



Mapping reflections from the sub-crustal lithosphere of southwestern Spain

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A conspicuous sub-crustal reflector has been imaged by the IBERSEIS and ALCUDIA controlled source experiments. Both experiments have acquired vertical incidence and wide-angle seismic reflection data in the Variscan South Portuguese, Ossa-Morena and Central Iberian Zones (SW Iberia). A SW-Iberia upper mantle reflector was first identified on the IBERSEIS wide angle reflection dataset. The upper mantle phase is found above 180 km offset in the shotgathers. This reflection was modeled as a boundary located between 61-72 km depth with a V_p increase from 8.2 km/s to 8.3 km/s. The fact that this reflector was not identified in the coincident vertical incidence dataset led us to interpret it as a gradient zone. A correlation with the 'Hales gradient zone', i.e. the boundary between spinel and garnet peridotites was our preferred interpretation

The ALCUDIA experiment, later acquired northwards of the IBERSEIS profiles, also shows prominent sub-crustal arrivals with the same characteristics as those observed in the IBERSEIS wide-angle data. These reflections appear at 19s TWT in the vertical incidence dataset, and as strong reflection in the wide-angle dataset. In addition, the ALCUDIA wide-angle dataset shows deeper reflectivity that maybe preliminarily associated with mantle anisotropy or even, with the lithosphere-asthenosphere boundary. Both upper mantle reflectors are modeled at 65 km and 100 km depth, respectively, shallowing to the north to 55 km and 90 km depth.

Integration of the information provided by the IBERSEIS and ALCUDIA datasets with older and lower resolution data from the ILIHA project, where three sub-crustal phases were identified in SW Iberia, allows us to conclude that, in this area, mantle reflectivity is outstanding. Also, modeling of all the datasets contributes to map, at a regional scale, the Hales discontinuity or gradient zone in southwest Iberia. Further research is necessary to propose a model of the mantle in this privileged area in terms of reflectivity.