



University of Genova

Department of Earth, Environmental  
and Life Sciences

Doctorate Course in Earth and  
Environmental Science and  
Technology

Earth Science Curriculum

Università degli Studi di Genova



Dottorato in Scienze e Tecnologie  
per l'Ambiente e il Territorio

### Research Theme n. 3

<p><b>Titolo:</b> Caratterizzazione di strutture simiche fossili preservate in unità di crosta oceanica con impronta metamorfica di alta pressione</p> <p><b>Title:</b> Records of seismic cycles in high pressure exhumed oceanic units: structural characterisation</p>
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<p>Program description including the formation program abroad</p> <p>Exhumed high-pressure (HP) oceanic terrains in subduction complexes and orogenic belts show a variety of geometries, ranging from almost continuous Km-scale units, where the original stratigraphy of the oceanic lithosphere is still recognizable, to highly sliced and disrupted terrains where the different HP lithologies have a poor lateral continuity (mélanges and chaotic rock units). The processes and factors driving the above arrangements may occur at different structural levels within, for example, the interface between the subducting and the upper plate, and they have not yet been clearly defined. Among the main factors we can include the presence/properties of fluids and their migration pathways, the rheological contrasts and mixing mechanism, the strain-rate and its partitioning, and the P-T-t of deformations. Within these tectonic complexes, well-known structures related to seismic deformations have been described so far and their complex rheological behavior makes them a privileged site where to explore the nucleation of slow-slip- and tremors. So tectonic mélanges with HP oceanic remnants are good candidates for the study of seismic cycles and transient, episodic ruptures at different structural levels.</p> <p>The candidate will address these open questions applying a multiscale and inter-disciplinary approach, including detailed field mapping and 3D structural modeling of the study areas and integrated microstructural/petrological investigations (e.g.: SEM, EPMA, EBSD LA-ICP-MS, XCT scan). Potential target areas for field investigations are within the Italian Western Alps (e.g.; Voltri and Monviso massifs). Research will be carried out in the framework of PRIN/MUR and PNRR projects that encompass multidisciplinary research groups with expertise in structural geology and petrology. Collaboration and abroad experiences: Sorbonne Université, Institut des Sciences de la Terre de Paris; Universität Bern, Institut für Geologie, Switzerland</p>
<p>Financial support: PRIN/MUR funds available</p>
<p>Tutor's publications (max 3)</p> <p><b>Federico L.</b>, Crispini L., Scarsi M., Capponi G., Piazza M. (2021). Late orogenic tectonics in the Ligurian Alps (Italy): constraints from syntectonic sedimentary deposits at the top of an exhumed plate interface. JOURNAL OF MAPS, p. 1-12, ISSN: 1744-5647, doi:10.1080/17445647.2021.2012535</p> <p><b>Locatelli M.</b>, Verlaquet A., Agard P., Pettke T., <b>Federico L.</b> (2019). Fluid Pulses During Stepwise Brecciation at Intermediate Subduction Depths (Monviso Eclogites, W. Alps): First Internally Then Externally Sourced. Geochemistry, Geophysics, Geosystems 20 (11), p. 5285-5318, ISSN: 1525-2027, doi: 10.1029/2019GC008549</p> <p>Malatesta, C., <b>Federico, L.</b>, Crispini, L., Capponi, G. (2018). Fluid-controlled deformation in blueschist-facies conditions: plastic vs brittle behaviour in a brecciated mylonite (Voltri Massif, Western Alps, Italy). Geological Magazine 155 (2), p. 335-355, ISSN: 0016-7568, doi: 10.1017/S0016756816001163</p>