



## **Tectonic mélanges and the exhumation of HP ophiolites: a case-study from the Ligurian Alps**

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Mélanges form in a variety of geodynamic settings and can be related to either sedimentary, tectonic or diapiric processes, or a combination of them.

We studied in detail a 100 m-scale tectonic mélange formed in the context of the alpine subduction/collision and we tested if the local-scale pattern could be applicable at larger scale in the Ligurian Western Alps.

The studied mélange crops out inside metamorphic serpentinites belonging to the high-pressure (HP), meta-ophiolitic Voltri Massif (southern end of the Western Alps). It is made up of a foliated chlorite-actinolite greenschist matrix enclosing 10m-scale lenses of metabasites and metasediments. These blocks appear to be exotic because similar rocks do not outcrop in the surrounding HP-units.

The matrix records three sets of superposed folds from blueschist to greenschist-facies conditions. The metabasite lenses preserve internal HP schistosity forming high angles with the greenschist matrix foliation.

The lenses equilibrated at different peak metamorphic conditions (ranging from eclogite- to blueschist-facies). The matrix is widely retrogressed in greenschist facies, but it contains rare relics of Na-amphibole. Individual lenses display different segments of typical subduction PT paths which apparently converge in the blueschist facies.

Moreover, geochronological data for the different HP blocks show that two undistinguishable blueschist samples display distinct peak ages of 43 and 40 Ma. One blueschist age is contemporaneous with the eclogitic equilibration of another block ( $43.2 \pm 0.5$  Ma) (Federico et al., 2007).

The described structural, metamorphic and geochronological features suggest that this mélange formed at depth in a subduction channel and was active at least from blueschist- to greenschist-facies conditions, but possibly also at higher pressures.

The subduction channel formed between the overriding and the subducting plates, as a consequence of progressive hydration of the mantle wedge by fluids released from the slab (e.g. Gerya et al., 2002). Here a forced flow inside serpentinites sampled different HP lenses from different depths and forced them to flow towards surface.

The pattern of the studied mélange could be applicable at larger scale in the Ligurian Alps, where various HP units may be larger-scale equivalents of blocks, and may have been exhumed in a subduction channel inside serpentinites. Different units of the Voltri massif display metamorphic peaks at conditions ranging from eclogite- to blueschist-facies and available geochronological constraints reveal the heterogeneous timing of eclogite-facies metamorphic re-equilibrations (Federico et al., 2005; Rubatto & Scambelluri, 2003). However, pervasive retrograde - stage tectonics and greenschist imprint (Capponi & Crispini, 2002) mask structural relationships among units acquired at high pressure conditions. As a consequence, we discuss formation of the studied mélange and the feasibility of the subduction channel mode of exhumation at larger scale, in the Voltri massif, as already invoked for the Monviso Massif of the Western Alps (Guillot et al., 2004).

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