Upper boundary of the Pacific plate inferred from moment tensor catalogue - off Fukushima and off Ibaraki - (2)

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Kubo and Fukuyama (2002, SSJ fall meeting) estimated the precise hypocenter distribution of medium sized earthquakes (Mw greater than 3.5) occurring between the trench of the Pacific plate and coast lines of north east Japan. They used both epicentral locations of unified hypocenter catalogue compiled by Japan Meteorological Agency (JMA) and Nat'l Res. Inst. Earth Sci. Disas. Prev. (NIED) moment tensor catalogue (Fukuyama et al., 1999, 2000ab, 2002ab). In this region, hypocenters are poorly estimated by the local microseismic network, especially their depths. Then, by taking into account their focal mechanisms, they estimated the shape of the upper boundary of the Pacific plate. However, JMA unified hypocenters include a trade-off between the epicentral location and its corresponding depth. In order to improve their accuracy, relocations of the hypocenters should be necessary.

Therefore, we tried to relocate the earthquakes using both a regional phase arrival data (JMA unified catalogue) as well as a teleseismic one (ISC phase data) based on the modified joint hypocenter determination method proposed by Hurukawa and Imoto (1992, GJI) and Hurukawa (1995, GRL). We relocated the earthquakes occurring in the region between 140.0E and 144.0E in longitude, 35.5N and 38.5N in latitude, 0km and 150km in depth, time window of October, 1, 1997 and September 1, 2002. We relocated 660 earthquakes whose moment tensors are determined by the NIED moment tensor catalogue. At 75 domestic stations among them both P- and S- arrival times are used. We confirmed that the depth of relocated hypocenters are consistent with that of moment tensor catalogue.

Then, following Kubo and Fukuyama (2002), we selected the earthquakes whose mechanisms are satisfied the following condition: the direction of P-axis is N115E plus or minus 20 degrees, plunges of P- and T-axes are lower and higher than 45 degrees, respectively. We regarded them as interplate earthquakes and the their distribution depicts the upper boundary of the Pacific plate. The present result shows more accurate estimates of the boundary than that of Kubo and Fukuyama (2002) judging from the thickness of the boundary layers of the interplate earthquakes.

Applying the present method to the more broad area along the subduction region of the Pacific plate, we will be able to obtain more precise boundary of the Pacific plate. And using this boundary, we will be able to distinguish the intraplate earthquakes occurring inside the Pacific plate or the north American plate lying above it. These earthquakes will be available to estimate the stress field inside the plate using the conventional stress tensor inversion technique.