

Characteristics of the stress drops for intraslab earthquakes beneath Tohoku and Hokkaido, northeastern Japan

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1. Introduction

Kita and Katsumata [2015] estimated the stress drops of ~2000 small-to-middle magnitude events in the Pacific plate at intermediate-depths and examined the spatial variation of stress drops of them. Some previous studies reported some degree of dependence of the stress drop on the focal mechanism of earthquakes. Kita et al. [2010] revealed that stress regime in the slab beneath Hokkaido is quite different that beneath Tohoku. In order to understand the characteristics of nature of the intermediate-depth intraslab earthquakes and relationship of stress drops and stress field, I examined characteristics of stress drops for ~5000 intraslab earthquakes beneath Tohoku and compared the results with that beneath Hokkaido.

2. Data and method

I adopted method and analysis procedure from Kita and Katsumata [2015, G-cubed]. In the estimation of stress drops of the events, I used corner frequencies of 5094 events from 70 to 200 km (August 2003 to July 2014) estimated by S-coda wave spectrum ratio method [e.g., Mayeda et al., 2007].

3. Results and Discussion

The stress drops of events generally increased with depth at depths of 70 to 200 km, which corresponds to results beneath Hokkaido. In the oceanic crust, we also found a decrease of median stress drops at depths of 70 to 110 km (6.8 to 3.6 MPa) and an increase with depth at depths of 110 to 170 km (3.6 to 8.6 MPa). This depth variation also corresponds to that beneath Hokkaido. Depth change of rigidities due to eclogite-forming phase change with dehydration causes the depth variation of stress drops in the oceanic crust. At the depth of 70 to 170 km, median stress drops for events in the oceanic crust (3.6 to 8.6 MPa) are smaller than those in the oceanic mantle (7.2 to 13 MPa). Differences of rigidities and/or rupture mechanisms of events could induce the difference between the stress drops of events in the oceanic crust and those in the oceanic mantle. In the oceanic mantle, median stress drops of events between the double seismic planes, which yields downdip compression stress field, is larger than those of the lower plane event, which yield downdip tension. This characteristics beneath Tohoku is different from that beneath Hokkaido, which implies that difference of stress field could cause the difference of the

stress drops.

Keywords: Intraslab earthquakes, stress drops, Dehydration due to the eclogite formation process in MORB, Stress field in the subducting slab