

Seismic structure of the crust and uppermost mantle beneath Kyushu as inferred from 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. 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 17 stations in and around Kyushu. We obtained 10-80 high quality receiver functions for each station. 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. The results reveal the followings. (1) The depths of the Moho-boundary beneath Kyushu are 25-35 km. The Moho of western Kyushu in backarc tends to be shallower, whereas the Moho of northeastern Kyushu and western Chugoku which locate at the junction of the Southwest Japan Arc and the Ryukyu Arc are deeper. The Moho depths beneath the active volcanoes tends to be slightly deeper. (2) The top of the subducting Philippine Sea plate is imaged clearly in the range of depth from 40 to 70 km beneath eastern Kyushu. (3) Low velocity layers are visible at the crust and uppermost mantle beneath the active volcanoes in Kyushu; for instance, at the upper crust under northern Kuju and eastern Aso volcanos, at the lower crust and uppermost mantle under western Aso volcano, and at the upper crust and uppermost mantle near Sakurajima volcano. (4) 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.