

Construction of real-time earthquake damage-estimation system J-RISQ

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From the viewpoint of a decision making of the first action to an earthquake, not only the hazard (ground motion) information but also the risk (damage) information evaluated in real-time are important. To meet this need, we developed real-time estimation system (J-RISQ) for exposed population and earthquake damage of buildings. We constructed the system by combining the database developed for J-SHIS and the real-time observation data obtained by strong motion seismograph networks such as K-NET and KiK-net. Database of J-SHIS consists of the site amplification factor, population distribution and the building information (age and structure type) as well as the fragility curves.

To avoid an estimation error of the source location and magnitude, we use only observed seismic intensities as an input of the system. When an earthquake occurs, seismic intensities are calculated in each observation station and sent to the DMC (Data Management Center) in different timing. For rapid estimation, the system does not wait for the data from all the stations but begins the first calculation when the number of the stations observing the seismic intensity of 2.5 or larger exceeds the threshold amount. Estimations are updated several times using all the available data at the moment. Spatial distribution of seismic intensity in 250 m meshes is estimated by the site amplification factor and the observed data. By using this intensity distribution, the exposed population and the numbers of damaged buildings are estimated using population data and the building information, respectively. The results are visualized by WebGIS and can be grasped using an internet browser.

This system is experimentally operated since 2010 and has performed the estimations in real-time for more than 600 earthquakes by the end of 2012. For about 75 % of these earthquakes, it takes less than one minute to send the e-mail of first estimation after receiving data from the first station, and therefore, the rapidity of the system is satisfactory. Though the accuracy of the estimations of exposed population is relatively high, the accuracy of the damage estimations using the fragility curves has some uncertainty. It is important to investigate the effective way to provide and utilize such information, which is potentially useful for mitigating the seismic disasters of ongoing earthquakes in spite of the relatively large uncertainty.

Keywords: earthquake damage-estimation system, real-time earthquake information, earthquake early warning, J-RISQ, K-NET, KiK-net