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Brittle/Ductile deformation at depth during continental crust eclogitization (Mont-Emilius klippe, Western Internal Alps).

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Eclogitic rocks are important for understanding tectonics at large scale as they provide key constraints on both the evolution (P-T-t-ε paths) and the deformation modes of the crust along the subduction interface. We herein focus our study on eclogitized mafic dykes remnants exposed within granulites from the continental basement silver of the Mt. Emilius klippe (Western Internal Alps, Italy). These eclogites exhibit highly deformed garnetite and clinopyroxenite levels. In some places, these rocks with a $\pm$ mylonitic aspect can be found as clasts within meter-thick brecciated fault rocks formed close to metamorphic peak conditions in eclogite facies. Especially, the garnet-rich levels tend to behave in a brittle fashion while deformation within clinopyroxene-rich levels is mostly accommodated by creep. This is evidenced by the presence of elongated grains, subgrain boundaries and intense grain size reduction close to rigid garnets. Crystallographic preferred orientation (CPO) measurements in garnets indicate a quasi-random distribution. In most of the clinopyroxenes levels nevertheless, the CPO is relatively strong, with multiples of uniform distribution varying from 4 to 5.5 (value of 1 is random texture). This CPO is characterized by a strong alignment of poles (001) parallel to the lineation and (100) and [010] distributed along girdles cross-cutting the foliation plane. Our study thus attests that the materials along the subduction interface at P$\sim$2.0-2.5 GPa and T$\sim$500-550°C can locally be brittle where deformation is classically envisioned as ductile. In addition to this deformation analysis, we present a petrological study of these eclogites, from the outcrop to the microscopic scale, tracking the chemical evolution associated to the observed deformation. Based on all these data, we finally propose a tectono-metamorphic history for these rocks allowing to explain the co-existence of ductile and brittle features developed in the same metamorphic facies, and closely associated to the circulation of metamorphic fluids.