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UPPER-MANTLE SHEAR WAVE VELOCITY STRUCTURE OF THE NORTHERN ZAGROS FROM TELESEISMIC TOMOGRAPHY AND TRANSDIMENSIONAL JOINT INVERSION OF LONG AND SHORT PERIOD SEISMIC DATA

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One of the youngest orogenic belts, the Zagros orogeny in the northern margin of the Arabian plate is formed during the Arabia-Eurasia collision. Despite a number of studies, the lithospheric structure of the Zagros and its deformation during the continental collision are less studied. We use seismic data from 44 seismic stations of Zagros03, a dense temporary seismic array installed across the Northern Zagros and central Alborz. Using the adaptive stacking method (Rawlinson & Kennet, 2004), 4629 relative arrival time residuals were picked from 172 distant earthquakes. We estimate the uppermost mantle relative *S*-wave velocity structure beneath the northern Zagros and western Central Iran using a nonlinear tomography method (Rawlinson et al., 2006). Moreover, the absolute *S*-wave velocity of the lithospheric structure across the collision zone is investigated by jointly inverting high frequency scattered wavefield observed in *P*-wave coda, together with long period surface wave phase and group velocity dispersion data (Rahimi et al., 2014) using a transdimensional Bayesian Markov Chain Monte Carlo approach (Bodin et al., 2012, 2014). The 1-D depth profiles beneath 23 seismic stations are interpolated to make a 2-D image from the lithospheric structure of the Zagros.

Different hypotheses are suggested for accommodating convergence and collision in this region. It is suggested that the viscous root of the lithospheric mantle lid has undergone distributed shortening (Priestley et al., 2012), or an alternate hypothesis suggests that significant amount of the Zagros lithosphere underthrusts beneath Central Iran (e.g., Motaghi et al., 2017). The relative and absolute *S*-wave velocity models, obtained by different data sets and methods, show a thick (>150 km) high-velocity anomaly beneath the northern part of the collision zone, which could be the thickened Zagros lithosphere that probably is responsible for active continental shortening. A relatively thin lithosphere (~80 km) and lower seismic velocity beneath the UDMA further NE may suggest that the lithospheric mantle of Central Iran and Alborz has been weakened by hot asthenospheric flows associated with slab break-off (Mahmoodabadi et al., 2019). Except the Zagros collision zone, a thin lithosphere is observed beneath the Arabian plate, which is less than ~120 km (e.g., Priestley & McKenzie, 2013). The thicker lithosphere beneath the Zagros may suggest that distributed shortening in the viscous root of the Arabian mantle lithosphere beneath the Zagros accommodated part of the convergence between the Arabian and Eurasian plates. Besides, the presence of a narrow low-velocity anomaly between the Zagros and SSZ lithosphere, consistent with the central Zagros (Shomali et al., 2011), may suggest that the mantle lithosphere lid of the Zagros is delaminating from the lower crust which prohibits transferring stress to the SSZ lithosphere causing lack of tectonic activities in the edge of the overriding plate. High seismic activity to the west of the suture and lack of seismic activity to the east may support the hypothesis of lithospheric delamination. We suggest that both thickening and delamination are accommodated convergence in the collision zone.

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