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A possible new UHP unit on the Western Alps: new interpretations on the eclogitic meta-ophiolites of the mid-Susa Valley (Western Alps).

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A multidisciplinary approach to the study of orogenic belts allows to develop a better knowledge of their geodynamic evolution and may suggest new models, especially for (U)HP rocks. In the axial sector of the Western Alps, several tectonic units in mid-Susa Valley preserve the different stages of their geodynamic evolution, from the early stages of subduction (eclogitic conditions) to the latest phases of exhumation (greenschist-facies re-equilibration). This study focuses on the meta-ophiolites of the Piedmont Zone stacked above the Dora Maira continental margin unit. The Piedmont Zone is classically subdivided in Internal Piedmont Zone (IPZ) and External Piedmont Zone (EPZ), which recorded the metamorphic peak under eclogite-facies and blueschist-facies conditions, respectively. The IPZ is a remnant of the Mesozoic Alpine Tethys, and consists of meta-ophiolites and their meta-sedimentary covers, whereas the EPZ consists of minor meta-ophiolites and a thick supra ophiolite meta-sedimentary cover (i.e. the Schistes Lustrès). The tectonic contact between the IPZ and the overlying EPZ is marked by a polyphase shear zone (i.e. the Susa Shear Zone; Gasco et al., 2011), which possibly caused exhumation and stacking of the presently exposed tectonic units.
Preliminary thermodynamic calculations on the eclogitic unit (IPZ) provided HP conditions around 600-630° C and about 2.8 GPa. Rutile porphyrobasts contain however opaque cubic inclusions consisting of disordered graphite identified via microRaman investigation. Preliminary investigations via ion beam (FIB) techniques suggest that such inclusions may be pseudomorphs after microdiamonds, thus pointing toward a peak metamorphism under UHP, rather than HP, conditions. Moreover, this finding, if confirmed by further investigations currently underway, would represent the first occurrence of diamonds in rutile. Further support to this hypothesis is provided by the occurrence of microdiamonds in a meta-ophiolitic unit at Lago di Cignana (Frezzotti et al., 2011), whose tectonic position is similar to the unit investigated in this study, being very close to the boundary between the eclogitic IPZ and the blueschist EPZ units. In conclusion, the discovery of microdiamonds in the Mid-Susa valley suggests that these eclogitic meta-ophiolites might represent a previously unrecognized UHP unit in the central part of the Western Alps.

References

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