

Variscan high-pressure granulite facies metamorphism recorded in the External Crystalline Massifs (Western Alps)

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The External Crystalline Massifs (ECM) of the Western Alps form the SE branch of the European Variscan Belt. During the late Carboniferous – early Permian, they have been strongly reworked by late strike-slip faults. Thus, the connection of ECM with other major Variscan massifs in Europe, especially with the French Massif Central and the Bohemian Massif, remains controversial. It had been previously suggested that the ECM recorded the closure of an oceanic domain between Gondwana, Armorica and Avalonia (Guillot & Ménot, 2009). Small bodies of retrogressed eclogites cropping out sporadically all across the ECM would be the relics of an early high pressure stage associated with the subduction, dated at 425 - 395 Ma (Paquette et al. 1989). However, in the southernmost ECM of Argentera, these Silurian ages have recently been re-estimated to 340 Ma (Rubatto et al. 2010). In the Belledonne-Pelvoux area, recent petrological and geochronological data are lacking, especially in the Pelvoux massif and in northeast Belledonne. To fill this gap, a new metamorphic, structural and geochronological study is currently done in northeast Belledonne. A preliminary work focused on a half-kilometer-long mafic lense embedded within high grade metasediments, which had been previously interpreted as a retrogressed eclogitic body. A careful field investigation has been done in order to find evidence of an early high pressure stage. This mafic body is composed of meter-sized Cpx-bearing boudins, embedded within an amphibolitic foliation. Nine samples were collected in the Cpx-bearing boudins, showing different retrogression degrees. They contain an assemblage of Grt + Cpx + Hbl + Pl + Qtz + Rt + Ilm. The less retrogressed domains contain Ca-rich garnet porphyroblasts (Grs25-30) rich in inclusions of quartz, rutile and clinopyroxene, surrounded by Cpx + Pl + Hbl symplectites, with rare preserved Cpx crystals. The jadeite content of clinopyroxene does not exceed 15-20%, both in the matrix and in the inclusions. The first thermobarometric estimations obtained on these domains indicate an equilibration at high temperature ($>700^{\circ}\text{C}$) and moderate pressure (1.1-1.4 GPa). The new P-T data obtained do not show any evidence of an early equilibration at high-P along a cold geothermal gradient. Further petrological and geochronological work is needed to fully understand the early-variscan evolution in northeast Belledonne, but these preliminary P-T data question the existence of a former subduction in the Belledonne Massif.

references:

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