Seismology

Overview

Europe has a long history of destructive earthquakes with Balkan and Mediterranean countries being at higher risk of earthquakes than other areas in Europe. Indeed, in recent times both Turkey and Italy have been affected. In 1999 Izmit in Turkey was hit by an earthquake measuring 7.9 on the Richter scale. The area was devastated and 17,000 people killed. In 2009, over 300 people lost their lives in L’Aquila in Italy to a 5.9 magnitude earthquake. With seismic hotspots across Europe, even a moderate earthquake can have devastating affects on our environment and economy, especially in densely populated areas hosting critical infrastructures.

Seismology is traditionally a domain where European infrastructures have been developed. Observatories and Research Facilities for European Seismology (ORFEUS) provides access to earthquake waveforms; the European-Mediterranean Seismological Centre (EMSC) determine the principal parameters (epicentre, depth, magnitude, focal mechanisms...) of major seismic events; while the European Facilities for Earthquake Hazard & Risk (EFEHR) provides access to data, models, tools and expertise relevant for assessment of seismic hazard and risk in Europe.

Lead by Florian Haslinger, ETH Zurich, EPOS Seismology will improve and extend these existing services, producing a single framework which is technically, organizationally and financially integrated with the EPOS architecture. The result will be a set of Seismology services for users such as scientists, engineers, public managers, citizen scientists covering infrastructures, data, products, hazard and information services. “We are benefiting from 25 years of organized seismological services in the European domain. We will harden these services, make them sustainable for the future, improve them and make them ready for integration in the overall EPOS framework.” says Florian.

Objectives

- Establish sustainable and harmonized services in Seismology that provide access to and interaction with seismological data, products, and tools (services) on a European level. These services will also link to relevant services on national or institutional level.
- Build the next generation European Integrated Data Archive (EIDA) to collect and access all classes of seismic waveforms, including permanent networks, temporary deployments, strong-motion, ocean-bottom, and structural monitoring arrays, together with advanced metadata (data quality metrics, station characterization).
- Extend the EPOS platform to collect, integrate, validate and distribute seismological products and information to scientists and other users, including improved access to information on historical (non-instrumental) and instrumental earthquake data, and develop authoritative concepts for products.
- Continue to provide open access to state of the art, authoritative information on earthquake hazard and risk,
harmonized across Europe, including software, models, and best practices, to a wide range of stakeholders to support national and local seismic hazard & risk assessment; provide curation, validation and community coordination of reviews and updates of the underlying data sets and models, and build an interface to the Geotechnical and Engineering communities and services.

- Implement the Computational Seismology tools and services as a pilot project for Computational Earth Sciences developments.
- Achieve close integration with other EPOS TCS and the ICS with regard to interoperability and common use of tools & services, common and coordinated data models and metadata formats, and common computational platforms and IT solution implementations.
- Establish and implement an integrated European governance structure that provides scientific and organizational oversight of the European seismological services within the overall EPOS framework. This governance structure will also secure the appropriate interaction with stakeholders and partners beyond EPOS.
- Conduct a rigorous validation phase, to test and qualify the TCS Seismology against established metrics.

Our services ready for 2019

Virtual Access to data/products/services relying on existing organizations - ORFEUS, EMSC, EFHER

- Seismic waveforms and metadata from permanent and temporary networks (including strong-motion data) and from ocean-bottom seismometers; derived parametric data (e.g. acceleration parameters for engineering) and metadata (Level 0, 1)
- Seismological products: authoritative earthquake locations and magnitudes; bulletins; earthquake catalogs (including historical); moment-tensors; shaking and damage maps; seismic source models; site response data (Level 1, 2)
- Earthquake hazard and risk data and products: tectonic fault maps and models; geotechnical, geological and site conditions inventory; tools for processing/analyzing/interpreting building/infrastructure weakness; exposure and vulnerability data and models for building/infrastructure risk assessment; hazard maps; risk maps & scenarios (Level 2, 3)

Virtual Access to computational platform/s

- Massive-data mining, data-intensive processing, visualization, processing (synthetic data from 3D Earth simulations)