

CMT solutions determined by using JISNET waveform data and their systematic deviations from Global CMT solutions

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We have been creating a Centroid Moment Tensor (CMT) catalogue of earthquakes that occurred in and around Indonesia (hereinafter referred to InaCMT) based on waveform inversion analysis (Yamashina *et al.*, 2008). We found systematic deviations in the solutions of InaCMT from those of the Global Centroid Moment Tensor project (GCMT) especially for earthquakes that occurred around Sumatra Island. In this study, we discuss the systematic deviations.

To create the InaCMT catalogue, we used waveform data from a regional broadband seismograph network in Indonesia. This network is operated under an international cooperation among Indonesia, Germany, Japan and China, and plays a part of the Indonesian Tsunami Early Warning System (InaTEWS). JISNET is a part of this seismograph network. To obtain CMT solutions, we used the waveform inversion method in the frequency domain developed by Nakano *et al.* (2008), in which a spatial grid search is used to estimate the centroid location. In this study, we used the grid spacings of 0.1 degree for the horizontal directions and 5 km (shallower than 100 km) or 50 km (100-400 km) for the vertical direction.

We compared each parameter of the solutions of InaCMT and GCMT for earthquakes that occurred around Sumatra Island (7S-5N, 95-105E) between July 2006 and January 2009. In this period, 92 events were listed in both catalogues. For the moment magnitude (M_W), the average of the M_W difference between InaCMT and GCMT was -0.04. The centroid depths of InaCMT were 5.7 km shallower than those of the GCMT in average. The horizontal centroid locations of InaCMT were 32.8 km NNE (N27.4E) from those of GCMT in average. Accordingly, the centroid locations of InaCMT were closer to Sumatra Island than those of GCMT.

We compared the centroid locations of both CMT catalogues with the hypocenter locations determined by USGS PDE. The centroid locations of InaCMT were 9.6 km WNW (N71.5W) from the hypocenters of PDE in average. On the other hand, the centroid locations of GCMT were 36.5 km SW (N133.9W) from the hypocenters of PDE in average. Therefore, the centroid locations of InaCMT were closer to the PDE hypocenters, while those of GCMT showed systematic deviations from the PDE hypocenters.

The systematic deviations in the centroid locations between InaCMT and GCMT may be caused by the tectonic setting around Sumatra Island, where an oceanic plate is subducting beneath a continental plate. Therefore, the seismic structure around Sumatra Island shows difference between the oceanic and continental sides. This may cause systematic errors of centroid locations especially in the GCMT solutions, which use global waveform data more seriously affected by the structure difference.

References:

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