

Fine scale mapping of the mantle discontinuities beneath the Japanese islands using short period Hi-net data

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In order to delineate the effect of the presence of the cold deep 'mantle slab' on the mantle transition zone discontinuities, we have conducted a preliminary receiver function analysis to finely map the seismic discontinuities beneath the Japanese islands using Hi-net data. Hi-net consists of nearly 700 short period seismometers (3-component) buried in deep boreholes around a depth of 100m to cover the Japanese islands with the designed spacing of ~20km. We have so far collected about four years of data, and for the present analysis, we select events in a distant range of 30-90 degrees with the minimum Mw of 5.6, which results in a total of 404 events. Receiver functions (RFs hereafter) are constructed for instrument response corrected seismograms employing the water level correction ($C=0.001$) in a frequency range of 0.1-0.5Hz. Out of 238,574 RFs, we select RFs with decent S/N ratio to make 74,083 RFs.

1-D IASPEI91 based imaging of mantle discontinuities beneath the Japanese islands shows clear continuous features corresponding to the 410km and 660km transition zone discontinuities, as well as the top boundary of the subducting Pacific plate traceable down to at least 300 km depth. The 660km discontinuity is deflected downwards as much as 40-50km with a width of approximately 500 km where the Pacific plate appears to stagnate in a recent tomographic model; The 410km discontinuity is elevated 20-30km where the Pacific plate penetrates through it. All these features are consistent with the previous RF analyses in the region. What appears remarkable is the continuity of these structures. The high spatial density of Hi-net seems to guarantee success of more sophisticated full 3-D imaging of the structure beneath the Japanese islands; the Kirchhoff type migration will be applied to the same data set.