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Metasediments Covering Ophiolites in the HP Internal Belt of the Western Alps: Review of Tectono-Stratigraphic Successions and Constraints for the Alpine Evolution

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Abstract: Ophiolites of the Alpine belt derive from the closure of the Mesozoic Tethys Ocean that was interposed between the palaeo-Europe and palaeo-Adria continental plates. The Alpine orogeny has intensely reworked the oceanic rocks into metaophiolites with various metamorphic imprints. In the Western Alps, metaophiolites and continental-derived units are distributed within two paired bands: An inner band where Alpine subduction-related high-pressure (HP) metamorphism is preserved, and an outer band where blueschist to greenschist facies recrystallisation due to the decompression path prevails. The metaophiolites of the inner band are hugely important not just because they provide records of the prograde tectonic and metamorphic evolution of the Western Alps, but also because they retain the signature of the intra-oceanic tectono-sedimentary evolution. Lithostratigraphic and petrographic criteria applied to metasediments associated with HP metaophiolites reveal the occurrence of distinct tectono-stratigraphic successions including quartzites with marbles, chaotic rock units, and layered calc schists. These successions, although sliced, deformed, and superposed in complex ways during the orogenic stage, preserve remnants of their primary depositional setting constraining the pre-orogenic evolution of the Jurassic Tethys Ocean.

Keywords: Western Alps; ophiolite; metasediments; calc schist; Tethyan Ocean

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1. Introduction

Ophiolites are a major component of the Alpine-Himalayan orogenic belt [1–3] (Figure 1A). They represent tectonic slices deriving from the oceanic lithosphere of the Jurassic Tethys Ocean and have thus been named *Tethyan ophiolites* [4,5]). Differently from other well known ophiolites of the Mediterranean area, such as the Troodos ophiolite in Cyprus [6,7], the metaophiolites of the Alpine belt have been intensely deformed and metamorphosed; they presently occur as tectonic slivers pinched between the palaeo-Europe and palaeo-Adria continental domains [8–10]. The Alpine orogenic cycle has deeply reworked the original characters of the primary oceanic lithosphere. Consequently, the internal structural and stratigraphic features of the Alpine metaophiolites are not comparable with those of the idealized ophiolite suite defined by the Penrose conference [5,11]. The Alpine metaophiolites are mostly composed of (now serpentinized) mantle peridotites (mainly harzburgites and minor lherzolite and few dunite) with mafic intrusions and ophicarbonates. A true sheeted dyke complex has never been documented, and metalavas occur in a low percentage. Furthermore, the original thickness of the Jurassic oceanic lithosphere has been strongly modified by the Alpine tectonics. The Alpine metaophiolites are then finally associated with different types of metasediments, only partially comparable with those of less deformed and metamorphosed ophiolites [12]. In the Western Alps, the metaophiolite