Geophysical Research Abstracts
Vol. 18, EGU2016-11489, 2016
EGU General Assembly 2016
© Author(s) 2016. CC Attribution 3.0 License.

Microfabrics in depleted mantle plaeotransform (New Caledonia)

Christian Teyssier (1), Vasileios Chatzaras (2), and Anette Von Der Handt (1)

(1) University of Minnesota, Minneapolis, United States (teyssier@umn.edu), (2) University of Wisconsin, Madison, United States

The New Caledonia ophiolite contains several wrench zones that have been interpreted as paleotransforms. These transform-ridge systems developed at the transition between ridge development and intra-oceanic subduction that resulted in depleted mantle (about 18 % melt according to olivine Mg# – spinel Cr#). The most prominent is the Bogota Peninsula paleotransform, a 10 km wide shear zone in which strain localizes in the 2 km wide Ouassé mylonite zone. This strain gradient is associated with microstructure and microfabric evolution that informs the relationship between hydration and strain in mantle mylonite. Olivine recrystallized grain size varies from about 1 mm to about 0.2 mm toward the mylonite zone. The strain gradient is also demonstrated by increasing deformation of orthopyroxene (opx) grains that become elongate porphyroclasts in the mylonite zone. Orthopyroxene geothermometry reveals T $\sim$ 1050-1000 C (Ca-opx) and 950-850 C (Cr-Al-opx) in the least deformed rocks. In the mylonite zone a wider range of T is recorded, with minima reaching 850 C (Ca-opx) and 750 C (Cr-Al-opx). Electron microprobe analysis also detects the presence of 20-200 micron interstitial, high-temperature amphibole (pargasite), with modal abundance increasing in the mylonite zone; this suggests that high-temperature pervasive fluid flow may have played a role in strain localization and mylonitization. Olivine crystallographic fabrics include A-type and E-type, the latter possibly reflecting hydration of shear zone tectonites. E-type fabrics are present in both mylonite and less deformed rocks, and appear to be more common in rocks with olivine grain size < 400 microns. A correlation between E-type fabrics and amphibole mode is being investigated. The shear zone protolith was depleted mantle in which the ridge-transform system was permeated by fluids. These fluids initially originated at the subduction interface, but during the transform evolution, ocean water likely permeated the shear zones at high temperature. A progression of fluid-rock interaction during cooling produced serpentinite strike-slip zones that are kinematically correlated with the high temperature mylonites. The Bogota paleotransform likely captures the fluid history from deep, subduction-related fluids to ocean water during progressive deformation of depleted peridotite to form mylonite and serpentinite.