

Research options available

Research topic(s) offered by every Doctoral Course involved in UNIPhD are frameworks within which every applicant has to present an original research project in collaboration with a Supervisor at the University of Padua.

Potential Supervisors at Unipd have proposed the following detailed research options, which are related to the research topic. They are offered as a guideline and should facilitate your contact with potential Supervisors. Supervisors' e-mail is specified in every research option table. You are welcome to contact them directly.

Note that this research option list is not at all exhaustive and, within the topic you have chosen, you are free to propose a different research project.

Doctoral Course	GEOSCIENCES
Macro-area	Physical Sciences and Engineering
Department name	Department of Geosciences
Webpage	https://www.geoscienze.unipd.it/corsi/scuola-dottorato
Research topic	<p>Deep Earth's volatile cycle: processes, fluxes and metasomatism</p> <p>The distribution of volatiles within the Earth's interior has profound implications on the dynamics and the evolution of our planet. Yet, our understanding of the deep-Earth volatiles cycle is crude, as several uncertainties remain relative to the storage of different volatile species at depths, and the surface and deep processes triggered by their subsequent release. The aim of the research topic is to bridge this knowledge gap by exploiting blended field, experimental and numerical approaches.</p>
Link to the UNIPhD Call (Academic Year 2023/2024)	https://uniphd.eu
Latest Update	02.12.2022
#Number of available Research Options	3 <i>Scroll down to see all the Research Options</i>

1 Research Option Description

Doctoral Course	Geosciences
Department name	Department of Geosciences
Research topic	Deep Earth's volatile cycle: processes, fluxes and metasomatism
Research option	Carbon cycling in the deep Crust
Supervisor	Supervisor: Bernardo CESARE - bernardo.cesare@unipd.it Research group: Omar BARTOLI Bruna B. CARVALHO
Webpage	http://www.eurispet.eu/ACME/Home.html http://www.eurispet.eu/bernardo/berning.html
Context of the research activity and objectives	This Option aims at understanding and quantifying the role of anatexis of the continental crust in the overall deep geological cycle of Carbon. Activities will include: 1) analysis of C-O-H fluids in melt inclusions and their bubbles in natural partially melted rocks; 2) experiments of partial melting of graphitic metapelites and analysis of C-O-H fluids in the experimental runs; 3) thermodynamic modelling and mass balance of the carbon budget in the anatectic deep crust.
Infrastructures	In house: FE-SEM equipped with EBSD, FIB, CL and WDS analyzer, Piston Cylinder; Laser Raman spectrometer; heating/freezing and HT stages for fluid and melt inclusions. Electron microprobe Lab and Quadrupole Mass Spectrometer (Milano, I); nanoSIMS (MNHN Paris, F).
Skills and competencies for the development of the activity	The ideal candidate should have a good background in geology and petrology, and propensity for laboratory activities and thermodynamic modeling.
Training offer	The Department will offer seminars and specific training on fluid and melt inclusion analysis, on experimental petrology with the piston cylinder apparatus, and on laser Raman microspectroscopy. External training will include analysis of C-O-H fluids in experimental capsules (Milan Univ., Milan) and thermodynamic modelling of geological systems (ETH, Switzerland).
Possible Secondments	ETH Zurich, Department of Earth Sciences, Institute for Geochemistry and Petrology, Switzerland (Prof. J.A.D. Connolly) Natural History Museum, Earth Sciences Department, London, UK (Dr. Chiara Maria Petrone)

2 Research Option Description

Doctoral Course	Geosciences
Department name	Department of Geosciences
Research topic	Deep Earth's volatile cycle: processes, fluxes and metasomatism
Research option	Origin, depth and age of super-deep diamonds
Supervisor	Supervisor: Prof. Fabrizio NESTOLA – fabrizio.nestola@unipd.it Research group: Prof. Martha PAMATO Dr. Davide Novella
Webpage	https://www.geoscienze.unipd.it/category/ruoli/personale-docente?key=2D51ECF0A9DA3DA2B5FB8634930ADE9C
Context of the research activity and objectives	Super-deep diamonds are the deepest geological samples. Such diamonds can form down to 1000 km depth. However, due to their extreme rarity (e.g., only 1% of all diamonds), we are still trying to get reliable statistics about their geological origin, their depth of formation and, more importantly, their age (for which only a few data are available in literature). The objectives of this Ph.D. project focus on: a) the selection of a significant number of super-deep diamonds containing CaSiO ₃ phases (breyite), which typically have high Sr, Nd and Pb contents that are suitable for dating; b) apply Elasto-plasto barometry on CaSiO ₃ to get information about the diamond depth of formation; c) studying C and N isotopes in diamonds to retrieve information about the carbon source.
Infrastructures	X-ray diffraction diffractometer, mass-spectrometer, micro-Raman and SEM at the Department of Geosciences; mass spectroscopy for dating at University of Alberta (Canada).
Skills and competencies for the development of the activity	The candidates should have some skills in X-ray diffraction and/or Raman spectroscopy and/or mass spectroscopy.
Training offer	The Department will offer seminars and specific training on diffraction, Raman spectroscopy and mass spectroscopy. External training will include age determination methods at University of Alberta (Canada) and optical analysis of diamonds at Gemological Institute of America (USA).
Possible Secondments	University of Alberta (Canada) - Graham Pearson Gemological Institute of America (USA) - Wuyi Wang

3 Research Option Description

Doctoral Course	Geosciences
Department name	Department of Geosciences
Research topic	Deep Earth's volatile cycle: processes, fluxes and metasomatism
Research option	Genesis, decomposition and exhumation of diamonds: insights from numerical modelling
Supervisor	Supervisor: Manuele FACCENDA – manuele.faccenda@unipd.it
Webpage	https://sites.google.com/site/manuelefaccenda/
Context of the research activity and objectives	This Option aims at understanding the formation /decomposition and exhumation of diamond-bearing rocks. Research activities will focus on coupled petrological-thermo-mechanical modelling of fluid-rock interaction. In particular, the PhD candidate will investigate: (1) the formation of volatile-rich and carbon-bearing fluids, (2) metasomatic processes that leads to the formation or decomposition of diamonds, (3) formation and migration of carbon-bearing magmas.
Infrastructures	HPC cluster: Superdome with 8 x 28 cores Intel Platinum 8180, 6 TB RAM; 4 x 2 x 28 cores Intel Gold 6132, 320 GB RAM; 100 TB storage.
Skills and competencies for the development of the activity	The ideal candidate should have a good background in geology, mineralogy and computational petrology and geodynamics, and propensity for numerical modeling activities.
Training offer	The hosting Department will offer seminars and specific training on diamond genesis, decomposition and exhumation, as well as on computational techniques required to conduct the research activities.
Possible Secondments	Dipartimento di Scienze della Terra, Università degli Studi di Milano Statale (Dr. S. Tumati) DERTS School, University of Alberta, Canada (Graham Pearson)