## POST-CONGRESS FIELD TRIP
## "The Northern Apennine ophiolites: from marginal to oceanward domains of the Jurassic Ligurian Tethys"

**Field trip leaders:**
**Andrea Artoni & Alessandra Montanini (Dipartimento di Scienze Chimiche della Vita e della Sost. Ambientale, Università di Parma), Giancarlo Molli (Università di Pisa), Riccardo Tribuzio (Dipartimento di Scienze della Terra e dell'Ambiente, Università di Pavia)**

**10 to 25 participants**
**Cost all included 150 euro**

**20-09-2019 Parma to 21-09-2019 Parma**

The field excursion enables unraveling the structural and compositional differences between marginal and distal sections of the Liguria-Piedmont basin, with the major purpose of tracking the processes leading to opening of the Jurassic ocean.
In the External Ligurian units, the ophiolitic basalts are primarily associated with remnants of continental crust, and include mantle sequences retaining a deep, subcontinental lithospheric origin. These mantle sequences show evidence for exhumation in response to Mesozoic lithospheric thinning and opening of the Jurassic Liguria-Piedmont basin. The External Ligurian ophiolites are therefore interpreted to have formed at magma-poor ocean-continent transitions similar to those of the Iberia-Newfoundland margins.
In the Internal Ligurian units, the ophiolites are not associated with continental crust material and have mantle sequences showing a depleted geochemical signature. In addition, the Internal Ligurian ophiolites include km-scale gabbroic bodies that structurally and compositionally recall the gabbroic oceanic core complexes from modern slow and ultraslow spreading centres. Hence, these ophiolites are typically attributed to ultradistal paleogeographic domains of the Jurassic basin.
All the outcrops are easily accessible from the roads or with short hiking along footpaths.

**Day 1. "Rifting-related structures in the mantle section from the External Ligurian ophiolites"**

Transfer to Val Perino (Bobbio, PC) by minibus starting from Parma.
The first day of the field excursion will be focused on the M. Sant'Agostino and M. Gavi mantle bodies from the External Ligurian units, with the main purpose of providing a snapshot of rifting-related mantle structures.
Two contrasting pyroxenite-peridotite mantle sequences will be examined:
- plagioclase-facies mylonitic lherzolites with diffuse cm-scale pyroxenite layering (M. Sant'Agostino);
- nearly undeformed spinel lherzolites hosting up metre-scale thick pyroxenite bodies and recording extensive melt/rock reactions in the plagioclase stability field (M. Gavi).
We will also visit breccias adjacent to M. Sant'Agostino mantle body, which include gabbro-derived granulites and granitoids of Late Variscan age. These rocks were both interpreted as continental crustal material exhumed during Mesozoic lithospheric extension.
Transfer to Framura (SP), dinner and overninght at Hotel Augusta.

M. Sant'Agostino mantle body

M. Gavi mantle body

Plagioclase facies mylonitic lherzolite enclosing concordant pyroxenite layers (M. Sant'Agostino)

Polymict breccia including blocks of gabbro-derived granulites and granitoids of Late Variscan age

Undeformed pyroxenite layers in spinel-plagioclase lherzolites (M. Gavi)

Undeformed clinopyroxene-rich spinel pyroxenite recording extensive melt/rock reactions under plagioclase facies conditions (M. Gavi)

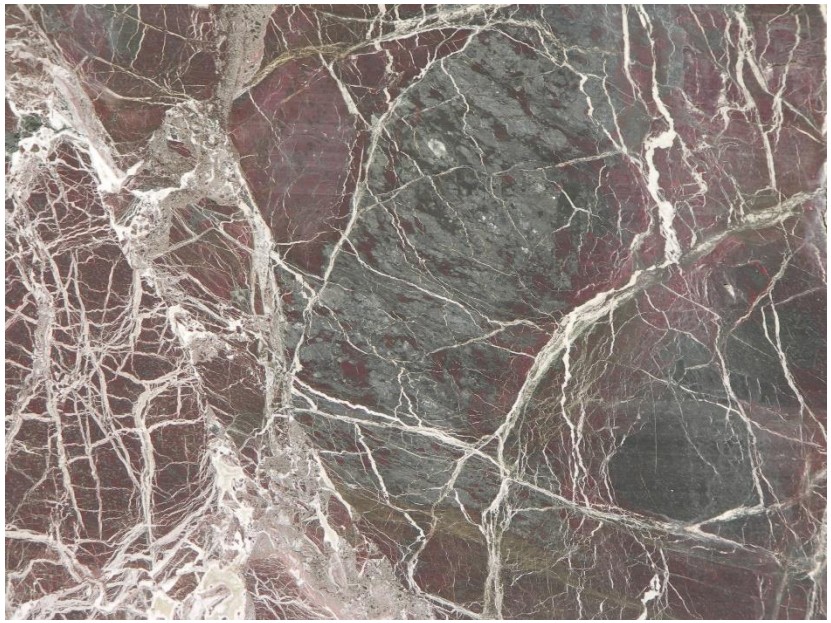
**Day 2. “High temperature deformation and hydrothermal alteration of the gabbro-peridotite association from the Internal Ligurian ophiolites”**

The second day of the field excursion will deal with the Bracco-Levanto ophiolite from Internal Ligurian units, and mostly winds along the shoreline winding from Framura railway station to Bonassola village. The Bracco-Levanto succession consists of a substrate consisting of serpentinized mantle peridotites intruded by MOR-type gabbroic bodies, and a heterogeneous cover made up of basalt lava flows, “ophiolitic” breccias, Middle to Upper Jurassic radiolarian cherts and Cretaceous shales. The peridotites and the gabbros record a composite history involving deformation and alteration from high temperature to seafloor conditions. In particular, the gabbros show ductile shear zones formed under near solidus conditions (c. 850°C), and are crosscut by amphibole veins developed in response to onset of hydrothermal circulation. The mantle peridotites are almost everywhere serpentinized and replaced at their stratigraphic top by fault rocks rich in calcite and hematite, commonly referred to as ophicalcites. Return to Parma (arrival at 7 pm approximately).

Hornblende vein crosscutting a pegmatoid gabbro (Bonassola)

Felsic dyke showing hornblende-rich domains along the contact with the host gabbro (Bonassola)

Pillow basalts (between Bonassola and Framura)



"Rosso di Levanto" (mantle ophicalcite)