

S-velocity structure of the crust and uppermost mantle of East Asia from ambient seismic noise

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We have collected continuous vertical-component broadband data from 1109 seismic stations in regional networks across China, Korea, and Japan for the year 2011, and we have measured over half a million Rayleigh wave group velocity dispersion curves from one-year stacks of station-pair ambient seismic noise cross-correlations. The Rayleigh wave group velocity dispersion curves are regionalized on a tessellated spherical shell grid in the period range 10 to 50 s to produce maps of Rayleigh wave group velocity distributions. Maps at 10 seconds period match well with geologic features at the surface. In particular, we observe low group velocities in the Songliao, Bohai Bay, Sichuan, Ordos, Tarim, and Junggar Basins in China, and the Ulleung and Yamato Basins in the East Sea (Sea of Japan). Higher group velocities are observed in regions with less sediment cover. At periods around 30 s, we observe group velocity decreases going from east to west in China, representing an overall trend of crustal thickening due to the collision between the Indian and Eurasian plates. The Ordos and Sichuan blocks show higher group velocities relative to the eastern margin of the Tibetan Plateau, possibly reflecting low temperatures in these cratons. Using the Rayleigh wave group velocity distributions, we have performed 1D linear inversions at each node on the spherical shell grid to retrieve S-velocity perturbations with respect to the reference model LITHO1.0 of Pasyanos *et al.* (2014). This has allowed us to construct a 3D model of the crust and uppermost mantle for East Asia. We observe large-scale lateral variation in the crust compared to the LITHO1.0 model. From 50 to 100 km depth, we observe a low-velocity mantle wedge underneath Japan and the Strait of Korea, and at 100 km depth we see a general trend of increasing S-velocities from east to west, possibly reflecting temperature/water content variations in the mantle.

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