

National seismic hazard maps of Japan -Seismic hazard information sharing bases-

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The national seismic hazard maps of Japan were published by the earthquake research committee of Japan. The hazard maps should be improved continuously as seismic hazard information sharing bases. I summarize the problems that should be solved in the future.

Strong-motion level of small probability is sometimes strongly affected by the amount of uncertainty contained in the empirical attenuation relation used in the seismic hazard analysis. We often adopt the quantity of deviation that is obtained during the statistical regression analyses to derive the attenuation relation. However, it consists of uncertainties from various sources because the empirical attenuation relation is based on the data observed at various sites from various earthquakes. It has been pointed out that this procedure overestimates the seismic hazard because the spatial uncertainty is to be considered separately as epistemic uncertainty. On the other hand, if we use the hybrid method instead of empirical attenuation relation in the strong-motion evaluation, the spatial uncertainty is not mingled and is more realistic. Further studies from both data and theory are necessary to properly quantify the uncertainty in ground motion evaluation.

The Brownian passage time distribution as well as the Poisson process is adopted for the long-term evaluation of earthquake activity. Because of insufficiency of information on past earthquake activity in fault zones, the average recurrence interval and elapsed time since the latest earthquake event are often expressed as a time range instead of a fixed value, and consequently the occurrence probability is given by an interval. In the probabilistic seismic hazard maps, we adopt the median for the typical case, and the maximum probability value for reference. Although not only the estimated parameters but also degrees of reliability on estimation of parameters are shown in the long-term evaluation of earthquake activity, it is quite difficult to quantify the degrees of reliability, thus are not reflected in the hazard maps.

Selection of a specified earthquake is essential to make a scenario earthquake shake map. The basic policy of the selection of a scenario earthquake in the National seismic hazard map is that we choose the most probable case. However available information to determine the source parameters of the scenario earthquake is often insufficient. When we do not have sufficient information, we assume several cases of the characteristic source model and compare the results of them to show deviation of strong-motion evaluation due to uncertainties. It is still under consideration as problems to be solved to evaluate reliability of the results with decision under the situation that uncertain factors are left.

In order to improve the accuracy of the hybrid method, development of computer capacities and simulation techniques, improvement of modeling of rupture processes of sources, and advanced modeling of underground structures are indispensable. We can expect developments of computer capacities and simulation techniques in the future because of the rapid progress of computer technology. On the other hand, the improvements of modeling of rupture processes of sources and modeling of underground structures require large efforts. On the basis of long-term policy, it should be promoted to accumulate data obtained from seismic observation networks and surveys for underground structure and to construct databases of them.