Toward to construction of strong-motion database for seismic hazard assessment in Japan

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After the 1995 Hyogoken-Nanbu (Kobe) earthquake, many records from nationwide strong-motion observation networks such as K-NET have been accumulated and released to the public, and have been widely used in the seismology and earthquake engineering. Under such circumstances, many research groups have proposed improved strong-motion prediction methods, such as ground-motion equations, based on the observed records. However, strong-motion databases have been constructed independently by individual research groups. As a result, the moment magnitude and the source fault model used are differ among research groups even if the same earthquake. For this reason, there is no strong-motion database in Japan at present to systematically develop a strong-motion prediction method and objectively verify the validity of the method.

To overcome this situation, we constructed a prototype strong-motion database consisting of K-NET and KiK-net records (about 1 million). As the source data (about 17,000 events), not only the hypocenter location and magnitude by Japan Meteorological Agency, but also the moment tensor parameters determined by F-net, NIED were registered. In addition, some source fault models by SRCMOD (Mai and Thingbaijam, 2014) were also registered. As the station data, site codes, location, and underground structure information were registered. We registered not only the average S-wave velocity up to 30m depth (Vs30) obtained from the PS logging data, the Vs30 from the engineering geomorphological classification and information on the deep sedimentary layers model by J-SHIS of NIED. Peak acceleration, peak velocity, instrumental seismic intensity, and 5% damped acceleration response spectrum (59 points with a period from 0.02 to 20 seconds) were registered as strong-motion data. For horizontal component, not only the amplitude of each of the two orthogonal components (NS, EW), but also RotD0, RotD25, RotD50, RotD75, and RotD100 were registered. We also registered vertical component.

In the future, we will add and expand data from other organizations such as Japan Meteorological Agency and overseas, and ground motion simulation data. Technical issues such as distinction of earthquake types (crustal, subduction inter-plate, and subduction intra-plate), selection of source fault models, and procedures to remove noise data remain. At the same time, efforts should be made to establish a framework for updating and maintaining the database.

Keywords: Strong-motion records, database, seismic hazard assessment, strong-motion prediction

