

# ***New insights on the lithostratigraphic setting and on the tectono-metamorphic evolution of the Dora Maira vs Piedmont Zone boundary (middle Susa Valley)***

Ivano Gasco<sup>1\*</sup>, Marco Gattiglio<sup>1</sup> and Alessandro Borghi<sup>2</sup>

<sup>1</sup> Dipartimento di Scienze della Terra, Università di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy

<sup>2</sup> Dipartimento di Scienze Mineralogiche e Petrologiche, Università di Torino, Via Valperga Caluso 35, I-10125 Torino, Italy

\* Corresponding Author: Phone: +39 011 6705335; Fax: +39 011 6705339; E-mail: ivano.gasco@unito.it

Detailed field mapping of the northern side of the middle Susa Valley has brought a new interpretation of the contact between the Dora-Maira Massif and the overlying Piedmont Zone. The Molares-type Mesozoic cover (Marthaler *et al.*, 1986; Tallone, 1990) consists of quartzites, marbles and calcschists but our field work enhanced that most of these calcschists are in tectonic contact with the marbles and contain bodies of serpentinites and greenstones which clearly suggest an oceanic affinity. These ophiolite-bearing calcschists are in stratigraphic contact with the oceanic crust and are part of an overturned sequence of oceanic crust. In the study area four deformation phases developed: pre-D<sub>1</sub> represents the eclogite facies event and is well preserved only in marbles, and rarely in the Dora-Maira basement (Cld-bearing foliations). D<sub>1</sub> transposed the early foliations, developed under greenschist facies conditions and was responsible for the development of the regional schistosity S<sub>1</sub> that generally dips towards N-NW with fold axes and stretching lineations both trending E-W. D<sub>2</sub> developed close to open folds with N dipping axial surfaces and E-W fold axes and the asymmetric folds show a top to S sense of shear. Finally, D<sub>3</sub> mainly developed macro-scale folds with E-dipping axial surfaces and N-S fold axes; the folds asymmetry reconstructed on the map scale suggests a top to W sense of shear.

The structural analysis of well exposed outcrops allowed to infer a relative timing for the tectonic coupling between the Dora-Maira and the overlying Piedmont Zone which were coupled before the development of the S<sub>1</sub> regional foliation under greenschist facies conditions but after the eclogite facies metamorphism.

Petrological investigation of metapelite samples allowed to identify two main metamorphic assemblages within the Dora-Maira basement: M1 defines the pre-S<sub>1</sub> foliation and consists of Phe + Pg + Cld + Grt + ChII + Qtz, while the M2 assemblage is related to the regional foliation S<sub>1</sub> and consists of Ms + Pg + Ab + ChIII + Qtz ± Bt.

Pseudosection modelling with the software PERPLE\_X (Connolly, 1990) of a garnet-chloritoid micaschist belonging to the polymetamorphic basement of the Dora-Maira Massif allowed to reconstruct a portion of the Alpine PT path. The northern Dora-Maira reached an eclogite facies peak pressure at 18-20 kbar and 515-525 °C (M1 event combined to pre-S<sub>1</sub> foliation) and then was exhumed during increasing T (10-11 kbar and 555-565°C). The M2 assemblage defining the S<sub>1</sub> regional foliation developed at P < 8 kbar and T < 575 °C.

Moreover, since the structural evidence highlighted that tectonic coupling between Dora-Maira and Piedmont Zone took place during exhumation, we suggest that the two nappes were coupled between 18-20 and 10-11 kbar (in the medium to lower crust) during their exhumation along the subduction channel.

Finally, the tectono-metamorphic evolution reconstructed for northern Dora-Maira vs Piedmont Zone boundary is similar to that reconstructed by Gasco *et al.* (2009) for the eastern Gran Paradiso vs Piedmont Zone boundary.

## References

Connolly, J.A.D., (1990). Multivariable phase diagrams: an algorithm based on generalized thermodynamics. *American Journal of Science*, 290, 666-718.

Gasco, I, Gattiglio, M., Borghi, A., (2009). Structural evolution of different tectonic units across the Austroalpine-Penninic boundary in the middle Orco Valley (Western Italian Alps). *Journal of Structural Geology*, 31, 301-314.

Marthaler, M, Fudral, S., Deville, E., Rampnoux, J.P., (1986). Mise en évidence du Crétacé supérieur dans la couverture septentrionale de Dora-Maira, région de Suse, Italie (Alpes occidentales). Conséquences paléogéographiques et structurales. *Comptes Rendus de l'Académie des Sciences Paris*, 302, Série II, 91-96.

Tallone, S., (1990). Il Dora-Maira settentrionale e le sue coperture mesozoiche: relazioni tra litostratigrafia, struttura ed evoluzione metamorfica. PhD thesis, University of Torino, 147 pp.