One dimensional P wave velocity structure beneath Indonesia derived from JISNET data

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The Indonesia region is characterized by complicated geometry of the convergence of several plates, such as Philippine Sea plate, Pacific plate, Eurasian plate, and Indo-Australia plate. Such a complicated tectonic setting should be manifested as an anomalous seismic velocity structure beneath this region. We investigate one-dimensional P-wave velocity structure beneath Indonesia using travel time and waveform data of JISNET(Japan-Indonesia Seismic Network).

First we select nearly 70 earthquakes from 1998 to 1999 around Indonesia with epicentral distance shorter than 40 degrees. We pick arrival times of P-waves on the vertical component seismograms. The P-wave travel times are computed with the PDE hypocenters and origin times, and are fitted by a 10th order polynomials to construct a travel time curve. The travel time curve is then transformed into a τ-p curve. We use a τ-p inversion scheme to invert one dimensional Vp model from the τ-p curve.

Although the τ-p method cannot resolve velocity discontinuities without using later phase data, the comparison between the obtained velocity structure and a global reference model (ak135) reveals a few gross differences between the two models. For instance, the τ-p model shows that there is a low-velocity anomaly of 3% relative to ak135 in the uppermost 200km of the mantle. This corresponds to the observation that the P-wave arrival times are systematically later than those predicted by ak135 by about 2 sec.

In addition to these analyses, we are going to investigate the detailed structure near the 410km and 660km velocity discontinuities for several events using waveform modeling. We obtain source time functions by stacking teleseismic P-waveform data archived by IRIS DMC. Green's functions are computed by the WKBJ method with Harvard CMT solutions as focal mechanism. We compute the synthetic vertical P waveforms and compare them with the observations to investigate the velocity structure in the upper mantle transition zone beneath the south and central parts of Indonesia.