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SEISMIC HAZARD IN THE MARMARA REGION, REVISITED IN THE LIGHT OF RECENT DATA AND METHODS

Karin ŞEŞETYAN[1], Mine B. DEMİRCİOĞLU[2], Özge ZULFİKAR[3] and Mustafa ERDİK[4]

Several studies with various degrees of sophistication have been conducted for the probabilistic assessment of seismic hazard in the Marmara Region (e.g. Atakan et al., 2002; Erdik et al., 2004; Kalkan et al., 2008; Gülerce and Ocak, 2013). The common point of these studies was that they have all addressed the hazard in the region in terms of both time-independent probabilistic (simple Poissonian) and time-dependent probabilistic (renewal) models. This tendency was dictated by the following considerations: the region has experienced a considerable number of large magnitude events in the history, which has also shown some periodicity, the seismic history of the region was well documented and studied and there have been, especially in the aftermath of the 1999 Kocaeli and Düzce events, several geological investigations both on-shore and off-shore aiming to obtain a regional fault model as complete as possible, which were reflected in the fault segmentation models of the PSHA studies.

The present study aims to re-eavaluate the seismic hazard in the region, in the light of recent studies in both earthquake occurrence and ground motion modelling, such as new off-shore segmentation models (e.g. Armijo et al., 2005), new on-shore fault data (e.g. MTA, 2013), descriptive and parametric historical earthquake compilations (e.g. Ambraseys, 2009; Stucchi et al., 2013), geologic and geodetic slip rate estimations (e.g. Reilinger et al., 2006) to revise the fault segmentation and the associated Poisson and time-dependent recurrence models as well as recently emerged global and regional ground motion prediction models. The PSHA approach based on characteristic earthquake modelling for fault segments and smoothed seismicity for background adopted by Erdik et al. (2004) is also followed in the present study. In addition, areal source and fault source plus background seismicity source zonation alternatives with truncated exponential and composite recurrence models are considered. Both Poisson and time-dependent recurrence approaches are considered and the results are compared with previous studies.

The study also incorporates the deaggregation of hazard for selected points in the İstanbul Metropolitan area. Especially for long return periods the hazard in Istanbul is essentially controlled by a single earthquake source, which renders the earthquake resistant design highly amenable to the use of deterministic scenario earthquakes that are commensurate with the hazard deaggregation.

[1] Asst. Prof., Boğaziçi University, Istanbul, karin@boun.edu.tr
[2] Res. Assoc., Boğaziçi University, Istanbul, betul.demircioglu@boun.edu.tr
[3] Boğaziçi University, Istanbul, nozgez@gmail.com
[4] Prof., Boğaziçi University, Istanbul, erdik@boun.edu.tr