Geodynamic significance of Permian magmatism and HT-LP metamorphism in the continental crust of the Alps: validation from numerical modeling of Variscan subduction to Permian rifting.

A. M. Marotta and M. I. Spalla
Department of Earth Sciences "Ardito Desio", University of Milan, Italy

The pre-Alpine continental crust of the Alps preserves Permian-Triassic magmatic and HT-metamorphic evolutions, which overprinted the records of Variscan subduction (eclogites) and collision (granulites, migmatites and amphibolites). The occurrence of recurrent Variscan eclogites in the pre-Alpine continental crust of different structural domains indicates that the Alps comprises part of the Variscan suture zone, which have been disrupted and re-accreted during the Tethys opening and Alpine convergence.

The late Variscan evolution took place from 340 to 300 Ma, and therefore the igneous and metamorphic signatures up to Upper Carboniferous may represent the record of the late orogenic evolution, whereas younger ages, from 290 to 180 Ma, characterising the HT metamorphism associated with gabbro to granite intrusions, probably related to lithospheric extension and thinning (Mayer et al., 2000; Rebay and Spalla, 2001 and refs. therein). The magmatic products emplaced in this last period (290-225 Ma) have an important mafic component, are frequently associated with ultramafics and are mainly concentrated in the Austroalpine-Southalpine domain. Gabbros country rocks range from HT-LP metamorphics (granulites; Sills, 1984; Handy and Zingg, 1991; Lardeaux and Spalla, 1991) to consolidated metasediments (Borsi et al., 1968), suggesting that the emplacement took place both in the lower and upper crust.

The Alps Permian magmatism and HT-LP metamorphism diffused in the continental crust of are widely diffused can result from two different mechanisms:

1) late-orogenic collapse of a collisional belt, as proposed for the Variscan belt (Bonin et al., 1993; Malavieille et al., 1990);
2) continental rifting, as suggested for the Adriatic crust of the Alps (Rebay and Spalla, 2001; Schuster et al., 2001 and refs. therein).

We use a thermo-mechanic numerical model to model the lithosphere deformation during the Variscan subduction to Permian rifting in order to reduce the ambiguity about the geodynamic significance of the Permian-Triassic HT metamorphism and igneous activity in the Alpine continental crust.

References