Geophysical Research Abstracts
Vol. 20, EGU2018-15865, 2018
EGU General Assembly 2018

Simulation-based Evaluation for Probabilistic Seismic Hazard Models - a Case Study for Japan

Sum Mak (1), Naoshi Hirata (), Hiromichi Nagao (), Fabrice Cotton (), and Danijel Schorlemmer ()

(1) Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ, Section 2.6, Potsdam, Germany (smak@gfz-potsdam.de), (2) Earthquake Research Institute, The University of Tokyo, Japan

A probabilistic seismic hazard analysis (PSHA) considers the occurrence of seismic strong ground motions as a random process. Any comparison between the hazard forecast and the observed hazard, therefore, should also be probabilistic. The hazard curve and the hazard map are the most common forms to disseminate the results of a PSHA. They do not convey the information about the spatial correlation of seismic hazard. This hinders the comparison between the hazard forecast and the observed hazard because the observed hazard is spatially correlated. This is particularly important for regions where the seismic hazard is dominated by large seismic sources, such as the Nankai subduction zone in Japan and the New Madrid seismic zone in the eastern United States.

To fully incorporate the spatial correlation into an evaluation of PSHA, we represented a hazard forecast of a model by a set of its simulated results, an approach often used in scenario-based seismic risk analysis and the approach used in Collaboratory for the Study of Earthquake Predictability (CSEP) for testing earthquake forecast. We compared the hazard forecast based on the 2009 version of the National Ground Motion Forecast Maps (with the base time of time-dependent sources adjusted to 2000) with the PGV observations from 2000 to 2017. While the agreement between the forecast and the observation was investigated, the focus of this study is the statistical power of a test of PSHA under the best available situations (i.e. the best-monitored region in a national sense that provides the best available data in both quantity and quality; the usefulness of a statistical test always depends on the amount of data available). The latter essentially estimates how wrong a hazard forecast needs to be in order to produce a detectable discrepancy between the forecast and the observation. This provides an estimate of what the best a statistical test of a hazard forecast can tell, which, by the principle of falsifiability of science, is also an empirical estimate of the credibility of a PSHA.