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HP METAMORPHISM AND TECTONICS IN THE SOUTHWESTERN PART OF THE SESIA-LANZO-ZONE (WESTERN ALPS)

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The Sesia-Lanzo zone (SLZ) is a piece of continental crust that underwent Alpine high pressure (HP) metamorphism and presently occupies a position atop the Penninic nappe pile in the Western Alps. It is bounded to the W and NW by the ophiolites and sediments of the Piemont unit, and to the E and SE by the steeply dipping Canavese mylonites that mark the boundary to the Southern Alpine Ivrea-Verbano Zone (IVZ). The SLZ comprises mainly three lithotectonic units: (1) The seconda zona dioritica kinzigita (II ZDK) unit, a sliver of IVZ containing pre-Alpine HT metamorphic rocks with a local Alpine overprint; (2) the eclogitic micaschist (EMS) unit, mainly containing continentally derived rocks with Alpine HP mineral assemblages; (3) and the gneiss minuti (GM) unit, consisting of fine-grained greenschist facies gneisses.

Crucial to understanding the exhumation of the HP assemblages is the correlation of Alpine structures and metamorphism within the SLZ, as well as knowledge of the continuation of the Tertiary Insubric mylonites towards the W and SW. The first Alpine deformations (D1, D2) in the central part of the SLZ are associated with HP metamorphism (e.g., Gosso et al. 1979). Relicts of garnet+omphacite+/-Na-amphibole within a S1/S2 composite foliation are found in the EMS. This foliation is steeply dipping in areas with only weak D3 overprint. In the GM, D1 and D2 structures are not found. In both units, garnets have a grossular-rich core, presumably related to HP metamorphism, and an almandine-rich rim. This suggests a similar Alpine evolution of the EMS and the GM.

D3 occurred under retrograde conditions. In the EMS, D3 comprises km scale isoclinal folds with horizontal to moderately NE-dipping axial planes and a weak axial plane foliation. The retrogression during D3 initiated under blueschist facies conditions and is manifest by growth of foliation-parallel glaucophanitic amphibole at the expense of almandine-rich garnet. Deformation continued under greenschist facies conditions, with the Na-amphibole partly replaced by barroisitic amphibole and chlorite, also oriented parallel to the S1/S2 foliation. In F3 fold hinges, garnet was replaced by brown biotite and chlorite which together define an axial plane foliation. In the absence of unequivocal D3 kinematic indicators, we tentatively relate this retrograde evolution to top-SE extensional shearing observed in the NE part of the SLZ (see Babist et al., this volume).

In the GM, adjacent to the contact of the SLZ with the Piemont ophiolites, the rocks have a tight, moderately SE-dipping mylonitic foliation. Stretching lineations and associated shear bands indicate a top-down-to-SE movement of the SLZ in the hanging wall. This deformation is related to Eocene movements along the Gressoney Shear Zone. Biotite, chlorite and epidote grew parallel to the foliation. Garnet clasts show only weak retrogression indicating upper greenschist to amphibolite facies conditions during D3. The relationship of this deformation with D3 in the EMS remains unclear. Both structures are younger than S2, but are truncated by D4 shear zones that are related to Oligo-Miocene Insubric mylonitization in the NE part of the SLZ (Babist et al.,

this volume). We suspect that D3 pre-dates the Eocene Gressoney Shear Zone, as D3 involved retrogression under (Late Cretaceous?) blueschist to greenschist facies conditions.

D4 occurred under greenschist facies conditions and comprises NE-SW trending tight to isoclinal F4 folds with steep axial planes and subhorizontal fold axes up to 100 m in amplitude. In some areas, isoclinal F4 folds merge with subvertical mylonitic zones some 10 to 100 m thick. These accommodated strike-slip shear parallel to **ENE-WSW trending** subhorizontal stretching lineations. D4 structures are found in the external part of the EMS and mostly in the internal part of the GM. There, D4 shear zones cut the mylonites of the Gressoney Shear Zone. The progressive structural overprint coincides with a strong metamorphic retrogression marked by the replacement of biotite, garnet, epidote and amphibole by chlorite, plagioclase and calcite.

D5 deformation is only locally developed and comprises open to tight F5 folds (mm to 100 m scale) with moderately to steeply dipping axial planes. An axial plane foliation is not developed. The regional significance of this deformation is unclear, but certainly indicates final shortening of a variably oriented main foliation.

References

GOSSO, G., DAL PIAZ, G.V., PIOVANO, V. & POLINO, R. (1979). High pressure emplacement of Early-Alpine nappes postnappe deformation and structural levels (Internal northwestern Alps). – Mem. Ist. Mineral. Petrogr. Univ. Padova, 32, 5–15.

BABIST, J., HANDY, M.R. & KONRAD, M. (2001). High P metamorphism and tectonics in the northeastern part of the Sesia-Lanzo zone (Western Alps). – This Volume.

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