Field-tested thermodynamic and numerical modeling to investigate exhumation of high-pressure rocks: the case of the Voltri Massif (Western Alps).

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The Voltri Massif (Ligurian-Piemontese Units, Western Alps, Italy) is made up of high pressure metaophiolitic rocks mainly consisting of serpentinite, serpentinite schist and metasediments which enclose m- to km-scale lenses of metabasites (metagabbro and metabasalt) (Capponi et al., 2006).

We identified, through field and petrographic survey together with detailed structural work, several serpentinite-hosted lenses of metagabbros that display different tectonometamorphic paths and peak metamorphic conditions, ranging from blueschist facies to eclogite facies. These lenses may represent pieces of slab materials exhumed from different depths within a serpentinic subduction channel (Gerya et al., 2002; Federico et al., 2007).

In order to constrain the P-T evolutions of these lenses we investigated in detail some of them. In particular we calculated, for different bulk compositions, the stable paragenesis as a function of pressure and temperature, which corresponds to the minimum of the Gibbs free energy of the system. In this way we drew pseudosections, cross-checked with the petrographic evidences, and we compared the P-T evolution of different lenses.

2D numerical simulations (Gerya et al., 2002) reproducing an Alpine-type intraoceanic subduction were created. The particular numerical technique used enables to trace the path of single elements of the model (markers) in the P–T field during time and therefore to study the metamorphic history of selected parts of the oceanic or continental crust during their subduction/exhumation.

We set up the initial conditions of the model in order to match the geometries and petrographic features of the Jurassic Ligurian-Piemontese ocean, developed between European and Adria continents.

The comparison of the P-T-deformation paths, resulting from the thermodynamic and numerical models, with the observed petrographic and structural evidence allowed us to investigate the more likely processes that controlled the exhumation of the Voltri Massif high-pressure rocks.

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