

Seismic imaging of the crust and uppermost mantle structure beneath Kyushu by receiver function analysis

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Kyushu is one of the typical active subduction zones where the Philippine Sea plate goes northwestward beneath the Eurasian plate. For understanding its tectonic features we studied seismic structure of the crust and uppermost mantle beneath Kyushu by use of receiver function analysis. Murakoshi et al.(2003) showed that a low velocity layer is visible in the uppermost mantle beneath Fukuejima island in the western Kyushu. It may show the partially melting by the mantle upwelling in the backarc of Kyushu. We installed new broadband seismic stations at Hirado and Sumoto in July, 2003 to study this structure in detail. The data used for receiver function are three-component broadband records of the teleseismic events occurring in the epicentral distance of 30-100 degree observed by 19 broadband seismic stations and 118 stations of the High sensitivity Seismograph Network (Hi-net) in and around Kyushu. And we applied SVD filtering to the receiver functions of multi-channel for each station to emphasize the coherent phases. Most of the filtered functions show the Moho-boundary phase converted from P to S. We also found the phases of negative amplitude which means the existence of low-velocity layers in the crust and uppermost mantle. We applied the receiver function inversion using genetic algorithm (GA) to estimate the detailed velocity structures beneath the stations. For estimating the both of shallow and deep structures with high accuracy we applied a new approach by separately using the high-frequency and low-frequency receiver functions. After calculating the receiver function inversion for each station, we estimated the three-dimensional velocity structures beneath Kyushu by using a migration technique. In the migration, we stacked each of the images of the direct converted phase (Ps) and reverberated phased (PpPs, PpSs and PsPs) using fourth order root nonlinear stacking to enhance the seismic image.