Regional waveform propagation in the Arabian Peninsula

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Abstract. Regional waveform propagation is characterized in the Arabian Peninsula using data from a temporary network of broadband seismometers. Between November 1995 and March 1997, 332 regional (delta < 15°) events were recorded from nine stations deployed across the Arabian Shield. Regional phase propagation was analyzed in two ways: by individual inspection of the waveforms and by stacking of waveforms. Inspection of the waveforms revealed consistent variations in individual seismograms according to the region of origin. Waveforms from events in the Gulf of Aqaba, northwest of the network, 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, a region northeast of the network. Events near the Straits of Hormuz also display *Pn* and *Sn* but lack a strong high-frequency *Lg*. Southern Red Sea and African earthquakes have moderate-amplitude body phases with some *Lg*. For the stacks the data were high-pass filtered at 1 Hz, rectified, binned, and then stacked by time/distance or by time/slowness. The time/distance stacks show clear differences between regions that correspond to the variations observed in individual seismograms. The time/slowness stacks allow comparison of relative phase velocities and amplitudes. *Pn* velocity under the network was estimated to be 8.0 ± 0.2 km/s, consistent with data from prior refraction profiles. The area of inefficient *Pn* and *Sn* propagation coincides with an area of Holocene volcanism and suggests that anomalous upper mantle underlies each of the Arabian Shield.