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Influence of upper mantle anisotropy on isotropic P-wave tomography images obtained in the Eastern Mediterranean Region

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Global compilation of seismic anisotropy measurements and models (e.g. from SKS splitting, surface waves tomography, receiver functions analyses, etc.) suggest that anisotropy is present in most subduction zones. Despite this fact, seismic tomography studies usually consider an isotropic upper mantle. In the present work, we gather seismological and 3D numerical geodynamic models on seismic anisotropy from, i.e. shear wave splitting measurements and numerical mantle flow patterns and include them into finite frequency velocity models with seven years of P-wave data recorded at 686 broadband stations. The complicated behavior of convergent plate tectonics in the eastern Mediterranean such as the African subduction beneath Anatolia involves the strong roll-back effect of the subducting plate along the Hellenic Trench and a tear in the slab underneath western Turkey. Further east a slab detachment in relation to the collisional tectonics and hot uprising bodies related to volcanism in eastern Anatolia can be detected in this isotropic P-wave tomography study as well as in prior studies. Resultant mantle convection-driven LPO of olivine mineral in the upper mantle that is developed due to a strong slab-mantle interaction in the entire region results in over 1 s of time delays between fast and slow shear wave components and cause questions about the reliability of model resolutions of tomographic images resolved under isotropic medium assumption. To investigate the influence of seismic anisotropy we follow the method tested in some synthetic cases in Bezada et al. (2016). Our study deals with both synthetic and real data inversions in which a realistic seismic anisotropy model derived from the mantle convection simulation is taken as the starting model for a region covering the eastern Mediterranean and Anatolia. Directional variation of teleseismic events and high density of events per station allow a potential to better resolve isotropic (thermal) anomalies and seismic anisotropy components of tomographic images compared to previous tomography studies and detect false or misinterpreted anomalies.