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PROBABILISTIC SEISMIC HAZARD ASSESSMENT IN CENTRAL ASIA USING DIFFERENT SOURCE MODELS

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Central Asia is one of the most seismically active regions in the world, with some of the world's largest events having taken place in this region. According to the hazard map produced at a global scale by the GSHAP project (Giardini, 1999), Central Asia is characterized by peak ground accelerations with return period of 475 years as high as 9 m/s^2. Therefore, Central Asia is selected as a target area for the EMCA project (Earthquake Model Central Asia). EMCA is a regional project of GEM (Global Earthquake Model), aiming to assess the harmonized regional seismic hazard in Central Asia. Within the framework of EMCA, intensity prediction equation was developed (Bindi et al. 2011) for the region and the hazard maps are foreseen in terms of macro-seismic intensity. Site effects studies have been carried out in the major cities of the region in terms of standard spectral ratios and array analyses, and are incorporated into the seismic hazard assessment of these cities.

In this study, we present the results of a probabilistic seismic hazard assessment for Central Asia from two source models, area sources and smooth seismicity. We have used the OpenQuake platform, which is an open source software tools developed by the GEM foundation. We consider the point source model of Frankel (1995), smoothed seismicity method with adaptive kernel of Stock and Smith (2002). For the area source model, we have divided the region in to super zone for the completeness analyses and maximum magnitude assessments. Then, the micro area sources are considered based on tectonic regionalization, seismicity and prominent faults structures in the region. The regional seismic hazard is estimated for rock site conditions for 10% probability of exceedance in 50 years in terms of macro seismic intensity. The logic tree approach is used to consider the epistemic uncertainty of maximum magnitude, different source models and attenuation relationships. The maximum hazard is observed in the Hindukush region which shows an intensity of about 9. The results are compared to the GSHAP results converted to Intensity, and show quite good agreement. Site effects estimated from array analysis in terms of vs30 and response spectral ratios, and are used to assess the seismic hazard for Bishkek. The maximum estimated hazard for Bishkek for rock site is 0.47g at 0.1s, for site effects in terms of vs30 is 0.72g at 0.3s, and for site effects in terms of response spectral ratio is 1.5g at 0.5s, for 10% probability of exceedance in 50 years.

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