WP 25: Update of the 2020 European Seismic Hazard Model (ESHM20)

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Keywords

Earthquake hazard, seismic hazard assessment, European Seismic Hazard Model (ESHM20), seismogenic sources, ground motion characteristic models, seismic hazard

Main Results

The 2020 European Seismic Hazard Model (ESHM20) provides an updated version of the earthquake hazard assessment of the Euro-Mediterranean region. The model has been developed on the basis of the most recent datasets, which means earthquake catalogues, active faults and ground shaking recordings. In addition, tectonic and geological information as well as models (seismogenic sources, ground shaking) were also used. A full probablistic framework was adopted to develop and implement the seismic hazard model with focus on cross-border harmonization. Furthermore, the ESHM20 development phase involved several regional workshops where the national experts have been consulted and their feedback was acknowledged and considered.

The newly developed seismogenic source model encompasses fully harmonized as well as cross-borders seismogenic sources and is following the recent national earthquake hazard models. The inherent uncertainties in characterizing the earthquake rupture forecast are handled by a complex logic tree, which consists of two main models (branches): an area source-based model and a hybrid fault-smoothed seismicity model. The ground motion characteristic model is built upon the most complete ground shaking recordings in Europe. It aims at capturing the effects of source and attenuation path of the expected ground shaking at a site. The regional variability of ground shaking is assessed based on the most updated dataset of ground motion recordings across Europe. A novel statistical approach was developed to assess the regional ground motion characteristics and the overall uncertainties are handled in a backbone logic tree. Finally, a complex input model, handling the intrinsic epistemic uncertainties of both seismogenic sources and ground shaking models, was used for assessing the earthquake ground shaking across the entire Euro-Mediterranean region. The open-source hazard library of OpenQuake was used, which facilitates the transparency of the models and allows to fully reproduce the results.

A full set of hazard results such as hazard curves and maps as well as uniform hazard spectra is provided for the entire region covered by ESHM20. Note that the results calculated through the ESHM20 represent ground shaking hazard forecasts on EC8 rock site class B with a V_{S30} of 800 m/s. Two additional hazard maps describing the spatial distribution of the engineering spectral factors (i.e. S_{alpha} and S_{beta}) are also provided with a uniform probability of exceedance of 10 % in fifty years. These two factors will form the basis of the future update of the European Seismic Design Code (CEN-EC8) aiming to reduce the potential of human casualties and economic losses from severe ground shakings in a long-term view.

Access to Data and Services

All datasets, key components and results are open for access and re-use at the web-platform of European Facilities of Earthquake Hazard and Risk (www.efehr.org).

List of Publications

A special issue describing the efforts undertaken to develop the 2020 European Seismic Hazard Model is planned and its content will be communicated in the next months.