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# Structure of the North Anatolian Fault Zone from the Autocorrelation of Ambient Seismic Noise

George Taylor, Sebastian Rost, and Gregory Houseman
Institute of Geophysics and Tectonics, School of Earth and Environment, University of Leeds, UK

In recent years the technique of cross-correlating the ambient seismic noise wavefield at two seismometers to reconstruct empirical Green's Functions for the determination of Earth structure has been a powerful tool to study the Earth's interior without earthquakes or man-made sources. However, far less attention has been paid to using auto-correlations of seismic noise to reveal body wave reflections from interfaces in the subsurface. In principle, the Green's functions thus derived should be comparable to the Earth's impulse response to a co-located source and receiver. We use data from a dense seismic array (Dense Array for Northern Anatolia - DANA) deployed across the northern branch of the North Anatolian Fault Zone (NAFZ) in the region of the 1999 magnitude 7.6 Izmit earthquake in western Turkey. The NAFZ is a major strike-slip system that extends ∼1200 km across northern Turkey and continues to pose a high level of seismic hazard, in particular to the mega-city of Istanbul. We construct body wave images for the entire crust and the shallow upper mantle over the ∼35 km by 70 km footprint of the 70-station DANA array. Using autocorrelations of the vertical component of ground motion, P-wave reflections can be retrieved from the wavefield to constrain crustal structure. We show that clear P-wave reflections from the crust-mantle boundary (Moho) can be retrieved using the autocorrelation technique, indicating topography on the Moho on horizontal scales of less than 10 km. Offsets in crustal structure can be identified that seem to be correlated with the surface expression of the northern branch of the fault zone, indicating that the NAFZ reaches the upper mantle as a narrow structure. The southern branch has a less clear effect on crustal structure. We also see evidence of several discontinuities in the mid-crust in addition to an upper mantle reflector that we interpret to represent the Hales discontinuity.