Geophysical Research Abstracts
Vol. 12, EGU2010-1718, 2010
EGU General Assembly 2010

Laboratory measurements of P-wave and S-wave velocities across a surface analog of the continental crust-mantle boundary: Cabo Ortegal, Spain

Dennis Brown (1), Sergio Llana-Funez (2), Ramon Carbonell (1), Joaquina Alvarez-Marron (1), David Marti (1), and Matt Salisbury (3)

(1) Instituto de Ciencias de la Tierra, Barcelona, Spain (dbrown@ictja.csic.es, 34904110012), (2) Departamento de Geología, Universidad de Oviedo, Oviedo, Spain, (3) Geological Survey of Canada-Atlantic, Bedford Institute of Oceanography, Nova Scotia, Canada

The Paleozoic Cabo Ortegal Complex of NW Spain provides an exposed analog of the continental crust-mantle transition. It is composed of an overturned section that, at its base, begins with felsic gneisses, followed upward by eclogites, intermediate and mafic granulties, and ultramafic rocks. Peak metamorphic conditions reached c. 800ºC and 1.7 GPa in the Middle to Late Devonian. Fourteen samples were analysed for P-wave and S-wave velocities, as well as density at the High Pressure Lab at Dalhousie University, Canada. Seismic velocities were measured at pressures of 10 to 600 MPa at a temperature of 20ºC. When possible, measurements were made parallel and perpendicular to banding and parallel to the lineation. The major element composition of each sample was measured by XRF at the University of Barcelona, Spain. Samples display a broad range of P-wave and S-wave velocities (6.2 to 8.2 km/s and 3.2 to 4.6 km/s at 600 MPa, respectively) that generally increase with density (2.7 to 3.4 g/cm3) and 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 seismic Moho (P-wave velocity > 7.6 km/s) is reached at the mappable contact between the gneisses and the eclogite, whereas the compositional Moho, or crust-mantle transition occurs at the transitional contact between the mafic granulites and peridotites. Between 200 and 600 MPa, P-wave anisotropy ranges from between 2% and 8%, whereas S-wave anisotropy ranges from <1% to around 8%, according to rock type. Poisson's ratios calculated from the laboratory measurements are within the range of those determined from field experiments elsewhere. P-wave reflection coefficients between the various lithologies range from 0.21 to 0.08. These laboratory data provide a calibration for the physical properties and the nature of reflectivity of the in-situ lower continental crust and upper mantle transition.