Retrieval of P wave Basin Response from Autocorrelation of Seismic Noise-Jakarta, Indonesia

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Indonesia's capital city, Jakarta, is home to a very large (over 10 million), vulnerable population and is proximate to known active faults, as well as to the subduction of Australian plate, which has a megathrust at abut 300 km distance, as well as intraslab seismicity extending to directly beneath the city. It is also located in a basin filled with a thick layer of unconsolidated and poorly consolidated sediment, which increases the seismic hazard the city is facing. Therefore, the information on the seismic velocity structure of the basin is crucial for increasing our knowledge of the seismic risk.
We undertook a passive deployment of broadband seismographs throughout the city over a 3-month interval in 2013-2014, recording ambient seismic noise at over 90 sites for intervals of 1 month or more. Here we consider autocorrelations of the vertical component of the continuously recorded seismic wavefield across this dense network to image the shallow P wave velocity structure of Jakarta, Indonesia.

Unlike the surface wave Green's functions used in ambient noise tomography, the vertical-component autocorrelograms are dominated by body wave energy that is potentially sensitive to sharp velocity contrasts, which makes them useful in seismic imaging. Results show autocorrelograms at different seismic stations with travel time variations that largely reflect changes in sediment thickness across the basin. We also confirm the validity our interpretation of the observed autocorrelation waveforms by conducting 2D finite difference full waveform numerical modeling for randomly distributed seismic sources to retrieve the reflection response through autocorrelation.

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