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Crustal and uppermost mantle structure beneath Iceland from ambient seismic noise correlations

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We used correlations of ambient seismic noise recorded continuously by 33 broadband stations of the HOTSPOT experiment (Allen et al., 1999) to study the structure of the crust and uppermost mantle beneath the Iceland. The method is based on the extraction of fundamental-mode Rayleigh and Love waves from correlations of seismic noise records between pairs of receivers. We applied a frequency-time analysis to the extracted surface wave signals to measure group velocities in the period range between 7 and 30s for Rayleigh and between 7 and 14s for Loves waves. We inverted the obtained measurements for two-dimensional group velocity maps. The regionalized dispersion curves were then inverted with a Monte-Carlo method to infer shear-velocity structure down to a 40 km depth. During the inversion, we fixed the deep mantle seismic structure to values typical for a young oceanic lithosphere. Our results clearly indicate a nearly circular low-velocity seismic anomaly in the mid-lower crust and the uppermost mantle where its radius does not exceed 50 km. At the center of this anomaly (18.5W, 64.6N), the upper mantle shear wave velocity is estimated to be 3.8 km/s. This corresponds to the temperature contrast between 240 and 400 K relative to the surrounding mantle.