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## The Frido Unit (Calabria-Lucania boundary, Italy): deformation, petrology and geodynamic evolution

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### RIASSUNTO

#### L'Unità Frido (confine Calabria-Lucania): deformazione, petrologia ed evoluzione geodinamica

L'Unità del Frido, una successione bacinale depositata su crosta di transizione oceanico-continentale (OCT) è stata subdotta dopo l'Oligocene superiore. Dopo aver raggiunto condizioni di metamorfismo di HP/LT è stata in seguito rapidamente esumata ed inclusa nel Complesso d'Accrezione Liguride. L'Unità del Frido è caratterizzata da quattro eventi deformativi principali, di cui i primi due avvenuti in condizioni di HP/LT. Il primo evento ha prodotto un clivaggio disgiuntivo ( $S_1$ ) mentre il secondo pieghere isoclinali e un clivaggio di crenulazione ( $S_2$ ). Il metamorfismo di HP/LT è testimoniato dalla presenza di diverse generazioni di Fe-Mg Carfolite e da un'associazione di mica bianca e clorite. Il terzo e quarto stadio deformativo hanno prodotto pieghere e thrust con vergenza, rispettivamente, verso NE e NW.

KEY WORDS: *Accretionary Complex, Carpholite, Ligurian, southern Apennines, structural geology,*

### INTRODUCTION

The Frido Unit (KNOTT, 1987; BONARDI *et alii*, 1988) is an interesting case of a subducted ocean-continent transition succession that reached HP/LT metamorphism conditions and then quickly exhumed. During the burial, exhumation and insertion in the Ligurian Accretionary Complex (CIARCIA *et alii*, 2012), the Frido Unit experienced several deformation stages. The first two occurred under the HP/LT conditions, being characterized by a strong NW-SE stretching with the formation of an incipient foliation ( $S_1$ ), almost transposed in a crenulation cleavage ( $S_2$ ) in the incompetent layers. Isoclinal folds related to the second stage generally show hinges parallel to the stretching lineation. The HP/LT metamorphism is testified by the occurrence of several generations of Fe-Mg-carpholite ( $X_{Mg} = 0.29-0.41$ ) in phyllite-hosted quartz veins and by assemblages of white mica and chlorite (in both phyllites and metapelites) indicating a pressure of ~1.2-1.4 GPa

and temperatures around 360 °C. The syntectonic exhumation is attested by the growth of Na-amphibole and stilpnomelane along extensional shear bands crosscutting the  $S_2$  foliation. These extensional shear bands are very common around the continental and oceanic crust bodies, usually forming huge boudins. In analogy with the tectonic transport recorded in the Lungro-Verbicaro Unit in northern Calabria (VITALE & MAZZOLI, 2008) or in the Nord-Calabrese and Parasacilide units in the Cilento area (VITALE *et alii*, 2011; CIARCIA *et alii*, 2012), a SE vergence for the Frido Unit is envisaged (Fig. 1). This vergence probably continued until the Frido Unit was included in the Ligurian Accretionary Complex, the latter previously formed by unmetamorphosed basin successions (Nord-Calabrese, Parasacilide and Sicilide Units, CIARCIA *et alii*, 2012). Successively, a third and a fourth deformation stages affected the Frido succession, with folds and thrusts verging to NE and NW, respectively (Fig. 1). The reconstruction of the structural and metamorphic evolution of the Frido Unit allowed to shed more light on the geodynamic evolution of the first stages of the Apennine orogen, remarking the difference between a first phase (from Upper Oligocene to Langhian) coeval with the closure of the Ligurian Ocean and the opening of the back-arc Balearic basin and characterized by a more or less SE vergence, and a second phase (from Tortonian to Middle Pleistocene) synchronous with the Tyrrhenian basin opening, characterized by overthrusting of the Ligurian Accretionary Complex onto the Apennine Platform carbonates and by the piling up of Apulian successions with a NE vergence.

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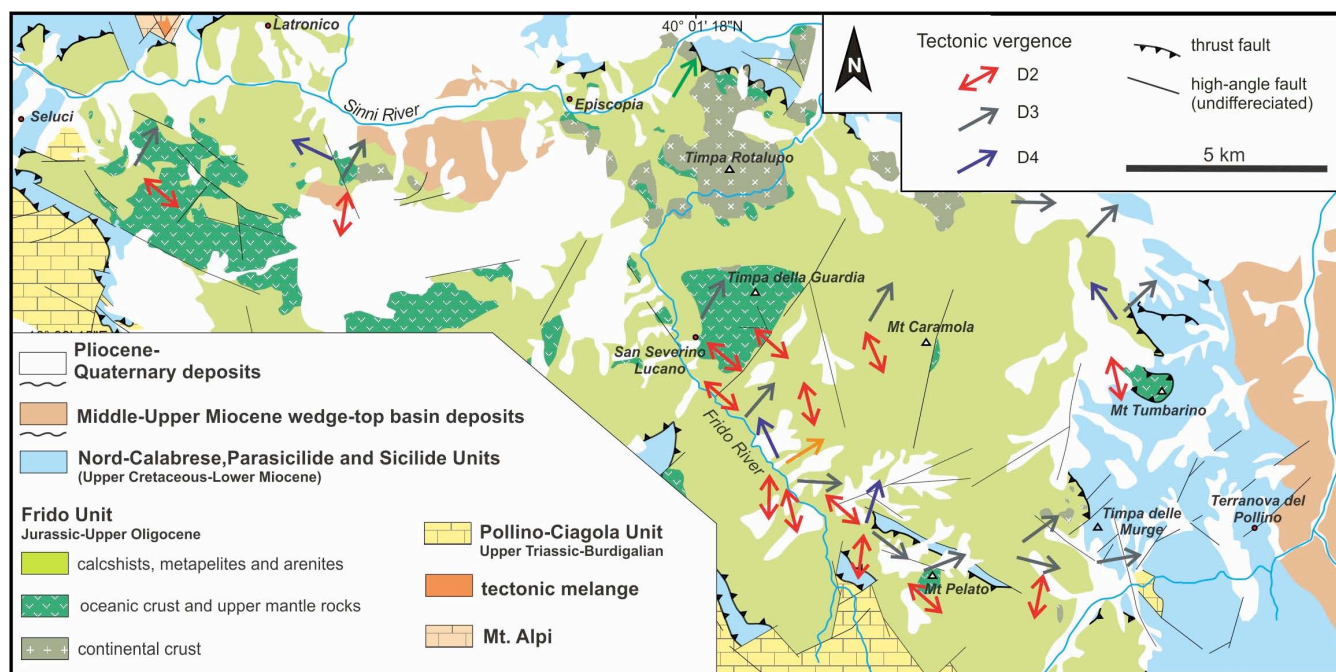


Fig. 1 – Geological map of the Mt. Pollino area (from Monaco *et al.*, 1995, modified) showing tectonic vergences of the Frido Unit referred to D2-D3-D4 deformation stages.

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