

Review on the strong motion observation in Japan since 1990 and prospects for future developments

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1. A general view on strong motion observation since 1990

The strong motion observation instrument, in Japan, was first manufactured in 1951 strongly affected by the damage caused due to the 1948 Fukui earthquake. The number of the observation sites was very slowly increased and strong motion records obtained in a focal area during a half century were very limited until the 1995 Hyogoken-nanbu earthquake. Even though we experienced large earthquakes, such as the 1964 Niigata earthquake, 1968 Tokachi-oki earthquake, 1978 Miyagiken-oki earthquake and so on. Needless to say, the strong motion observation structure or system in Japan has drastically been changed by the lessons from the 1995 Hyogoken-nanbu earthquake. That is the establishment of K-NET, KiK-net (NIED) and the observation systems for seismic intensity information network by JMA and the local governments. Especially, the establishment of K-NET in 1996 has provided 1) free-field sites with homogenously in whole land in Japan (previous sites were mostly in man-made structures in the big cities), 2) high resolution data with online control and data acquisition, 3) very quick data dissemination through the internet. Users of strong motion data might feel a somewhat different age due to the great change of availability of strong motion data. The KiK-net was initially established as a branch of the Hi-net. The sites are mostly on hard rock in deep boreholes so that the data are representative nearby the sites with high quality of less noise. The seismic intensity information network maintained by JMA and the local governments, of which an instrument of each site is basically a strong motion observation device, has a role to supply social and administrative needs for seismic safety.

2. Multi-directional observation purposes associated with technical developments.

Recent developments of electronics and communication tools or systems have given strong effects on strong motion observation and instruments. Those are a high resolution of AD converter, a realization of huge memory capacity, a high speed data transmission, and so on. Some sorts of revolution of electricity and data transmission have provided a multi-directional use of strong motion instruments. The seismic intensity information system is one representative. On the other hand, conventional or handy instruments of low price have also been developed and applications to control devices for an emergency due to earthquake have been realized.

3. Some subjects to be solved and prospects

Present major or basic strong motion observation systems, K-NET, KiK-net, including JMA seismic intensity information network, are the most sophisticated in the world. However, are deployments of instruments sufficient for understanding complexity of earthquake source rupture process and wave propagations in a complex medium such as basin structure?

A strong motion instrument or an observation system will be required for multi-directional use rather than that have ever been requested to get sufficient financial supports. To respond to these requirements, we need to further study what strong motion parameters are useful and stable for seismic safety information.