

Development of earthquake information by JMA

Keiji Doi^{1*}, Mitsuyuki Hoshihara²

¹Japan Meteorological Agency, ²Meteorological Research Institute, JMA

Hogoken Nanbu Earthquake in 1995, which derived devastating disaster to the Hanshin-Awaji Region, showed the importance of rapid response by the government. Seismic intensity information was recognized as the most important and fastest information for the government for the emergency operation, and the Japan Meteorological Agency (JMA) was asked to provide and disseminate the earthquake information properly and rapidly. Then JMA introduced seismic intensity meters to observe seismic intensity instrumentally as well as furnished seismic intensity scale of JMA in 1996.

The earthquake was thrust for developing earthquake early warning (EEW) by JMA. Just after the Earthquake, JMA started feasibility studies for utilization of EEWs. Technique of EEW was developed practically by the establishment of an automatic method which estimates azimuth and distance from an epicenter at a single seismic station (Odaka, et.al. (2003)). JMA started provision of EEWs for advance users in August 2006, and for the public in October 2007, introducing a new location technique independently developed by National Institute of Earth Science and Disaster Prevention (NIED). In December 2007, EEW was legislated as a forecast or a warning of ground motion in the Meteorological Service Law (Kamigaichi et.al. (2009)).

As of 2010, more than 4200 seismic intensity meters are operated not only by JMA but by NIED and local governments. JMA collects seismic intensity values from all of the seismic intensity meters on a real time basis to issue seismic intensity information. At present, tsunami forecast/warning as well as earthquake warning/information are issued by the Headquarters of JMA and Osaka District Meteorological Observatory. When a seismic signal is detected, within a few to a few tens seconds, Earthquake Early Warning is issued if seismic intensity is expected 3 or more. Seismic Intensity Information is issued in 2 minutes, Tsunami Forecast/Warning is issued in 3 minutes, and Earthquake Information including location and magnitude of an earthquake and all of observed seismic intensities is issued in 10-15 minutes. These kinds of information are disseminated to responsible organization for emergency operation. They are also broadcast through TV/radio. You can easily get earthquake information within a few minutes after you feel a tremor by turning on TV/radio. Prompt broadcast by TV/radio is quite unique in the world. This is not only because of recent development of seismology and observation systems, but because of requirement of people who want to know whether tsunami may come or not when they feel tremors, and also efforts taken by broadcasting companies which understand necessity of broadcast to response people's requirement.

JMA also has been collecting all of seismic data from short period seismometers operated by universities, NIED, and other institutes, to locate earthquakes since 1997. The results are used for detail documentation of seismic activities, and are published as a national archive.

Reference

Japan Meteorological Agency, 2009, Earthquake and Tsunami ?Disaster prevention-, JMA's brochure

Kamigaichi, O., M. Saito, K. Doi, T. Matsumori, S. Tsukada, K. Takeda, T. Shimoyama, K.

Nakamura, M. Kiyomoto, and Y. Watanabe, 2009, Earthquake Early Warning in Japan: Warning

the General Public and Future Prospects, *Seism. Res. Lett.*, 80(5), 717-726
Odaka, T.,K. Ashiya, S. Tsukada, S. Sato, K. Otake, and D. Nozaka, 2003, A new method of quickly estimating epicentral distance and magnitude from a single seismic record, *Bull. Seism. Soc. Am.*, 93, 526-532

Keywords: Hyougoken Nanbu Earthquake, earthquake information, earthquake early warning, seismic intensity