Schweizerischer Erdbebendienst
Service Sismologique Suisse
Servizio Sismico Svizzero
Swiss Seismological Service

ETH zürich

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

Florian Haslinger, S. Wiemer., L. Danciu, D. Giardini

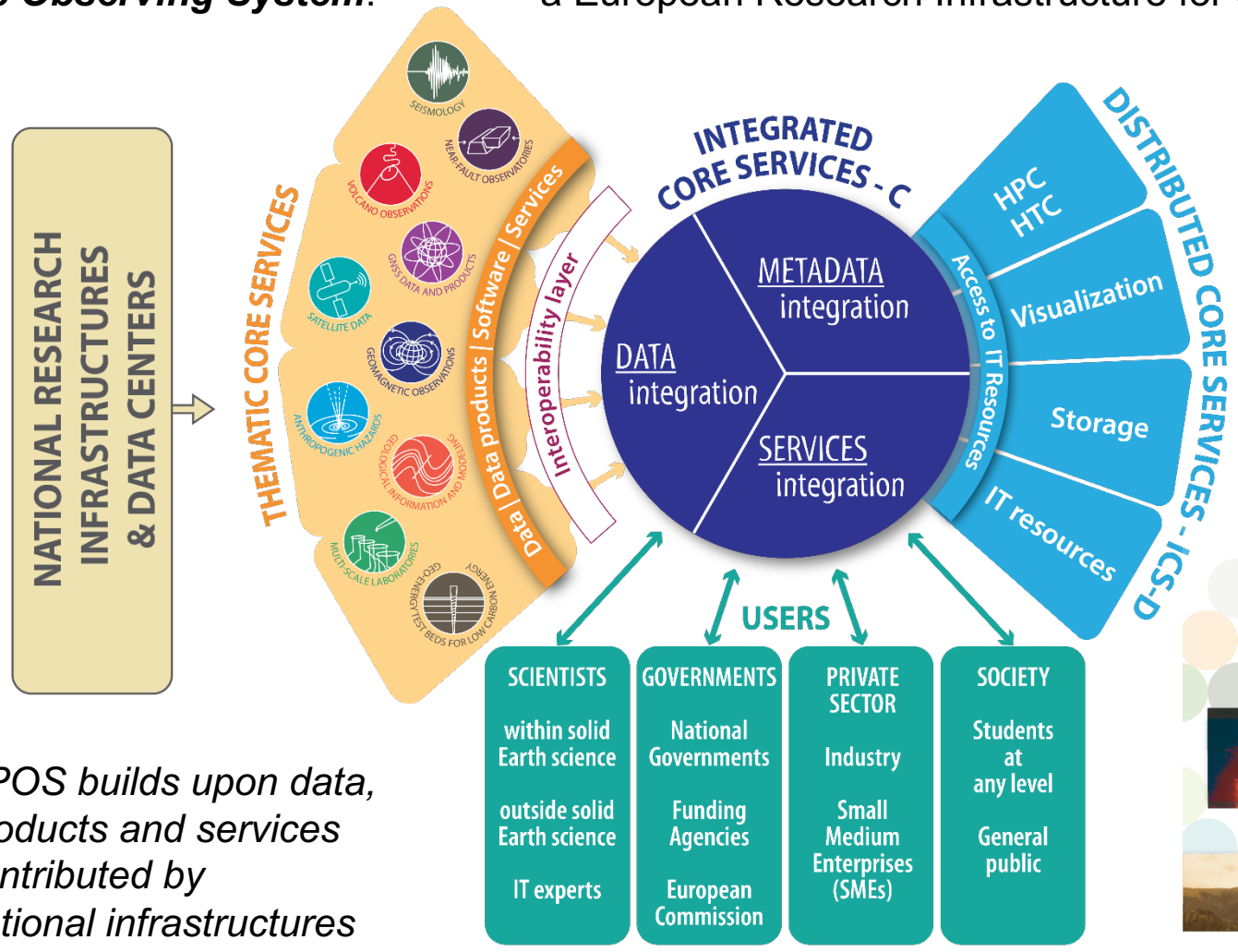
with contributions from R. Basili (INGV), F. Cotton et al. (GFZ), K. Pitilakis et al. (AUTH), E. Safak (KOERI), H. Crowley (EUCENTER)

EPOS in a nutshell (tiny nut…)

www.seismo.ethz.ch

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

EPOS
EUROPEANPLATEOBSERVINGSYSTEM



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…)

www.seismo.ethz.ch

EPOS EUROPEANPLATEOBSERVINGSYSTEM

community driven and governed services

Waveform Services

Orfeus

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

Seismological Products

CSEM EMSC

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

Hazard and Risk Services

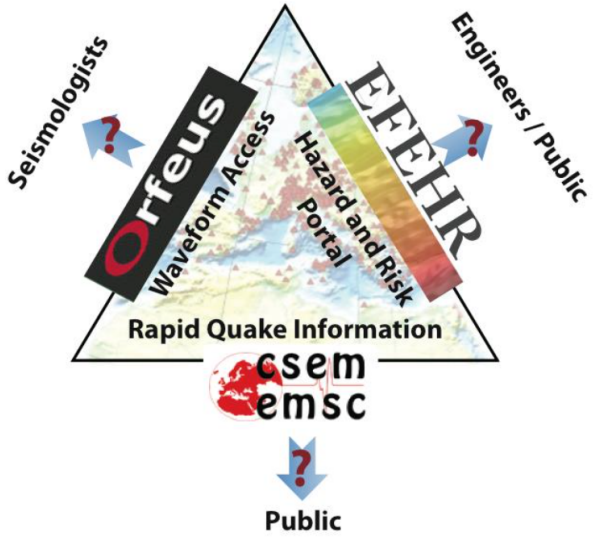
EFEHR

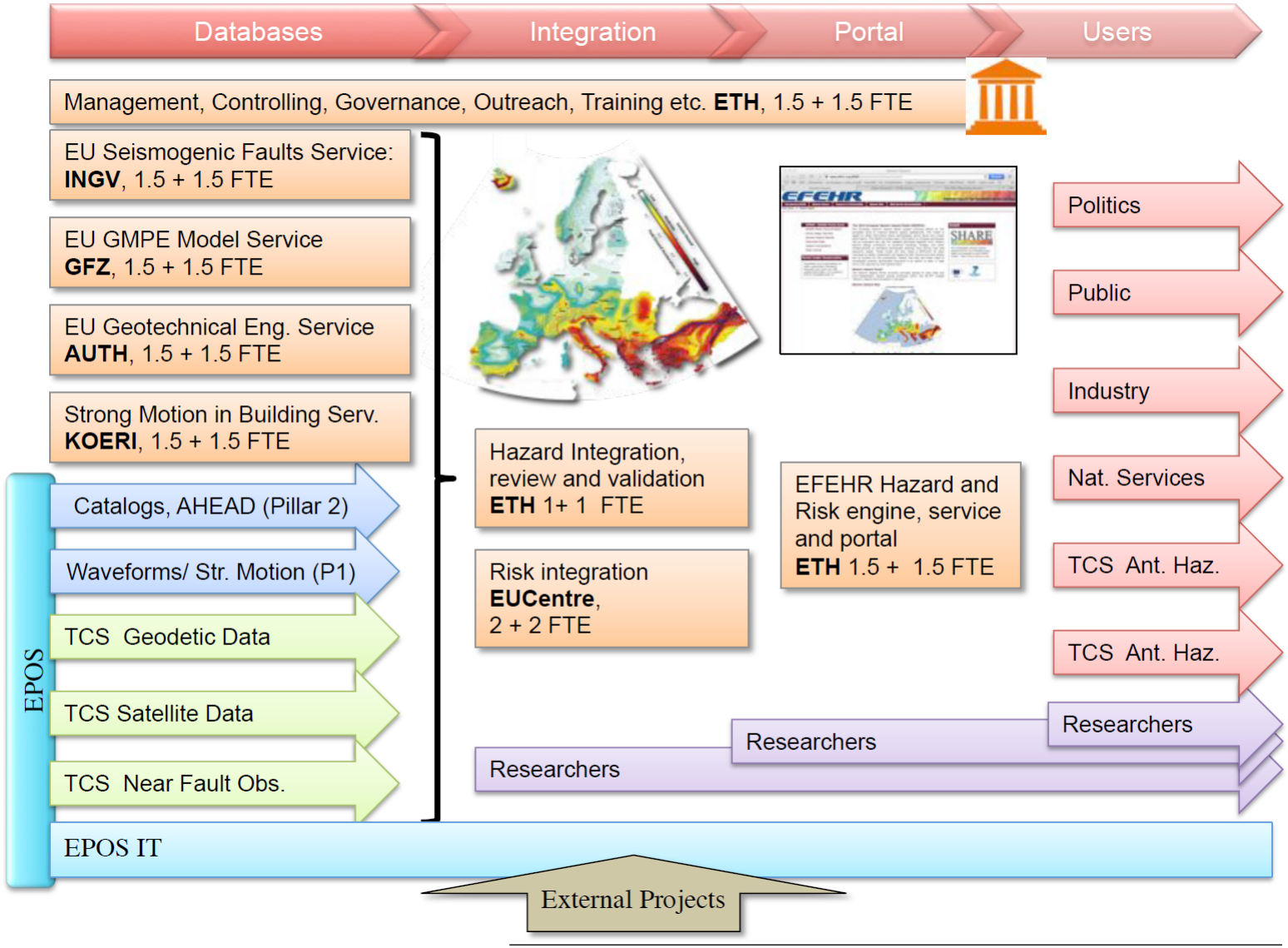
Seismic Hazard Models
Seismogenic Faults
Ground Shaking Models
Geotechnical Engineering Information
Strong Motion records in buildings
Earthquake Engineering & Risk Services

EPOS SEISMOLOGY

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

www.seismo.ethz.ch

www.efehr.org

Services and Partners

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.

GFZ Helmholtz Centre Potsdam

Schweizerischer Erdbebendienst Service Sismologique Suisse Servizio Sismico Svizzero Swiss Seismological Service

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

EUCENTRE European Centre for Training and Research in Earthquake Engineering

Istituto Nazionale di Geofisica e Vulcanologia

Boğaziçi University Kandilli Observatory and Earthquake Research Institute

Aristotle University of Thessaloniki

EFEHR Services

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

EFEHR

2010
- NERA start development

2011

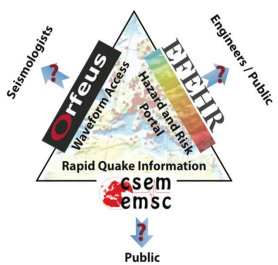
2012
- web-services
- web-platform
- documentation
- SHARE

2013
- European Seismic Hazard Model

2015
- Swiss Seismic Hazard Model
- GSHAP Model

2016

2017
- Earthquake Hazard Model of the Middle East (EMME14)
- update web-platform



EFEHR services - operational

www.seismo.ethz.ch

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.

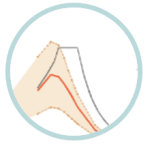
Currently, the seismic hazard models and resources for Europe, Middle East and the GSHAP global model are available. The latest update of the Swiss Seismic Hazard Model is also available through this platform. As updates and new information become available they will be added to the portal. Access the seismic hazard tools below.

Tutorial

Web Services

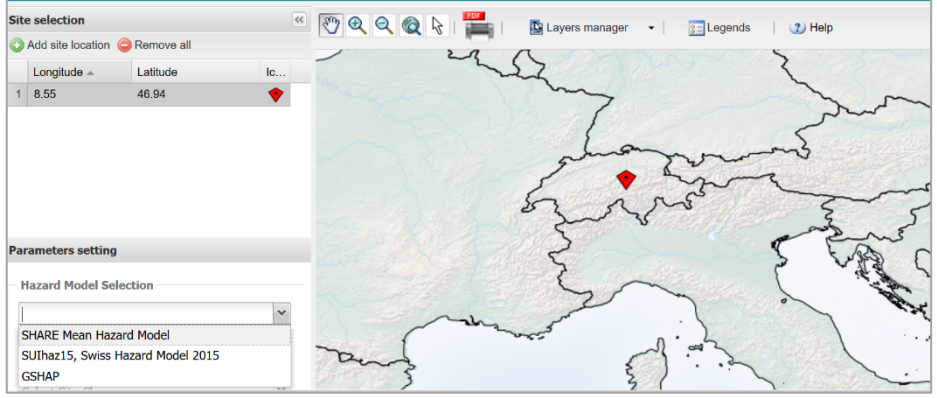
Hazard Maps

Hazard Curves



Hazard Spectra

Maps



Documentation

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

Specific Hazard Models

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. The seismic hazard models are described at the regional and national level.

Tutorial

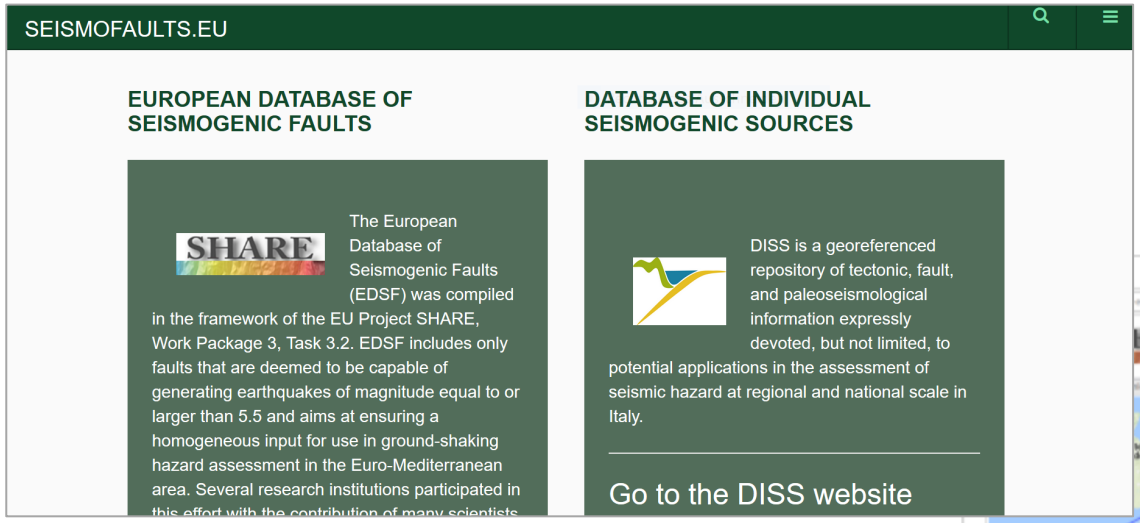
Web Services

Europe

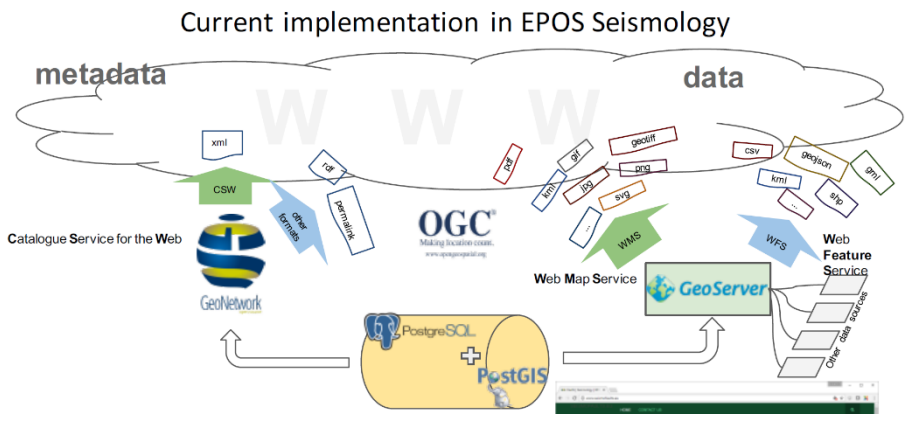
Middle East

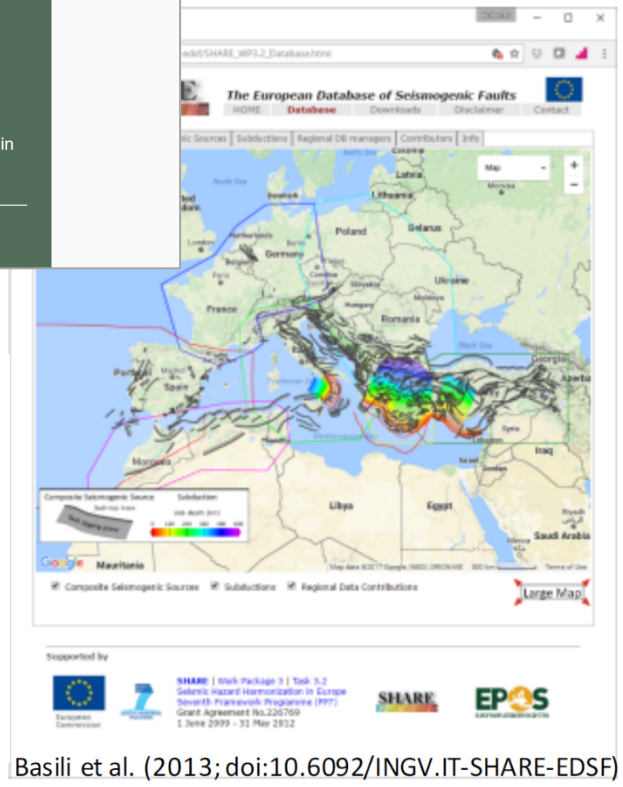
National

EFEHR services - operational



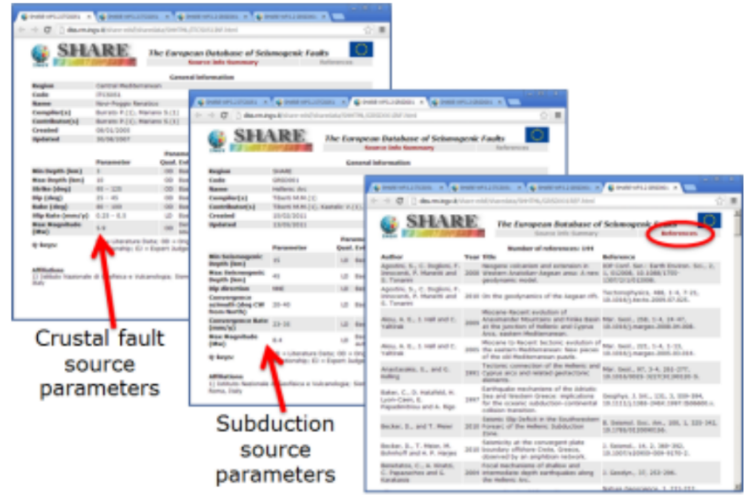
EDSF
European Database of Seismogenic Faults





Basili et al. (2013; doi:10.6092/INGV.IT-SHARE-EDSF)

The legacy of project SHARE



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)

EFEHR services – under construction

eGSIM
European Ground Shaking Intensity Models

Web-Interface

Regionalisation or Geospatial Query

FLATFILES
ESM
NGA West 2
NGA East
KikNet
……..
User-supplied

-Finalization of ESM flatfile
-Development of flatfile for continental Europe
-Definition of common flatfile formats (*for users)*
-Standardization of Ground Motion Database format

GMPE Library

OPENQUAKE
calculate share explore

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

SERA EPOS EUROPEANPLATEOBSERVINGSYSTEM

EFEHR services – under construction

www.seismo.ethz.ch

EGD
European Geotechnical Database
Within EPOS – European Plate Observing System

Building a QuakeML data model
for geotechnical (site) information

ELEMENT: gd_sites

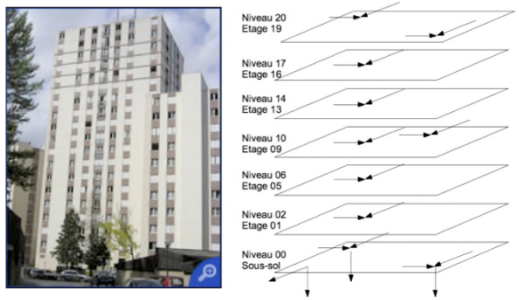
Field Name	Description	Restrictions to values	Unit
latitude	Geographic latitude (+/- for northern/southern hemisphere, respectively)		Decimal degrees
longitude	Geographic longitude from Greenwich (+/- for eastern/western longitude, respectively)		Decimal degrees
altitude	Elevation of ground with respect to sea level (+/- for above/below sea level, respectively)		m
country	Country where the site belongs		
morphology_id	Qualitative description of the shape of the earth's surface	• Valley • Basin • Flat • Slope • ridge	
topography_scheme_a_id	Quantitative description of the shape of the earth's	• T1	

SERA EPOS EUROPEANPLATEOBSERVINGSYSTEM

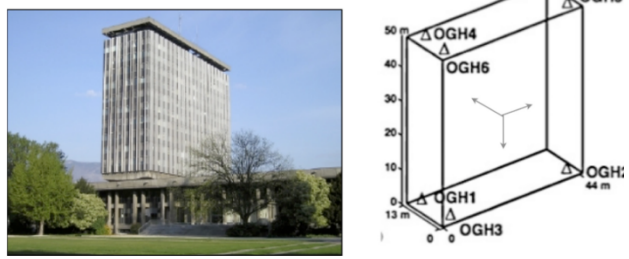
EFEHR services – under construction

Strong Motion Structural Monitoring Database

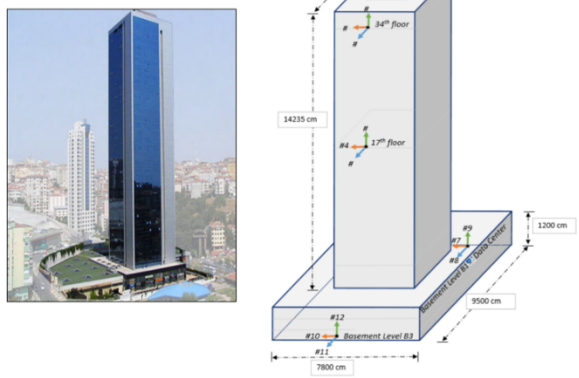
EXAMPLES OF STRUCTURES WITH MONITORING SYSTEMS



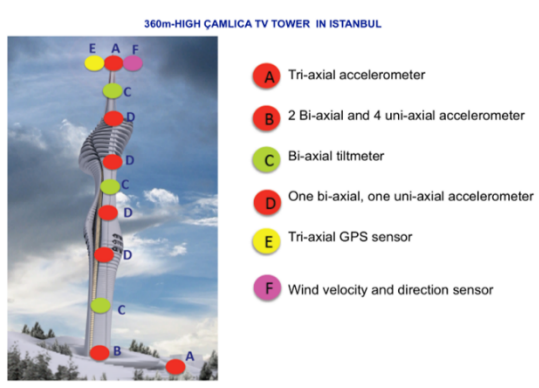
Ophite Tower, Lourdes, France



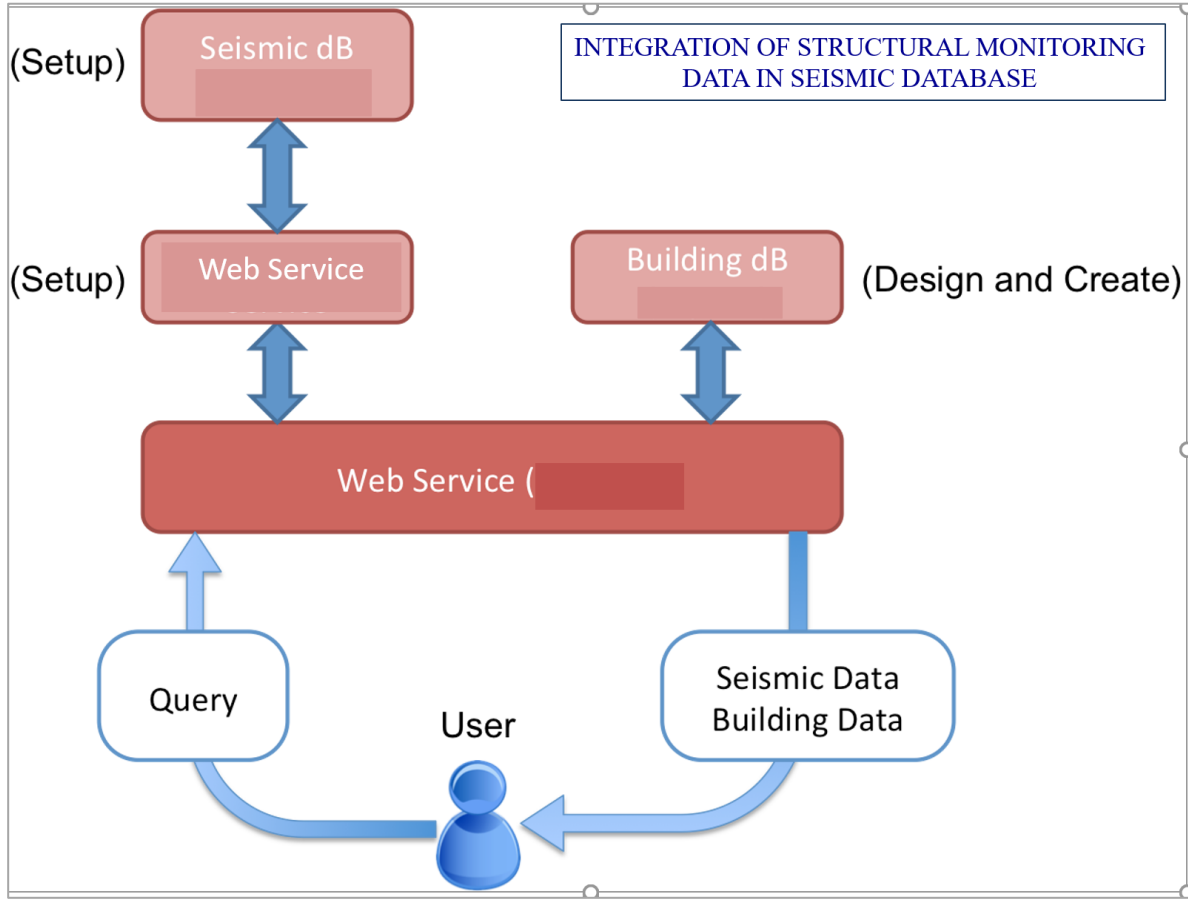
Grenoble City Hall in Grenoble, France



Polat Tower, Istanbul, Turkey



Camlica TV Tower, Istanbul, Turkey

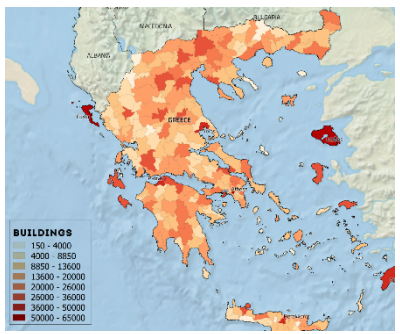


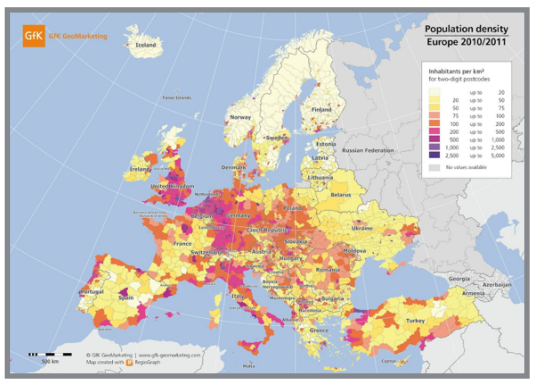
EFEHR services – under construction

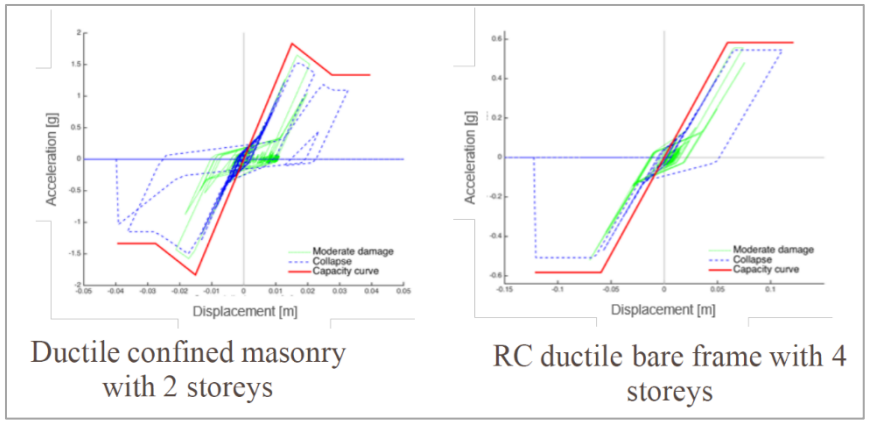
European Risk Modelling

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





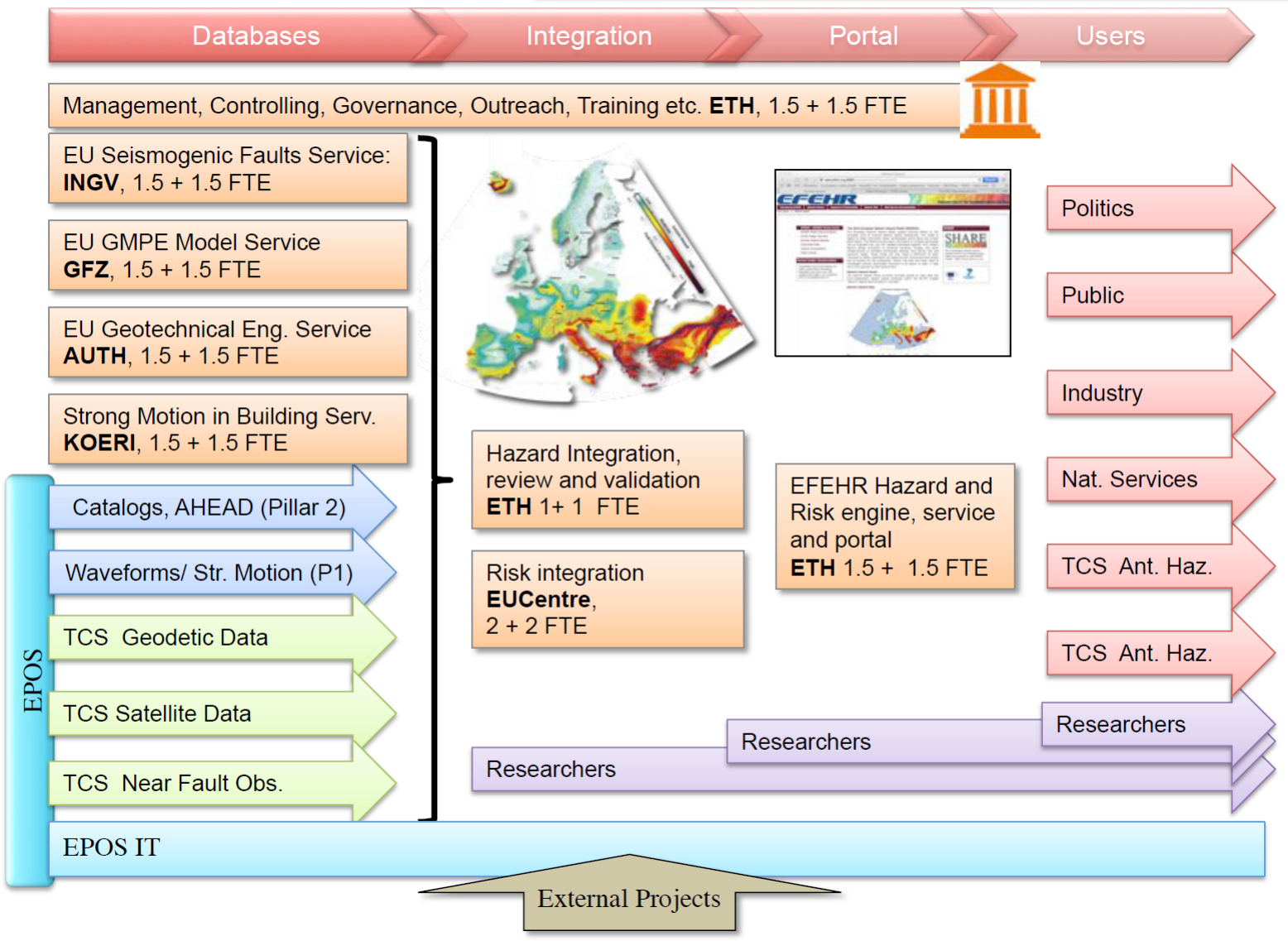


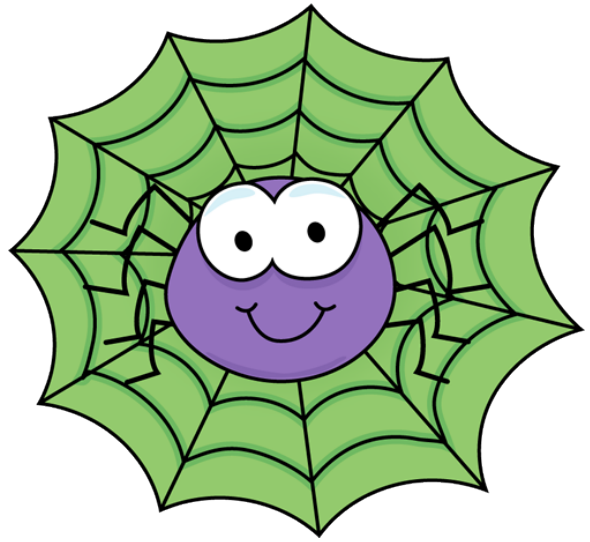
Within SERA, a framework for modelling seismic risk at local (e.g. city), national and continental scale will be developed.

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 (?)

EFEHR / EPOS challenges

www.seismo.ethz.ch

technical & scientific

- European harmonization of national practices
- metadata development and standardization
- transparency, reproducibility, discoverability
- digest and integrate all the new –very specific- developments

political & legal

- sustainability of service infrastructure
- data (provider) agreements
- licensing and intellectual property rights
- representation and governance
- societal uptake of hazard and risk

EFEHR / EPOS **potential**

www.seismo.ethz.ch

technical & scientific	political & legal
- European harmonization of national practices	- sustainability of service infrastructure
- metadata development and standardization	- data (provider) agreements
- transparency, reproducibility, discoverability	- licensing and intellectual property rights
- digest and integrate all the new –very specific- developments	- 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