

Geological-structural and metamorphic study of the Southern Dora-Maira Massif in Valmala (Varaita Valley, Western Alps)

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This study presents new field, structural and petrographic data (supported by geological map) on a portion of the southern Dora-Maira Massif (Western Alps), with implications for its tectono-stratigraphic and tectono-metamorphic architecture.

The southern Dora-Maira Massif is a tectonic nappe stack consisting of several continental crust units which underwent (ultra)-high pressure ((U)HP) metamorphism during the Alpine orogenesis. The study area is located in the Valmala Valley, immediately south of the well-known UHP Brossasco-Isasca Unit. Here, from lower to upper structural levels, are exposed a quartz-eclogitic unit (Rocca Solei Unit; RSU) and a blueschist unit (Dronero-Sampeyre Unit; DSU).

At the contact between the RSU and DSU a shear zone has been recognized (here addressed as Valmala Shear Zone; VSZ). The VSZ lower portion is characterized by blocks of metabasite, serpentinite and calcschist, lenticular in shape and up to hundreds of meters in size, embedded in a matrix dominated by micaschist locally rich in carbonates. On the contrary, the upper portion of the VSZ contains blocks of micro-augen gneiss and minor impure marble, lenticular to tabular in shape and up to tens of meters wide, embedded in a matrix of micaschist.

In the DSU, a metasedimentary Polymetamorphic Complex has been recognised on the basis of the occurrence of relict pre-Alpine porphyroblastic garnet, and distinguished from a Monometamorphic Complex mostly consisting of metavolcanic rocks.

The structural setting of the DSU + VSZ is the result of two principal deformation stages (D1 and D2). The D1 is responsible for the development of a HP foliation (S1) marked by Gln + Grt ±Zo ±Ru in the metabasite and Ctd + Grt + white mica ±Gln ±Lws ±Ru in the micaschist. The D2 generates km-scale folds and an axial plane foliation (S2) marked by low pressure mineral assemblages (Act + Chl + Ab ±Czo ±Ttn in the metabasite and white mica + Chl ±Ab ±Czo ±Ilm in the metapelite). Preliminary petrologic data on the metapelites from the DSU constrain peak P-T conditions at ca. 470°C, 19 kbar, in the lawsonite-blueschist facies.