Lateral variation of crust and upper mantle structures in NW Iran derived from surface wave analysis

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Abstract To obtain the shear velocity structure across North-West of Iran and surrounding areas to a depth of 160 km, we performed a namely Hedgehog nonlinear inversion on Rayleigh wave group velocity dispersion curves in the period range from 7 to 60 s. The distributed dispersion curves are the results of our surface wave dispersion tomography using the data of 280 local and regional seismic events, recorded by the medium- and broad-band seismic stations in the region. We outline different crust and upper mantle structures for the study area based on calculated group and shear velocities. Our results reveal relatively low velocities at the shorter periods (7–10 s) in the presence of sedimentary basins (e.g., South Caspian Basin) and for eastern Anatolia and relatively high velocities along the Sanandaj–Sirjan Metamorphic zone, Alborz, Talish, and the Lesser Caucasus Mountains. By depth inversion of group velocities, we observed 14-km-thick sediments in South Caspian Basin and Kura Depression. Based on our maps at 20 s, we outline different crustal models for the region and highlight the differences between South Caspian Basin and NW Iran, on one side, and the similarities between the South Caspian Basin and Kura Depression that extend beneath Talish, Alborz, and Lesser Caucasus, on the other. Comparing the shear velocity of lower crust in South Caspian Basin and Kura Depression with that of NW Iran proves different origination of lower crust in the basin, probably oceanic source, because of its significant higher shear velocity rather than NW Iran. In Talish, we observe indications of an under-thrusting of the lower crust of SCB beneath NW Iran while the middle crust is locked. The analysis of group velocities at longer periods (≥35 s) and obtained shear velocity models allows us to outline different lithospheric structures and crustal depth in the region. The high group velocities in Talish, South Caspian Sea, and Lesser Caucasus on one side and Zagros Folding and Thrust Belt on the other, beside the result of shear velocity models, suggest the presence of a stable and thick mantle lid that seems to be thin or absent in the eastern Anatolia and much of NW Iran. The shallowest Moho...


