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Characterization of seismic velocity structure in the eastern Sea of Marmara region, NW Turkey, using ambient noise

Digdem Acarel, Fatih Bulut, and Marco Bohnhoff
Helmholtz-Centre Potsdam, German Research Centre for Geosciences GFZ, Potsdam, Germany (acarel@gfz-potsdam.de)

We analyze the ambient seismic noise field in order to investigate crustal structure and seismic anisotropy at the North Anatolian Fault Zone (NAFZ) in NW Turkey. We focus on the eastern Sea of Marmara section of the NAFZ representing a pre-seismic phase of the seismic cycle just prior to an expected major (M>7) earthquake. The target area has been monitored by the PIRES seismic network since autumn 2006 (Bulut et al., 2009; 2011). We apply a spatial autocorrelation and cross-correlation analysis of the seismic ambient noise to firstly determine spectral dependence of the seismic velocity in order to image crustal structure at near-surface and seismogenic depths. The time-domain cross-correlation of ambient noise recordings computed between a pair of receivers, will result in a waveform that differs only by a smooth frequency dependent amplitude factor from the Greens function between the receivers (Shapiro et al., 2005). The basic assumption is that the emerging signal from the noise correlation function will be dominated mainly by fundamental mode Rayleigh waves. Time-domain cross correlations are calculated for all available stations pairs in the target area. As a first step, we aim to investigate the crustal anisotropy to analyze the stress field orientation and/or structural heterogeneity along this section of the NAFZ. Therefore, group velocity dispersion curves are obtained for selected correlation paths in particular to address the velocity variation at different back azimuths. In a frequency band of 0.02 to 1.2 Hz, average group velocity ranges between $\sim$1.5 to 3.5 km/s. We present our results in three subsets, in terms of interstation distance and propagation path. The observations will thereby allow us to investigate physical parameters along and across the fault zone at pre-seismic phase of the seismic cycle providing insights into crustal characteristics. Dispersion curves corresponding to the paths crossing the NAFZ (north-south oriented) exhibit low group velocities of $\sim$1.5 to 1.8 km/s, indicating the sedimentary basin, whereas for the paths within the Istanbul and Armutlu peninsula (east-west oriented with respect to NAFZ) higher group velocities, up to 3.5 km/s, are seen. As a future perspective, we plan to extend the study towards the ICDP-GONAF project (www.gonaf.de) using the borehole recordings providing a better signal to noise ratio and therefore a better detection of the ambient noise field.