



Crustal structure and thickness variations determined by double-difference tomography and receiver functions in the Marmara Region, north western Turkey

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The Marmara region is a seismically active, rapidly deforming area in the northwestern Turkey. The right-lateral strike-slip North Anatolian Fault (NAF) splits into several fault splays forming an enormous complex-pull-apart basin, the Marmara Sea. We constructed an integrated model of the velocity structure and crustal thickness by the joint use of Double-Difference tomography and receiver function analysis. To determine the crustal thickness variations across the Marmara region, we have carried out receiver function analysis using teleseismic earthquake data recorded at 14 broadband seismic stations that were recently established by the Kandilli Observatory and Earthquake Research Institute (KOERI). We used a regional double-difference tomography method (Zhang and Thurber, 2003) to relocate earthquakes and to determine velocity models of the crust simultaneously. The crustal velocities obtained by the Double-Difference tomography indicate a rather complex and heterogeneous crustal structure for the Marmara region. Receiver functions were obtained using time domain deconvolution, and they were stacked using the H-K stacking method (Zhu and Kanamori, 2000). The P-wave velocities beneath each station computed from the Double-Difference tomography were used as input parameters in the receiver function analysis. Over 300 events recorded between 2002 – 2007 were analyzed, resulting in

over 900 high-quality receiver functions. Close scrutiny indicates complex features especially for the transverse components of some of the receiver functions such as double-pulsed phases which suggest that there might be a dipping Moho or strongly anisotropic layers in the Marmara region. The estimated crustal thicknesses range from 29 km to 37 km, with an average crustal thickness of 32 km. In general crustal thickness decreases from east to west towards the Marmara Sea and the crust is thinner in the north (Istanbul Zone) compared to the central Sakarya Zone in the south.

Zhu and Kanamori, 2000, JRG, 105, 2969-2980; Zhang and Thurber, 2003, BSSA, 93, 1875-1889.