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Crustal Thickness in the Ibero-Maghrebian region I: Northern Morocco

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During the TopoIberia experiment, a total of 26 seismic broadband stations were recording in northern Morocco, providing for the first time extended regional coverage for investigating structure and seismotectonics of the southern branch of the Betic-Rif arc, its foreland and the Atlas domain. Here, we analyze P-to-S converted waves in teleseismic receiver functions to infer gross crustal properties as thickness and Vp/Vs ratio. Strong lateral variations of the crustal thickness are observed throughout the region. Crustal thicknesses vary between 22 km and 44 km and display a simple geographic pattern that divides the study area into three domains: entire northwestern Morocco underlain by a thickened crust with crustal thicknesses between 35 km and 44 km; northeastern Morocco affected by significant crustal thinning, with crustal thicknesses ranging from 22 km to 30 km, with the shallowest Moho along the Mediterranean coast; and an extended domain of 27-34 km thick crust, further south which includes the Atlas domain and its foreland regions. Vp/Vs ratios show normal values of $\sim$ 1.75 for most stations except for the Atlas domain, where several stations give low Vp/Vs ratios around 1.71. The very sharp transition from thick crust in northwestern Morocco to thin crust in northeastern Morocco is attributed to regional geodynamics possibly the realm of present-day subcrustal dynamics in the final stage of western Mediterranean subduction. Crustal thicknesses just slightly above 30km in the southern domain are intriguing, showing that high topography in this region is not isostatically compensated at crustal level.