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Illumination of Jakarta Basin with Full Seismic Noise Tomography

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The greater Jakarta area is densely populated with over 20 million residents. The rapid subduction of Australian crust beneath Sundaland, and the alluvial basin covering most of Jakarta increase the seismic hazard that the city is facing during an earthquake. We apply 3D Full Seismic Wave Tomography to invert interstation Green's functions retrieved from stacked correlations of seismic ambient noise recorded at a dense broadband network operated in Jakarta, Indonesia. Over 1200 Green's Functions were used in an iteratively applied adjoint scheme to map 3D velocity structure. The initial model used in the simulations, is derived from the combination of a 2-step procedure of Bayesian tomography and point wise inversions of dispersions curves. The iterative updates on the starting model, reduced the misfits between observed and synthetic Green's functions. Simulations were conducted in a parallelized approach with 128 compute cores. Green's functions were filtered between 0.08 and 0.2 Hz where their signal to noise ration is optimum.

Results of the full waveform inversions show a thick very low velocity layer in the north-west part of the city with shortening towards the south east. Shear wave velocities as low as 1 km/s is observed across the region. The resulting model contributes to the quantification of the seismic hazard of Jakarta.