EPOS, EFEHR, and the Value of Hazard and Risk Services for the Community

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EPOS in a nutshell (tiny nut...)

The European Plate Observing System: a European Research Infrastructure for Solid Earth Sciences

EPOS builds upon data, products and services contributed by national infrastructures

EPOS provides integrated cross-disciplinary access to data, products, and services for all themes of solid earth science.
EPOS in a nutshell (tiny nut...)

**Seismology**
- Seismic waveforms (ORFEUS)
- Seismological products (EMSC)
- Hazard & risk products (EFEHR)
- Computational seismology

**Satellite data**
- SAR interferograms
- Integrated satellite products
- On-line processing tools

**Global and regional geomagnetic models**
- Magnetotelluric data

**Anthropogenic hazards**
- Data for AH episodes
- Multi-hazard simulator - multi-risk assessment
- AH data visualisation

**Multi-scale laboratories**
- Experimental & analogue data
- TNA to experimental & micro-analytical facilities

**Seismedological Products**
- Earthquake Parameter Information
- Macroseismic & Historical Event data
- Seismological Products Platform
  - rupture models / SiteCharTool / MT
  - EventID / F-E-Region / ...

**Hazard and Risk Services**
- Seismic Hazard Models
- Seismogenic Faults
- Ground Shaking Models
- Geotechnical Engineering Information
- Strong Motion records in buildings
- Earthquake Engineering & Risk Services

**Waveform Services**
- Waveform selection & access
- Waveform metrics & Station Information
- Strong Motion parameters
- OBS data integration
- Mobile Pool coordination & integration
- Waveform modeling

**Community driven and governed services**
The EFEHR vision

EFEHR and its services provide access to a living, harmonized European hazard and risk model, as well as the relevant data, models, tools and expertise.
EFEHR services - operational

EFEHR aims to operate by 2019 six coordinated services for earthquake hazard and risk with a European dimension. The Swiss Seismological Service at ETH Zurich is responsible for the connection among the six partners.

- EFEHR - Hazard Platform
- EU Geotechnical Engineering Information
- Strong Motion Recordings in Buildings
- EU Database of Seismogenic Faults
- EU Ground Shaking Models
- EU Earthquake Risk

www.efehr.org
EFEHR services - operational

Hazard Data Access

The EFEHR web-platform provides access to interactive tools such as seismic hazard models, products and information. Distributed data, models, products and information are based on research projects carried out by academic and public organisations. Currently, the seismic hazard models and resources for Europe, Middle East and the OSHAP global model are available. The latest update of the Swiss Seismic Hazard Model is also available through this platform. As updates and new information become available they will be added to the portal. Access the seismic hazard tools below.

Maps

Specific Hazard Models

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Documentation

About Seismic Hazard
Specific Hazard Models

Europe
- ESHM2013 Overview
- Earthquake Catalogue Europe
- Active Faults
- Seismogenic Sources
- Strong Motion Data
- Hazard Computation Input

Europe

Middle East

National
EFEHR services - operational

EDSF
European Database of Seismogenic Faults

The European Database of Seismogenic Faults (EDSF) was compiled in the framework of the EU Project SHARE. Work Package 3, Task 3.2. EDSF includes only faults that are deemed to be capable of generating earthquakes of magnitude equal to or larger than 5.5 and aims at ensuring a homogeneous input for use in ground-shaking hazard assessment in the Euro-Mediterranean area. Several research institutions participated in the development of the database.

Go to the DISS website

The legacy of project SHARE

Current implementation in EPOS Seismology

1,128 records for ~63,775 km of crustal faults
3 subduction zones

Contributors: 109 scientists from 49 different institutions plus a number of regional initiatives from DISS WG (Italy), EMME Project (Turkey), GreDASS (Greece), QAFI (Spain and Portugal)

Basili et al. (2013; doi:10.6092/INGV.IT-SHARE-EDSF)
EFEHR services – under construction

**eGSIM**
*European Ground Shaking Intensity Models*

- **Web-Interface**

- **GMPE Library**
  - Common GMPE library, open-source, tested

- **OpenQuake Ground Motion Toolkit**
  - Comparison of models (trellis plotting)
  - Comparison against data (testing)

- **Visualisation/Results**
  - Testing scores
  - Trellis Plots
  - Residual Plots
  - Sammon’s Maps

**FLATFILES**
- ESM
- NGA West 2
- NGA East
- KikNet
- User-supplied

**Regionalisation or Geospatial Query**

- Finalization of ESM flatfile
- Development of flatfile for continental Europe
- Definition of common flatfile formats *(for users)*
- Standardization of Ground Motion Database format
# EFEHR services – under construction

## Building a QuakeML data model for geotechnical (site) information

### ELEMENT: gd_sites

<table>
<thead>
<tr>
<th>Field Name</th>
<th>Description</th>
<th>Restrictions to values</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>latitude</td>
<td>Geographic latitude (+/- for northern/southern hemisphere, respectively)</td>
<td></td>
<td>Decimal degrees</td>
</tr>
<tr>
<td>longitude</td>
<td>Geographic longitude from Greenwich (+/- for eastern/western longitude, respectively)</td>
<td></td>
<td>Decimal degrees</td>
</tr>
<tr>
<td>altitude</td>
<td>Elevation of ground with respect to sea level (+/- for above/below sea level, respectively)</td>
<td></td>
<td>m</td>
</tr>
<tr>
<td>country</td>
<td>Country where the site belongs</td>
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<td>morphology_id</td>
<td>Qualitative description of the shape of the earth’s surface</td>
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<tr>
<td></td>
<td></td>
<td>• Basin</td>
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<td>• Flat</td>
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<td>• Slope</td>
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<td></td>
<td></td>
<td>• Ridge</td>
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<td>Quantitative description of the shape of the earth’s</td>
<td>• T1</td>
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</tr>
</tbody>
</table>
EFEHR services – under construction

Strong Motion Structural Monitoring Database

EXAMPLES OF STRUCTURES WITH MONITORING SYSTEMS

Ophite Tower, Lourdes, France

Grenoble City Hall in Grenoble, France

Polat Tower, Istanbul, Turkey

Camlica TV Tower, Istanbul, Turkey
EFEHR services – under construction

European Risk Modelling

EFEHR will provide access to the following products:

- Building exposure model at European scale
- Physical fragility for predominant European building types
- Damage-loss models for predominant European building types
- National socio-economic vulnerability models
- European maps of physical and integrated risk

Within SERA, a framework for modelling seismic risk at local (e.g. city), national and continental scale will be developed.

This framework will build upon research efforts and data collected in previous projects, e.g. SHARE (seismic hazard), NERA (residential building exposure) and SYNER-G (building and infrastructure fragility)

New exposure and vulnerability models and risk maps at a European scale will also be developed.
EFEHR in EPOS – synergies and dependencies

Geohazard harmonisation group:
Coordinate geohazard across EPOS
- Volcano hazard
- Anthropogenic (seismic) hazard
- Near-fault-observatories
- Geological hazard (?)
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<th>political &amp; legal</th>
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Technical & Scientific

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Political & Legal

- Sustainability of service infrastructure
- Data (provider) agreements
- Licensing and intellectual property rights
- Representation and governance
- Societal uptake of hazard and risk

"Geology, natural hazards, natural resources and, in general, environmental processes do not respect national boundaries, therefore seamless, trans-national integration of measurements and calibrated data is often vital for optimal research and related activities."

"...RIs in the solid Earth domain provide a crucial contribution to two areas of high societal relevance: geo-hazards and geo-resources. In particular, they: enable mitigating the effects of natural hazards ... as well as anthropogenic hazards, ...".

European Strategy Forum on Research Infrastructures, 2016