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A 700 km long crustal transect across northern Morocco

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Two controlled-source wide angle seismic reflection experiments have been acquired recently (2010 and 2011) in northern Africa across Morocco. A lithospheric scale transect can be constructed by joining both data sets. Hence, an approximately 700 km-long seismic velocity cross section can be derived. From south-to-north the transect goes from the Sahara Platform, south of Merzouga, to Tanger in the north. The first experiment, SIMA, aimed to constrain the crustal structure across the Atlas Mountains. The Rif, the orogenic belt located just south of the coast of Alboran Sea, was the target of the second experiment, RIFSIS. In both cases 900 recording instruments (TEXANS) from the IRIS-PASSCAL instrument center were used to record the acoustic energy generated by explosion shots. In both experiments the shots consisted of 1 TM of explosives fired in $\sim$30 m deep boreholes. Although the data quality varies from shot to shot, key seismic phases as Pg, PmP, Pn, and a few intra-crustal arrivals have been identified to constrain the velocity-depth structure along the whole transect. Forward modelling of the seismic reflection/refraction phases reveals a crust consisting of 3 layers in average. The Moho topography shows from south to north a relatively moderate crustal root beneath the High Atlas, which can reach 40-42 km depth. The crust is thicker beneath the Rif where the Moho is imaged as an asymmetric feature that locally defines a crustal root reaching depths of 50 km and suggesting a crustal imbrication. P wave velocities are rather low in the crust and upper mantle. First arrivals/reflections tomography supports the forward modelling results. Low fold wide-angle stacks obtained by using hyperbolic move-out reveals the geometry of the Moho along the entire transect. Beneath the Atlas, the moderate crustal root inferred is not isostatically consistent with the high surface elevations, hence supporting the idea of a ‘mantle plume’ as main contributor to the Atlas Mountains topography.