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EARTHQUAKE SOURCE MODEL FOR SEISMIC HAZARD ASSESSMENT IN THE MIDDLE EAST REGION

Laurentiu DANCIU[1], Karin SESETYAN[2], Mine B. DEMIRCIOGLU[3],
Levent GULEN[4], Mustafa ERDIK[5] and Domenico GIARDINI[6]

The Earthquake Model of the Middle East Region (EMME) project was a cooperative initiative, coordinated by ETH-Zurich and Boğaziçi University, Kandilli Observatory and Earthquake Res. Institute. EMME was designed to address the potential risk posed by earthquakes to the region of Middle East. The overall aim of EMME was to enable earthquake risk mitigation in the region in terms of damages, casualties, and socio-economic losses through homogenization of the seismo-tectonic information, uniform computation of the earthquake hazard, compilation of data regarding the built environment and uniform assessment seismic risk and increase awareness in the region through proper dissemination and capacity building.

Within EMME project the probabilistic approach was preferred to estimate the seismic hazard. The probabilistic approach requires combination of statistical methods to forecast earthquake occurrence rates and empirical models to describe the ground shaking attenuation. The earthquake occurrence rates quantify the probability of all damaging earthquakes in a region, for a given time period, above a magnitude threshold, and at some level of discretization considered sufficient for hazard assessment. Building a probabilistic earthquake source model (ESM) implies to understand the seismicity of the area - which is a description of the earthquakes that occur in the area; collect detailed geological information of location of earthquake fault zones and shear zones; and eventually the reasons for earthquakes in the region, the mechanics of fault movement, and how much stress (due to earthquakes) is built up in the region due to tectonic movement.

The Earthquake Source Model (ESM) as designed and implemented in EMME consists of two key earthquake source realizations each depicting different type of source representation a) earthquakes rates distributed within zones within which the future seismicity is thought to be homogeneous in time and space; b) earthquake rates given the existence of active faults. The ESM was the base of a region-wide, time-independent, long-term earthquake hazard model by quantitatively addressing the uncertainties associated with the modeling process; by mean of multiple options for the key model parameters.

EMME adopted OpenQuake (Pagani et al 2013) for seismic hazard computation. The use of OpenQuake allowed adopting Natural hazards and Risk Mark-up Language (NRML) standard for the input/output files for transparency and easy to communicate seismic hazard models. Each individual earthquake source model was customized and parameterized according to the OpenQuake standardized source representation, as well as standardized input file format (NRML).

We present i) an overview of the earthquake source model used for ground motion estimates; ii) a summary of the main datasets collected; iii) a description of the main modeling assumptions, iv) overview of the procedure to address the uncertainties, v) a list of the key source model parameters identified as critical for model implementation for hazard calculation.

[1] PhD, Swiss Seismological Service, ETH Zurich, laurentiu.danciu@sed.ethz.ch
[2] Asst. Prof., Boğaziçi University, Istanbul, karin@boun.edu.tr
[3] PhD, Boğaziçi University, Istanbul, betul.demircioglu@boun.edu.tr
[4] Prof., Sakarya University, Sakarya, lgulen@sakarya.edu.tr
[5] Prof., Boğaziçi University, Istanbul, erdik@boun.edu.tr
[6] Prof., Swiss Seismological Service, ETH Zurich, domenico.giardini@erdw.ethz.ch

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