



Carlotta Ferrando

Fixed-term assistant professor

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Education and training

2018

Ph. D. Research in igneous petrology in the context of the FP7-PEOPLE-2013-ITN MARIE CURIE Training network on reactive geological systems from the mantle to the abyssal sub-seafloor (Multi-partner ITN)

Melt transport and dissolution-precipitation processes through the heterogeneous lower oceanic crust microstructural and petro-geochemical constraints from drill cores

University of Montpellier - Montpellier - FR

2014

Masters Degree in Geology and Geological Techniques

Microstructural and petrological investigations on troctolites olivine gabbros and peridotites in ophiolites outcrop Erro Tobbio (Piani di Praglia Genova) - 110/110 e lode

University of Genova - Genova - IT

2013

Bachelors Degree in Geology

Pyroxenite layers in peridotites at Monte Maggiore (Cap Corse France) petrographic chemical and geothermometric investigations

University of Genova - Genova - IT

Academic experience

2022 - ONGOING

Researcher (RTD-A)

University of Genova - Genova - IT

Investigation of petrological and geochemical processes involved in the formation of the oceanic lithosphere from mantle melting beneath spreading centers to crystallization and cooling of the gabbroic sequences in the lower oceanic crust. Teaching activity (see dedicated section)

2020 - 2022

Post-doctoral fellow in igneous petrology (funding CNR ECORD - IODP-Italia 2018)

University of Pavia - Pavia - IT

Principal Investigator of the project funded by ECORD - IODP-Italia 2018 aiming at understanding the interaction between magmatism deformation and hydrothermalism during formation and exhumation of the lower oceanic crust along slow-spreading ridges. This study included a first microstructural investigation of olivine gabbros (EBSD) followed by petrographic observations of brown amphiboles occurring in various lithologies within the oceanic crust exposed at the Atlantis Bank Oceanic Core Complex coupled with analysis of mineral geochemical compositions (EPMA and LA-ICP-MS) and analysis of O and H stable isotopes in amphibole (SIMS)

2018 - 2019

Teaching assistant - Attaché Temporaire à l' Enseignement et à la Recherche (ATER)

University of Lorraine - Nancy - FR

Practical activities of Structural geology for the first year of the Geological Engineering School (École Nationale Supérieure de Géologie) - equivalent to the third year of the Italian Bachelor in geology. Practical activities of Geochemistry atmosphere and climate changes for the second year of the Geological Engineering School (École Nationale Supérieure de Géologie) - equivalent to the first year of the Italian Master in geology. Teaching of 'Magmatic petrology and geodynamics' for the second year of Master in geology - Master2 Terre Planètes formation à la Recherche par la recherche

2018 - 2020

Post-doctoral fellow in igneous petrology

Centre de Recherche Petrographiques et Geochimiques - Nancy - FR

Investigation of melt migration processes through the lower oceanic crust along ultraslow-spreading ridges. This study included a first petrographic observation of grain-size variations in olivine gabbros followed by determination of the mineral geochemical compositions (EPMA and LA-ICP-MS) compared with numerical models of fractional crystallization and melt-rock interactions (AFC).

Language skills

Italian

Mother tongue

English

Proficient

French

Proficient

Spanish

Proficient

Teaching activity

TEACHING

At the University of Genova, from the academic year 2022/2023, C. Ferrando is co-teacher (1 CFU) with Prof. E. Rampone of 'LITOLOGY' for the second year of Bachelor in Environmental and Natural Sciences and responsible of the practical activities in 'PETROGRAPHY' (3 CFU) for the second year of Bachelor in Geology.

Between 2018 and 2021, C. Ferrando was involved in the following teaching activities:

- academic year 2018/2019 at the University of Lorraine (France): co-teacher of the practical activities of 'Structural geology' for the first year of the Geological Engineering School (École Nationale Supérieure de Géologie) – equivalent to the third year of the Italian Bachelor in Geology; co-teacher of the practical activities of 'Geochemistry atmosphere and climate changes' for the second year of the Geological Engineering School (École Nationale Supérieure de Géologie) – equivalent to the first year of the Italian Master in Geology; co-teacher of 'Magmatic petrology and geodynamics' for the second year of Master in Geology (Master2 Terre Planètes formation à la Recherche par la recherche)
- academic year 2020/2021 at the University of Pavia: co-teacher of the practical activities at the microscope in 'Petrography' for the second year of Bachelor in Geology.

CO-SUPERVISOR OF RESEARCH THESIS IN GEOLOGICAL SCIENCES

In the academic year 2020/2021 C. Ferrando was co-supervisor of two thesis:

- Co-supervisor of the Bachelor thesis of Sarah Scarani at the University of Pavia (Supervisor: Prof. A. Sanfilippo) 3 CFU. Title of the thesis: Peridotites exhumed and exposed at the Doldrums Fracture Zone (8°N): petrographic and chemical investigations.
- Co-supervisor of the Master thesis of Davide Mariani at the University of Pavia (Supervisor: Prof. R. Tribuzio) 23 CFU. Title of the thesis: Amphibole-rich granoblastic dikes in the gabbroic crust exposed at the Atlantis Bank (57°E, Southwest Indian Ridge): microstructural and petrological investigations.

Research interests

With a multidisciplinary methodological approach, from structural and microstructural investigations to geochemical analysis, the scientific research of C. Ferrando is focused on the understanding of the petrological and geochemical processes involved in the formation of the oceanic lithosphere, from mantle melting beneath spreading centers to crystallization and cooling of the gabbroic sequences in the lower oceanic crust. This research aims at constraining the evolution of magmatic systems beneath spreading centers and the interplay among magmatism and hydrothermalism during the formation and exhumation of the lower oceanic crust, mainly at slow-spreading environments. The investigations focus on (i) melt formation during decompression melting, (ii) melt extraction and reactive porous flow through the lithospheric mantle during melt migration to the overlying oceanic crust, (iii) segregation of melts at various depths in the lithosphere and formation of pyroxenitic layers, (iv) fractional crystallization and melt-rock interactions during reactive transport in the lower oceanic crust, (v) mobilization of evolved melts driven by plastic deformation in gabbroic sequences along detachment faults, (vi) origin of SiO₂- and H₂O-rich fluids deep lower oceanic crustal sections, and (vii) element diffusive re-equilibration under subsolidus conditions during cooling of the oceanic crust. Samples investigated by C. Ferrando include peridotites, pyroxenites and gabbroic sequences sampled at modern ridges (Mid-Atlantic Ridge and Southwest Indian Ridge) and

analogue ophiolites (Erro-Tobbio, Ligurian Alps, Italy; Monte Maggiore, Alpine Corsica, France).

Grants

2019 - 2022

Oceanic crust accretion at ultraslow-spreading ridges insights from a 800m-long crustal transect drilled at IODP Hole U1473A Atlantis Bank gabbroic massif (Southwest Indian Ridge)

CNR - ECORD - IODP-Italia - IT

85000 - Principal investigator

Investigation of the interplay among magmatism and hydrothermalism during the formation and exhumation of the lower oceanic crust along slow-spreading ridges (see Academic experience for further details).

2019 - 2022

Oceanic Megatransforms a New Class of Plate Boundaries (PRIN-MIUR2017 - 2017KY5ZX8)

Ministero dell'Università e della Ricerca - IT

Participant

2019 - 2022

Dynamic mass transfer from subduction zones to volcanic arcs (PRIN-MIUR2017 - 2017ZE49E7)

Ministero dell'Università e della Ricerca - IT

Participant

Editorial activity

Reviewer of ISI Journals: *Ofioliti*; *Journal of Petrology*; *Chemical geology*; *Minerals*; *Lithos*; *European Journal of Mineralogy*; *Geology*.

Assignments abroad

In the academic year 2018/2019 at the University of Lorraine (France) C. Ferrando was involved in the following teaching activities:

- co-teacher of the practical activities of 'Structural geology' for the first year of the Geological Engineering School (École Nationale Supérieure de Géologie) – equivalent to the third year of the Italian Bachelor in Geology;
- co-teacher of the practical activities of 'Geochemistry atmosphere and climate changes' for the second year of the Geological Engineering School (École Nationale Supérieure de Géologie) – equivalent to the first year of the Italian Master in Geology;
- co-teacher of 'Magmatic petrology and geodynamics' for the second year of Master in Geology (Master2 Terre Planètes formation à la Recherche par la recherche)

Other professional activities

RESEARCH ACTIVITIES

From 2016 to 2021 C. Ferrando joined four oceanographic expeditions:

- in 2016 participation in the oceanographic expedition 'Integrated Ocean Discovery Program Expedition 360: "SW Indian Ridge Lower Crust and Moho (Atlantis Bank Oceanic Core Complex)"' after a international competitive call of the program International Ocean Discovery Program. The Expedition reports can be found at

<http://publications.iodp.org/proceedings/360/360title.html>. C. Ferrando was the member of the Shipboard Scientific Party (structural geology team) on board the JOIDES Resolution. The work focused on the description of the magmatic structures in the 800 m of drilled samples through the lower oceanic crust at the Atlantis Bank Oceanic Core Complex (57° E, Southwest Indian Ridge).

- in 2019 participation in the oceanographic expedition in the framework of the project PRIN-MIUR2017 'Oceanic Megatransforms: a New Class of Plate Boundaries' and the italian- russian collaboration (ISMAR Bologna and the Russian Accademy of Russian Sciences - Moscou). Oceanographic expedition on board the R/V Akademik Nikolaj Strakhov, Expedition S45: "The 'Doldrums Fracture Zone' (Mid-Atlantic Ridge; 7°-8° N)". The work focused on the description of dredge samples and scientific discussion on the new bathymetric data.

- in 2020 participation in the oceanographic expedition in the framework of the project PRIN-MIUR2017 'Oceanic Megatransforms: a New Class of Plate Boundaries' and the italian- russian collaboration (ISMAR Bologna and the Russian Accademy of Russian Sciences - Moscou). Oceanographic expedition on board the R/V Akademik Nikolaj Strakhov, Expedition S50: "The 'Charlie Gibbs Fracture Zone' (Mid-Atlantic Ridge; 52° N)". The work focused on the description of dredge samples and scientific discussion on the new bathymetric data.

- in 2021 participation in the oceanographic expedition in the framework of the project PRIN-MIUR2017 'Oceanic Megatransforms: a New Class of Plate Boundaries' and the italian- russian collaboration (ISMAR Bologna and the Russian Accademy of Russian Sciences - Moscou). Oceanographic expedition on board the R/V Akademik S. Vavilov, Expedition V53: "The 'Charlie Gibbs Fracture Zone' (Mid-Atlantic Ridge; 52° N) and 'Bight Fracture Zone' (Mid-Atlantic Ridge; 57° N)". The work focused on the description of dredge samples.

ACTIVITY OF SCIENTIFIC DISSEMINATION

At the 'Festival della comunicazione 2022' at Camogli, C. Ferrando presented an overview on our state-of-the-art knowledge on the Earth system, and the up-to-date methodologies used and the findings on the formation and structure of the oceanic crust and Earth mantle.