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Imprints of Crust- and Mantle-Scale Deformation in Central Anatolide-Tauride Region: Exploiting Receiver Functions

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Central Anatolia is a seismically active region with complex tectonic provinces and represents one of the significant regions experiencing active deformation in Turkey. It involves the Anatolide-Tauride Block settled in southern Anatolia that is separated from the Pontides by the İzmir-Ankara-Erzincan Suture Zone (IAESZ). In central Anatolia, the Kırşehir Massif mainly comprises complex crystalline metamorphic and plutonic rocks with obducted ophiolitic fragments. It is detached from the Anatolide-Tauride Block by the Intra-Tauride Suture (ITS). The ITS is thought to represent the footprint of subducted Neo-Tethyan ocean. This region further includes a number of active tectonic features, i.e., the Central Anatolian Fault Zone (CAFZ), the Tuz Gölü Fault (TGZ), the East Anatolian Fault zone (EAFZ), the Dead Sea Fault (DSF), and the Bitlis-Zagros Suture. In order to investigate the style of deformation of the region and its influence on the crustal and lithospheric structure and to better understand the relationship between tectonic features and regional deformation at different depth and tectonic features, we quantify the strength and orientation of seismic anisotropy. To achieve this, we focus on the directional dependence of P-to-S converted teleseismic waves (i.e., receiver functions) through the harmonic decomposition analysis. Our findings indicate that seismic anisotropy is mostly localized in the mid-crust (15-25 km) with an overall NE-SW and NNW-SSE orientation in the west and east portions of the study area which is present in the mid-crust (15-25 km). In the uppermost mantle, we observed NE-SW oriented and relatively strong anisotropy. This is compatible with fast shear wave azimuths inferred from SKS splitting measurements reported in previous studies and likely be associated with a sub-lithospheric origin. Anisotropic orientations found at crustal and upper mantle depths are consistent with a model of the ITS reaching to great depths suggest anisotropic fabrics in frozen related to past deformation events. We further perform a joint inversion of receiver functions with apparent S wave velocities to better constrain crustal thickness estimates derived from the harmonic decomposition analysis. The resulting crustal thicknesses vary from about 25-28 km nearby the EAFZ and DSF, and to ~35 and 40 km beneath the Kırşehir block and the Eastern Tauride Mountains.