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Structural and metamorphic features of a Permian lower crust section from the Western Italian Alps (Valpelline Unit, Valle d'Aosta)

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High temperature (HT) processes culminating in granulitization and partial melting significantly contribute to the growth and internal differentiation of the continental crust. These processes may be activated in different geodynamic contexts, under both extensional and compressional regimes. The exhumed HT metamorphic rocks are thus crucial to unveil the P–T–d–t and compositional evolution of the lowest crustal levels, which are not accessible in any other way. Permian lithospheric extension led to an HT regime that affected the Variscan crust, which is nowadays fragmented and widespread worldwide, and within the Alpine belt, and is not always well-preserved. The Valpelline Unit (Dent-Blanche Tectonic System, Western Italian Alps) represents a spectacular exposure of a pre-Alpine lower continental crust section; it has almost totally escaped the Alpine-age metamorphic imprint perfectly preserving Permian HT metamorphic assemblages and structures. This unit comprises migmatitic gneiss displaying heterogeneous mineral assemblages (i.e., Grt-Bt-Crd, Grt-Bt-Opx, Grt-Sil-Bt) and complex structural relationships, together with minor migmatitic amphibolites, basic granulites and marbles. Therefore, the Valpelline Unit represents a rare opportunity to explore the evolution of the lower crustal levels during the Permian lithospheric extension. Mostly for these reasons, several works (Diehl et al., 1952; Nicot, 1977; Gardien et al., 1994; Manzotti & Zucali, 2013) have dealt with the HT evolution of the Valpelline Unit in the past decades, but a full description of the rock types and structures is still lacking. This kind of information, coupled with a clear overview of the melt-present deformation and its resulting fabric relationships, is necessary to start an extensive multidisciplinary study (e.g., P–T–d paths, geochronology and geochemical surveys) aimed to unveil the processes of crustal differentiation and make interpretations regarding the Permian HT tectonics affecting these deep continental fragments. This contribution provides (i) a detailed litho-structural overview of the rocks exposed in the Valpelline Unit and (ii) preliminary thermometric and barometric estimations (e.g., by combining Zr–in–rutile and Ti–in–biotite geothermometers with quartz–in–garnet elastic geobarometry) related to HT metamorphism and melt production stages to check pressure and temperature variations among different types of migmatites (e.g., Crd– vs. Opx–bearing) in different sectors of the studied area.

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