

National seismic hazard maps for Japan and evaluation of long-term possibility of large earthquake occurrence in Japan

Yoshinori Suzuki

Ministry of Education, Culture, Sports, Science and Technology

suzuki-y@mext.go.jp

This paper outlines activities of the Headquarters for Earthquake Research Promotion (HERP). The HERP was established based on a Special Measures Law on Earthquake Disaster Prevention, which took the lessons of the Great Hanshin (Kobe) Earthquake on January 17, 1995. The executive office of the HERP is set up at the MEXT. The HERP is promoting researches into earthquake with the goal of strengthening disaster prevention measures, particularly for the reduction of damage and casualties from earthquakes. The HERP carries out many projects to achieve the goal.

One of our products is the National Seismic Hazard Maps for Japan (fig.1). It consists of two types of maps. One is the Probabilistic Seismic Hazard Maps, and the other is the Seismic Hazard Map for a Specified Seismic Source Fault (the scenario map). It was first published in 2005 and updated annually by including added / updated long-term evaluation result & yearly update of the probability of earthquake occurrence. In 2009, a major revision was published. 250m (formerly 1km) grid is employed for probability (or ground motion) estimation. Landform type classification and amplification factor of surface soil layers were reconsidered and updated. As for the probabilistic maps, maps showing the 'impact' of each category of earthquakes were added (fig.2). As for the scenario maps, the detailed distribution of seismic intensity was created for all major active fault zones though it was published for limited faults in the past. In 2009, the HERP published another type of experimental scenario maps called long-period ground motion maps (experimental). Targets of the maps are currently the presumed Tokai, Tonankai, and Miyagi-ken-oki earthquakes. The products include distributions of velocity response spectra (natural periods are 5, 7, 10 sec. with the damping factor 0.05.), maximum velocities, and durations of ground motions (fig.3).

The HERP executes the long-term evaluation of the occurrence both for shallow crustal earthquakes (on active faults) and plate-boundary earthquakes. Three items are evaluated in the evaluation; location, magnitude, and long-term possibility of occurrence. The possibility is calculated by the time dependent model (BPT model) if both the last event and recurrence interval are known or by the Poisson distribution model if only recurrence interval is known.

The HERP selected 110 (initially 98 in 1997 and 12 added in 2005) fault zones based on their length and slip rate as the major active fault zone. The HERP and the relevant organizations continuously survey their properties (length, past activities, etc.) and the HERP revises the evaluation (fig.4). 33 sea areas were selected and the properties of earthquakes in each area are also evaluated. Supplemental survey has been executed for updating the evaluation if reliability of the evaluation is low. As for the active fault at the coastal zones, the HERP made the survey plan in 2009 and 21 faults are now in the survey list. The HERP listed 13 active faults as the candidates of the focused survey. The MEXT promotes the survey for the coupled earthquake at the Nankai trough where over M8 earthquake will occur in the near future.

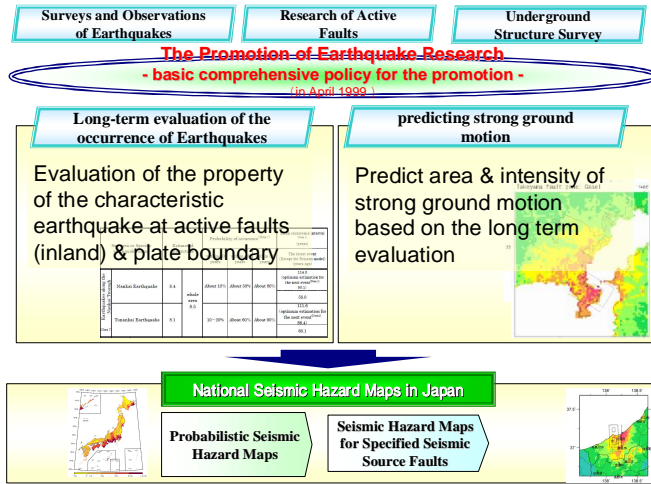


Fig.1 Schematic diagram of earthquake evaluation in Japan

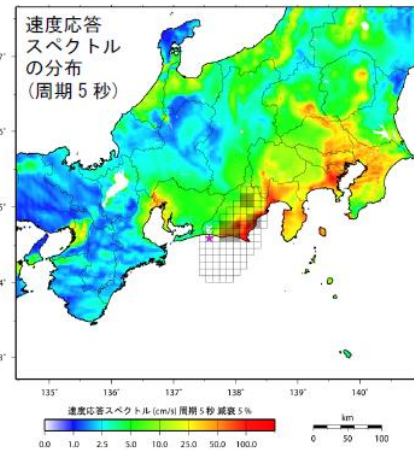


Fig.3 Distribution of velocity response spectrum (natural period 5 sec.) in the long-period ground motion maps of the presumed Tokai earthquake (experimental).

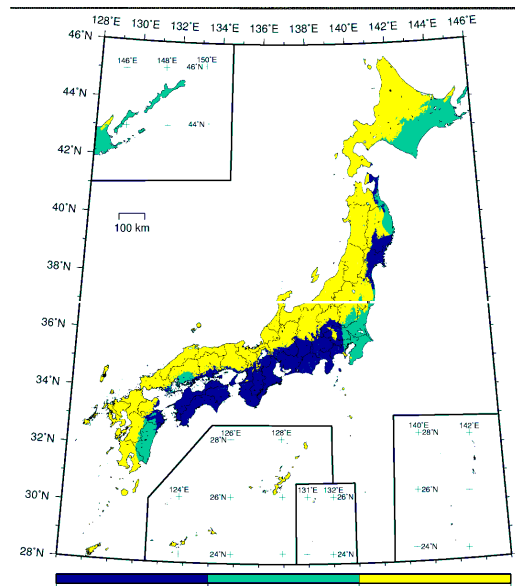


Fig.2 A sample of probabilistic maps showing impact of each category of earthquakes. (blue: characteristic earthquakes at subduction zones. green: non characteristic earthquakes at subduction zones. yellow: shallow crustal earthquakes)

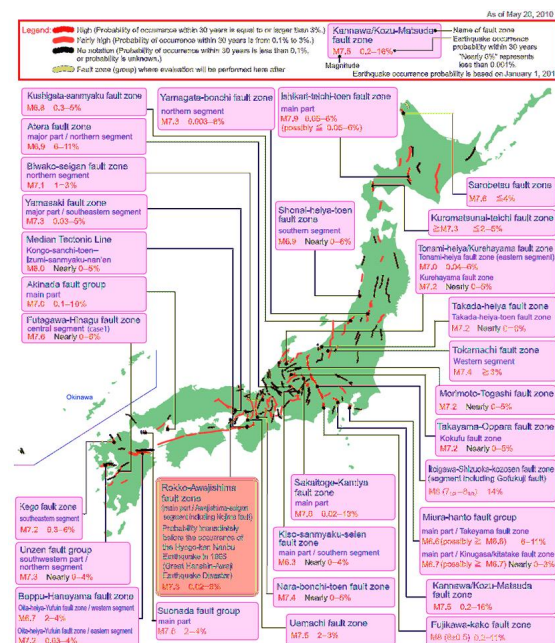


Fig.4 long-term evaluation result of the earthquakes at the major active fault zones.