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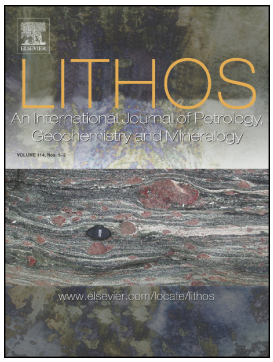

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Intermediate-depth brecciation along the subduction plate interface (Monviso eclogite, W. Alps)

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Abstract

The Monviso meta-ophiolite complex (Northern Italy, Western Alps) represents an almost intact fragment of Tethyan oceanic lithosphere metamorphosed at ~80 km depth (~2.6GPa - 550°C) during the Alpine subduction. We focus our study on a major shear zone cutting across this slab fragment at low angle (the Lower Shear Zone; LSZ). Here, in its talc and tremolite-rich serpentinite matrix, are embedded (together with metasedimentary lenses) variously brecciated Fe-Ti and Mg-Al metagabbro blocks. The latter were either interpreted as eclogitic breccias resulting from intermediate-depth rupture or as inherited, overprinted oceanic core complex features. Our new field, structural and petrographic data testify the genesis of this metagabbro breccia blocks at eclogite-facies conditions. Three types of eclogitic blocks can be distinguished, with non-random distribution (and decreasing size from top to base) throughout the ~200-meter-thick and ~15 km-long LSZ: (1) Fe-Ti-metagabbros, brecciated and scattered in the upper to intermediate levels of the LSZ; (2) meter-size blocks and decameter-scale slivers of intact Mg-Al metagabbros, locally brecciated; (3) dm- to m-scale blocks of intact Fe-Ti metagabbros without breccia fabrics. Brecciation at eclogite facies conditions (at ~80 km depth) is documented by: i) the eclogitic foliation of intact Mg-Al-rich metagabbros (composed of omphacite + clinozoisite ± rutile and locally garnet) cut by breccia planes (cemented by omphacite + garnet ± lawsonite) and ii) the occurrence in breccia clasts of minerals that are fractured and offset along peak P-T omphacite-bearing planes. Rupture preferentially affected the Fe-Ti metagabbros, suggesting that rheological contrasts controlled the locus of brecciation. The occurrence of a first omphacite-rich matrix (M1, ~2.7GPa - 580°C) crosscut by omphacite + garnet-bearing matrix M2 (~2.4GPa - 560°C), witnesses multiple brittle rupture events, prior to a stage of eclogite facies fluid ingression marked by massive lawsonite recrystallization (matrix M3).

Keywords: eclogite-facies breccia, plate interface, Monviso, Western Alps