Moho depth variation in the forearc region of the northeastern Japan subduction zone estimated from converted waves

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Nationwide seismograph network in NE Japan records hundreds of offshore small repeating earthquakes with low-angle thrust-fault type focal mechanisms (eg. Igarashi et al. 2003; Uchida et al. 2004). We identified SP waves converted at the forearc Moho from these interplate events and estimated the Moho depth in the forarc region of the northeastern Japan subduction zone. The SP converted waves are suitable to estimate the offshore Moho depth because the conversion points are located close to the respective epicenters of the offshore events. The converted waves at the Moho are identified visually by using three component seismograms for earthquakes within 100km from each station. The analysis was performed by using the method developed by Horiuchi et al (1982): We measured time differences between SP converted waves and direct S waves and inverted the data by approximating the depth to the Moho by polynomial of latitude and longitude. The Moho depth for the land area in the central part of northeastern Japan is already examined by Nakajima et al. (2002) by using a similar method, therefore this analysis add new results for the offshore region.

By using earthquakes with reliable focal depths, we picked 132 converted phases from 34 earthquakes as a preliminary analysis. In addition to the SP converted data, the data of converted and reflected waves for inland area (Nakajima et al. 2002, N=692) are also used to constrain the shape of the Moho near the coastline.

The overall pattern of the Moho depth shows that it becomes shallower from west to east (about 30km beneath the coast line and about 25km at 50km off shore). The present result is nearly consistent with the result of the reflection/refraction experiments along several survey lines (Ito et al. 2002, 2005; Fujie et al. 2007, 2008). Detailed examination of along-arc variation shows that the Moho at off Miyagi area is deeper than the northern area. This Moho depth variation may be related to the forearc seismicity as well as the along-arc variation in interplate coupling (e.g. Suwa et al. 2006) and 'supraslab' seismicity above the plate boundary (Uchida et al. 2008).

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