
[JJ] Evening Poster | S (Solid Earth Sciences) | S-SS Seismology

[S-SS13]Earthquake prediction and forecast

convener:Toshitaka Baba(Graduate School of Science and Technology, Tokushima University)

Thu. May 24, 2018 5:15 PM - 6:30 PM Poster Hall (International Exhibition Hall7, Makuhari Messe)

This session provides the opportunity for contributions that fall within the scientific spectrum of earthquake prediction and forecasting. We welcome theoretical, observational or numerical papers that are either on long- or short-term predictions, and either based on deterministic or probabilistic approaches.

[SSS13-P04]Determining Magnitude of Large Earthquake in Japan using Seismic Stations in China

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Keywords:real-time, large earthquakes, back-projection

Rapid determination of earthquake magnitude is of importance for estimating shaking damages, and tsunami hazards. However, due to the complexity of source process, it is still a challenge for great earthquakes to accurately estimate magnitude in minutes after origin time. A recent example is the 2011 M 9 Tohoku, Japan earthquake.

Here we determine the magnitudes of eleven $M \geq 7.0$ (USGS) shallow earthquakes that occurred in and around Japan from 2008 to 2016, using seismic data recorded in China and across the global. The magnitude is estimated by considering P-wave maximum displacement of global stations and source duration derived from back-projection using dense seismic stations in China.

The results agree well with the M_w estimated from W-phase inversion, with a standard deviation of 0.19, and suggest that the magnitudes can be accurately estimated in 3 to 9 min after origin times of earthquakes, depending on the epicenter distances to seismic stations in China. For the case of the 2011 M 9 Tohoku, Japan earthquake, the magnitude is estimated as to be 9.1, 9.0, 8.8, 8.9 at 3, 5, 7, 9 min after the origin time, respectively.

We use station corrections derived from nearby earthquakes to perform back-projection. The final source durations don't show significant variations, demonstrating that the magnitude of earthquake can be estimated with the pre-stored database of station corrections. Therefore, we propose to build an automated system for determining magnitude of large earthquake in and around Japan using real-time seismic data in China and across the global, for disaster mitigation right after a damaging earthquake, especially when dealing with the tsunami evacuation and emergency rescue.