Surface wave tomography for southeastern Asia using JISNET and IRIS-FAR M data

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The tectonic setting around Indonesia is very complex because of the presence of many lithospheric plates. Determining accurate seismic velocity structure is essential for better understanding how the plates are subducted or collide each oter there.

Previous seismic studies of this area include few broadband seismic stations within the area, so that the results should have considerable uncertainty and very limited resolution. In this study we use data of IRIS-FARM (Fast Archive Recovery Method) and JISNET (Japan Indonesia Seismic NETwork) with 23 broadband seismic stations temporarily installed in central to western Indonesia since 1998. We use vertical component LP seismograms of FARM data recorded from 1989 to 1993 (11,609 seismograms) and vertical component of broadband JISNET data recorded from 1998 to 1999 (596 seismograms). The sampling rate of FARM data is 1 Hz, while that of JISNET is 50 Hz. We decimate the JISNET data down to 2 Hz for waveform analysis. We select the seismic events whose body wave magnitude are greater than 5.5. Hypocenters of these events are taken from the PDE catalogue. Phase velocity anomalies relative to PREM of fundamental mode Rayleigh waves (period from 40 to 200sec) are determined by measuring phase differences between the synthetic waveforms and observations. A block inversion with damped least squares are performed for 10 by 10 degrees block size.

Firstly we compare results obtained from the FARM data only and those from the FARM and JISNET data to have an idea how resolution improves by including regional data. There is a clear tendency that the results obtained from the FARM and JISNET data have greater degrees of heterogeneity of phase velocity than those from the FARM data alone. For example, the region around Kalimantan has 1% slower phase velocity than PREM at period of about 67 sec for the FARM inversion, whereas including JISNET data increases the low velocity anomaly up to 4%.

Secondly we compare the resolution of both data set. The FARM and JISNET data in general shows better resolution around Indonesia than the FARM data. Around east Java sea, the resolution of the FARM and JISNET data is substantially better than that of the FARM data alone. The resolution improvement is the best for Kalimantan, consistent with the improved ray path coverage in this area. On the other hand, for western Sumatra, the resolution does not improve much.

Based on the phase velocity map obtained, an inversion of three dimensional shear wave structure is now being performed. The results will be presented.