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Toward utilization of the National seismic hazard maps for Japan

Hiroyuki Fujiwara[1*]

[1]NIED

The Headquarters for Earthquake Research Promotion of Japan (HERP) published the National Seismic Hazard Maps for Japan in July 2009, which was initialized by the earthquake research committee of Japan (ERCJ) on a basis of long-term evaluation of seismic activity, and on a basis of strong-motion evaluation. The hazard maps consist of two kinds of maps. One is a probabilistic seismic hazard map (PSHM) that shows the relation between seismic intensity value and its probability of exceedance within a certain time period. The other one is a scenario earthquake shaking map (SESM).

The examples of PSHMs are maps of probabilities that seismic intensity exceeds the JMA scale 5-, 5+, 6- and 6+ in 30 or 50 years, and maps of the JMA seismic intensity corresponding to the exceedance probability of 3% and 6% in 30 years and of 2%, 5%, 10% and 39% in 50 years. We classify earthquakes in and around Japan into three categories such as the characteristic subduction zone earthquakes, subduction zone earthquakes, and crustal earthquakes. PSHMs for three earthquake category are also evaluated.

The SESMs are evaluated for 490 scenario earthquakes of all major faults in Japan. For the SESMs, based on the source modeling for strong-motion evaluation we adopt a hybrid method to simulate waveforms on the engineering bedrock and peak ground velocity. The hybrid method aims to evaluate strong-motions in a broadband frequency range and is a combination of a deterministic approach using numerical simulation methods, such as the finite difference method, for low frequency range and a stochastic approach using the empirical or stochastic Greens function method for high frequency range. A lot of parameters on source characterization and modeling of underground structure are required for the hybrid method. The standardization of the setting parameters for the hybrid method is studied. We summarized the technical details on the hybrid method based on the ”Recipe for strong-motion evaluation”, which are published by the ERCJ.

The National Seismic Hazard Maps for Japan are a comprehensive integration from all of the research aspects conducted by ERCJ. It contains information of all necessary data for producing the maps. We have developed an open web system to provide seismic hazard information interactively, and named this system as Japan Seismic Hazard Information Station, J-SHIS (http://www.j-shis.bosai.go.jp/). We aim to distribute a process of uncertainty evaluation and to meet multi-purpose needs in engineering fields. The information provided from J-SHIS includes not only results of the hazard maps but also various information required in the processes of making the hazard maps, such as data on seismic activity, source models and underground structure.

In April 2009, HERP compiled ”New Policy for Earthquake Research: The second basic comprehensive policy for the promotion of earthquake observation, measurement, surveys and research.” The new policy sets out, as its basic objectives, to promote various research for further advancing seismic hazard maps as well as ”strengthening bridge functions to promote engineering and sociological research for disaster prevention and mitigation.”

In order to mitigate earthquake damage, it is essential to raise each individual’s awareness of earthquakes and to encourage them to be prepared for future earthquakes. The first necessary step to this end is to prepare highly realistic, detailed hazard maps and risk information covering earthquakes that occur in all parts of Japan, based on which each individual can consider earthquake risk as own personal issue. Therefore, the next stage of our research is planned to expand its target from conventional seismic hazard to also cover seismic risk evaluation.

Keywords: National Seismic Hazard Maps, strong-motion, seismic hazard, seismic risk, J-SHIS