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Seismic hazard and risks for social and infrastructure exposures adjacent to the Baikal–Amur Mainline

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Seismic hazard assessment requires an adequate understanding the earthquake distribution in magnitude, space, and time ranges. Laking data for a period of several thousand years makes probabilistic approach to estimating the recurrence time of hazardous ground shaking unreliable and misleading. In spite of theoretical flaws and actual failures on practice, the probabilistic seismic hazard assessment (PSHA) maps keep being actively used both at global and national scales. In recent decades, alternative methodologies have been developed to improve the reliability and accuracy of reproducible seismic hazard maps that pass intensive testing by historical evidence and realistic modelling of scenario earthquakes. In particular, the neo-deterministic seismic hazard assessment (NDSHA) confirms providing reliable and effective input for mitigating object-oriented earthquake risks. The unified scaling law for earthquakes (USLE) is a basic part of NDSHA that generalizes application of the Gutenberg-Richter law (G-RL). The USLE states that the logarithm of expected annual number of earthquakes of magnitude M in an area of linear size L within the magnitude range [M– , M+] follows the relationship log N(M, L) = A + B×(5 − M) + C×log L, where A, B, and C are constants. Naturally, A and B are analogous to the classical a- and b-values, while C compliments to G-RL with the estimate of local fractal dimension of earthquake epicentres allowing for realistic rescaling seismic hazard to the size of exposure at risk. USLE implies that the maximum magnitude MX expected with p% chance in T years can be obtained from N(MX, L) = p%, then used for estimating and mapping ground shaking parameters by means of the NDSHA algorithms. So far, the reliable USLE based seismic hazard maps tested by historical evidence have been plotted for a number of regions worldwide. We present the USLE based maps of MX computed at earthquake-prone cells of a regular grid, as well as the adapted NDSHA estimates of seismic hazard and risks for social and infrastructure exposures in the regions adjacent to the Russian Federation Baikal–Amur Mainline. The study supported by the Russian Science Foundation Grant No. 20-17-00180.