Geophysical Research Abstracts
Vol. 18, EGU2016-14060, 2016
EGU General Assembly 2016

Eclogitic breccia from the Monviso meta-ophiolite complex: field and petrographic evidences of multiple-stage eclogite-facies brecciation

Michele Locatelli (1), Anne Verlaguet (1), Laura Federico (2), and Philippe Agard (1)

(1) Sorbonne Universités, UPMC Univ. Paris 06, CNRS, Institut des Sciences de la Terre de Paris (iSTeP), 4 place Jussieu, 75005 Paris, France, (2) Dipartimento di Scienze della Terra, dell'Ambiente e della Vita (DISTAV), Università di Genova, Genova –Italia

The Monviso meta-ophiolite complex (Northern Italy, Western Alps) represents a coherent portion of oceanic lithosphere metamorphosed up to eclogite-facies peak metamorphic conditions during the Alpine orogeny (2.6 GPa - 550 °C, Lago Superiore Unit), and exhibits from bottom to top a thick serpentinite sole capped by metasediments, Mg-Al-rich metagabbros, then Fe-Ti-metagabbros and metabasalts. This section is disrupted by three main shear zones. Our study focusses on the Lower Shear Zone (LSZ), extending from the serpentinite sole (to the East) to the Mg-metagabbro bodies (to the West), composed of blocks of both Fe-Ti and Mg-Al variably brecciated metagabbros embedded in a talc and tremolite-rich serpentinite matrix. The origin of these breccias is debated, being interpreted either as eclogitic breccias resulting from (potentially seismic) intermediate-depth rupture or as sedimentary-derived breccias inherited from Oceanic Core Complex stages. Here we present new field data on the distribution and petrographic characterization of these eclogitic blocks that demonstrate their univocal formation at eclogite-facies conditions.

In the LSZ the occurrence of eclogite blocks is uniform along the strike of the shear-zone, resulting in a 16 km-long belt of outcropping eclogitic bodies embedded in serpentinite matrix (from Pian del Re to Colle di Luca). Shear-zone thickness, by contrast, varies from 1 km to 0.6 km and a marked decrease in block size from top to base occurs. Three types of eclogitic blocks can be distinguished: (1) intact (not brecciated) blocks of Fe-Ti-metagabbros restricted to the lower part of the shear zone; (2) numerous brecciated Fe-Ti-metagabbros scattered in the intermediate to upper levels of the LSZ; (3) blocks of gabbros showing compositional variations and complex structures. Brecciation in type 3 blocks occurs in Fe-Ti rich gabbro layers embedded in Mg-Al gabbro bodies. The surrounding Mg-Al gabbros show no brecciation, but rather folding, indicating a strong rheological contrast during deformation.

Type 3 blocks, wherever preserved, evidence the full transition from intact to highly brecciated rocks. The amount of matrix vs clast increases towards the core of breccia layers, associated with reduction in clast size and increasing clast rotation, likewise representing fault-derived tectonic breccias. The foliation of intact Mg-Al-rich metagabbros (composed of omphacite + rutile $\pm$ apatite $\pm$ quartz and locally garnet) cut by breccia planes (cement composed by omphacite + garnet $\pm$ lawsonite) univocally indicates brecciation at eclogite facies conditions. In the breccias the occurrence of a first omphacite-rich matrix cut by secondary garnet + lawsonite pseudomorphs rich matrix witnesses multiple brittle rupture events, likely driven by different fluid pulses and/or seismic events.

Field and petrographic data thus demonstrate that brecciation at eclogite-facies conditions have to be considered a constant feature along the LSZ. Presence of different eclogite-facies matrix types in the breccias suggest multiple brittle events driven by successive fluids inputs, potentially associated to intermediate-depth seismicity. Further work is needed to determine the P-T conditions at which the different eclogite-facies cements were developed, recognize the origin of infiltrating fluids and reconstruct the late-stage redistribution of blocks by ductile deformation along the LSZ.