

Annual Report 2022

Georesources Switzerland Group
Fachgruppe Georessourcen Schweiz (FGS)

March 2023

Acknowledgements

This annual report has been prepared by Dr. Stefan Heuberger (FGS group head) with support of all FGS team members.

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1 The Georesources Switzerland Group

The Georesources Switzerland Group (Fachgruppe Georessourcen Schweiz, FGS) processes information and conducts applied research on Swiss mineral resources and their industrial application on behalf of the federal government and in collaboration with industry partners. Our group forms an associated group in the Department of Earth Sciences and currently has 5 employees. The group is >90% third-party funded (excl. SNF) and currently raises an average annual budget of ca. 650 kCHF.

The close collaboration with the Swiss Geological Survey (Federal Office of Topography swisstopo) provides a financial basis for the long-term focus of our applied research. We focus on collecting and compiling fundamental geological data and data related to the use of the geological resources in Switzerland. Focus areas are (1) non-metallic mineral resources (i.e. gravel, sand, clay, limestone, salt, natural building stones) and (2) reservoir rocks and energy resources in the deep underground. The group maintains a sample and literature archive taken over from the Swiss Geotechnical Commission (SGTK), and makes these data accessible to the public by web services and through the swisstopo web portal map.geo.admin.ch.

Our group has a unique position in this field of applied research in Switzerland - a field that will remain essential in the future. Extraction of raw materials is becoming increasingly complicated because of the scarcity of materials, land use conflicts and several types of emissions. Since Switzerland has neither a hydrocarbon nor a substantial mining industry, fundamental geological data on the deeper underground are still scarce. Switzerland possesses abundant mineral resources, but the country does not have the uniform mineral royalty laws that most other European countries do. Thus, the mineral resources sector suffers from a lack of systematic production and resources data. This hampers the generation of reliable predictions of the national resources supply situation. In this field, our group conducts essential applied research. We process basic geological data to consolidate our knowledge on the Swiss geological underground and to improve the corresponding geodatabases, cartographic tools and 3D models.

georessourcen.ethz.ch/en

erdw.ethz.ch/en/research/associated-groups/fgs.html

2 Projects

2.1 Research projects

2.1.1 Targeting of potential hard rock aggregate units

The construction and maintenance of the Swiss railway and road infrastructure highly depends on the availability of fractured bedrock of highest physical strength and durability, referred to as hard rock aggregates. Lithologies, typically extracted in Switzerland, are siliceous limestone and weakly metamorphic sandstone. In the past decades, Switzerland has seen a dramatic decrease of extraction sites, mostly due to conflicting interests. Quarry operators are therefore struggling to cover the domestic demand of hard rock aggregates.

In collaboration with the Swiss Geological Survey (swisstopo), we develop and maintain a country-wide geospatial database of potential hard rock occurrences. This dataset will support cantonal and federal spatial planners in securing the access to these important raw materials. Our developed standardised evaluation procedure focuses on the estimation of (1) the thickness and orientation and (2) the petro-physical properties of the potential target lithologies. Thickness estimates are based on published geological maps and cross-sections or processed through a Matlab- and python-based routine, which automatically extracts orientation and layer thickness data from the GeoCover geological vector dataset.

Achievements in 2022

- Matlab-based approach to extract layer thickness from geological maps

The manuscript “Automated extraction of orientation and stratigraphic thickness from geological maps” is accepted with minor revision in the Journal of Structural Geology. In the manuscript, we present the Matlab-based approach to automatically extract the orientation (dip direction/dip) and the stratigraphic thickness from a 1:25'000 geological map vector data set of the Swiss Alps. The approach allows a rapid spatial overview on the orientation and thickness of a given geological unit over large regions. Numeric parameters are used to evaluate the reliability and to select high quality model outputs. We describe the approach, highlight its potential and discuss challenges and limitations with well-illustrated examples.

In her MSc thesis, Lorena Juchler successfully developed an alternative approach to automatically extract thickness data based on the field orientation measurement stored in geological maps. These scripts are being integrated into the thickness extraction approach described above.

- Python-based approach to identify relevant hard rock occurrences

We developed several python scripts to automate the production process of the country-wide geospatial database of potential hard rock occurrences. A first set of scripts prepares the input data sets for the automated extraction of orientation and thickness data (see above). In a second set of scripts, the reliability of the automatically extracted thickness model output is assessed. By comparing the model output with literature data (see bullet point below), we select the most reliable thickness estimates. Finally, the automatically and literature-based thickness data are used to identify relevant hard rock occurrences. The approach was successfully tested in central Switzerland. (Fig. 1). Reproducible and objective results generated by the approach will be very helpful in the process of reducing potential conflicts associated with the extraction of hard rock.

- Estimation of thickness and quality (grade) from literature data

We have completed the data compilation of literature data for entire Switzerland. 1875 stratigraphic thickness values and 400 estimates of the proportion of hard rock quality material have been collected from more than 700 documents and for 15 potential hard rock units. The results have been stored in a geospatial database (see paragraph below) and are used to validate the performance of our Matlab approach.

- Field investigations at Swiss extraction sites

Field investigations at all hard rock extraction sites helped to complete and verify our thickness data set and to test the physical properties of the hard rock lithologies (Fig. 2).

In her BSc thesis, Irina Mayer investigated the hard rock potential of the Hohgant Sandstone in the Berner Oberland area. According to her results, the unit is likely to contain sufficiently thick sandstone deposits of hard rock quality in some regions between Entlebuch and Kandersteg.

Project leader: Lukas Nibourel

Project members: Sandra Grazioli, Lorena Juchler (MSc student), Irina Mayer (BSc student), Joël Morgenthaler, Stefan Heuberger

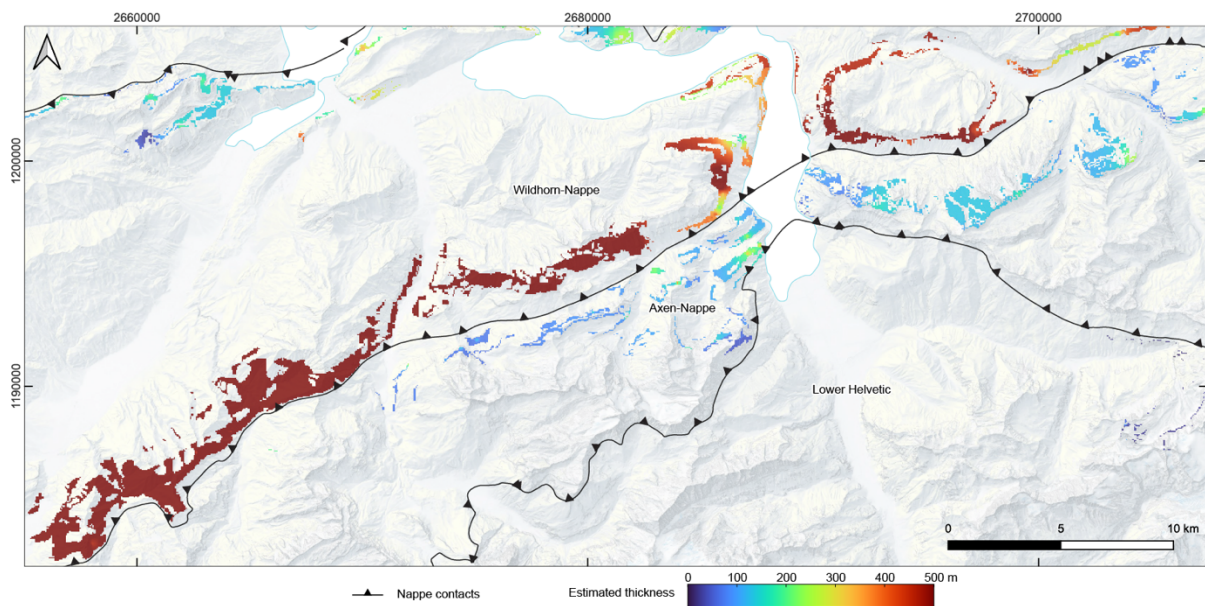


Fig. 1. Map highlighting distinct thickness variations of the Helvetic Kieselkalk Formation in central Switzerland, especially across the nappe boundaries of the Wildhorn and Axen nappes as well as the Lower Helvetic. Areas such as the Lower Helvetic, in which the thickness is lower than 50 m, are considered not relevant for the inventory of potential hard rock occurrences.



Fig. 2. Testing of the physical properties of the Altdorf Sandstone at the Attinghausen extraction site (1.4.2022).

2.1.2 Automated analysis of geoscientific datasets

Based on the Swiss Federal energy strategy 2050, the Swiss Federal Office of Energy (SFOE) and the Swiss Federal Office of Topography (swisstopo) are significantly pushing forward the establishment of a solid geoscientific knowhow pool to further support and enable geothermal exploration projects. A substantial amount of diverse geoscientific data is generated during prospecting and exploration of geothermal projects. These data are collected, compiled and stored by the Swiss Geological Survey and represented the basis of this project that started in 2019 and terminated at the end of 2022. The overall goal was to enable making well-supported predictions for the geothermal potential in Switzerland within the next few years using modern statistical methods.

We were focusing on two subordinate projects. The project planners of geothermal exploration projects should hand in their collected geoscientific data to swisstopo as uniformly, structured and harmonised as possible. In order to ensure this, one subproject aimed at developing specific delivery specifications which agree with the data models of the Swiss Geological Survey as well as with the current geological (measurement) standards. With that, newly acquired data can be easily analysed and processed.

The Swiss Geological Survey hosts a large inventory of comprehensive geological reports and data which are mainly archived as PDF documents and contain essential information about the Swiss subsurface. As a second subproject, we focused on the targeted retrieval and extraction of information starting from these reports. Based on that inventory, we have built a search engine customised to query geological terms. Along this process, semantically similar reports were classified into geoscientific classes using Natural Language Processing methods. And, geological report elements such as borehole profiles, maps and figures were automatically identified, extracted and stored separately for further digitisation.

Achievements in 2022

- Swisstopo webportal tool *swissgeol*
Significant improvements were made by defining the design and by setting up key functionalities (PostgreSQL, GUI). Data from *infogeol* were prepared and migrated. Testing of the different modules is completed.
- Publication of article in Swiss Bulletin of Applied Geology
Our paper (Morgenthaler et al. 2022) on the methods and results of the GAIA project phase 2020/2021 was published in the Swiss Bulletin of Applied Geology (see chap 6).

Project leader: Joël Morgenthaler

2.1.3 Lithium from geothermal brines

The production of geothermal energy, coupled with the extraction of lithium, or other critical metals from deep aquifers could provide, an important economic incentive to scale up geothermal exploration and production in Switzerland. Deep geothermal aquifers are known to occasionally contain significant concentrations of lithium and other critical metals (e.g. in the Upper Rhine Graben). In collaboration with the Swiss Geological Survey and the Swiss Federal Office of Energy, we are evaluating the occurrence and distribution of these metals based on deep well records in Switzerland with a focus on lithium. We review and update the existing hydrogeochemical database by Sonney & Vuataz (2008) with new (post 2007) hydrochemistry well data from geothermal exploration projects and from Nagra exploration wells.

Preliminary results show that Na-Cl brines from Keuper-, Muschelkalk and Permian aquifers in central northern Switzerland have slightly elevated lithium concentrations (5-30 mg/l, Fig. 3). There are two wells with higher concentrations: Pfaffnau (82 mg/l) and Berlingen (144 mg/l). Compared to the

concentrations in the Upper Rhine Graben, reaching up to 150-210 mg/l, the lithium concentrations in the currently available Swiss wells are clearly lower.

Achievements in 2022

- Literature review and compilation lithium concentration measurements from Swiss wells

We have reviewed the literature and web portals regarding ongoing research projects in Europe on the extraction of critical raw materials (i.e. lithium) in Europe. Based on the BDFGeotherm database and an extract of the Nagra well database, we compiled lithium concentrations from all publicly available wells in Switzerland.

- Draft version of report

In December, the draft report (43 p.) "Lithium in geothermal brines – Status report on the current situation in Switzerland and in neighbouring countries" was handed in to swisstopo. It will be published in spring 2023 through the federal administration publication platform ARAMIS.

- Talk at the Swiss Geoscience Meeting in Lausanne

Stefan Heuberger presented this lithium research topic at the 2022 Swiss Geoscience Meeting in Lausanne with a talk titled "Lithium extraction from geothermal brines in Switzerland?".

Project leader: Stefan Heuberger

Project member: Joël Morgenthaler

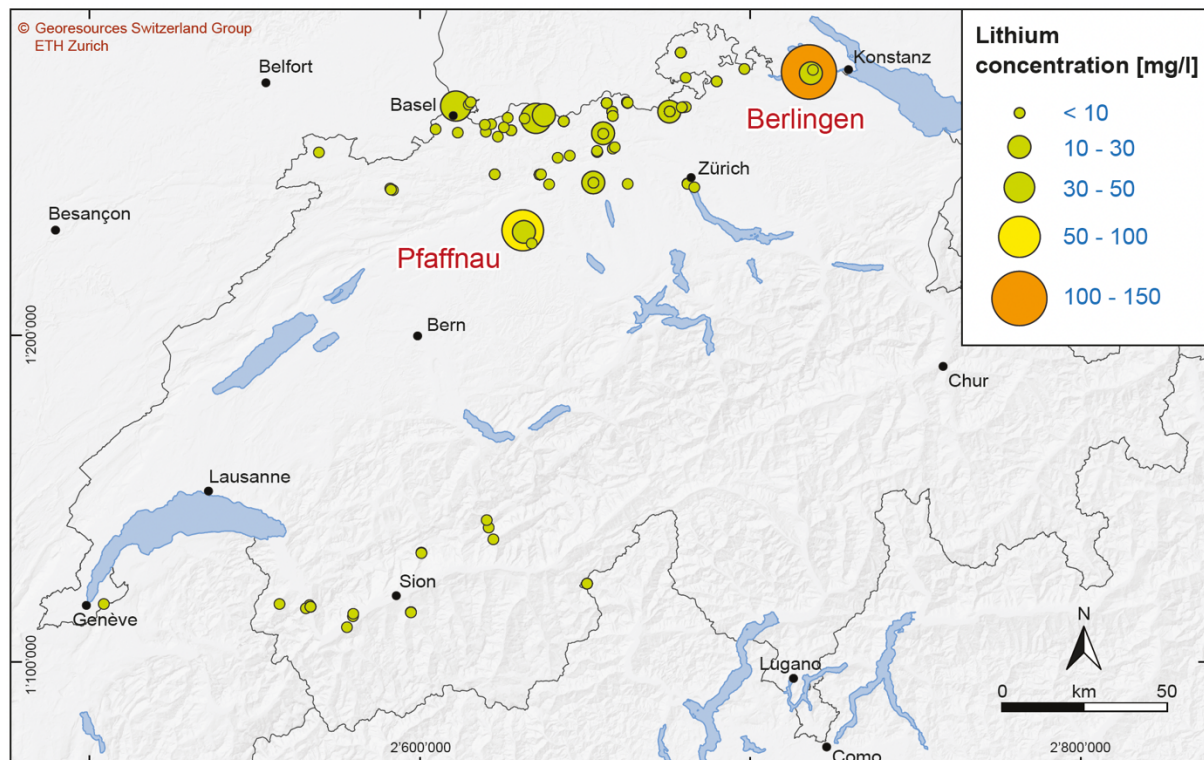


Fig. 3. The 79 well sites with lithium measurements in Switzerland, grouped by the lithium concentration. Note the elevated concentrations at Pfaffnau (82 mg/l) and Berlingen (144 mg/l).

2.2 Service projects

2.2.1 Cartographic earthquake risk visualisation

Since October, we are collaborating with the Swiss Seismological Service (SED) at ETH Zurich and support the production of different sorts of earthquake occurrences and risk maps.

As a first project, led by Michèle Marti (SED), we are developing a fact-based colour representation of the new Swiss earthquake risk model as a map. The SED's new national earthquake risk model combines detailed data on earthquake hazard, the local geological subsurface, the vulnerability of buildings, and the people and values potentially affected by an earthquake. This new model makes it possible for the first time to quantify the impacts of earthquakes in Switzerland.

Achievements in 2022

- Earthquake risk map prototypes

We developed coloured map representations for three earthquake risk model outputs that are based on different risk metrics. We finally chose that map which is based on the risk metric combining the expected number of fatalities with the estimated financial losses due to building damage. By the end of the year, we developed three visualisation variants of this 2 x 2 kilometre grid based map.

Project leader: Donat Fulda

2.2.2 Geological Atlas Map Sheets "Val Bregaglia" and "Campodolcino"

The Val Bregaglia mapping project, mandated by the Swiss Geological Survey (swisstopo), was extended for another two years (2022-2023). We are producing the new geological map sheet "Val Bregaglia" (Geologischer Atlas der Schweiz 1:25'000, sheet 1276) and now also the easternmost third of the neighbouring sheet "Campodolcino", including the corresponding explanatory notes. The field area is located in the Central Alps in southeastern Switzerland (Bergell-Avers area).

The main tasks of this project are the compilation and digitisation of the 200 km² "Val Bregaglia" map sheet, 60 km² of the "Campodolcino" map sheet as well as writing the explanatory notes. The map sheet compilation is based on more than 30 local field mappings mainly carried out by MSc and PhD students during the last 60 years. In addition, we use some published, regional map sheets from the first half of the 20th century. The compilation and digitisation work is done in the ToolMap software, the output is processed with QGIS. Field mapping is carried out in places (1) where detailed mappings are missing or inaccurate, (2) where inconsistencies between map templates occur or (3) to quality check the existing map templates.

The explanatory notes will (1) describe the more than 150 bedrock units and the Quaternary deposits, (2) contain a series of cross-sections, (3) describe the use and occurrence of mineral resources and (4) discuss the tectonometamorphic evolution of the area.

Achievements in 2022

- Digitisation of the map sheet "Campodolcino"

We mapped the Quaternary formations and their boundaries to the bedrock on the "Campodolcino" map sheet. Mapping had to be done from scratch using aerial photographs, the digital elevation model (swissALTI3D) and photographs taken in the field, because the few existing geological maps covering this remote area are of poor accuracy. However, these maps helped to localise the formation boundaries of the Suretta and Avers units and to compare them with the findings of our field work. As a result, the southern part of the Madris valley and thus about half of the "Campodolcino" map sheet could be completed.

- 31 days of field work mainly in Val Madris

We spent more than 30 days in the field mapping the units of the Suretta nappe on the Campodolcino map sheet and verifying existing maps mainly in the Val Madris (Fig. 4). We collected lithological information from more than 1'700 outcrops and took 60 rock samples for thin section and petrological analyses. The Suretta cover units could be mapped entirely. However, the Suretta basement, cropping out in the southernmost and most remote parts of the Madris valley and consisting of a broad variety of schists and gneisses, was only mapped cursorily.

Together with our group's MSc student Maira Coray, we investigated the lithostratigraphy of a mappable, presumably Paleozoic cover formation of the Suretta basement and also mapped the Permian to Mesozoic sedimentary cover units. Maira's MSc thesis focuses on the lithostratigraphic characterisation of the Paleozoic units of the Suretta nappe by field observations and U-Pb zircon dating.

Project leader: Donat Fulda

Project member: Peter Nievergelt, Maira Coray (MSc student)



Fig. 4. Field investigations at the Permian-Triassic boundary of the Suretta nappe cover sequences at Russapass, Val Madris (Avers). Direction of view: SSW.

2.2.3 Natural stones online portal

The ETH Materials Hub (MATHUB) is the materials platform at ETH Zurich which harnesses materials expertise for research and teaching. This knowledge can be publicly accessed via the online materials database Material-Archiv (materialarchiv.ch), a cooperation project of eight Swiss educational and cultural institutions (incl. the ETH library). As part of the MATHUB focus project "Naturstein", initiated in 2016, we are producing fact sheets on natural stones in collaboration with the MATHUB and with support of the Swiss Natural Stone Association (NVS). We are responsible for editing new contributions and reviewing existing ones. The former Swiss Geotechnical Commission (SGTK) and today our group

compiled fact sheets for all natural stones currently quarried in Switzerland. In 2019, the focus was extended to include natural stones from abroad that are either used in contemporary architecture or are of historical significance although some of which are no longer mined today. Furthermore, we compose explanations of geological terms.

Achievements in 2022

- New fact sheets on quarried natural stones

We reviewed the fact sheets of 15 quarried natural stones like for example the Sardinian granite “Rosa Sardo” already used in prehistoric times, the blue Proterozoic quartzite “Azul Macaubas” from Brazil and the Pleistocene breccia “Ceppo di Gré” quarried in northern Italy.

Project leader: Donat Fulda

Project member: Sandra Grazioli

2.2.4 Resources Information System (RIS)

We are running a freely accessible web portal (map.georessourcen.ethz.ch) providing detailed information on occurrences and extraction sites of mineral resources in Switzerland. This includes data on cement raw materials, brickyard raw materials, crushed stones, natural building stones, gypsum and salt, all of which currently being extracted in Switzerland. Furthermore, the RIS also contains data on currently not produced mineral resources like energy resources, metals and metallic ores. The RIS thus represents a platform that aggregates comprehensive information on mineral resources at a national scale. In addition, the RIS is mutually linked with the web portal of the Federal Office of Topography [swisstopo map.geo.admin.ch](http://swisstopo.map.geo.admin.ch).

Achievements in 2022

- Providing feedback to user requests

We provided individual feedback on user requests related to data published on the RIS. The enquiries covered a wide range of topics such as the availability of clay occurrence maps in Switzerland, raw material occurrences in the Surselva area as part of an exhibition or extraction volumes of raw materials on a cantonal scale.

- Keeping RIS up to date

In January, the RIS webserver technologies were completely updated and a few necessary content-related and technical updates of the RIS have been carried out during the year.

Project leader: Donat Fulda

3 Funding

3.1 Framework agreements

Project	Sponsor	Runtime	Budget
Teaching contribution to D-ERDW	D-ERDW	ongoing	50 kCHF/y
Long-term swisstopo framework agreement	swisstopo	ongoing	200 kCHF/y
Long-term SED (Swiss Seismological Service) framework agreement	SED	Since 10.2022	22 kCHF/y
Total			272 kCHF/y

3.2 Applied research projects

Project	Sponsor	Runtime	Budget
Assessment of mineral resources of Switzerland	swisstopo & SFOE	2018-2031	1'450 kCHF
Automated analysis of geothermal exploration data of Switzerland	swisstopo & SFOE	2018-2022	500 kCHF
Semi-automated mapping of hard rock lithologies of Switzerland	swisstopo	2023	95 kCHF
Mapping of Geologischer Atlas map sheet "Campodolcino"	swisstopo	2022-2023	80 kCHF
Compilation of Swiss borehole data regarding lithium content	swisstopo & SFOE	2022-2023	52 kCHF
Evaluation of HTC coal storage sites in Switzerland	industry sponsor	2023	98 kCHF
Total			2'275 kCHF

3.3 Service projects

Project	Sponsor	Runtime	Budget
Characterisation of natural building stones	ETH MatHub & NVS	2018-2023	35 kCHF
Total			35 kCHF

4 Personnel

Employee	Function	max. contract/funding until	Pensum
Dr. Stefan Heuberger	Group Head, Senior Scientist Technology	permanent	80%
Donat Fulda	Technical Specialist II	permanent	80%
Dr. Lukas Nibourel	Scientific Assistant II	02/2029 / 12/2031	80%
Joël Morgenthaler	Scientific Assistant I	01/2023	100%
		Total FTE	3.4
Sandra Grazioli	Hilfsassistentin	until 05/2022	20%
Maira Coray	Hilfsassistentin	until 06/2023	20%
		additional FTE	0.4

Guest	Function
Peter Nievergelt	third-party collaborator



Fig. 5. One-day excursion «Erdwissenschaftliche Exkursionen I – Glarnerland» in the Landesplattenberg slate quarry in Engi (Glarus area), 20.5.2022.

5 Teaching and public outreach

5.1 Teaching at D-ERDW and other universities

Stefan Heuberger

Course title	Level	ECTS	Comments
Integrierte Erdsysteme III	BSc	5	main responsibility
Erdwissenschaftliche Exkursionen I - Glarnerland	BSc	1	main responsibility
Erdwissenschaftliche Exkursionen I - Gotthard	BSc	1	lead: L. Nibourel
Feldkurs II Sedimente, Gemmipass	BSc	3	lead: V. Picotti
Signal propagation in source to sink for the future of earth resources and energies	PhD		Horizon2020 proj., supporting contribution to Uni. Bern (Prof. F. Schlunegger)

Donat Fulda

Course title	Level	ECTS	Comments
Swiss Alpine Archaeology Summer School	MSc	3	run Uni Bern & Uni Zürich
Geological city excursion in Zürich	public		by focusTerra

Lukas Nibourel

Course title	Level	ECTS	Comments
Erdwissenschaftliches Kartenpraktikum I	BSc	2	lead: J. Ruh
Rock and Soil Mechanical Lab Practical	MSc	3	lead: L. de Palézieux & C. Madonna
Erdwissenschaftliche Exkursionen I - Gotthard	BSc	1	main responsibility
Erdwissenschaftliche Exkursionen I - Glarnerland	BSc	1	lead: S. Heuberger

Sandra Grazioli

Course title	Level	Comments
Geological city excursion in Zürich	public	in collaboration with focusTerra

Maira Coray

Course title	Level	Comments
Geological city excursion in Zürich	public	In collaboration with focusTerra

5.2 MSc projects

Project	Runtime
Reconstruction of the lithostratigraphy of the Paleozoic units of the Suretta Nappe by U-Pb dating of detrital zircons. MSc candidate: Maira Coray. Supervision: Stefan Heuberger , Andrea Galli, Donat Fulda , Peter Nievergelt	HS 2022 - FS 2023
Age and temperature conditions of folding and thrusting in the Säntis Nappe and the adjacent Subalpine Molasse from U-Pb dating and clumped isotope thermometry. MSc candidate: Gillian Iten. Supervision: Stefan Heuberger , Lukas Nibourel , Stefano Bernasconi, Nathan Looser	FS 2021 - FS 2022
Automated Extraction of Layer Thickness Information from Geological Maps for the Rapid Evaluation of Mineral Occurrences. MSc candidate: Lorena Juchler. Supervision: Stefan Heuberger , Lukas Nibourel , Jonas Ruh	FS 2022

5.3 BSc projects

Project	Completed
High-quality sandstones for the use as hard rock aggregates - petrophysical properties of the Hohgant-Sandstone BSc candidate: Irina Mayer. Supervision: Lukas Nibourel (main) & Stefan Heuberger	FS 2022



Fig. 6. One-day excursion «Erdwissenschaftliche Exkursionen I – Glarnerland» at the Lochsiten UNESCO world heritage outcrop on 20.5.2022.

6 Publications

Papers

- Heuberger, S., Nibourel, L., Fulda, D. & Vernooij, M.** (2022). 120 years of georesources research in Switzerland: the Swiss Geotechnical Commission (1899-2018). *Swiss Journal of Geosciences* 115:10.
- Morgenthaler, J., Frefel, D., Meier, J., Oesterling, N., Perren, G. & Heuberger, S.** (2022). Revalue Geoscientific Data Utilising Deep Learning. *Swiss of Bulletin of Applied Geology* 27/1, 45-55.

Papers *(accepted)*

- Nibourel, L., Morgenthaler, J., Grazioli, S., Schumacher, I., Schläfli, S., Galfetti, T. & Heuberger, S.** *(accepted)*. Automated extraction of orientation and stratigraphic thickness from geological maps. Submitted to *Journal of Structural Geology*.

Abstracts (Talks)

- Heuberger, S., Morgenthaler, J. & Galfetti, T.** (2022). Lithium extraction from geothermal brines in Switzerland? Abstract 20th Swiss Geoscience Meeting, Lausanne, 2022.
- Iten, G., Nibourel, L., Looser, N., Guillong, M., Tavazzani, L., Bernasconi, S. M. & Heuberger, S.** (2022). Age and temperature conditions of folding and thrusting in the Säntis Nappe and the adjacent Subalpine Molasse from calcite U-Pb dating and clumped isotope thermometry. Abstract 20th Swiss Geoscience Meeting, Lausanne, 2022
- Juchler, L., Nibourel, L., Morgenthaler, J., Coray, M., Galfetti, T., Schläfli, S., Baland, P., Ruh, J. & Heuberger, S.** (2022). Stratigraphic thickness variations of the Helvetian Kieselkalk in Central Switzerland: new, automatically extracted data based on geological vector data and orientation field measurements. Abstract 20th Swiss Geoscience Meeting, Lausanne, 2022.
- Morgenthaler, J., Oesterling, N. & Heuberger, S.** (2022). Revalue geoscientific archive data utilising Machine Learning. Abstract 20th Swiss Geoscience Meeting, Lausanne, 2022
- Nibourel, L., Coray, M., Grazioli, S., Morgenthaler S., Schläfli S., Schumacher I., Galfetti T. & Heuberger, S.** (2022). Towards a faster identification of relevant mineral occurrences: the hard rock example. Invited talk at the swisstopo Rohstoff-Kolloquium, Wabern, 8.4.2022

CAS Thesis

- Morgenthaler, J.** (2022). Reliability assessment of automatically extracted thickness data from geological maps. CAS Spatial Information Systems. Project Thesis

Fact sheets

Rocks

- Material-Archiv (2022). Azul Macaubas. materialarchiv.ch/de/ma:material_299 [last retrieved: 15.3.2023]
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Material-Archiv (2022). Bauhaus-Travertin. materialarchiv.ch/de/ma:material_273ddd38-ff09-4dcc-8bcc-01f29bce8ff9 [last retrieved: 15.3.2023]

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Material-Archiv (2022). Wachenzeller Dolomit. materialarchiv.ch/de/ma:material_1997 [last retrieved: 15.3.2023]



Fig. 8. Mapping course (Feldkurs II Sedimente) on the Gemmi pass. Note the group of students on the Gemmi fault running from the lower left to the upper right of the picture. View towards SE (9.9.2022).

7 Committee memberships

Organisation	FGS member	Function	Period
Paul Niggli Foundation	S. Heuberger	board member	2022-today
KBGeol (Federal Coordination Body for Geology)	S. Heuberger	member without voting rights	2021-today
NEROS (Network for Mineral Resources in Switzerland)	S. Heuberger	member of the steering committee	2019-2022
SASEG (Swiss Association of Energy Geoscientists)	S. Heuberger	member of the steering committee	2019-2022
NVS (Natural Building Stones Association Switzerland)	D. Fulda	member of the quarry commission	2018-today
SGPK (Swiss Geophysical Commission)	S. Heuberger	visiting guest	2017-today

FGS Fachgruppe
Georessourcen
Schweiz

ETH Zurich
Department of Earth Sciences
Georesources Switzerland Group
Sonneggstrasse 5, NO F 35
8092 Zurich

georessourcen.ethz.ch/en
erdw.ethz.ch/en/research/associated-groups/fgs.html

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