UNI FR

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Bern-Fribourg Master in Earth Sciences

MSc-Projects offered in Bern and Fribourg

Specialization : **ELE**: Earth and Life Evolution, **EM**: Earth Materials, **ERG**: Environmental & Resource Geochemistry, **Geol**: Geology, **PAQS**: Pure & Applied Quaternary Sciences

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☐	☐	☐	☒	☐	3D Characterization of the Subalpine Molasse (Raegeflühli, Lucerne)	The Subalpine Molasse experienced shorting during a late stage of Alpine compression. Besides classical imbricate thrusting, there appear more and more evidence for folding. Particularly in the case of mechanically stiff conglomerate beds, such folding under low temperature conditions is rather surprising. We hypothesize that parts of this deformation could have occurred under non-consolidated conditions, i.e. potentially during or directly after the deposition of the sediments at the orogenic front. The aim of this project is to explore the style of deformation – thrusting, folding, strike-slip faulting – in the Subalpine Molasse in the region of Raegeflühli, Lucerne. For this purpose a combination of remote sensing (digital elevation models, drone imaging) and field-based structural mapping will be combined with sedimentological analysis. The obtained data will then be used to construct a 3D structural model. Restoration of selection cross-sections will provide information on the structo-sedimentological evolution of the area. If of interest, additional topics can be analyses such as deformation behavior (fabric analysis) or the timing of deformation (U-Pb dating of calcite precipitates). The project can be conducted by a team of MSc students. The tools applied and expected findings are of interest for a variety of applied project in the Subalpine Molasse, as for example, for the exploration of geothermal energy.	Prof. Marco Herwegh Prof. Fritz Schlunegger Dr. Philippos Garefalakis	BE
☐	☐	☐	☒	☐	3D Fault Geometrie and Evolution of the Sax-Schwende fault (E-Switzerland)	Strike-slip faults are important brittle structures that dissect the upper crust and can act as fluid conduits. The latter is of particular interest for geothermal energy, but also for seismicity. This requires in-depth knowledge of the 3D fault architecture, which is often difficult to obtain from surface information. In this study, we will investigate the 3D fault geometry of the Sax-Schwende fault in the Helvetic Alps of eastern Switzerland. The fault will be studied using structural mapping (remote sensing, drone imaging, field work), structural field analysis and 3D structural modelling. Depending on the student's interest, modelling of fault kinematics/permeability or microstructural investigations (e.g. including U-Pb dating) can be carried out.	Prof. Marco Herwegh	BE

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☐	☒	☐	☒	☐	Adapting and extending the ICP-Base software for MC-ICP-MS data processing, with applications to non-traditional stable isotope systematics in georeference materials	Consistent data processing between different laboratories across the world is of paramount importance for direct data comparisons, ensuring high-quality data and minimizing errors in data processing and uncertainty propagations. Recently, the ICP-Base software was developed by Sebastian Stumpf at the University of Bern. ICP-Base is an open-source, user-friendly, MATLAB-based software to process LA-ICP-MS data. This project aims to expand the ICP-Base software framework with new modules to process MC-ICP-MS isotope data. The first stage of the project consists of trace element analysis via LA-ICP-MS on a range of georeference materials. This will establish firmer constraints on georeference values and will aid in understanding the ICP-Base software architecture and existing data processing workflow. Further Fe isotope analysis via MC-ICP-MS on the same materials builds the basis for becoming familiar with MC-ICP-MS data formats, interference corrections and understanding what contributes to uncertainties. The second stage of the project focuses on implementing a data processing workflow in ICP-Base for MC-ICP-MS isotope analyses, effectively extending the software for widespread public use. The project will include programming in the MATLAB App Designer, and chromatography (cleanlab) + MC-ICP-MS analyses and LA-ICP-MS analyses.	Prof. Suzette Timmerman PD Dr. Martin Wille	BE
☐	☒	☒	☒	☐	Alteration of the upper mantle – insights from 1.2 km of mantle rock recovered during IODP Exp. 399 from the Atlantis Massif	In spring 2023 the Joides Resolution, the scientific drilling vessel of the International Ocean Discovery Program, recovered a more than 1.2 km long section of upper mantle lithologies at the Atlantis Massif, located at 30°N along the Mid-Atlantic Ridge. Ocean floor drilling recovered primarily serpentinized peridotites (~70%), and gabbroic intrusions and magmatic veins (~30%), thus recovering a unique sequence of upper mantle lithologies never sampled before. Alteration of upper mantle rocks (peridotites) has wide-ranging implications for mineralogical, geochemical, biological to magmatic and tectonic processes. This includes that seawater-peridotite interaction influence ocean water chemistry over geological timescales, magmatic and ore forming processes in the volcanic arc, and through abiogenic production of hydrogen supports simple microbial lifeforms. Hence, these drill cores can provide insights into fluid-rock-microbe(-magma) interaction in the shallow upper mantle. Specific research topics may be 1) to investigate the elemental exchange between mafic magmatic veins and surrounding host rock, including magmatic degassing, on providing energy sources for microorganisms and their influence on providing fluid pathways, and 2) investigating the extent and impact of seafloor (serpentinite) weathering on geochemical cycles and microbial communities. These projects will be carried out within a SNSF-funded project that supports two PhD students. Analytics may involve petrographic characterization of thin sections, Raman spectroscopy, X-ray powder diffraction, electron microprobe analyses and/or laser ablation mass spectrometry. Students interested in this project or in any topic related to fluid-rock interaction processes and metamorphic petrology are welcome to discuss research possibilities with Esther Schwarzenbach.	Prof. Esther Schwarzenbach	FR
☐	☒	☒	☐	☐	Applied Topics in Environmental Mineralogy & Geochemistry	The research group Fachstelle Sekundärrohstoffe offers a broad variety of applied topics in the context of (i) recycling of mineral wastes in the cement, concrete and ceramics industries (circular economy), (ii) chemical and mineralogical characterization of industrial materials and its effects on the environment (e.g. in landfills). The topics involve classical methods of solid characterization (e.g., X-ray diffraction, X-ray fluorescence analysis, optical & scanning electron microscopy), wet-chemical characterization methods (extraction tests) and/or thermodynamic modelling. The topics vary depending on actual research questions from industry and offer a valuable insight into an applied research field. Interested students are encouraged to get in touch to discuss available topics and personal interests.	Dr. Mirjam Wolffers Dr. Gisela Weibel	BE

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☐	☒	☒	☐	☐	Atomistic simulations of mineral-fluids interfaces	Mineral surfaces influence many geochemical and environmental processes, including ion adsorption, dissolution, charge transfer, and surface-catalysed reactions. Their structural and chemical properties determine their reactivity, stability, and interaction with aqueous solutions, and these features can be modelled at the atomistic level with an appropriate computational setup. In this project, you will use atomistic simulations based on empirical force fields and/or density functional theory, to investigate the structure, stability, and reactivity of selected mineral surfaces. You may analyse the influence of defects, different surface terminations, and adsorption mechanisms. The resulting insights will help interpret experimental observations and contribute to improved models for geochemical reactivity in natural and engineered environments.	Dr. Michelle Ernst Prof. Sergey Churakov	BE
☐	☐	☐	☐	☒	Chasing the Early Pleistocene glaciations	The Swiss northern Alpine Foreland has been sculpted by at least 15 glacier advances during the Quaternary. To trace the pace of the Early Pleistocene glaciations, Deckenschotter deposits are investigated as they are considered to be the oldest Quaternary deposits being preserved as relict mesa-type hilltops in the northern Alpine Foreland. This MSc topic consists of fieldwork, laboratory work, and interpretations. The focus of this MSc thesis is on determining the timing of the Deckenschotter glaciations and reconstructing the landscape evolution during the Early Pleistocene. The Deckenschotter site, at which the study will be conducted, will be up for discussion. The objective is to first identify the origin, transport mechanism, and depositional environment of the Deckenschotter and second to select one or two suitable outcrops to collect samples for isochron-burial dating to determine the timing and finally to integrate all the obtained results into a landscape evolution history. To achieve this, the MSc student will perform sediment analysis, including clast petrography, morphometry, and fabric. Furthermore, the student will collect samples in the field and process them in the lab to analyze 10Be and 26Al in order to determine the deposition age using isochron-burial dating. The MSc student will present their findings at national conferences and submit their thesis in manuscript format, aiming to publish in an open-access scientific journal.	Prof. Naki Akçar	BE
☒	☐	☐	☐	☐	Coprolites from the Kimmeridgian Reuchenette Formation (Swiss Jura): preservation, morphology and paleoecological context		Dr. Lara Sciscio	FR

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☐	☐	☒	☐	☐	Exploration for geothermal systems using Helium and other hydrogeological tracers (various areas possible)	Orogenic geothermal systems result from the topography-driven, deep circulation of meteoric water through the crystalline basement including the fast upflow of the heated water along permeable fault zones (Diamond et al., 2018). Such orogenic systems are responsible for the 15 thermal water occurrences in and near the Rhône Valley discharging at temperatures up to 65°C. Due to the abundance of deep-reaching structures, it can be assumed that there are also an unknown number of blind geothermal systems, i.e. systems without surface manifestations (e.g. warm spring). One approach to identify such blind systems is to identify areas where ions such as Na, K, Cl and SO4 are elevated compared to the geogenic background levels. Several such anomalies have been identified in the districts of Martigny, Sion and Sierre during the ongoing GeoTex Rhône project. However, all of these elements can also have anthropogenic sources (naturally occurring evaporites, contaminated sites, fertilisers etc.). In order to confirm the thermal nature of the anomalies, additional data on more specific thermal tracers (Si, Li and 4He) need to be collected and evaluated. Once confirmed as blind geothermal systems caused by the upwelling of deep basement fluids, several aspects need to be investigated in the areas of interest: - Structural setting (collaboration with tectonic research group) - Make-up of the unconsolidated Quaternary infill of the Rhône Valley (based on existing data from shallow wells and some seismic profiles) Together this will lead to the development of a detailed conceptual model of the blind geothermal system(s) present in the area investigated. This in turn will help to advance our understanding of orogenic geothermal systems present in inneralpine valleys and guide national as well as international exploration.	Dr. Daniela Van den Heuvel Dr. Daniel Rufer PD Dr. Christoph Wanner	BE
☒	☐	☐	☒	☐	Exploring paleoenvironments at the extremes: An example from the Jurassic Cañadón Asfalto paleolake, Argentina		Dr. Alicia Fantasia	FR
☐	☐	☐	☐	☒	Exploring the phases of gravel accumulation in the Aare valley	During the Quaternary, the Aare valley drained the Alpine ice as result of repeated glaciations. This drainage is documented by the phases of gravel accumulations in the valley. The last phase of gravel accumulation that occurred during the advance of the Aare lobe during the Last Glacial Maximum is relatively well known whereas the older phases of accumulation is poorly understood. The goal of this MSc. Thesis is to identify phases of gravel accumulation, explore the depositional environment, and determine the timing of accumulation in the Aare valley in the selected sites and gather information about their source, catchment area and transportation. This project consists of fieldwork, laboratory work, modeling and interpretation. To achieve this goal, MSc. student will do detailed sedimentological analysis and collect samples in the field. Techniques to be applied both in the field and laboratory are as follows: grain size analysis, pebble petrography, pebble morphometry and fabric. The MSc student will present their findings at national conferences and submit their thesis in manuscript format, aiming to publish in an open-access scientific journal.	Prof. Naki Akçar Prof. Fritz Schlunegger	BE
☐	☐	☐	☒	☒	Fault gouges in the Clavaniev Zone: Microstructures and the relations to earthquakes	The Clavaniev Zone is located between the Aar and the Tavetsch Massifs and is interpreted as major deformation zone. The fault gouges and related tectonites should be mapped on a small scale (100m scale) using drone imaging. Some fault gouges display spectacular mirror planes potentially being indicative for near surface seismic slip. These samples can be stabilized and analyzed microscopically in terms of deformation geometries and processes. This includes detailed SEM work and detecting the newly formed phases by XRD. In addition, some AFM investigations might be possible. The natural microstructures can be compared to microstructures from experimentally deformed granitoid gouges. The final goal of the project is to identify evidence for paleo-earthquakes in the rock record.	Prof. Marco Herwegh Prof. Alfons Berger	BE

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☒	☒	☐	☒	☐	Fe isotope systematics of the Premier kimberlite: tracing sources and melt evolution	Kimberlites are volatile-rich, volcanic rocks. The melts derive from up to 300 km depth, near the base of thick lithospheric mantle. Upon ascent to the Earth's surface the kimberlitic melt evolves, interacting with the lithospheric mantle and sampling pieces of it along the way. This results in kimberlites containing abundant xenoliths and xenocrysts in addition to the crystallized magmatic phases. This project focuses on Fe isotopes of the Premier kimberlite in more detail. What phases are contributing to the Fe isotope composition of kimberlite and can we see a signature from Fe-rich (possibly subducted material) domains near the base of the lithosphere? Questions such as the following will be answered: i) is there Fe isotope fractionation during kimberlite evolution? ii) what minerals and sources influence the Fe isotope signature? iii) how heterogeneous is the Fe isotope composition within a kimberlite? iv) how do the Fe isotope compositions of the Premier kimberlite compare to other kimberlites and OIBs? The project will include petrographic descriptions of thin sections, EPMA, LAICPMS, Fe chromatography + MCICPMS analyses of bulk rocks and mineral phases, modelling of Fe isotope fractionation and mixing end-member compositions.	Prof. Suzette Timmerman Prof. Jörg Hermann	BE
☒	☐	☐	☒	☐	Filling the gaps in the Jurassic paleoclimate and paleoenvironmental records to better understand Earth's climate sensitivity		Dr. Alicia Fantasia	FR
☐	☒	☐	☒	☐	Formation temperatures and ages of igneous, pegmatitic and migmatitic garnets from the Central Alps	Garnet is a key mineral to constrain magmatic and metamorphic processes in the Earth's interior. Recent progress in the study of garnet has shown that some garnet can be dated by the U-Pb method. This is a new and exciting tool to date high grade metamorphic and magmatic rocks. However, only a few garnets contain enough U for dating. Another new development is the use of Zr-contents in garnet as a measure for the temperature of formation. While this is established for granulite facies garnets, the calibration for amphibolite facies conditions is less robust. . The aim of this project is to investigate garnets from igneous, pegmatitic and migmatitic rocks from the Central Alps. The Zr contents of garnet will be systematically evaluated and linked to the determined formation temperatures of the rocks to establish the Zr content of garnet at the onset of melting and to improve the calibration of the Zr-in-garnet thermometer. Partial melts can be enriched in U, leading to garnet that can be dated. Where possible, we aim to date the onset of partial melting by U-P chronology to determine key events in the Alpine orogeny. . The project will include detailed microscopy, electron microprobe and laser ablation mass spectrometry analyses.	Prof. Jörg Hermann Prof. Daniela Rubatto	BE

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☐	☐	☐	☒	☐	Frozen in a Flash: Pseudotachylites as Records of Cyclic Seismic Slip	Project description: This project aims to investigate pseudotachylites—fault rocks resulting from the solidification of frictional melts formed along faults during fast seismic slip (slip rates of ~10-4–101 m/s). Because the structures represent very rapid deformation, they can provide valuable clues about past fault movements and high-strain processes deep in the Earth's crust. Your goal is to investigate the relationship between fast seismic slip (pseudotachlyite) and coexisting viscous (possibly non-steady-state) creep in the form of mylonites along the base of the Silvretta Nappe in eastern Switzerland. Through documenting the spatiotemporal distribution of the pseudotachylites as well as their timing and cross cutting relationships with the mylonite along the Silvretta Nappe you will infer strain localization processes during tectonic nappe emplacement and with that gain a better understanding of the seismic cycle. Project tasks: You will perform field work at the base of the Silvretta Nappe using digital mapping tools and unmanned aerial vehicles (UAV; drones) to systematically 3D map the pseudotachylite occurrences, thicknesses, orientations and cross cutting relationships. You will collect sample material for detailed microstructural investigation. The latter will include a combination of light optical as well as scanning electron microscopy alongside several geochemical analyses (SEM EDS; LA-ICP-MS) to confirm if the material documents frictional melting. Finally, few samples from the pseudotachylites and their host rocks will be investigated for their potential of U-Pb dating of zircon or Ar-Ar of white mica and amphibole in order to constrain the timing of these seismic events during nappe emplacement.	Dr. Ismay Vénice Akker Prof. Marco Herwegh Prof. em. Mark Handy	BE
☐	☐	☐	☒	☒	General topics in lacustrine paleoseismology, other natural hazards	Different topics will be presented and discussed during an informal meeting and adapted to the interestets of the student.	Prof. Katrina Kremer	BE
☐	☐	☒	☒	☒	General topics in paleoclimatology, paleoenvironments and sedimentary geochemistry	To be presented and discussed in an informal meeting upon interest.	Prof. Hendrik Vogel	BE
☒	☐	☐	☒	☐	General topics in paleoclimatology, paleoenvironments and sedimentary geochemistry. To be presented and discussed in an informal meeting upon interest		Dr. Alicia Fantasia	FR
☐	☐	☐	☐	☒	General topics in Quaternary Geology and Paleoclimatology	To be presented and discussed in an informal meeting upon interest.	Prof. Flavio Anselmetti	BE
☐	☒	☐	☒	☐	Geochemical investigation of water-rock interaction at the ocean floor	Serpentinites are hydrated ultramafic rocks that play a crucial role in the transfer of water from the hydrosphere to the lithosphere and finally to the deep Earth via subduction. The chemical and isotopic signatures of serpentinites therefore provide crucial information for geochemical mass balances. In serpentinites, trace element concentrations depend on both protolith and water-rock interactions during serpentinisation, whereas oxygen isotopes are controlled by water composition and serpentinisation temperature. Correlations between these two chemical signatures can therefore help to elucidate the conditions of serpentinisation. The project will study serpentinites from the Ligurian Ophiolites to reconstruct their oceanic evolution using textural, chemical and isotopic information. The results will be compared with chemical evolution trends recently defined from the study of serpentinites from oceanic cores. The student will carry out petrographic investigations, trace element mineral and oxygen isotope analyses and geochemical modelling.	Prof. Daniela Rubatto Prof. Thomas Pettke	BE

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☐	☒	☐	☒	☐	Geochemistry of gold-ore forming fluids in the Monte Rosa Gold District, NW Italian Alps	The Monte Rosa Gold District encompasses a series of late-orogenic gold quartz veins, with the most spectacular examples occurring in the Brusson area. This project aims at quantifying the ore-forming fluid chemistry via LA-ICP-MS measurements of individual fluid inclusions, in order to better constrain gold vein genesis in such a globally classical geotectonic setting. Field work, vein mineralogy, detailed fluid inclusion petrography, microthermometry, and petrochemistry of hydrothermal alteration envelopes will be investigated for selected ancient gold mines. Fluid LA-ICP-MS measurements will emphasize concentrations of Au, S, Cl, Br, and possibly I, so far unconstrained for such world class gold resources, and for which we currently develop new standard materials. Results will allow fundamental questions to be addressed, including the dissolved Au concentrations in orogenic ore forming fluids, hydrothermal element transport, the geochemical signal of fluid-rock interaction forming the hydrothermal alteration envelope around the veins, and potential sources of ore-forming fluids. This project is particularly suited for individuals with a strong interest in diverse geochemical measurement techniques as applied to open system hydrothermal processes.	Prof. Thomas Pettke PD Dr. Malte Junge	BE
☐	☐	☒	☒	☐	Geometries of 3D Flow paths in fault-related hydrothermal systems	Orogenic hydrothermal systems often rely on recharge of meteoric water in mountainous areas, fluid circulation and heating of fluids down to depths of up to 10 km have to ascent and eventually leading to hot water springs. Such hydrothermal cells are of great interest for the exploration of geothermal energy within the Alps. In past research projects, we discovered the importance of brittle fault systems and associated kinematics in order to provide information on pathways allowing fluid circulation in quantities being substantial for the successful exploitation of heat. With this respect, quantitative information on the 3D geometries of flow paths, associated brittle tectonites and permeabilities is mandatory. In active hydrothermal systems, deep parts of hydrothermal cells are not accessible with enough spatial resolution by geophysical techniques. For this reason, we investigate in this study exhumed paleo-hydrothermal fault systems by means of quantitative mapping at a multitude of scales (remote sensing on aerial photographs, DEMS and drone images), on selected hand specimen and thin sections. This information allows the generation of 3D models visualizing and quantifying 3D pathways for fluid flow in a comprehensive manner. In addition, special emphasis can be paid to porosity forming (dilatancy by brittle deformation) and destroying (e.g. hydrothermal mineral precipitation) processes allowing to link porosity evolution to relative time sequences. In this sense, high-end analytical techniques such as light optical and scanning electron microscopy in combination with digital images analysis can be applied. This part of the project will be conducted in close collaboration with Prof. Beda Hofmann of the museum of natural sciences. There is opportunity for different MSc projects. Interested MSc students can select from different study sites (e.g. lower Engadin, upper Engadin, Grimsel pass, Furka pass, Wildhorn area, Lac de Fully). Also collaboration within the Geotex Rhône project (joint project between Structural Geology and RWI) is possible.	Prof. Marco Herwegh Prof. Alfons Berger Dr. Timothy Schmid	BE

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☐	☐	☐	☒	☐	How and how fast deforms the granitoid middle crust?	Project description: Granitoids represent the most important rock type of the crystalline crust. Here, deformation is strongly localized in fine-grained polymineralic shear zones. Commonly, it is assumed that deformation rates in these shear zones are constant over long time intervals but is this really the case? The occurrence of shear bands and fractures may indicate that substantial variations in strain rates occur and that deformation might accelerate in certain domains. Such behavior would be important to be detected, since such viscous ductile shear zones often are in charge for “loading” the elastic energy in brittle deforming rocks in shallower crustal levels. It is the instantaneous release of this elastic energy, which induces earthquakes and associated seismic waves. In this project, you will investigate a crustal scale shear zone in the Aar Massif (Central Swiss Alps) by means of structural mapping and microstructural analysis to find evidence for the occurrence of variations in strain rates hinting to episodic deformation. Project tasks: You will acquire high-resolution mosaics of drone images as a base for detailed structural mapping. You will discriminate different fabric domains being characteristic for specific deformation episodes. The extend and spatial distribution of these fabric domains will be quantified in QGIS. These data serve as a base for selective collection of ultramylonitic samples in the field, which will then be prepared for investigations on the scanning electron microscope. Electron backscatter diffraction mapping will be used to gain information on phase and grain distributions and their changes in transects across the shear zone. Via paleopiezometry estimates on the stress states can be made. Geothermometry will be applied on newly crystallized sheet silicate minerals to quantify deformation temperatures and potential lateral changes. These data, in combination with the geometric constraints of the mapping, are then combined to evaluate the deformation rates in the different fabric domains and their evolution in space and time. In this way, you will be able to unravel episodic deformation stages and to brainstorm on their effect on the elastic loading of tectonic stresses.	Prof. Marco Herwegh Prof. Alfons Berger	BE
☒	☐	☐	☐	☐	Impact study of a biogeographical event on rhinocerotid communities in Western Europe		Dr. Manon Hullot Dr. Olivier Maridet	FR
☒	☒	☐	☒	☐	Isotope geochemistry projects in planetary sciences	The Institute of Geological Sciences, the Natural History Museum of Bern, and the Institute of Physics have meteorite collections accessible for research projects. Specific research topics may focus on for example: i) characterizing a new meteorite and mapping its heterogeneity, ii) investigating isotopic compositions of meteorites to determine the time of formation or to better understand formation processes. Analytics may involve petrographic characterization, scanning electron microscopy analyses, electron microprobe analyses, laser ablation mass spectrometry, and/or chromatography + TIMS/MC-ICP-MS isotope analyses. Students interested in any topic related to geochemistry of meteorites and planetary sciences, are welcome to discuss MSc research possibilities with Suzette Timmerman.	Prof. Suzette Timmerman Prof. em. Klaus Mezger	BE
☒	☐	☐	☐	☐	Late Eocene - Early Oligocene continental climate in South Caucasus: Organic Geochemical approach	Eocene – Oligocene transition is marked by severe glaciations in Antarctica and cooling of global climate. Apart from this, paleogeographic reorganisation in Eurasia facilitating arrival of Asian forms to Europe, an event known as Grande Coupure. West Asia is suggested one of the routes for the dispersal of vertebrate faunas. However, the fossil and geological record stays largely unstudied. To understand the climate evolution at the Eo-Oligocene transition in the West Asian region, two newly-discovered section with continental record will be studied. The organic geochemical methods on GDGTs and n-alkenons will be applied to recontruct the paleotemperature evolution, vegetation composition and the paleoprecipitation trends over this period of time.	PD Dr. Davit Vasilyan	FR
☒	☐	☐	☐	☐	Late Miocene - Pliocene Cercopithecidae (Primates) from Moldova		PD Dr. Davit Vasilyan	FR

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☒	☒	☐	☒	☐	Metasomatic processes in the mantle beneath Karowe, Botswana	The mantle beneath the Kaapvaal Craton has undergone extensive metasomatism, particularly during kimberlite, carbonate-rich olivine lamproite, and Karoo plume-related magmatism. One population of micro-xenoliths in the Karowe kimberlite, Botswana, is characterized by dominant clinopyroxene + phlogopite. Some of these highly metasomatized rocks are directly in contact with depleted dunitic or harzburgitic lithologies in the same micro-xenolith (see image). These samples are ideal for studying metasomatic processes in the mantle on a mm to cm-scale. The aim of this project is to reconstruct the evolution of this metasomatic suite. What metasomatic reactions took place, what type of fluid/melt percolated, at what PT conditions did this occur, and when did this metasomatic event happen? Is the fluid/melt enhancing diamond formation or resorbing diamonds? The Sr isotopic composition of clinopyroxene will additionally be used as a source tracer of the fluid/melt. The project will include petrographic characterization of samples, electron microprobe mineral analysis, laser ablation ICP-MS trace element analysis, and Rb-Sr dating via TIMS. In collaboration with Dr. Ingrid Chinn, De Beers Group of Companies	Prof. Suzette Timmerman Prof. Daniela Rubatto	BE
☐	☒	☒	☒	☐	Mineralogy and geochemistry of hydrothermal deposits from the Mid-Atlantic Ridge	Near mid-ocean ridges seawater circulation through the oceanic lithosphere leads to the formation of hydrothermal deposits and the venting of hydrothermal fluids that can range from ‘black smoker type’ high-T, acidic and sulfide-rich fluids to ‘Lost City type’ low-T, alkaline, and Ca- and H2-rich fluids. These hydrothermal fluids are the result of an extensive chemical exchange between seawater and basement rock lithologies and play a key role in the global geochemical cycles, mineral deposit formation, and in supporting simple life forms within the oceanic lithosphere. In spring of 2023 a sampling campaign lead by collaborators at NOAA and Oregon State University in Oregon, USA, will conduct a research cruise to the Mid-Atlantic Ridge in search of new hydrothermal systems. In this project, we will investigate hard rock samples and mineral deposits that will be collected during this cruise. The aim and outcome of the research project is largely dependent on the samples that will be recovered during the cruise. Though a focus will be on the mineralogical, petrological and geochemical examination of the samples to constrain the metasomatic processes in the basement rock, fluid-rock interaction temperatures, redox processes and/or the impact of fluid-rock interaction on geochemical cycles such as those of carbon and sulfur. Analytics may involve petrographic characterization of thin sections, Raman spectroscopy, X-ray powder diffraction, electron microprobe analyses and/or laser ablation mass spectrometry. Note, this project can be started no earlier than July/August 2023. Students interested in this project or in any topic related to alteration of the oceanic lithosphere and fluid-rock interaction processes are welcome to discuss research possibilities with the advisor.	Prof. Esther Schwarzenbach	FR
☐	☐	☒	☒	☒	Mobilization of toxic elements as novel proxy for tracking permafrost degradation	In the central Eastern Alps, an increasing number of high-altitude streams draining ice-rich permafrost display high concentrations of toxic element such as nickel, aluminum and manganese. To assess the environmental hazard, we continuously monitor the fluxes of toxic elements exported from a site in Val Mustair, Eastern Switzerland, since 2021. This multi-disciplinary thesis project will continue and expand this flux monitoring. It includes frequent field trips (i.e. hikes) to high-altitude settings in Val Mustair to collect water samples and subsequent chemical analyses in the laboratories of the institute. In addition, the temporal evolution of the permafrost area at the source of the stream will be documented and quantified by taking high-resolution images by a drone and their post-processing by photogrammetry and GIS-Based methods as well as geological modelling. The main aim of the thesis is to assess whether the combination of flux measurement and drone-based photogrammetry methods could serve as novel permafrost degradation proxy. To achieve this, the fluxes of toxic elements recorded since 2021 will be put into context with other, more traditional permafrost degradation proxies such as temperature measurements. In addition, the data collected during the thesis should lead to an improved quantitative understanding of the coupled thermal, hydraulic, and chemical processes controlling the mobilization of toxic solutes. This should ultimately allow to make a more informed prediction of the future environmental hazard caused by such systems.	PD Dr. Christoph Wanner Dr. David Mair	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☐	☐	☒	☒	☐	Multiscale 3D Fault Patterns and their Role for Seismic Activity in Switzerland	Although not being a high-risk country, Switzerland experiences several hundred earthquakes a year because of the still stressed lithosphere. Given the Alpine orogeny, we know that the crustal structure is tectonically pervasively dissected by faults, reaching from the tens of kilometers down to the meter scale. Currently it is poorly understood how these preconditioned fault patterns control ambient seismic activity. SeismoTeCH, a project conducted by the Swiss Geophysical Commission (led by swisstopo, Swiss Seismological Survey and University of Bern) will unravel this link, providing opportunities for MSc students to participate. One important question to be solved is: Can near surface fault patterns be used to explain seismicity at depth? Based on remote sensing techniques and fieldwork (aerial photos, DEMs, drone images, ShapeMetrix3D), multi-scale fault maps will be generated and transferred into 3D structural models (MOVE). By fieldwork, deformation style, kinematics and paleo-stresses of individual faults will quantitatively be investigated. This part of the project is supervised by the Structural Geology group of University of Bern. In collaboration with the team from the Swiss Seismological Survey (Tobias Diehl, Federica Lanza), obtained results will then be compared and analysed in terms of recent seismic activity. There is opportunity for different MSc projects since studies can be conducted in a variety of field areas ranging from the Valais to the Grisons.	Prof. Marco Herwegh	BE
☒	☒	☐	☒	☐	New project in Isotope Geology	Topics of interest in Isotope Geology may be discussed with the student.	Prof. Suzette Timmerman	BE
☒	☐	☐	☒	☒	New projects in Carbonate Sedimentology	The research group carbonate sedimentology is focusing on carbonate systems in a broad sense, encompassing the tight interaction between the geosphere and the biosphere. Notably, the research group is putting emphasis on the thorough understanding of reef and mound systems (especially cold-water coral ecosystems in deep environments) through space and time in order to reconstruct palaeo-environmental settings and early diagenetic pathways. Another major focus is the study of microbial carbonates in different settings to reconstruct microbial-induced carbonate diagenetic pathways and the interaction between fluid-flow, petrophysical characteristics and early diagenesis. Many projects are in close interaction with industry and/or framed within international collaborative research efforts. Fieldwork (on land or at sea) is an important component in carbonate sedimentological studies and will be integrated with the potential MSc topics. Students interested in any topics related to the broad domain of 'Carbonate Sedimentology', are mostly welcome to discuss further research possibilities and potential MSc topics with the advisor.	Prof. Anneleen Foubert	FR
☒	☐	☐	☐	☒	New projects in Macropaleontology	The field of macropaleontology pertains to the evolution of invertebrates (e.g., trilobites, brachiopods, ammonites, and bivalves), vertebrates (i.e., fish, amphibians, mammals, birds, and reptiles), and plants. The most important tools for macropaleontologists are comparative anatomy, phylogenetic reconstruction, functional anatomy, histology, and isotope analysis. Fossil material is available for study at numerous Swiss museums, particularly from the Triassic, Jurassic, and Tertiary and a tight network of paleontologists are willing to support a broad pallet of projects. Students are encouraged to discuss potential topics with the adviser to ensure that a topic is found that best suits their interests.	Prof. Walter Joyce	FR
☒	☐	☐	☐	☒	New projects in Micropaleontology	The research group in micropaleontology investigates microfossils and microorganisms possessing biomineralized shells. Stratigraphy based on microfossils is the best tool to date and correlate sediments. Beside this classical aspect of micropaleontology widely applied in both industrial and private sectors, the Micropaleontology group in Fribourg broadly applies geology, sedimentology and geochemistry to reconstruct the environments of the past in collaboration with the international leading scientists in each field. One of the "hot topics" of our research deals with the still poorly known deep-sea cold-water coral ecosystems through space and time. Another important subject that we are currently developing in collaboration with biologists, is the identification of new tools for the biomonitoring of marine coastal pollution based on microorganisms. This approach has recently met the interest of environmental agencies. Students interested to acquire an academic knowledge but also an applied approach are welcome to directly contact the advisor to discuss potential and suitable Master topics.		FR

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☒	☐	☐	☐	☐	Oldest record of brawn frogs from Oligocene of France with exceptional preservation		PD Dr. Davit Vasilyan	FR
☒	☐	☐	☒	☐	Paleoenvironmental conditions in the aftermath of past hyperthermal events (e. g., Paleocene-Eocene Thermal Maximum, Toarcian Oceanic Anoxic Event)		Dr. Alicia Fantasia	FR
☒	☐	☐	☐	☐	Phylogeny of Rhinocerotidae from Aquitanian from Western Europe		Dr. Damien Becker	FR
☐	☒	☒	☐	☐	Research topics in Aqueous Geochemistry	Topics of interest in environmental and aqueous geochemistry may be discussed with the student.	Prof. Anna Lee Harrison PD Dr. Vasileios Mavromatis	BE
☐	☐	☒	☐	☐	Research Topics in Environmental Geochemistry	In addition to offering specific, pre-defined thesis projects, the ERG Speciality offers students the chance to design new projects that fit their scientific interests and career goals. Typically, such projects are attached to large team investigations now being carried out by academics at Bern, in conjunction with industry partners. Current projects include groundwater contamination (e.g. heavy metals), geochemical studies to support selection of radioactive waste repositories, CO2 sequestration, geothermal energy, and genesis of hydrothermal ore deposits. Master theses in these fields may involve combinations of field, analytical, experimental or modelling work. Interested students are welcome to contact Prof. Larryn Diamond. Advisors are members of the Institute of Geological Sciences at Bern and research partners from industry.	Prof. Anna Lee Harrison	BE
☐	☐	☐	☒	☐	Silent Shakers: Uncovering the Mechanics Behind Slow Earthquakes	Project description: The discovery of slow earthquakes at active plate boundaries—seismic events that slip more slowly than typical earthquakes—has reshaped our understanding of how energy is dissipated along major tectonic plate boundaries. One way to increase our understanding of what controls these slow earthquakes is to study exhumed faults and shear zones that potentially formed under these conditions. Some studies have found that slow slip at low stresses is linked to very fine grain-scale deformation processes and fluid flow as well as variations in rock types. In this project, you will investigate the physical and chemical mechanisms governing slow slip earthquakes. This potentially contributes to our understanding of fault mechanics and earthquake hazards. Project tasks: Together with a team of experts from UniBe and UNESCO, your goal is to study the famous natural carbonate mylonites at the Glarus Thrust in the UNESCO World Heritage Site Tectonic Arena Sardona. Thereby showing interplay between fast frictional events manifest by vein formation and slow viscous deformation including the overprint of the veins by dynamic recrystallization at the thrust contact. Owing to a retreating Vorab Glacier, there are worldclass textbook outcrops not having yet been investigated in detail. Through the use of modern unmanned aerial vehicle (UAV; drones), you will digitally map the structures on the freshly glacial polished rock surfaces. Samples will be collected to identify major microstructural domains and overprinting relationships using optical light microscopy, high-resolution SEM, cathodoluminescence microscopy and finally cutting-edge LA-ICP-MS will be applied to obtain the geochemical signature of these rocks. All data will be integrated by comparing the observations in the Alps with active seismic processes along present-day plate boundaries (e.g., Japan, New-Zealand).	Dr. Ismay Vénice Akker Prof. Marco Herwegh	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☒	☐	☐	☐	☐	Skull anatomy of recent Darevkia genus (Lacertidae) with outlook on its rare fossil record	The project will be dealing with the study of the lizard skulls via virtual segmentation of a large μCT-dataset of recent species. The project will aim to study in detail the morphological differences of the lacertid lizards; provide morphology-based analysis of the phylogenetical relationships of species from this group. The project will focus on the very divers genus Darevskia and include further closely related genera. Depending on the progress of the project, fossil remains from the Neogene of Eurasia will be included, to compare and reevaluate previous identifications.	PD Dr. Davit Vasilyan	FR
☐	☐	☐	☒	☐	Storm deposits recorded by Molasse sequences	Orkanartige Wetterbedingungen, wie der Wirbelsturm Katarina (2005 in New Orleans) sind Ereignisse, deren Ablagerungen in der Geologie als Tempestite bezeichnet werden. Sturmereignisse sind aber nicht nur rezent bekannt sondern finden sich in vielen fossilen küstennahen Ablagerungen, wie z.B. der basalen Trias der Zentralschweiz oder der oberen UMM. Besonders die Sturmlagen der UMM sind sehr interessant, finden sich dort doch eine grosse Anzahl von Ereignissen in einer ca. 15 m mächtigen Abfolge, die von der Sturmwellen-Basis bis zum Strand reicht. Mittels Geländeaufnahme (Marbach, Entlebuch) und Laboruntersuchungen (Anschliffe, Radiographie) sollen die einzelnen Ereignisse sedimentologisch charakterisiert werden, sowie eine Abschätzung der Häufigkeit, Intensität und Energie der Sturmereignisse erstellt werden.	Prof. Fritz Schlunegger	BE
☒	☐	☐	☐	☐	Study of a complete skeleton of a dormouse from the Upper Miocene of France		Dr. Olivier Maridet	FR
☐	☒	☐	☒	☐	Subduction zone history of an oceanic slab unit in the tectonic accretionary channel of the Alps	Along the subduction plate interface melange series occur that contain fragments of subducted hydrous oceanic lithosphere, its sedimentary cover, and mantle wedge material, all variably modified in response to fluid-rock interaction during the subduction cycle. The fate of such fragments during subduction and exhumation has remained controversial, however, with models proposing that such fragments remain coherent during the entire cycle and models proposing that the units we now find exposed are the product of late amalgamation during exhumation along the plate interface. This project will investigate in detail one body (to be identified) of hydrous mantle rocks associated with basaltic eclogite and ±sediments from the Central Alps (Ticino) to decipher its metamorphic history during the subduction cycle and to constrain the trace element inventory of the different rock units. Such results are essential to our better understanding of subduction zone geochemical cycling and geodynamics. Sample materials will be collected and detailed outcrop mapping will be performed during field work in the Central Alps; hence, safe mountaineering in steep, pathless terrains is of advantage. Petrographic characterization of thin sections forms the basis for electron probe and laser ablation-ICP-MS measurements and chemical mapping to constrain the petrochemistry of the diverse fragment constituents. Continuing research can focus either on mineral stabilities and transformations employing modelling, on dating subduction metamorphism, or on chemical interactions between different rocks in the oceanic fragment – to be decided according to student's interests.	Prof. Thomas Pettke Prof. Jörg Hermann	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☐	☒	☒	☒	☐	Sulfur and carbon signatures in oceanic lithosphere from the Alpine belt	The oceanic crust and upper mantle undergo significant hydrothermal alteration upon interaction with seawater along mid-ocean ridge spreading centers. During this process sulfur and carbon are incorporated into the altered lithologies and are eventually transported into Earth's interior through subduction. Both sulfur and carbon are essential components in the Earth's system as they occur in mineral phases in rocks, are abundant in ocean water, occur in trace amounts in the atmosphere, and are major constituents of biogenic processes. Thus, it is essential to understand the cycling of these elements between different Earth reservoirs. This project will include field work in exhumed ocean lithosphere lithologies in the Swiss Alps (e.g., Saas-Zermatt Zone, Antrona ophiolite, Platta Nappe). Carbon and sulfur isotope signatures will be used to track the source and speciation of C and S during ocean floor to subduction zone processes. The analytical work will include petrographic characterization of rock samples and the analyses of C and S isotope ratios. Additional analytical methods may include electron microprobe analyses, scanning electron microscopy, Raman spectroscopy, X-ray powder diffraction, and/or laser ablation mass spectrometry. Students interested in this project or in any topic related to alteration of the oceanic lithosphere and fluid-rock interaction processes are welcome to discuss research possibilities with Esther Schwarzenbach.	Prof. Esther Schwarzenbach	FR
☐	☒	☒	☐	☐	Sustainable cements: investigation of the recycling- and CO2 savings potential through the use of calcined clays from secondary raw materials	To achieve the goal of climate-neutral cement by 2050, Swiss cement plants are increasingly relying on the use of calcined clays as clinker substitutes, which can save up to 40% CO2 in the cement production. Beside the reduction in CO2-emission, a further environmental advantage can result if the clay-containing raw materials are not extracted from quarries (primary raw materials), but recycled from mineral waste (secondary raw materials). In Switzerland, gravel washing sludge, a fine residue from gravel processing with a relatively high clay content, is a secondary raw material with high potential for this purpose. Within this MSc thesis, the recycling potential of gravel washing sludge as a raw material for calcined clays will be investigated with laboratory experiments. The main research questions are 1) mineral reactions as a function of temperature 2) reactivity and potential as a clinker substitute material. Beside initial mineralogical-geochemical characterization, the experimental setup involves heating experiments in non-ambient XRD and lab-scale rotary kilns combined with mineralogical analysis and reactivity tests of the calcined material. The understanding of the mineralogical-geochemical material properties of the gravel washing sludge and its calcination and reactivity behavior is key to enable its use on an industrial scale. This applied MSc thesis is thematically embedded in a multi-year research project investigating the recycling potential of secondary raw materials in the cement industry. There will be a close collaboration with cement plants as well as other research institutions in Switzerland (e.g. EMPA).	Dr. Mirjam Wolffers PD Dr. Georgia Cametti Prof. Sergey Churakov	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☐	☐	☐	☒	☐	The Glarus Thrust: an Example of Confined Upflow of Late Hydrothermal Fluids?	Project description: The Glarus Thrust is a major crustal shear zone in the UNESCO natural world heritage Tectonic Arena Sardona. Besides its relevance as textbook example for thrust tectonics it is also well known as synkinematic fluid conduit. With exhumation and ongoing deformation, shearing resulted in continuous embrittlement. This embrittlement might have important consequences for the late circulation of hydrothermal fluids. Field evidence indeed shows discordant alteration structures in the carbonate mylonites, which clearly postdate mylonitic deformation. We therefore hypothesize that parts of the brittle part of the Glarus thrust may in fact present late-stage fault-bound upflow pathways. In this way, the Glarus thrust could present a key structure to gain an improved understanding on the upwelling of hydrothermal fluids, as potentially still occurring at depth along embrittled carbonate hosted fault zones. The findings of this study may therefore have implications for the exploration of such systems for renewable geothermal energy. Project tasks: Together with a team of experts from UniBe and UNESCO, your goal is to map out late-stage fluid conduits and hydrothermal alteration zones. Owing to a retreating Vorab Glacier, there are worldclass textbook outcrops not having yet been investigated in detail. Through the use of modern unmanned aerial vehicle (UAV; drones), you will digitally map the structures and alteration zones on the freshly glacial polished rock surfaces. Samples will be collected to identify major microstructural domains as well as the mineralogy and stable isotopes of the alteration zones. For this purpose, optical light microscopy, high-resolution SEM, cathodoluminescence microscopy, XRD and finally cutting-edge LA-ICP-MS will be applied to obtain the geochemical signature of these rocks. In addition, K-Ar dating of potential fault gouges my shed new light on the stages of embrittlement and hydrothermal fluid circulation. The obtained data can be used for inferences on active hydrothermal circulation along carbonate hosted systems in orogenic hydrothermal plays.	Prof. Marco Herwegh Dr. Ismay Vénice Akker	BE
☐	☒	☐	☐	☐	The Spittellamm-cleft: The history of hydrothermal fluid circulation in open space in the crystalline basement	The Spittellamm-cleft, an Alpine fissure hosted in the Grimsel Granodiorite, was discovered during the construction of the new Grimselsee barrage in July 2019 and then covered. Some isolated cleft material has already been investigated; however, a systematic approach starting with sampling on-site during the planned re-opening in spring 2026 offers unique opportunities to addressing diverse scientific questions relating to fluid circulation and fluid-rock interactions in exhuming orogens. Findings offer relevant constraints not only on fundamental scientific questions, but also on applied topics, including deep basement surface water circulation and geothermal energy. Sample material will be collected at the Spittellamm-cleft (guided by Kraftwerke Oberhasli AG -KWO) and its direct surroundings. The collected materials (minerals, rocks, altered zones) will be characterized petrographically and documented to serve as a collection for later use. Possible projects include stable and radiogenic isotopes of the late-stage cleft materials (e.g., calcite, clays) to trace sources of fluids and dissolved matter in them, to use fluid inclusion systematics to constrain cleft genesis, or radiometric dating to constrain timing of cleft formation in the exhuming Aar massif. Comparison with literature data and/or data/analyses from nearby clefts may also be possible. This project is available with a start in spring 2026, only.	PD Dr. Malte Junge Prof. Thomas Pettke	BE
☐	☐	☒	☒	☐	The subduction plate interface: Geodynamics, chemical cycling and more	In addition to specific, pre-defined MSc projects, research theme proposals by students or together designing a research topic in the broad framework of subduction geochemical cycling are highly welcome. Focus in such projects should be on Geochemistry and Petrology, and they will be collaboratively supervised, involving experts from within the institute that are to be contacted from case to case. Field and analytical techniques are at the core of the research, combined with modelling and possibly some experiments if desirable. See project "The subduction zone history of an oceanic slab unit in the tectonic accretionary channel of the Alps" for an example. Please contact Thomas Pettke for further information.	Prof. Thomas Pettke	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☐	☒	☐	☒	☐	Ti-Clinohumite and Chondrodite dikes in Zermatt: Metasomatism of Ti-rich basalts	The ophiolite rocks of Zermatt are an excellent natural laboratory to study processes during the formation, hydrothermal alteration and subduction of former oceanic crust of the Piemont ocean in the Alpine orogeny. The Piemont ocean was a slow spreading system, in which dykes of gabbros and basalt intruded the mantle rocks. These dykes experienced extensive alteration during seafloor metasomatism leading to rodingites and chlorite-rich rocks, followed by recrystallization during subduction-related metamorphism. Former Ti-rich basalt dikes in the peridotites are metamorphosed to Ti-clinohumite and Ti-chondrotite-rich rocks. The aim of this project is to reconstruct the evolution of this peculiar rock types from the magmatic emplacement at the mid-ocean ridge, to the alteration during sea-floor metasomatism and Alpine recrystallization during subduction. A special focus is placed on the phase relations of Ti-rich minerals and accessory minerals. The project will include fieldwork, petrographic characterization of thin sections, electron microprobe, infrared spectroscopy and laser ablation ICP-MS.	Prof. Jörg Hermann Prof. Daniela Rubatto Dr. Francesca Piccoli	BE
☐	☐	☐	☒	☒	Unveiling the Onset and Long-Term Evolution of Rock Glaciers in Macun, Val Zeznina (GR)	Val Zeznina, located within the Swiss National Park in the canton of Grisons, hosts active rock glaciers that are globally significant as indicators of alpine permafrost and climatic changes. Despite their importance, the timing of their formation and the processes driving their long-term evolution remain poorly understood. Understanding these factors is key to reconstructing the paleoenvironmental conditions of high-altitude regions and the role of permafrost in shaping alpine landscapes. This MSc thesis aims to determine the timing of rock glacier formation in Macun, reconstruct their long-term evolution, and establish their paleoenvironmental context. To achieve this, detailed mapping of the post-Last Glacial Maximum landforms and rock glaciers will be conducted using UAV-derived high-resolution orthoimages and digital elevation models. Samples will be collected from rock glacier boulders for surface exposure dating to constrain the timing of their onset and significant evolutionary phases. Sedimentological and petrographic analyses will be performed to investigate the internal dynamics and long-term stability of these landforms. Finally, the results will be integrated with regional paleoclimatic records to identify links between climate oscillations and rock glacier development. By combining geomorphological, geochronological, and sedimentological approaches, this study will contribute to a deeper understanding of the processes shaping the alpine periglacial landscape. This study aims to uncover the temporal framework and environmental drivers of rock glacier formation in Val Zeznina. The findings will contribute to our understanding of periglacial processes in alpine regions, with implications for reconstructing Quaternary landscape evolution and permafrost dynamics. The MSc student will present their findings at national conferences and submit their thesis in manuscript format, aiming to publish in an open-access scientific journal.	Prof. Naki Akçar	BE
☐	☐	☐	☐	☒	Using cosmogenic nuclides to determine landscape change: amplitude, timing and frequency	This MSc topic spans broad spectrum of geological settings and sites. Depending on the scientific interest, goals and expectations of the MSc student, the specific sub-project will be designed. Each sub-project will consist of fieldwork, laboratory work, modeling and interpretation. Our objective is to determine the landscape change in the selected geological setting and site. To achieve this, MSc. student will do detailed geological mapping (with support of UAV and GIS technologies) and collect samples in the field, prepare samples for analysis of cosmogenic nuclides (10Be, 26Al and 36Cl) in the lab to calibrate the timing, calculate the amplitude and frequency, and model the change. MSc. Student is expected to present his/her research (both the work in progress and results) in national conferences. The ultimate scientific goal would be a publication. Research topics for individual sub-projects may be such as Quaternary glaciations, catchment-wide erosion rates, paleo-erosion rates, paleo-earthquakes, uplift rates (isostatic and neotectonic), paleo-discharge of fluvial systems etc… The sites for these are mainly located in the Alps. The MSc student will present their findings at national conferences and submit their thesis in manuscript format, aiming to publish in an open-access scientific journal.	Prof. Naki Akçar Prof. Fritz Schlunegger	BE

ELE	EM	ERG	GEOL	PAQS	Title	Description	Advisor 1 / 2 / 3	Uni
☒	☒	☐	☒	☐	Xenolith and xenocryst chemistry as potential proxy for diamond grade at the Karowe mine, Botswana	Diamond mines with a significant population of sublithospheric diamonds show a larger abundance of olivine xenocrysts coming from the base of the lithosphere and even extending beyond the Lithosphere-Asthenosphere Boundary (LAB), compared to diamond mines with little or no sublithospheric diamonds. However, it is not yet understood in what lithological host the sublithospheric diamonds are residing and if there is a direct connection between the olivine xenocrysts and sublithospheric diamonds or if they are simply only sampled from the same region but are not genetically related. The aim of this project is to characterize micro-peridotitic xenoliths and xenocrysts from Large Diameter Drilling (LDD) samples from the Karowe diamond mine and determine how much mixing and disruption of diamond-hosting lithologies takes place during kimberlite eruption. The samples are from 12 meter depth intervals in the drill core and show a variation in mineral assemblages and textures. The diamond grades for lithospheric/sublithospheric diamond proportions are known (by De Beers) for each 12 meter depth interval. By connecting the chemistry of the xenoliths and xenocrysts to the diamond information, the following questions can be answered: i) is there a correlation between diamond grade and xenolith/xenocryst chemistry, ii) is there a correlation between lithospheric/sublithospheric diamond proportions and xenolith/xenocryst chemistry, iii) how much mixing is there in the kimberlite or are xenoliths/xenocrysts and diamonds partially staying together during ascent and eruption, iv) what is the density distribution of olivine with depth? The project will include petrographic characterization of selected thin sections, electron microprobe, laser ablation ICP-MS on thin sections and mounts, and potentially Fe stable isotope analyses of selected samples. In collaboration with Dr. Ingrid Chinn, De Beers Group of Companies	Prof. Suzette Timmerman	BE