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The Nature of the Moho Beneath the Iberian Peninsula

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The Mohorovičić discontinuity (Moho) was defined by Andrija Mohorovičić in 1910 on the basis of an interpretation of regional earthquake records in Eastern Europe as a relatively abrupt increase in P-wave seismic velocities. The Moho is observed/detected world wide. It is the most important boundary within the Earth's lithosphere. The high resolution subsurface geophysical images have demonstrated that the crust-mantle boundary is a far more complex structure that the initial seismological definition established. The purpose of this contribution is to bring together some of the findings related to the crust-mantle transition beneath the Iberian peninsula and to synthesize these results into a perspective that has global implications. For the last three decades an extensive acquisition of varieties of geophysical and geological data has been carried out. These data include controlled-source seismic (refraction and reflection), natural source seismic, and regional geology. In NW Iberia an analog of the continental crust-mantle transition is exposed within the Paleozoic Cabo Ortegal Complex and can be used for comparison and model building. This provides a unique view into the nature of the crust-mantle transition.
From the multi-seismic data the character of the Moho is highly variable, in some areas there are no reflections visible in the normal incidence (e.g. ESCI-BETICS-1), in others reflections are prominent single events (e.g. IBERSEIS) and in still others complex geometric features are observed (ESCI-NORTE). There are also time (depth) differences between the wide-angle and the normal incidence seismic Moho's. Laboratory measurements of P- and S-wave velocities reflect an overall increase from middle to lower crustal velocities in the felsic gneisses and intermediate-to-mafic granulites to mantle velocities in the eclogites and ultramafic rocks. The surface outcrops of Cabo Ortegal complex suggests that the seismic Moho is reached at the contact between the genisses and the eclogite, while the petrological Moho, the crust-mantle boundary occurs at the transitional contact between the mafic granulites and peridotites. This suggests that the seismic Moho and the petrologic crust-mantle transition don't need to overlap.