Statistic Characteristics of BATS CMT Catalogue for Regional Earthquakes around Taiwan

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Abstract

We collected 1130 regional centroid moment tensor (CMT) solutions, which were obtained by the Institute of Earth Sciences, Academia Sinica for earthquakes occurred in the Taiwan region in 1995-2005 by inverting the BATS broadband waveforms, to characterize their statistic properties and tectonic implications. The moment magnitude ranges from 3.3 to 7.1 in this catalog with a complete magnitude (Mc) of ~4.2. A linear relationship between BATS Mw and CWB ML is determined as: $Mw = (0.034\pm0.059) + (0.899\pm0.013)\times ML$. Predominant thrusting events are common in the colliding boundary, fold-and-thrusting belt, and subducting interface, whereas the normal faulting presents mainly in the Okinawa Trough, northern Hoping Basin, and the eastern Central Range.

To evaluate the robustness of BATS CMT solutions, we compare 96 CMT solutions that are in common between BATS and Harvard catalogs. Results show that the BATS solutions are well constrained for events with misfit ≤ 0.5, which are roughly comparable to Harvard's solution with moment error ≤ 0.2. The BATS Mw is generally less than Harvard Mw by an average of ~0.17. This is very likely due to the fact that the BATS is using relatively shorter frequency band (0.1-0.02 Hz). A linear relation is revealed as $Mw_{HVR} = (0.779\pm0.014) + (0.886\pm0.021)\times Mw_{BATS}$. Furthermore, we found the magnitude different is smaller for deeper (≥ 40 km) events. Horizontal seismic strain directions, which are shown in terms of well constrained BATS CMT dataset, agree well with the surface geodetic GPS observations. Our results provide seismological constraints on the mode of deformation and stress field in the Taiwan region.