COMPARISON OF THE STANDARD (POINT-WISE) AND MULTIPLE-LOCATION PROBABILISTIC SEISMIC HAZARD ASSESSMENTS

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Abstract. The results of classical probabilistic seismic hazard analysis (PSHA) contain no information about simultaneous ground motions at different sites during particular earthquake. Seismic risk analysis for distributed critical structures requires estimates of the level of earthquake shaking that are likely to occur concurrently at multiple locations: whether the vulnerable elements of a lifeline system are likely to be simultaneously affected by shaking of sufficient strength to disable them; whether the shaking in any of critical points may be sufficient to cause failure of the whole system. While the analysis of lifeline performance requires multiple-location estimations, the sparsely located elements of a network or critical facilities are designed on the basis of point-wise PSHA. In this paper we studied specific features of multiple-location PSHA, as compared with the classical point-wise PSHA, using Monte Carlo simulation. We analyzed level of ground motion (*PGA*), which will be exceeded in at least one site or in several sites simultaneously with reference annual probability. The analysis has been performed for regions of South-Western Germany, Northern and Eastern Taiwan, which represent different levels of seismicity (low, moderate and high, respectively). The relationship between the multiple-location and point-wise estimations are analyzed and quantified. Results of the study may be used in decisions whether it may be possible to utilize the procedure of point-wise PSHA in particular cases of multiple-location PSHA, i.e. for assessment of maximum level of ground motion among several sites, or for estimation a reasonable lower safety level when considering simultaneous exceedances.

Keywords: multiple-location seismic hazard assessments, strong ground motions, correlation of strong motions.