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Lithospheric Structure of Arabia from the Joint Inversion of P- and S-wave Receiver Functions and Dispersion Velocities

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Seismic imaging of the lithosphere under the Arabian shield and platform is critical to help answer important geologic questions of regional and global interest. The Arabian Shield can be regarded as an amalgamation of several arcs and microplates of Proterozoic age that culminated in the accretion of the Arabian portion of Gondwana during the Pan-African event at $\sim$550 Ma and the role of important geologic features observed on the surface - such as the lineaments and shear zones separating the Proterozoic terrains in the shield - is not completely understood. Also, current models of Precambrian crustal evolution predict that Proterozoic terranes are underlain by fertile (FeO-rich) cratonic roots that should promote the production of mafic magmas and underplating of the Arabian shield terranes, and the shield contains Tertiary and Quaternary volcanic rocks related to the early stages of the Red Sea formation that might also be related to plume-related lithospheric "erosion". In order to better understand these relationships, we are developing new velocity models of litospheric structure for the Arabian shield and platform from the joint inversion of up to four seismic data sets: P-wave receiver functions, S-wave receiver functions, dispersion velocities from surface-waves, and dispersion velocities from ambient-noise cross-correlations. The joint inversion combines constraints on crustal thickness from P-wave receiver functions, constraints on lithospheric thickness from S-wave receiver functions and constraints on S-velocity and S-velocity gradients from dispersion velocities to produce detailed S-velocity profiles under single recording stations. We will present S-velocity profiles for a number of permanent stations operated by the Saudi Geological Survey and the King ing Abdulaziz Center for Science and Technology as well as stations from past temporary deployments and discuss the implications of the velocity models regarding composition and tectonics of the Arabian shield and platform.