

Receiver function analysis in and around the Mid Niigata prefecture

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We applied the receiver function estimation technique using multiple-taper spectral correlation methods [Park and Levin, 2000] and estimated a crustal structure in and around the Mid Niigata prefecture. This area includes the source region of the 2004 Mid Niigata prefecture earthquake (M6.8) and many aftershocks. 52 temporary seismographic stations had installed in this area and had observed many events for a month. In this period, five earthquakes occurred in teleseismic distances (epicenter distances between 30 to 90 degrees) were also recorded. We analyzed these events at all stations and seismograms recorded by permanent seismographic networks from August 2002. A velocity structure beneath the Mid Niigata prefecture is very complex. A thick sediment layer with low velocity near surface may be preventing to resolve deep structure. Therefore, we estimated the effect of sediment layer beneath stations. We stacked all observed receiver function and compared them with the synthetic trace assumed three layer structures including a sediment layer. As the results, we found that a distinct velocity boundary exist on the line of NNE-SSW direction bounds between plain or basin and mountain district. Estimated average P-wave velocities from surface to 5 km depth were 2.5 to 4.7 km/s in the plain and basin area and there weren't any records in about a half of temporary stations. On the other hand, mountain district which located in south eastern part was 5.1 to 6.3 km/s. Furthermore, we analyzed the azimuthally variation of receiver function in several permanent stations. Hirokami (Earthquake Research Institute, University of Tokyo), Hirokami (Japan Meteorological Agency), and Yunotani (Hi-net), which located in a near place and just eastern position of the boundary, have almost the same traces and positive pulses at about 4 seconds correspond to the Moho discontinuity. They also suggested that incident from western direction or the station located in western side was on somewhat thick sediment layer. On the other hand, Yahiko (ERI) station located in north east of the source region of the Mid Niigata prefecture earthquake indicates existence of thick sediment beneath south eastern direction. Traces from the north western direction suggest no or thin sediment layer and shallower Moho discontinuity than the eastern station. We expect to clarify the seismic velocity structure of deeper part of the crust and the upper mantle beneath the Mid Niigata prefecture from these analyses.