

Lithospheric Structure of the Arabian Peninsula

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Regional waveform propagation is characterized in the Arabian Peninsula using broadband data from nine stations deployed across the Arabian Shield. The lithospheric structure of the Arabian Shield and Platform has been derived from complete regional waveform modeling and surface wave group velocities. Waveforms from events in the Gulf of Aqabah possess weak Pn , Pg and Sn but show a prominent Lg phase. In contrast, clear Pn , Sn and Lg are observed for events located in the Zagros. Southern Red Sea and African earthquakes have moderate amplitude body phases with some Lg .

Resulting lithospheric structures indicate that the Arabian Platform has an average crustal thickness of 40 km with relatively low crustal velocities of 6.07 km/s and 3.5 km/s for P- and S-wave velocities, respectively. The Moho is shallower (36 km) and crustal velocities are 6% higher for the Arabian Shield with little or no sedimentary cover. The Platform is covered by sedimentary cover of 4 km thick. Fast crustal velocities of the Arabian Shield result from a predominately mafic composition in the lower crust. Lower velocities in the Arabian Platform crust indicate a bulk felsic composition. P- and S-wave velocities immediately below the Moho are slower in the Arabian Shield than in the Arabian Platform. The lower mantle velocities and higher Poisson's ratio beneath the Arabian Shield likely arise from a partially molten mantle associated with Red Sea spreading and continental volcanism.