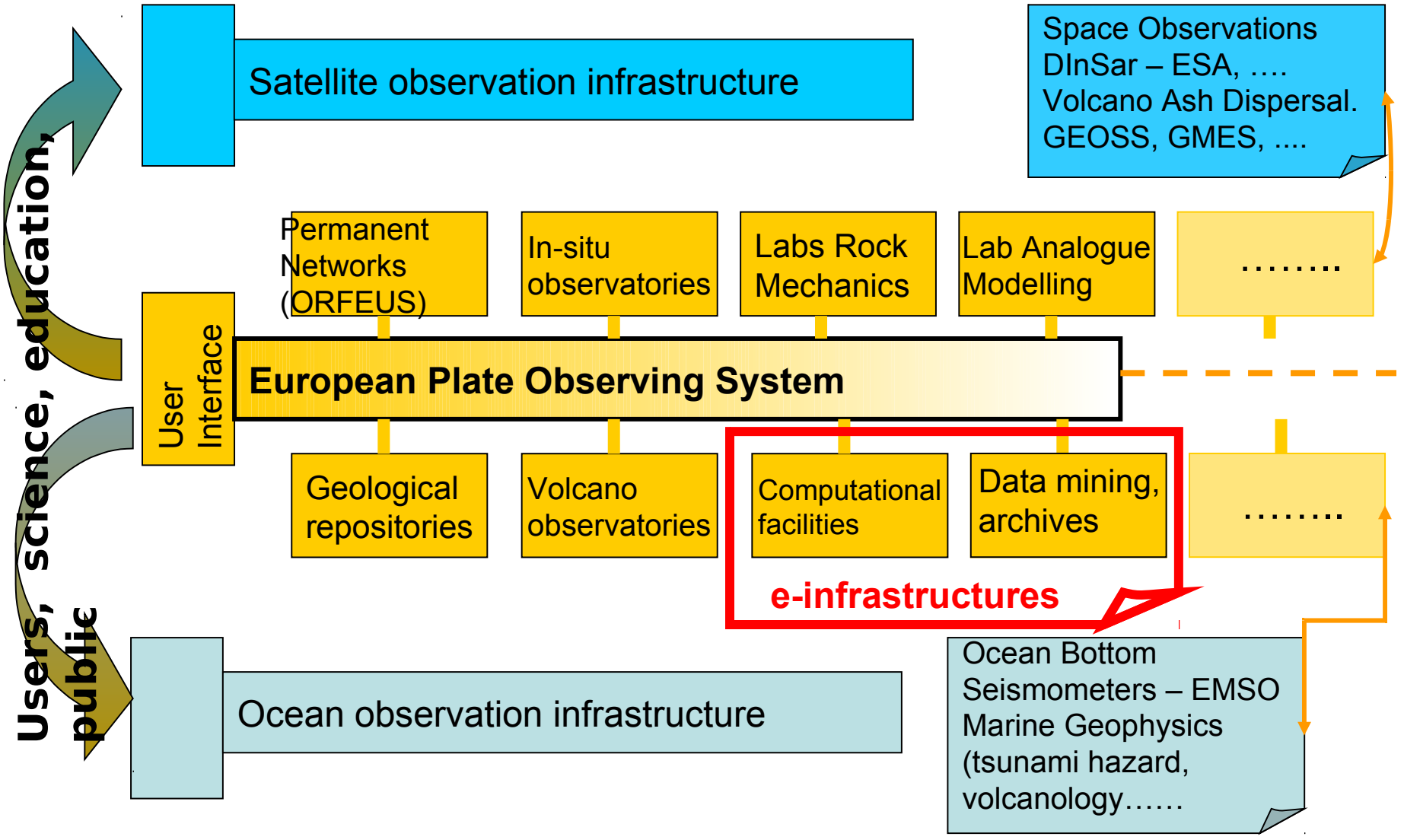
Regional Coordination:
Parameter data
EMSC
Waveform data
ORFEUS

Current projects:
NERIES (EU)
NERA (EU)
GEOFON (GR)
GEOSCOPE (FR)
MEDNET (I)

Orfeus

csem emsc

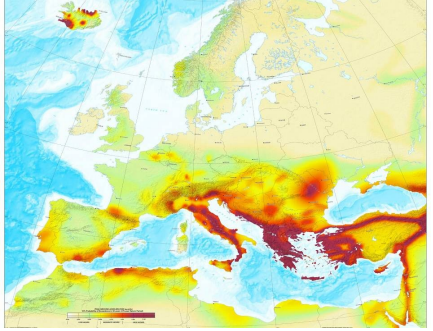
EPOS infrastructure concept



EPOS advances for scientists

- Influencing national priorities
- Implementing transnational access
- Giving visibility and coherence to our community
- Structuring our community to be competitive for global challenges
- Ensuring long term sustainability of our RIs
- Reducing fragmentation
- Optimizing effectiveness and impact

What is EPOS PP



Technical

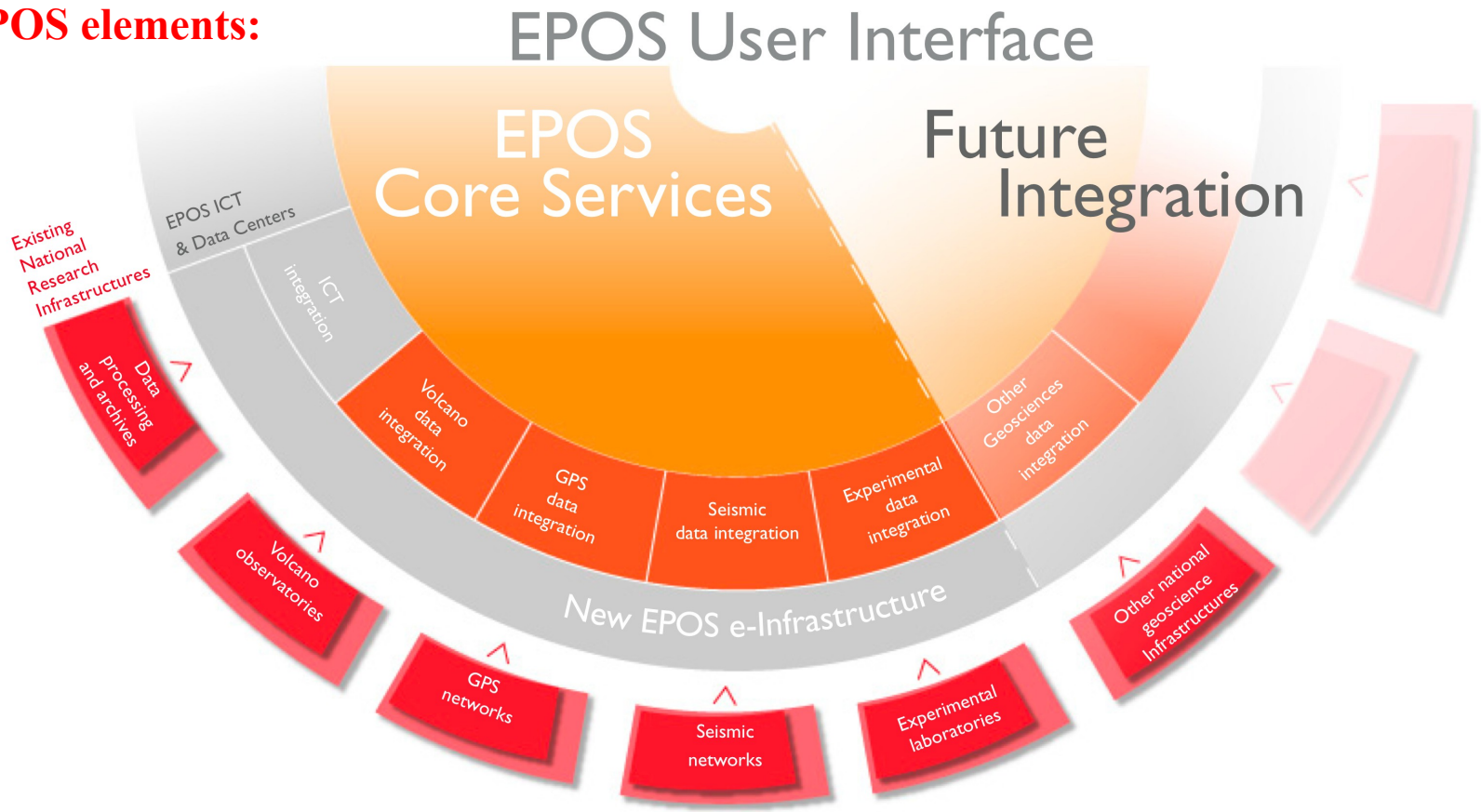
- To integrate existing national research infrastructures through the novel EPOS Data Centres representing a network of community service providers for distributed data storage and processing.

- To develop an innovative and coherent e-infrastructure architecture, which will form the platform and data service infrastructure (not community specific) by means of the EPOS Core Services, for interdisciplinary data and metadata exchange, processing tools and computational simulations through the EPOS user interface.

- To link EPOS with other international Earth Observing Systems.

- To promote coherent training, educational and dissemination programmes and outreach.

The EPOS elements:

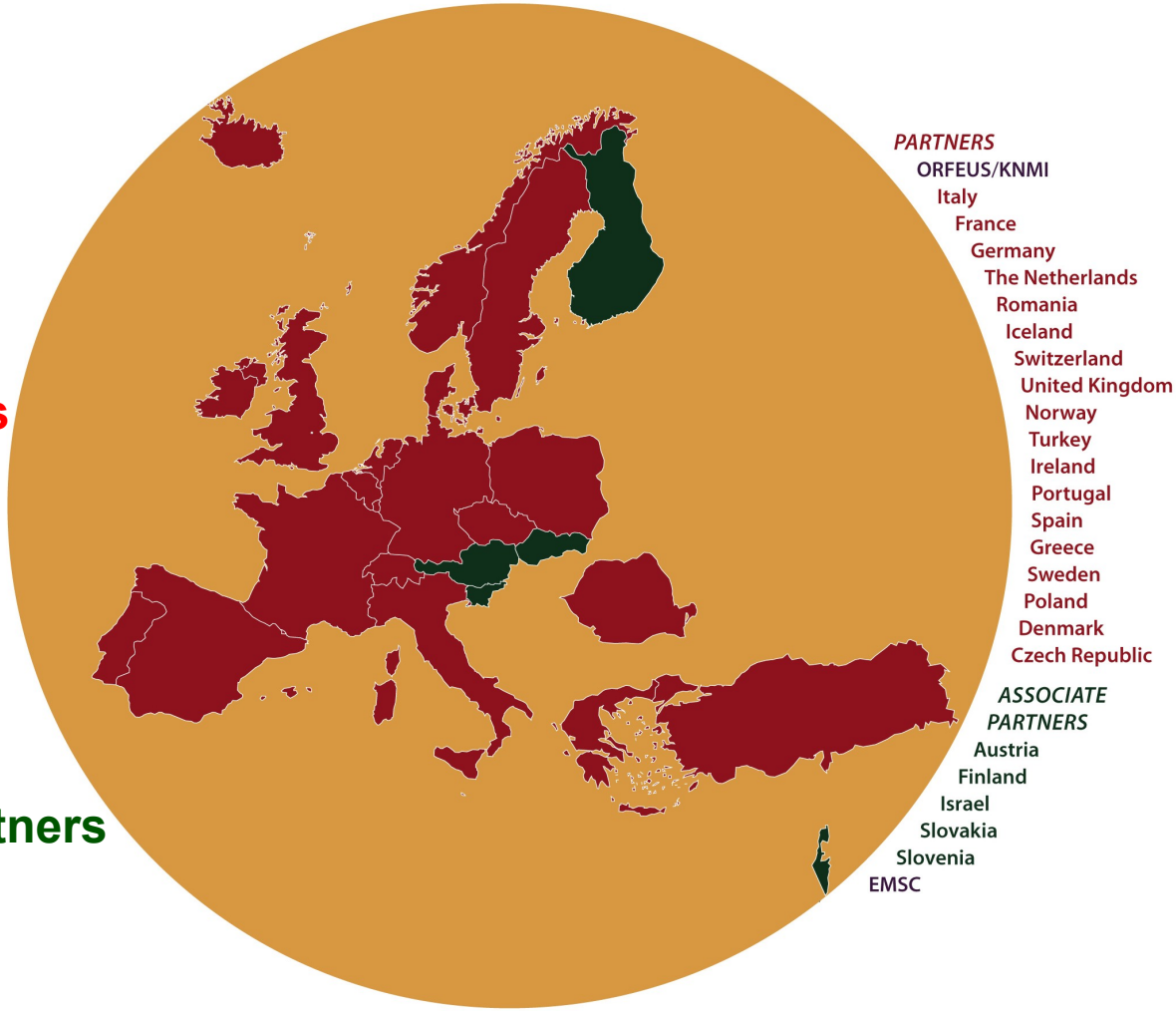


- The existing national research infrastructures are integrated into the EPOS Data Centres, which represent community specific services for data archiving and mining having their own computational resources.
- Community specific data centres are further integrated by the EPOS Core Services, representing the infrastructure layer consisting of common data services.
- EPOS data service infrastructure will be designed and established during the PP to serve multiple communities studying the solid Earth dynamics.

EUROPEAN COMMISSION
European Research Area

EPOS: the Partnership

20 partners for 18 countries

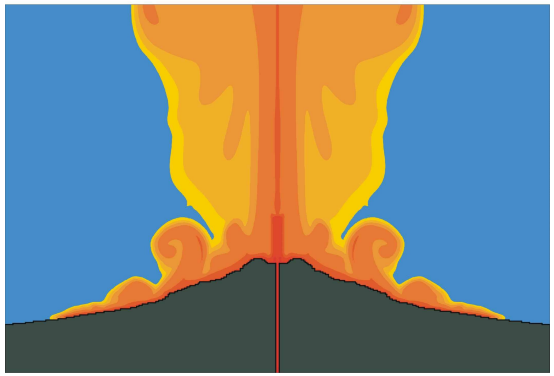


6 associate partners for 5 countries

New Associate Partners: Finland, Austria, Slovenia

research connection join us 09

Work Packages



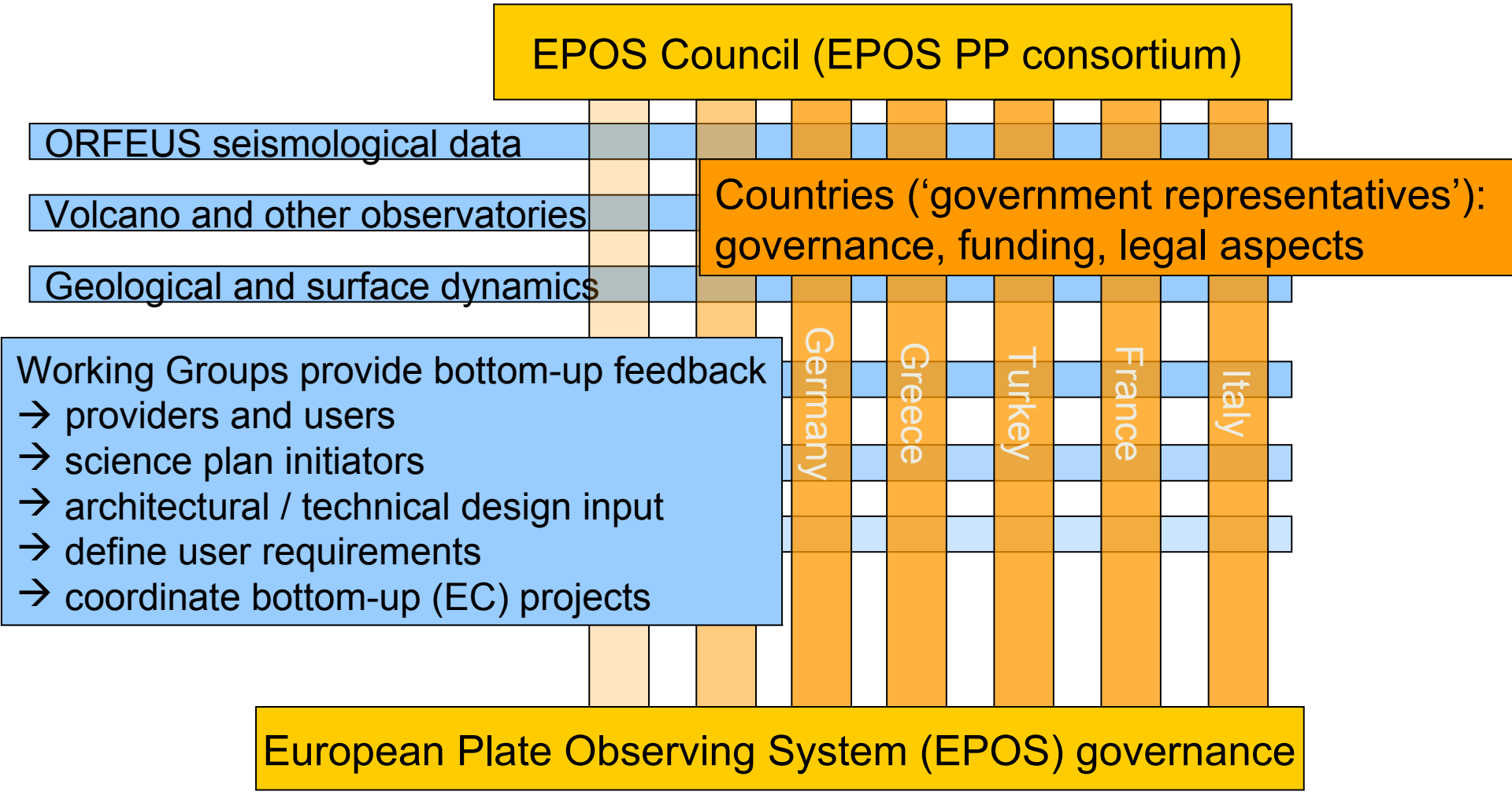
- WP 1 Preparatory Phase Managem
- WP2 Legal work
- WP3 Governance
- WP4Financial Plan
- WP5 Strategy
- WP6 Technical preparation
- WP7 Architecture and implementation plan
- Wp8 Stakeholder interactions & dissemination

WP6 Technical preparation

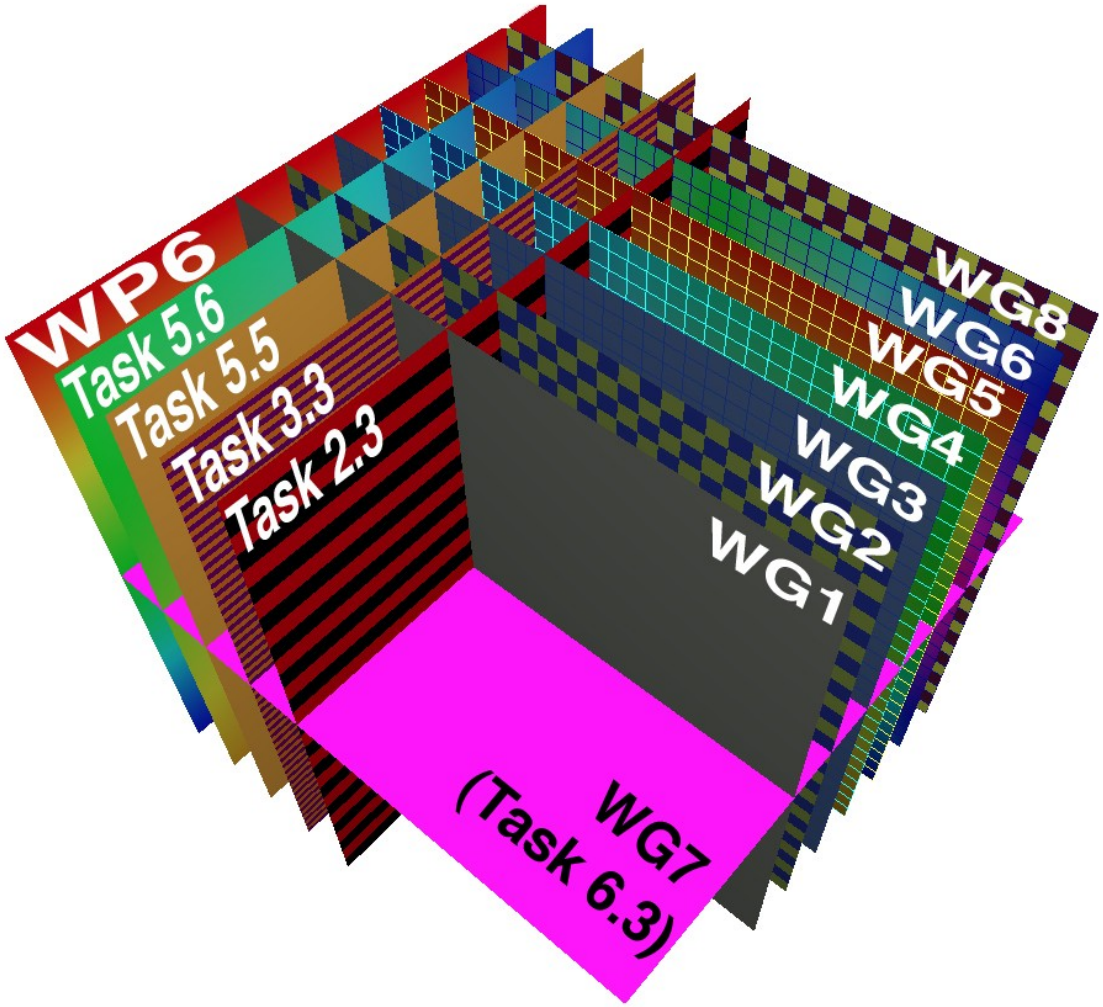
- Task 1 Inter-operability of RIs
- Task 2 Standardization & Technological Challenges
- Task 3 Access to data centres, modelling and technical facilities
- Task 4 IT standardization
- Task 5 WG integration and overview

✓WG 1 Seismological data
✓WG2 Data from Volcano Observatories
✓WG3 Geological and Surface Dynamics data
✓WG4 GNSS data and other Geodetic data
✓WG5 Other Geophysical data
✓WG6 Analytic and Experimental Rock Physics Laboratories
✓WG7 e-infrastructures and virtual community (HPC and Grid)
✓WG8 Satellite data

EPOS EPOS PP project Working Groups
The EPOS research infrastructure fabric



EPOS Technological Work



Coordinating Interactions with the User Community and Stakeholders

EPOS stakeholders categories:

(i) National Research Organisations & funding agencies,

(ii)EPOS data providers,

(iii)RI data users (including Academia),

(iv)data and services providers and users outside the research community (including industry).

European Geosciences Union (EGU) & European Seismological Commission (ESC) belong to category (iii)

Regional Conferences are envisioned for the EPOS Strategic Work

Thematic Workshops are promoted

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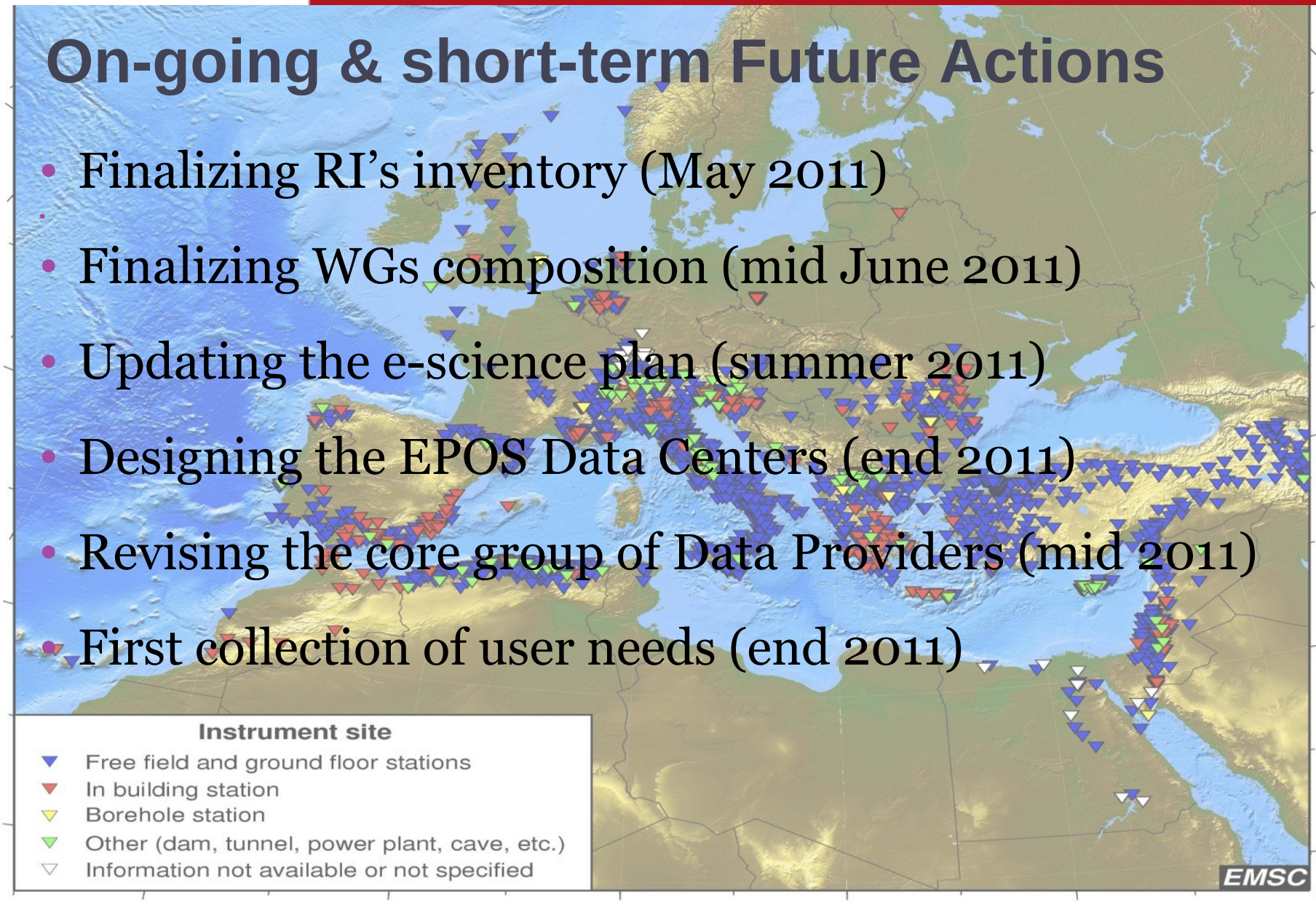
Defining Mission Needs

- Identify data providers 
- Define the EPOS Working Groups for technological work 
- Define EPOS core groups of Users 
- Define EPOS technical requirements 
- Define optimal legal and governance structure 
- Validation, authentication and impact assessment
- Provide long-term sustainability at national level 

On-going & short-term Future Actions

- Finalizing RI's inventory (May 2011)
- Finalizing WGs composition (mid June 2011)
- Updating the e-science plan (summer 2011)
- Designing the EPOS Data Centers (end 2011)
- Revising the core group of Data Providers (mid 2011)
- First collection of user needs (end 2011)



EPOS-related European Projects

Training Initiatives: links with existing ITN (QUEST & TOPOMOD) and search for opportunities for new ITN (i.e., for Rock Physics Laboratories)

Links with ESF programs and initiatives (**TOPOEurope**, MeMoVolc)

Links with other EC Projects (NERIES/**NERA**, SHARE, ...)

Interactions with new submitted EC projects in e-science (**VERCE**, EUDAT, **ENVRI**) and cooperation (REAKT, ...)

Interactions with other Global Initiatives (Onegeology, GEM, **GEO**, ...)

Interactions and Collaborations with Satellite data community (ESA, TERRAFIRMA, GENESI-DEC, ...)

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Interactions with existing European platforms

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Ocean and seafloor sciences
EMSO - ESONET

Seafloor & land-based observations

Engineering seismology
EFAST - SERIES

NERA

ORFEUS
EMSC
FDSN

Seismology: research and data infrastructure

Environmental ESFRI initiatives
EUDAT, ENVRI proposals

VERCE

EGI/HPC
INSPIRE

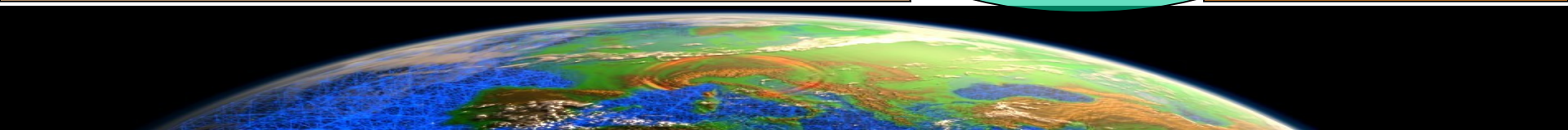
E-science ecosystems: research and infrastructure

Earth Observations
GEOSS, ESA

Terrestrial & Satellite observations

EPOS Preparatory Phase project

Earthquakes, Volcanoes, Earth dynamics, Tectonics



Issues for international cooperation: collaborations with US-NSF

- There are ongoing initiatives for global coordination and integration of infrastructures in geophysics, seismology and geodesy:
  - International Federation of Digital Seismograph Networks (**FDSN**, http://www.fdsn.org/) involved in **GEO**
  - Incorporated Research Institutions for Seismology (**IRIS**) and the Global Seismographic Network (**GSN**) coordinated with **ORFEUS** (EPOS partner)
  - UNAVCO (www.unavco.org/) and European geodesy initiatives
- The Earth science program **EarthScope** and collaborations on scientific drilling, geodesy, rock physics and seismology
- World Organization of Volcano Observatories (WoVO, www.wovo.org)

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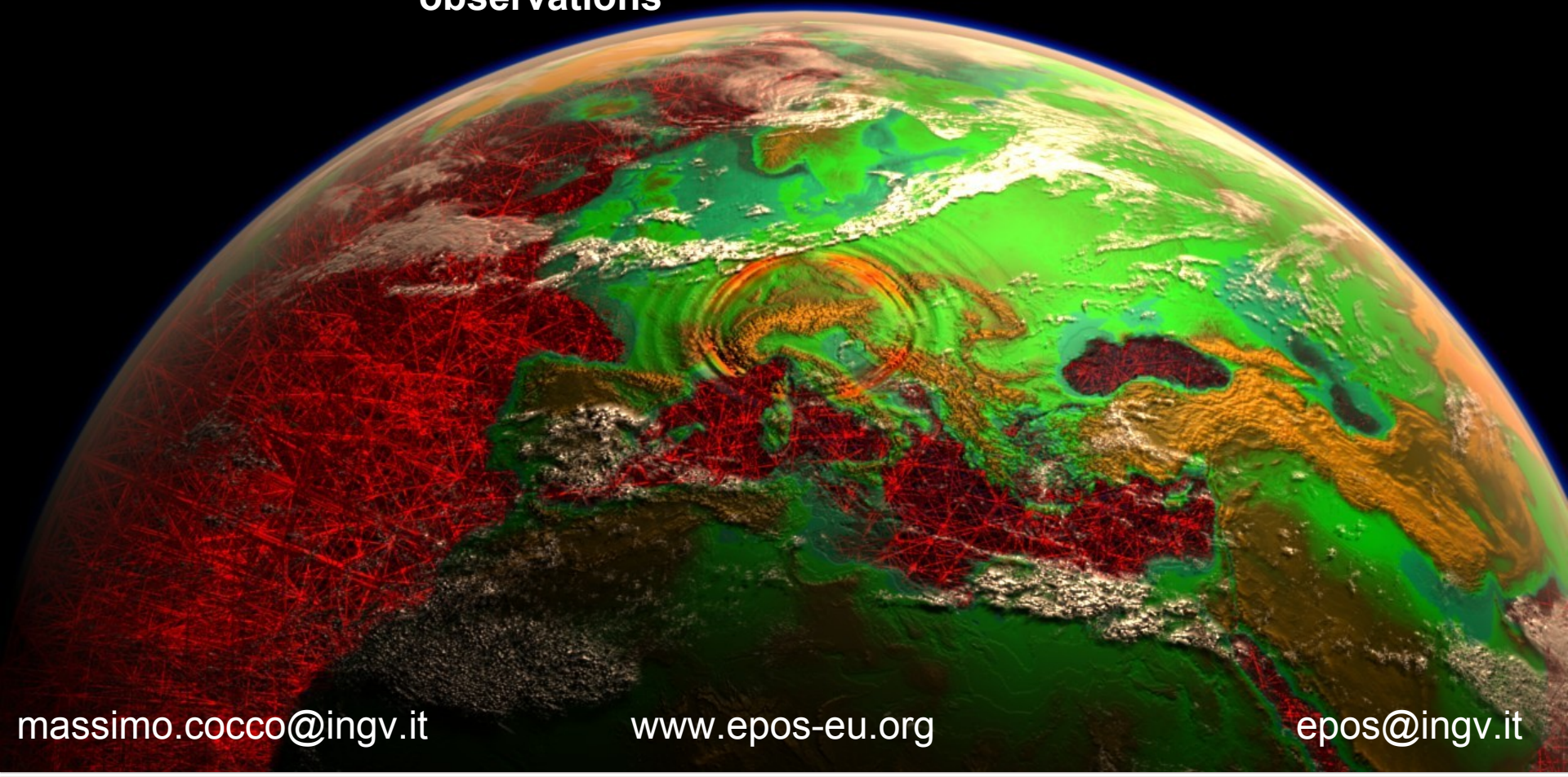
Research Infrastructure and e-science for Data and Observatories on
Earthquakes, Volcanoes, Surface Dynamics and Tectonics

EPOS is going to contribute to the white paper on the integration of seafloor and land-based observations

Thank you for attention



massimo.cocco@ingv.it

www.epos-eu.org

epos@ingv.it

The EPOS NewsLetter ---- Please contribute

EPOS newsletter
www.epos-eu.org
Integrating European Research Infrastructures for solid Earth Science

INSIDE THIS ISSUE

NEWS

The EPOS Mission Statement. EPOS will integrate the diverse, but advanced European Research Infrastructures for solid Earth Science, and will build on new e-science opportunities to monitor and understand the dynamic and complex solid-Earth System. EPOS will identify existing gaps and promote implementation plans with other disciplines of environmental science to help solve the grand challenges facing the Earth and its people

by Massimo Cocco & EPOS team

Adding scientific and socio-economic value in Europe by integrating solid Earth science infrastructures

The understanding of the physical processes responsible for earthquakes, volcanic eruptions, landslides, surface and tectonic processes, and tsunamis requires the prompt and continuous availability of high quality data obtained through direct observations and accurate predictive modeling of their temporal and spatial evolution. The accessibility to these data can accelerate the discovery of new and novel uses of Earth science results for societal benefit. The in-situ monitoring and forecast be completely assessed (for instance in terms of energy supply, insurance and re-insurance companies, financial markets, etc...). In addition to its other effects, the Tohoku earthquake will affect Japan's and the world's supply of some minerals, at least temporarily. Up to one-quarter of the world's iodine and one-third of Japan's cement production may be affected, according to a recently released U.S. Geological Survey report.

Understanding the processes and forecasting, mitigating the effects of such events requires a pan-European coordination of national facilities and expertise. This plan aims at integrating the currently scattered, but highly advanced European facilities

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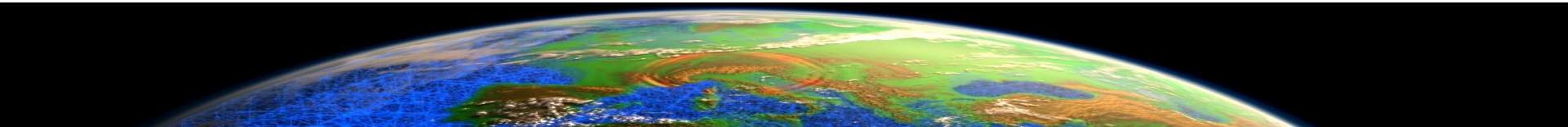
Collaborative Area is now open

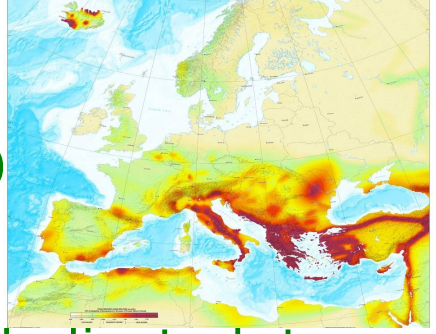
VERCE : Virtual Earthquake and Seismology Research Community in Europe e-science environment

Centre National de la Recherche Scientifique (CNRS-INSU), France
University of Edinburgh (UEDIN), United Kingdom
Royal Netherlands Meteorological Institute (KNMI-ORFEUS), Netherlands
European-Mediterranean Seismological Centre (EMSC), France
Istituto Nazionale di Geofisica e Vulcanologia (INGV), Italy
Ludwig-Maximilians-Universität (LMU), Germany
University of Liverpool (ULIV), United Kingdom
Bayerische Akademie der Wissenschaften (BADW-LRZ), Germany
Fraunhofer-Gesellschaft e.V. (SCAI), Germany
Centro di Calcolo Interuniversitario (CINECA), Italy

Jean-Pierre Vilotte (CNRS-IPG Paris), Malcolm Atkinson (UEDIN), Torild van Eyck (ORFEUS-KNMI), Anton Frank (BADW-LRZ)



What is EPOS PP



The Preparatory Phase is a timely initiative dedicated to establishing a management framework with efficient centralized coordination to achieve the following objectives:

Strategic

- To establish efficient coordination and management of the infrastructure at European level that will govern the process of building the necessary components, the expenditure assessment and the outreach at the project level.

- To reach mutual agreement among the countries involved regarding the core legal entity and its governance structure as well as commitments for funding that will ensure the construction of the infrastructure and its long-term operation.

EPOS: the Concept

EPOS intends to integrate five existing core elements within one cyber infrastructure to realize:

- A comprehensive geographical distributed observational infrastructure consisting of existing permanent monitoring networks on a European scale (seismic, geodetic, ….)

- Dedicated observatories for multidisciplinary local data acquisition (volcanoes, in-situ fault monitoring experiments, geothermal and deep drilling experiments, geological repositories)

- A network of experimental laboratories creating a single distributed research infrastructure for rock and mineral properties

- Facilities for data repositories as well as for data integration, archiving and mining (including different solid Earth data, such as geophysical, geological, topographic, geochemical)

- Facilities for high performance distributed computing consisting of cyber infrastructures for collaborative computing and large scale data analysis

WP1 Preparatory Phase Management

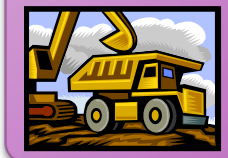
WP2 Legal work

WP3 Governance

WP4 Financial Plan

WP 5 Strategy

WP6 Technical preparation



WP7 Architecture and implementation plan

Wp8 Stakeholder interactions & dissemination

The EPOS PP Management Structure & Advising Boards

Advisory Board :

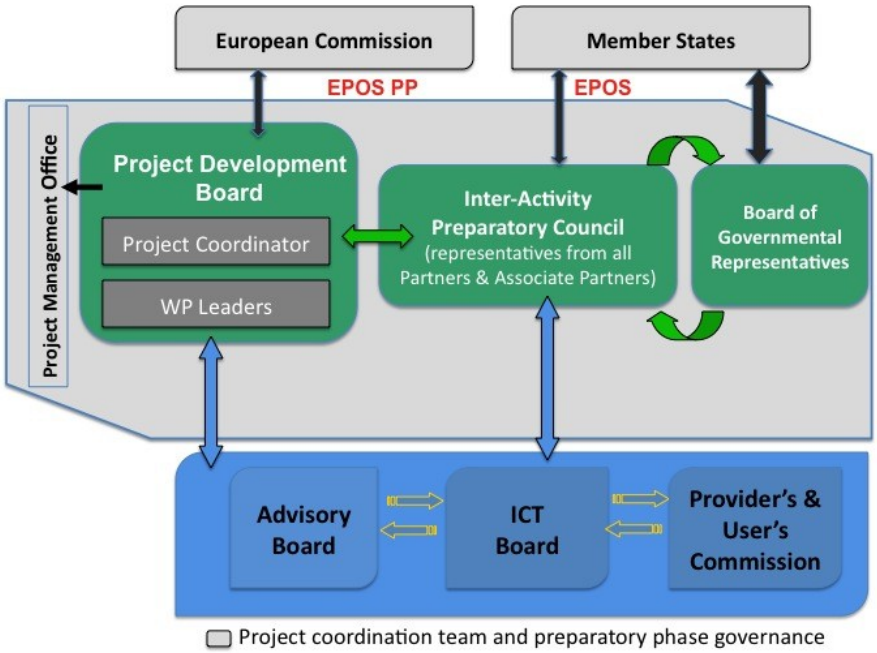
- ✓ Goran Ekstrom (Earthscope)
- ✓ Rui Pinho (GEM, Global Earthquake Model)
- ✓ Mark Robinson (ITER)
- ✓ Enric Banda (Director of Science, Research and Environment at the "La Caixa" Foundation)

ICT Board

- ✓ Leif Laaksonen (e-IRG)
- ✓ Giuseppe Fiameni (CINECA)
- ✓ Steven Newhouse (EGI)
- ✓ Francois Robida (Onegeology, BRGM)

DP&U Commission:

- ✓ Mike Jackson (PBO / UNAVCO)
- ✓ Don Dingwell (EGU President)
- ✓ Michael Rast (ESA)
- ✓ Tim Ahern (IRIS)
- ✓ Steinunn Jakobsdottir (ESC President)



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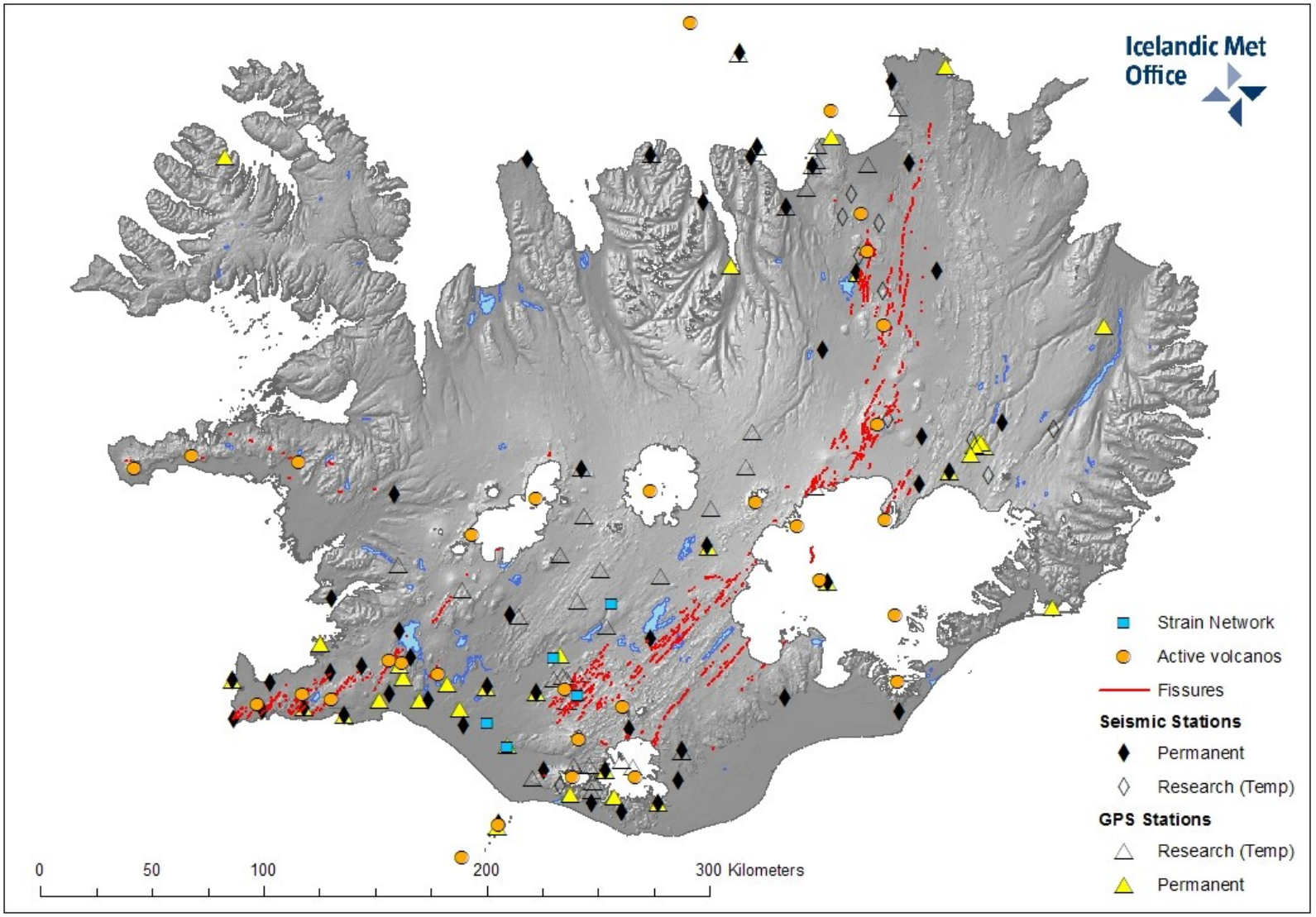
A Natural Laboratory for solid Earth Science



Data Intensive applications

Earthquake and seismology community is facing a fundamental paradigm shift: from data driven to data intensive research:

Large volume data analysis: extracting information from space and time correlations in dense array observations,

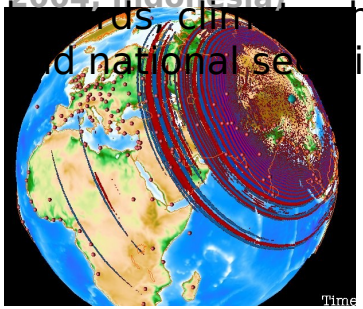
Data and computing intensive simulation/inversion: 3D wave form information using adjoint methods, stochastic strong motion simulation,

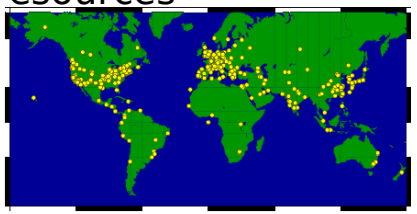
Orchestrated workflows across service components.

Seamless access to large volumes of multi-sets data across the Grid and HPC components

Large earthquake source radiation: Sichuan (Mw 7.9, 2008, China), Sumatra-Andaman (Mw 9.2, 2004, Indonesia)

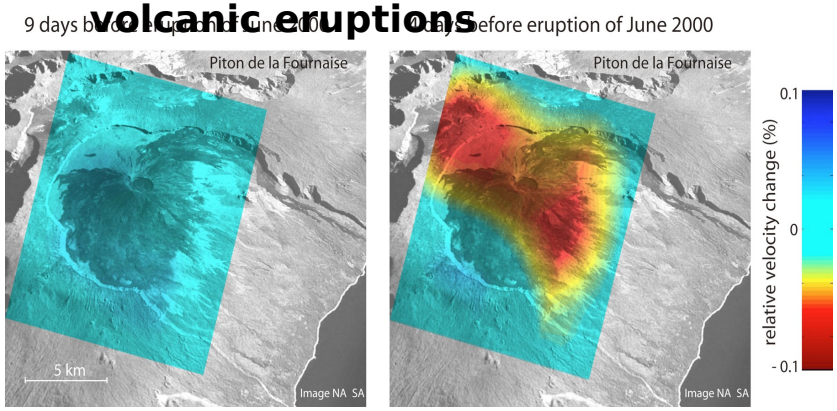
Industrial and societal applications: natural hazards, climate change, energy resources and national security.



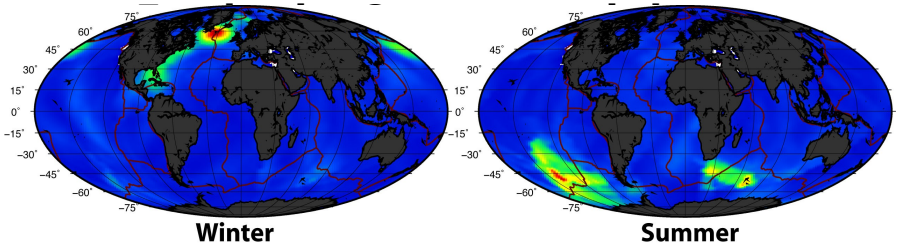


Research groups using SPECFEM3D

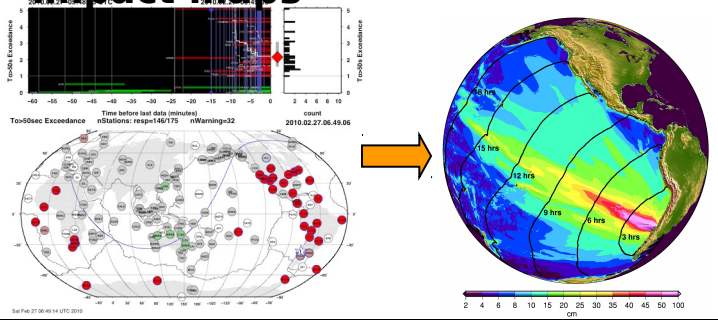
Seismic noise correlations: observing precursors to volcanic eruptions

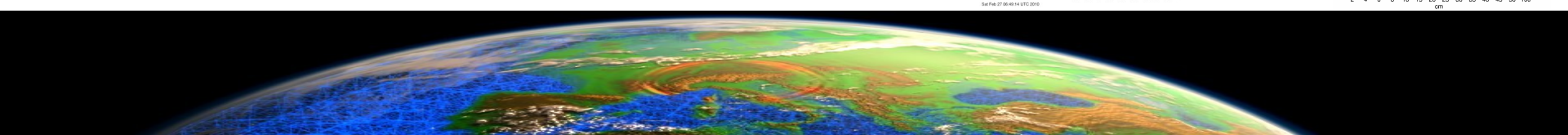


Studying the coupling between the Solid

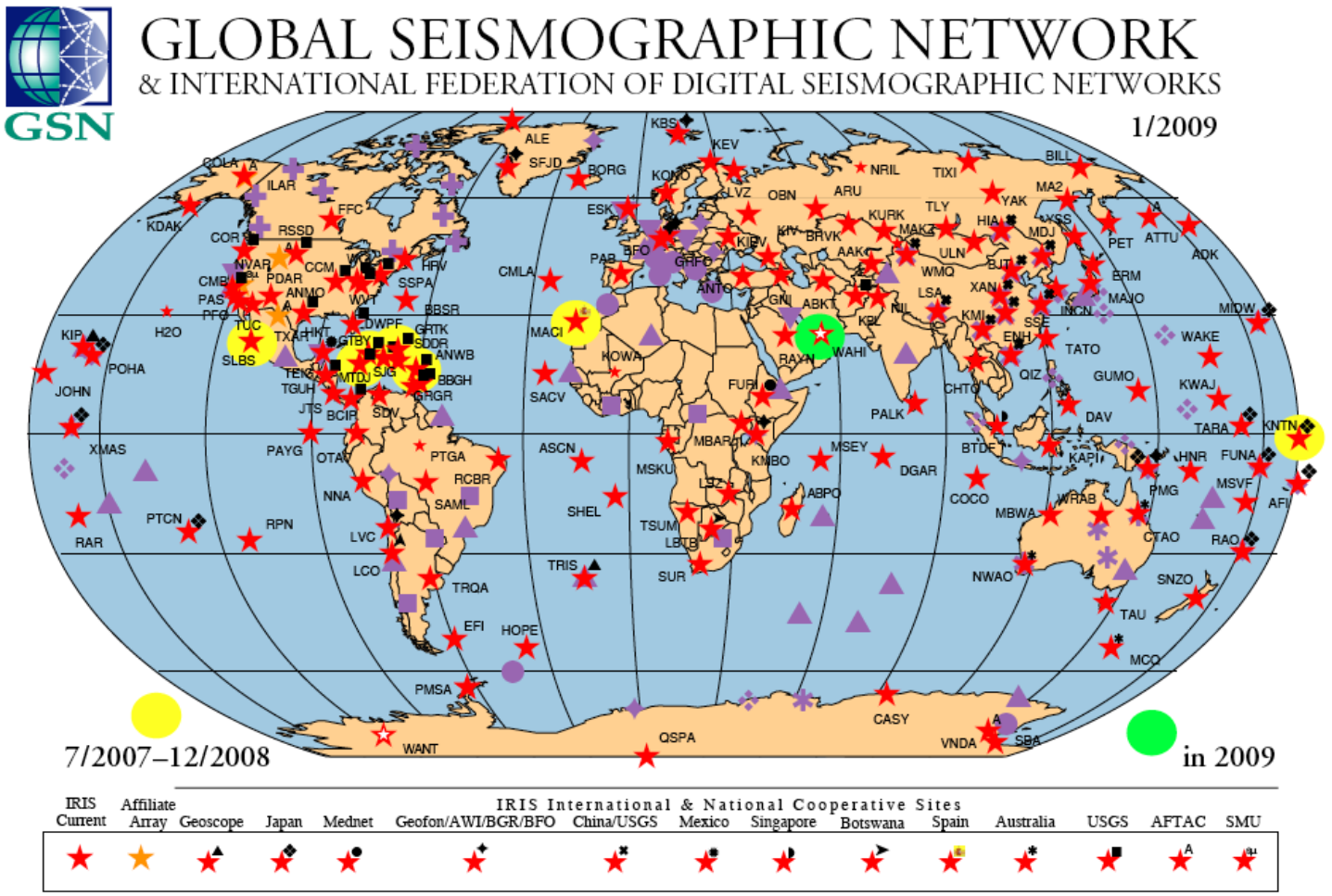


Earthquake detection: tsunami impact maps





Participating to Global Initiatives



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Responding to the specific needs for Europe

- **Innovation**
  - Integrated accessibility to multidisciplinary data will accelerate the discovery of new and novel uses of Earth science results for societal benefit (including both scientific discoveries and technological progress)
  - Development of **educational**, **training** and dissemination material (e-learning)
- **Connections to other RIs and to other scientific fields**
- **Maintaining a key role and collaborating with other global and international initiatives**

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EPOS DUAL ROLE

getting ready for construction phase

- Pan-European integration of existing research infrastructures
  - Integrating multidisciplinary infrastructures as a key challenge for solid Earth Science
  - Identifying existing gaps and pilot projects to promote a modern implementation of RIs
- Long-term sustainability of research infrastructures at national level
  - Guaranteeing maintenance and the minimum required implementation level
  - Supporting the development of the monitoring infrastructures coordinated with the Epos's pan-European integrated vision