Integrating maps, structures and P-T paths : The Cogne area as a test of conflicting models.

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The Cogne village is located close to several of the major units of the Western Alps, namely European-derived continental basement units (Money, Gran Paradiso, Valsavarenche), oceanic units derived from the Liguro-Piemont ocean, and finally a few Austro-alpine slices (Emilius). The geometry and the kinematics of the nappe stack are quite complex, and several points are still a matter of debate. Despite considerable advances in terms of P-T paths (Le Bayon et al., 2006; Bouquet, 2008) and geochronology (Radulescu et al., 2008), the mapping of the lithological boundaries and the field identification of their nature (stratigraphic, tectonic) remains the prime tool for testing competing models. This approach will be used for discussing three topics.

The first topic will concern (once more!) the internal geometry of the Gran Paradiso basement and its metamorphic evolution. New mapping (during the summers 2007 and 2009) in the Valsavarenche and along the Valsavarenche-Valnontey divide has succeeded in providing a refined structural map. This will be used for (i) assessing the reliability of the nappe boundaries previously proposed (Le Bayon and Ballèvre, 2006), (ii) clarifying the imprint of the deformation associated to backfolding/backthrusting along the western margin of the Gran Paradiso massif.

The second topic will be devoted to the structure of the oceanic domain (locally known as the Grivola zone), for which three main models have been proposed (see Bousquet 2008). Some of the consequences of these models will be explored, and then tested against detailed field observations at both outcrop and map scale.

The third topic will be a discussion of the compatibility (or not) of larger-scale kinematic models, that are based on widely-divergent P-T paths (e.g. Le Bayon et al. 2006 for the Gran Paradiso basement and Beltrando et al., 2007 and 2008 for the overlying oceanic units).

Beltrando M., Hermann J., Lister G., Compagnoni R. (2007). On the evolution of orogens: Pressure cycles and deformation mode switches. Earth and Planetary Science Letters, 256, 372-388.

Beltrando M., Lister G., Hermann J., Forster M., Compagnoni R. (2008). Deformation mode switches in the Penninic units of the Urtier Valley (Western Alps): Evidence for a dynamic orogen. Journal of Structural Geology, 30, 194-219.

Bousquet R. (2008). Metamorphic heterogeneities within a single HP unit: Overprint effect or metamorphic mix? Lithos 103, 46-69.

Le Bayon B., Ballèvre M. (2006). Deformation history of a subducted continental crust (Gran Paradiso, Western Alps) : continuing crustal shortening during exhumation. Journal of Structural Geology, 28, 793-815.

Le Bayon B., Pitra P., Ballèvre M., Bohn M. (2006). Reconstructing P-T paths during continental collision using multi-stage garnet (Gran Paradiso nappe, Western Alps). Journal of Metamorphic Geology, 24, 477-496.

Radulescu I.G., Rubatto D., Gregory C., Compagnoni R. (2009). The age of the HP metamorphism in the Gran Paradiso Massif, Western Alps: a petrological and geochronological study of “silvery micaschists”. Lithos, 110, 95-108.