

## Tectonostratigraphy of the northern Monviso Meta-ophiolite Complex (Western Alps)

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### ABSTRACT

The Monviso Meta-Ophiolite Complex is a remnant of the Piedmont-Ligurian oceanic lithosphere stacked in the Western Alps, and consisting of dismembered HP meta-ophiolite sequences. In this work, focused on the little-investigated northern sector of the Complex, we differentiate six tectonic units which structural, petrographic and stratigraphic characteristics are described in detail and discussed in the light of a comparison with the overall geology of the Monviso Meta-Ophiolite Complex. The structural evolution has been referred to *i*) an early syn-eclogitic deformation phase (D<sub>1</sub>), *ii*) a main deformation phase (D<sub>2</sub>) occurred in the blueschist- to greenschist-facies transition and characterized by the development of a regional foliation (S<sub>2</sub>) that is parallel to the tectonic contacts and to the axial plane of map-scale W-verging folds, and *iii*) a late-metamorphic deformation phase (D<sub>3</sub>) characterized by westward extensional tectonic. The northern Monviso Meta-Ophiolite Complex is characterized by a poor preservation of HP paragenesis and a widespread overprint of the blueschist- to greenschist-facies metamorphism, but the occurrence of garnet-, omphacite-, talc- and lawsonite-assemblage in a Fe-Ti metagabbro indicates P-T eclogitic conditions (2.5-2.7 GPa for 550-570 °C) very similar to those calculated in the southern sector of the Complex. The stratigraphic characteristics of the meta-ophiolite sequences point out that, differently from the southern sector of the Complex where basalt-poor and basalt-rich oceanic units have been distinguished, in the northern Monviso Meta-Ophiolite Complex the different types of metasediments may be the key to restore the oceanic tectonostratigraphy, marked by gabbro and mantle peridotite exposition on a puzzle-like ocean floor where basalt effusion and different sedimentation processes took place.

KEY WORDS: *Monviso, HP meta-ophiolites, tectonic units, Western Alps.*

### INTRODUCTION

The Monviso Meta-ophiolite Complex is one of remnants of the Piedmont-Ligurian ocean stacked in the Western Alps. The other oceanic lithosphere remnants correspond to the Antrona nappe (TURCO & TARTAROTTI, 2006 and references therein), the Zermatt-Saas Zone (BEARTH, 1967; DAL PIAZ *et alii*, 2001; ANGIBOUST *et alii*, 2009, and references therein), the Lanzo ultramafic Complex (PICCARDO *et alii*, 2007), the Bassa Val di Susa-Valli di Lanzo-Monte Orsiera tectonometamorphic Unit (SANDRONE *et alii*, 1986; CADOPPI *et alii*, 2002), the Rocciavè

tectonometamorphic Unit (POGNANTE, 1979; CADOPPI *et alii*, 2002), the Monviso Meta-ophiolite Complex (LOMBARDO *et alii*, 1978; SCHWARTZ *et alii*, 2000; ANGIBOUST *et alii*, 2012), the Voltri Massif (FEDERICO *et alii*, 2007, and references therein; PICCARDO, 2013, and references therein). They preserve the traces of a long and complex tectonic history from the opening of the Piedmont-Ligurian ocean in Early-Middle Jurassic times, to the Late Cretaceous subduction and subsequent Eocene-Oligocene continental collision and exhumation (COWARD & DIETRICH, 1989; ROURE *et alii*, 1990; LAUBSCHER, 1991; DAL PIAZ, 1999; SCHMID *et alii*, 2004; ROSENBAUM & LISTER, 2005).

The Monviso Meta-ophiolite Complex (MO), that crops out in the axial sector of the inner Western Alps, is tectonically superposed on the carbonate Mesozoic cover of the Paleozoic Dora Maira Unit (VIALON, 1966; SANDRONE *et alii*, 1993), corresponding to the paleo-European continental margin involved in the Alpine accretionary wedge, and is tectonically overlain by the Mesozoic Queyras Schistes Lustrés (LEMOINE & TRICART, 1986; DEVILLE *et alii*, 1992), consisting of carbonate metasediments of oceanic origin (fig. 1). Internally, the MO is characterized by dismembered sequences of serpentinitized peridotites, metagabbros, metabasalts and metasediments, that were metamorphosed under eclogite-facies conditions and heterogeneously retrogressed under blueschist- to greenschist-facies conditions. This complex structural architecture was alternatively interpreted as *i*) a pile of imbricated tectonostratigraphic units (LOMBARDO *et alii*, 1978), *ii*) a fossilized serpentinite subduction channel wherein ophiolite blocks were tectonically and chaotically juxtaposed (GUILLOT *et alii*, 2004), and *iii*) a nearly continuous portion of oceanic lithosphere subducted to 80 km depth and deformed by eclogite-facies shear zones (ANGIBOUST *et alii*, 2011).

Detailed lithological, structural and petrological studies mainly focused on the southern sector of the MO (LOMBARDO *et alii*, 1978; PHILIPPOT, 1990; SCHWARTZ *et alii*, 2000; ANGIBOUST *et alii*, 2012), whereas specific information about the northern sector (i.e. Pellice Valley; fig. 1) is still lacking. On the basis of new geological mapping (BALESTRO *et alii*, 2011, 2013) and structural, stratigraphic and petrographic observations, this paper aims to fill this gap of geological knowledge by describing in detail and interpreting the tectonostratigraphy and the metamorphic evolution of the northern MO.

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