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Strength and effective elastic thickness (Te) of the Arabian Plate

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Density model of the crust and upper mantle in the Middle East and surroundings based on seismic, gravity, and seismic tomography data reveal a strong asymmetry in the lithospheric structure of the Arabian plate (Kaban et al., 2015): the uppermost mantle layer in the Arabian Shield has a low density at a depth of ∼100 km, while the opposite is observed in the Arabian platform. We estimate the lithospheric temperatures distribution assuming a uniform composition of a 'fertile' upper mantle. We used the density model of Kaban et al. (2015) to correct this initial thermal field. The new thermal model and two end-members crustal rheologies ('weak' and 'hard', respectively) are the input for the calculation of the strength and effective elastic thickness (Te). The models obtained show a sharp transition between the large/low values of strength and Te, characterizing the eastern/western part of the peninsula, respectively. These results, in agreement with the Te estimates based on the fan wavelet method (Bo et al., 2013), confirm that the pronounced asymmetry of the plate is rather associated with fundamental structural differences of the lithosphere. Furthermore, we can speculate that the high topography in the western part of the plate is supported by relatively hot mantle, which is also responsible for the decrease of Te.