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Crustal structure of Turkey from teleseismic receiver functions

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The Anatolian plate of Turkey acts like a tectonic bumper between the northward moving African & Arabian plates and the stable Eurasian plate in the north. Most of the associated tectonic forces and related deformations are neutralised over relatively short distances in this region. Therefore, Turkey appears as the most seismically active neighbour of the European Union and perhaps presents the highest seismic risk in the area. Especially after the devastating 1999, M 7.4 İzmit earthquake and the following debates on increased seismic hazard for the Sea of Marmara region, a long-awaited instrumentation race has begun in the country. Within 20 years, as a result of substantial efforts from the seismology groups in Earth and Marine Sciences Institute of TÜBİTAK Marmara Research Centre, Kandilli Observatory and Earthquake Research Institute of Boğaziçi University and the Earthquake Research Department of Turkish Republic Disaster and Emergency Management Presidency, there are more than 300 high-quality broadband seismic stations operational in Turkey, today.

We take the full advantage of this public dataset and aim to shed more light on the puzzling crustal structure of Turkey and its tectonic divides. As most of the seismologist working on similar problems, we decide to calculate receiver functions for teleseismic earthquakes with magnitudes Mw $\geq$ 5.5. We choose to perform the deconvolution in time domain using truncated singular value decomposition, which is a very easy-to-implement technique and makes the computations very stable. Truncating the number of singular values serves as regularisation in linearised-inversion and effectively suppresses the noise related effects from the real seismograms. Following the calculation of receiver functions, record sections in radial and transverse directions are formed for each station. Finally, our isotropic considerations end with the application of traditional H-K stacking combined with bootstrapping to construct 3-D variation maps of crustal thickness, Vp/Vs ratio and their associated errors. Energetic and coherent signals observed on transverse receiver functions, on the other hand, further implies an anisotropic nature for the crustal material with a possibility of presence of dipping interfaces in the region.