

Structural geometries and tectonic evolution of ophiolite- and continental-units in the Urtier Valley, Cogne (Western Alps)

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In this contribution we summarize the main results of structural investigations originally performed during diploma theses (Loprieno, 1994; Ellero, 1994) in the Urtier Valley, an area located at the northern flank of the Gran Paradiso Massif.

The structural geometries and tectonic evolution of the different ophiolite-bearing Piemonte units and their relationships with continental-derived units have been the main target of our work.

Five different tectonic units were mapped in the area, from the geometrically lowermost to the uppermost they are: 1) the Gran Paradiso basement unit mainly composed of late Variscan granitoids and metapelites; 2) the Pene Blanche unit (part of the so-called “Fascieux de Cogne”) which comprises Triassic quartzites and dolomites and Liassic calcschists; 3) the oceanic Broillot unit including ophiolites and their metasedimentary cover; 4) the Acque Rosse mélange unit with ophiolites (mainly metabasites) only represented in clasts and/or slices from centimeter to pluridecameter in size within an abundant carbonate/quartzitic and/or metabasic matrix; 5) the continental basement units made of lower to middle crustal protholits which crop out at the Tour Ponton and Laghi Miserin. On the base of structural overprinting patterns from cartographic- to microscopic-scale and relationships between fabrics and metamorphic mineral assemblages we recognize three major deformation stages and related structures. D1 structures, largely overprinted by subsequent deformations, are represented by relict fabrics and isoclinal mainly micro-scale folds associated with eclogite-facies assemblages in the unit 1, 2 (Beltrando et al., 2008), 4 and 5, whereas only blueschist facies relicts can be observed in unit 3. D2 is the dominant deformation stage (cfr, Ballevre et al., 1986; Pennacchioni, 1988; Butler and Freeman, 1996), refolding the tectonic units contacts. D2 is characterized by F2 isoclinal folds on all scales, associated with S2 greenschist facies axial plane fabric that represents the main foliation at regional scale. L2 stretching lineations are parallel to E-W oriented A2 fold axes. D3 is instead characterized by open to close folds with NE or SW gently dipping axial plane crenulation fabrics.

At the scale of the study area, the architecture of the stacked units can be interpreted as a D2-D3 interference structure. D2 synform involved all the tectonic units juxtaposed on the Gran Paradiso basement, with unit 5 in the core of the structure. D3 antiform refolds D2 synform, with unit 2 in the core of D3 antiform.

We suggest that the structures recognized in the Urtier Valley represent an extension of those described in adjacent areas by Bucher et al. (2003). In particular, D3 Urtier antiform can be interpreted as the eastern closure of the Valsavaranche mega-fold.