Geophysical Research Abstracts
Vol. 20, EGU2018-8893-1, 2018
EGU General Assembly 2018
© Author(s) 2018. CC Attribution 4.0 license.

The effect of eclogitization and associated deformation on the petrophysical properties of lower continental crust

Sascha Zertani (1), Timm John (1), Frederik Tilmann (2), Loic Labrousse (3), and Torgeir B. Andersen (4)

(1) Institut für Geologische Wissenschaften, Freie Universität Berlin, Berlin, Germany, (2) Deutsches GeoForschungsZentrum, Helmholtz-Zentrum Potsdam, Potsdam, Germany, (3) Institut des Sciences de la Terre de Paris, Université Pierre et Marie Curie, Paris, France, (4) Centre of Earth Evolution and Dynamics, University of Oslo, Oslo, Norway

The subduction of crustal material is accompanied by fabric and petrology changes of the downgoing rocks. These changes cause modifications of the physical properties of the subducted material (e.g., seismic velocities and anisotropies). In geophysical images, such as receiver functions, the subducting crust is typically well imaged in the shallow parts of the subduction zone, while the deeper parts cannot be imaged at all. This is generally attributed to the eclogitization of the downgoing crust and the subsequent decrease of the contrast between subducted material and the surrounding mantle with respect to seismic velocities. The transition between theses zones is marked by a characteristic blurring and fading of the receiver function signal, possibly caused by partial eclogitization and inhomogeneously distributed deformation.

In order to better understand the effect of deformation and eclogitization on P- and S-wave velocities and their respective anisotropies we conducted field work on the island of Holsnøy in western Norway with the goal of linking seismic properties with petrological and structural properties of the rocks. We performed direct measurements of P- and S-wave velocities (ultrasonic pulse emission technique) from selected samples related to the three principal fabric directions. The resulting seismic velocities and their anisotropy were then compared to seismic velocities derived from thermodynamic modelling and texture analysis using neutron diffraction.

The resulting dataset links seismic with petrological/structural features of the investigated samples and was used for 2D seismic modelling. The resulting synthetic receiver function models show that eclogitization and deformation cause the same blurring or fading of receiver function signals as observed in currently active subduction zones, suggesting that the structures observed in the field are similar to those in subduction zones active today. Further, these synthetic signals may be used to further enhance our knowledge of the processes taking place during subduction and improve the visualization of the geometries within subduction zones.