Geophysical Research Abstracts
Vol. 18, EGU2016-16867-1, 2016
EGU General Assembly 2016

Nanoscale 3D distribution of low melt and fluid fractions in mantle rocks

Emmanuel Gardes (1), Luiz Morales (2), Wilhelm Heinrich (2), David Sifre (3), Leila Hashim (3), Fabrice Gaillard (3), and Marquardt Katharina (4)

(1) CIMAP, Caen, France (gardes@ganil.fr), (2) GFZ, Potsdam, Germany, (3) ISTO, Orléans, France, (4) BGI, Bayreuth, Germany

The presence of melts or fluids in the intergranular medium of rocks strongly influences their bulk physico-chemical properties (e.g. mass transport and chemical reactivity, electrical conductivity, seismic wave velocity, etc). Actually, the effects can be so large that only small melt or fluid fractions must sometimes be involved for explaining mantle geophysical discontinuities and anomalies. The investigation of the distribution of such small fractions in the intergranular medium of mantle rocks is therefore crucial for relating them to bulk and large scale properties. However, it involves submicrometric structures which are hardly characterizable using conventional techniques. Here we present how the FIB-SEM-STEM microscope can be used to produce 3D imaging at unequalled resolution. We show that low melt and fluid fractions can form films as thin as 20 nm at olivine grain boundaries, and that they can modify the physico-chemical properties of mantle rocks by orders of magnitude. The fine relationships between films at grain boundaries, tubules at triple junctions and pockets at grain corners can be explored, and appear to be complex and to differ from usual visions.