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Calculated petrophysical properties of rocks from microstructural analysis by electron microscopy in a section across the Moho in Cabo Ortegal (N Spain)

Sergio Llana-Funez (1,2), Dennis Brown (3), Ramón Carbonell (3), Joaquina Álvarez-Marrón (3), David Martí (3), and Matthew Salisbury (4)

(1) Department of Earth and Ocean Sciences, University of Liverpool, Liverpool, UK, (2) Universidad de Oviedo, Geologia, Oviedo, Spain (slf@geol.uniovi.es), (3) Instituto Ciencias de la Tierra 'Jaume Almera', CSIC, Barcelona, Spain, (4) Geological Survey of Canada, Bedford Institute of Oceanography, Dartmouth, Canada

Rocks representing the transition between the upper mantle and the lower crust and exposed in continuity in the Upper Tectonic Unit of the Cabo Ortegal Complex (N Spain) were sampled for microstructural analysis. Crystallographic preferred orientation (CPO) in rock-forming minerals in selected samples was measured using electron back-scattered diffraction (EBSD) technique to calculate the propagation velocities of seismic waves from elastic constants of mineral phases and their CPO patterns. When the cartographic arrangement of the rock units is considered, the velocity data highlights the reflectivity of two of the contacts, one representing a 'geophysical' Moho between eclogites and gneisses, the other the 'petrological' Moho, between mantle websterites and high pressure granulites of the lower crust. The study of the microstructure shows that the location of the second reflector is determined by the progress of the plagioclase-in reaction during high-pressure granulitization of the garnet-clinopyroxene rocks that form the lower crust. The appearance of plagioclase in these rocks reduces significantly seismic velocities, to well below 7.6 km/s. The migration of the reaction front through the lithostratigraphy during the progress of the reaction would have the effect of migrating a seismic reflector through the transition between the mantle and a mafic lower crust without major movement of a petrological contact.