
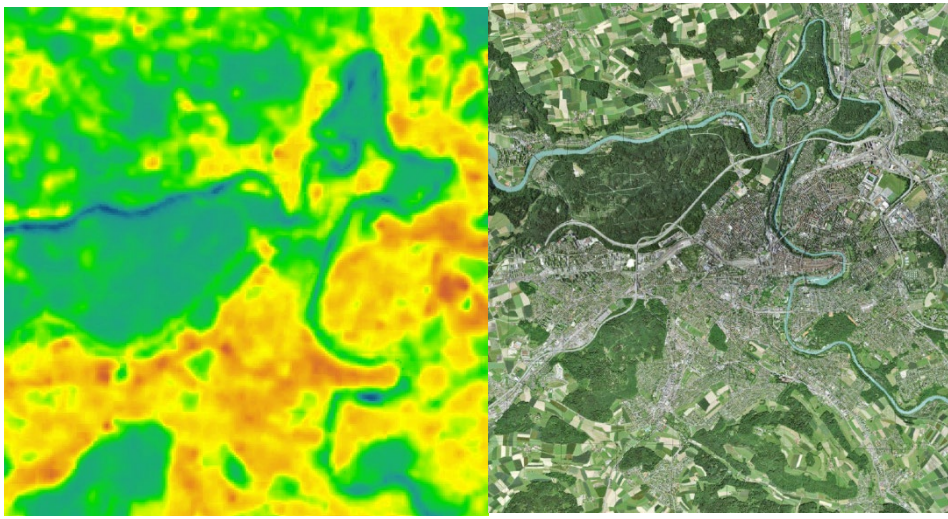


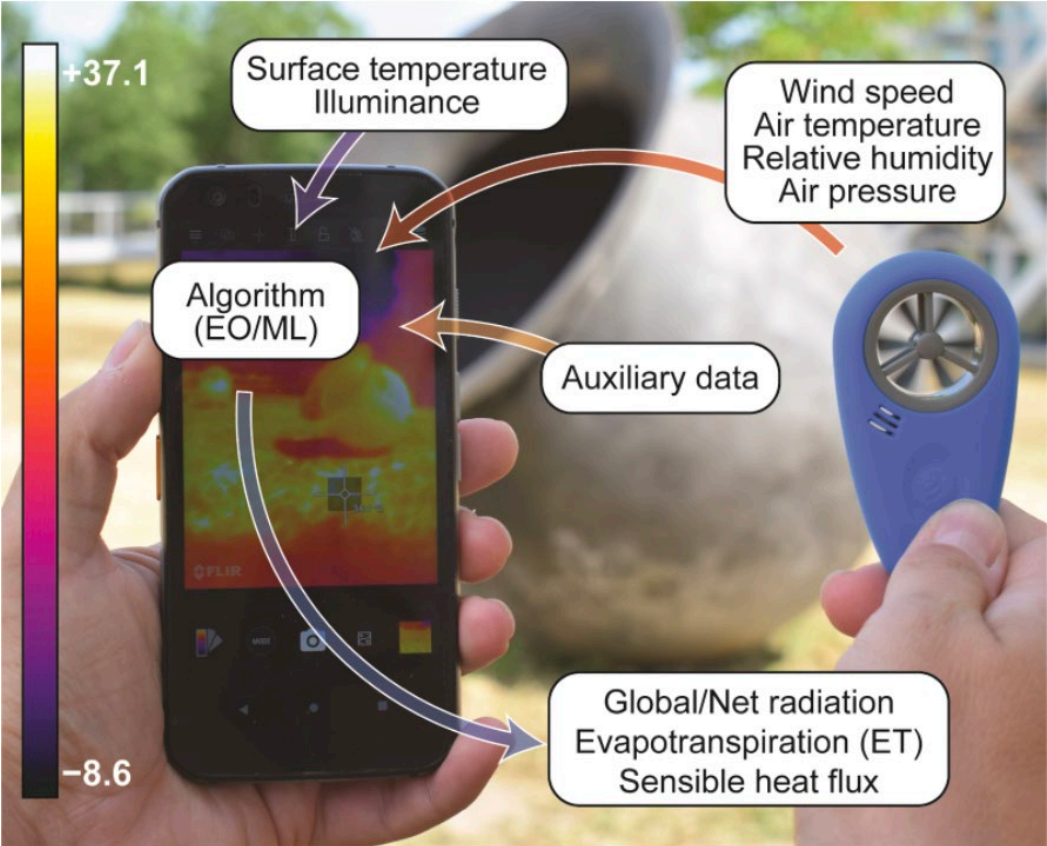
# Urban climate

<b>Title</b>	<b>UrbanLab Viererfeld</b>
Level	BSc or MSc
Prerequisites	Statistics (basics), GIS (basics), interest in inter- and transdisciplinary approaches
Methods	Measurements, statistical analyses, GIS-based mapping, interviews, surveys, etc.
Description	<p>The Vierer- and Mittelfeld, situated at the northeastern edge of the Länggasse, shall be transformed into housing complex for ca. 3000 people over the next 5-10 years. As a showcase for urban densification and socio-ecological sustainability, it offers unique potentials for transdisciplinary research on sustainable urban development. Taking this opportunity, different research groups of the GIUB and OCCR have, together with various stakeholders (e.g., Stadtgrün, Tiefbauamt, Quartierverein, Gymnasium Neufeld, PHBern, BFH), recently launched the “UrbanLab Viererfeld”, which also got funded by <a href="#">“Engaged UniBE”</a> initiative. In this context, multiple possibilities for BSc and MSc thesis topics arise – using different methodologies and often in collaboration with other research units and stakeholders:</p> <ul style="list-style-type: none"> <li>- Collection and analysis of environmental data serving as a basis for monitoring and modelling (e.g., measuring air pollution, soil temperatures, subsurface water flows ...)</li> <li>- Mobility and connectivity analyses focussing on pedestrians and public transportation (e.g., using GIS, statistics, surveys, ....)</li> <li>- Analyses of social perceptions, framings, and appraisals of the Viererfeld and its surroundings across different segments of the Bernese population (e.g., using surveys, interviews, participative approaches with young people, ...)</li> <li>- Potentials and challenges of citizen science in climate-sensitive urban development (e.g., with surrounding neighbourhood, upper secondary school classes from Gymnasium Neufeld, ...)</li> </ul> 
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Advisors	<p>Prof. Dr. Edouard Davin (Wyss Academy for Nature), <a href="mailto:edouard.davin@unibe.ch">edouard.davin@unibe.ch</a>          Dr. Moritz Burger, <a href="mailto:moritz.burger@unibe.ch">moritz.burger@unibe.ch</a>          Patrick Bigler, <a href="mailto:patrick.bigler2@unibe.ch">patrick.bigler2@unibe.ch</a></p>

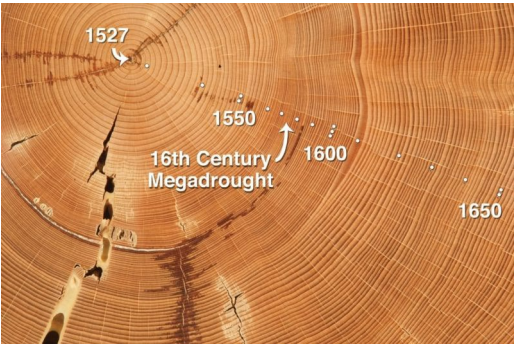
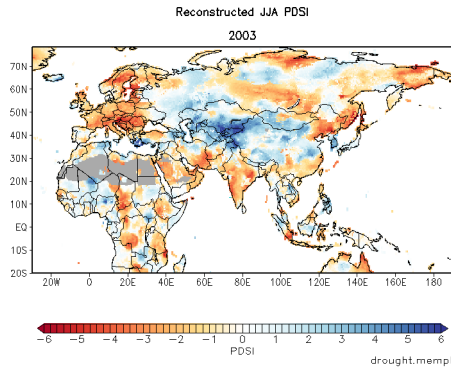
<b>Title</b>	<b>Mobile Measurement Tower</b>
Level	BSc
Prerequisites	R (basics); interest in climatology/meteorology and in fieldwork
Methods	Statistical analyses (R), fieldwork (micrometeorological measurements)
Description	<p>Despite a growing number of monitoring networks and sensor types, micrometeorological measurements within the near-surface urban atmosphere remain challenging due to high costs and rare intercomparison sites within cities. To gain more detailed information about the vertical structure of the urban canopy layer and to compare different measurement approaches (e.g., air temperature, surface temperature) in different urban environments, a low-cost mobile measurement tower has been recently constructed. Further, we conducted some pilot measurements in August 2025. We are looking for 1-2 motivated BSc students to do additional measurements (in fall or winter) and to further analyse the data already collected... The specific topic can be discussed based on individual ideas and preferences (e.g., effect of green surfaces, impacts of meteorological conditions, ...)</p> 
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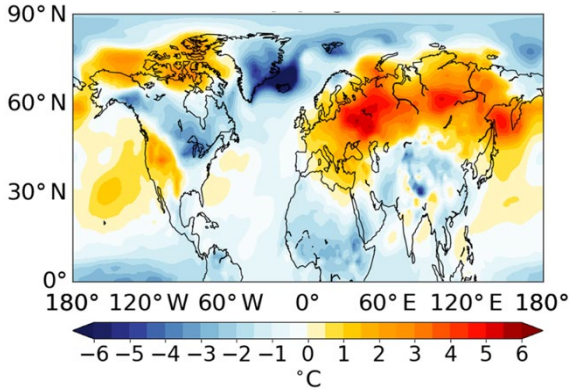
<b>Title</b>	<b>Detecting Urban Water Stress via Land Surface Temperatures</b>
Level	MSc
Prerequisites	Background in statistical or machine learning-based modelling, experience working with R or other data science tools, interest in remote sensing and urban climatology
Methods	This project will develop a machine learning-based method that estimates a potential ("moist") LST, using ECOSTRESS LST data, paired with climate variables and a set of time-invariant layers that characterise urban land surface properties.
Description	<p>Land surface temperatures (LST) can be sensed from space. They reflect climatic conditions at the land surface (air temperature, radiation), and surface properties. The clue is that they also reflect to what extent water vapour fluxes cool surfaces and that plants have a strong influence on them. Hence, the activity of plants and the degree to which they are water limited have an imprint on remotely sensed LST. This is of special importance for blue-green infrastructures being increasingly implemented in urban areas to mitigate urban heat stress (e.g., green roofs). The challenge is to disentangle this signal from large-scale satellite data. If a solution is found, it will yield a novel approach for interpreting high resolution LST data for informing our understanding of vegetation water stress in cities. The aim of this MSc thesis is to develop and evaluate a quantitative method for measuring the degree of vegetation water limitation effects on LST in cities, thereby deriving a spatial picture of water limitation across the urban landscape.</p> 
Supervisors	Prof. Dr. Benjamin Stocker, <a href="mailto:benjamin.stocker@unibe.ch">benjamin.stocker@unibe.ch</a> Prof. Dr. Stefan Brönnimann, <a href="mailto:stefan.broennimann@unibe.ch">stefan.broennimann@unibe.ch</a>
Advisors	Prof. Dr. Edouard Davin (Wyss Academy for Nature), <a href="mailto:edouard.davin@unibe.ch">edouard.davin@unibe.ch</a> Dr. Moritz Burger, <a href="mailto:moritz.burger@unibe.ch">moritz.burger@unibe.ch</a>

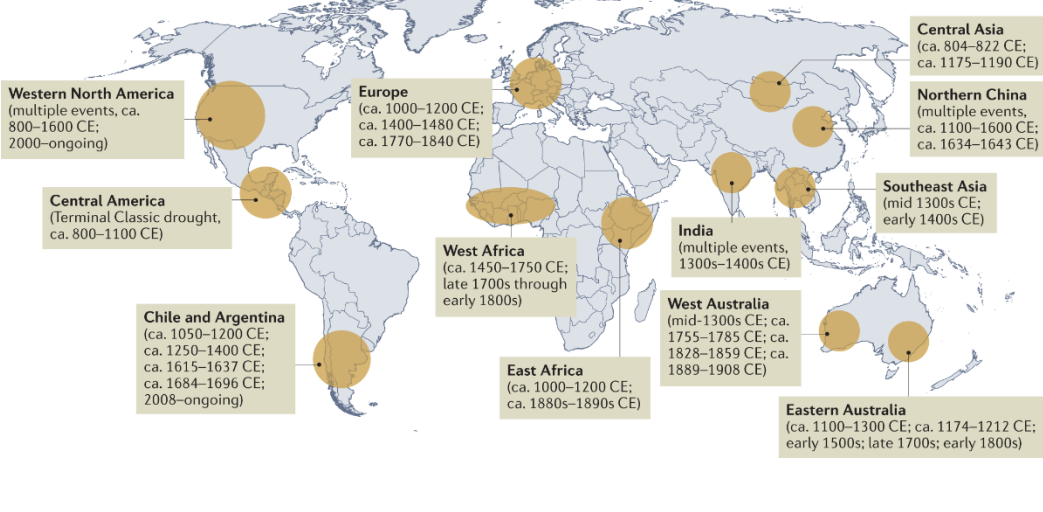
<b>Title</b>	<b>Low-Cost Carbon Sensing – Benchmarking the LI-COR Carbon Node at a Swiss FluxNet Station</b>
Level	BSc
Prerequisites	<b>Immediate Start!</b> Interest in meteorological fieldwork, technical skill and data analysis
Methods	Statistical analyses (R or Python), fieldwork (micrometeorological measurements)
Description	<p>This Bachelor thesis focuses on the performance evaluation of our new LI-COR Carbon Node, an emerging low-cost solution for carbon dioxide monitoring. The project involves conducting parallel measurements at the official Swiss FluxNetstation in Oensingen (CH-OE2) to compare the node's output with high-precision reference data from established eddy covariance instrumentation. Using statistical methods, the student will assess the measurement accuracy, stability, and potential environmental dependencies of the sensor. The results will help determine the reliability of such low-cost nodes for dense environmental monitoring networks. This project offers practical experience in field-based climate science, sensor calibration, and rigorous data analysis.</p> <div data-bbox="357 674 1417 1144"> <p>The Carbon Node uses a single sensor - the LI-720 Carbon Flux Sensor - to deliver accurate, actionable carbon dioxide flux measurements. It also offers a variety of complementary measurements, such as latent heat flux, sensible heat flux, and other biomet measurements for better insight into your ecosystem. Easy to install or move, data is sent automatically to cloud-based software from the sensor and is accessible in minutes.</p> </div>
Supervisors	Dr. Jörg Franke, <a href="mailto:joerg.franke@unibe.ch">joerg.franke@unibe.ch</a>
Advisors	Patrick Bigler, <a href="mailto:patrick.bigler2@unibe.ch">patrick.bigler2@unibe.ch</a>

Title	Smartphone-based evapotranspiration estimation
Level	MSc
Prerequisites	Technical and programming skills to create the low-cost measurement system mobile phone app. Statistical basics to validate measurement. Interest in urban climatology.
Methods	Field measurements, statistical modelling and model validation.
Description	<p>As part of this master's thesis, the smartphone-based method for estimating evapotranspiration (ET) developed by Teuling et al. (2024) will be implemented and validated at a new location. First, the low-cost measurement system, consisting of a smartphone-based thermal sensor for surface temperature measurement, an integrated light sensor for global radiation estimation, and external Bluetooth sensors for meteorological parameters (air temperature, relative humidity, air pressure, wind speed), must be built in form of a mobile phone app. The original study showed promising results with mean RMSE values of 0.10 and 0.05 mm h<sup>-1</sup> compared to lysimeter and eddy covariance measurements, respectively. High-precision eddy covariance measurements at a Swiss reference station will serve reference measurements to validate the new smartphone-based ET estimates. This validation strategy will make it possible to evaluate the performance and transferability of the cost-effective approach under different climatic and vegetation-related conditions and to identify site-specific calibration requirements.</p> 
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Advisor	Patrick Bigler, <a href="mailto:patrick.bigler2@unibe.ch">patrick.bigler2@unibe.ch</a>

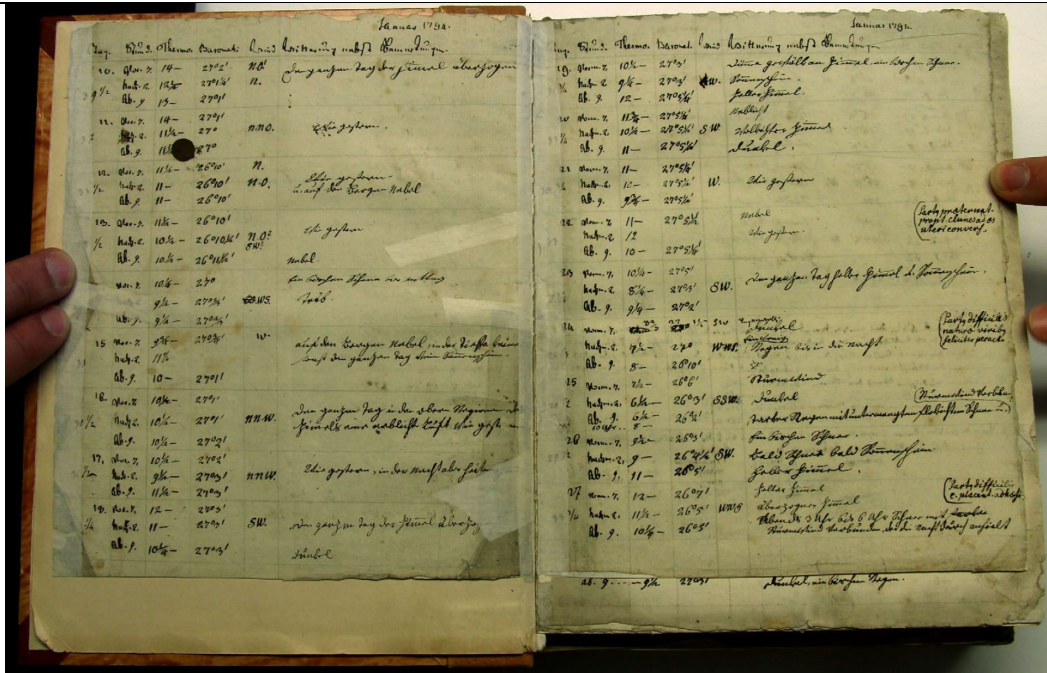
# Climatology

<b>Title</b>	<b>Tree-Ring Based Drought Reconstruction Using Potential Cumulative Water Deficit (PCWD)</b>	
Level	MSc	
Prerequisites	Statistics (basics), R or Python (basics)	
Methods	Statistical analyses, especially regression	
Description	<p>Traditional dendrochronological drought reconstructions have predominantly relied on correlating tree-ring width measurements from moisture-limited trees with the Palmer Drought Severity Index (PDSI) to extend drought records into pre-instrumental periods. While this approach has provided valuable insights into long-term drought variability, the PDSI's standardized framework spanning -10 (dry) to +10 (wet) may not fully capture the physiological water stress responses that directly influence tree growth. This master thesis proposes an innovative methodological advancement by employing Potential Cumulative Water Deficit (PCWD) as the target drought metric for tree-ring based reconstructions. Unlike PDSI, PCWD measures drought severity through maximum accumulated water deficit values, providing a direct indicator of meteorologically induced water stress that more closely aligns with the physiological mechanisms driving tree growth responses to drought conditions. The research will analyze tree-ring chronologies from moisture-sensitive species and develop statistical relationships between ring-width variations and PCWD indices. By utilizing PCWD's cumulative deficit approach and comparisons with PDSI reconstruction, this study will contribute to improved understanding of long-term drought.</p>	
		
Supervisors	Dr. Jörg Franke, <a href="mailto:joerg.franke@unibe.ch">joerg.franke@unibe.ch</a>	
Advisor	Prof. Dr. Benjamin Stocker, <a href="mailto:benjamin.stocker@unibe.ch">benjamin.stocker@unibe.ch</a>	


<b>Title</b>	<b>High-latitude winter warming after volcanic eruptions in large ensemble simulations</b>	
Level	MSc	
Prerequisites	Basic knowledge and interest in paleo-climatology and atmospheric dynamics. Basics in data analysis with R or Python. Willingness to work with large data sets.	
Methods	Statistical analysis of a model simulations ensemble	
Description	<p>This thesis will investigate the possible mechanisms driving the controversially discussed post-volcanic winter warming at high latitudes through analysis of a large ensemble of climate model simulations spanning multiple major eruptions. By utilizing ensemble modeling approaches, we aim to quantify the relative contributions of different physical processes—including stratospheric aerosol radiative forcing, Arctic Oscillation modulation, polar vortex dynamics, and ocean-atmosphere teleconnections—to the development of a warming signal. The large ensemble framework will enable robust statistical analysis of the likelihood for a warming, its magnitude and persistence while accounting for internal climate variability, allowing us to isolate the volcanic signal from natural fluctuations. Through systematic analysis across different eruption magnitudes and seasonal timing, this research will advance our understanding of volcano-climate interactions and improve predictive capabilities for post-eruption climate anomalies in polar regions.</p>	
		
Supervisors	Dr. Jörg Franke, <a href="mailto:joerg.franke@unibe.ch">joerg.franke@unibe.ch</a>	
Advisor	Dr. Ralf Hand, <a href="mailto:Ralf.Hand@dwd.de">Ralf.Hand@dwd.de</a>	


Title	<b>The West African megadrought of the late 18<sup>th</sup>/early 19<sup>th</sup> century.</b>
Level	MSc
Prerequisites	climatology, R, statistics
Methods	Statistical analyses
Description	West Africa suffered from a long-lasting drought from around the 1780s to the 1820s, although the evidence is scarce. The goal of the thesis is to analyse this drought event in our new family of climate reconstructions as well as climate model simulations and complement this analysis with additional sources on climate in Africa during this period. Furthermore, the drought event and its consequences should be analysed in a historical context.
	 <p>The map displays several regions with callout boxes detailing drought events:</p> <ul style="list-style-type: none"> <li><b>Western North America:</b> (multiple events, ca. 800–1600 CE; 2000–ongoing)</li> <li><b>Central America:</b> (Terminal Classic drought, ca. 800–1100 CE)</li> <li><b>Chile and Argentina:</b> (ca. 1050–1200 CE; ca. 1250–1400 CE; ca. 1615–1637 CE; ca. 1684–1696 CE; 2008–ongoing)</li> <li><b>Europe:</b> (ca. 1000–1200 CE; ca. 1400–1480 CE; ca. 1770–1840 CE)</li> <li><b>West Africa:</b> (ca. 1450–1750 CE; late 1700s through early 1800s)</li> <li><b>East Africa:</b> (ca. 1000–1200 CE; ca. 1880s–1890s CE)</li> <li><b>Central Asia:</b> (ca. 804–822 CE; ca. 1175–1190 CE)</li> <li><b>Northern China:</b> (multiple events, ca. 1100–1600 CE; ca. 1634–1643 CE)</li> <li><b>India:</b> (multiple events, 1300s–1400s CE)</li> <li><b>West Australia:</b> (mid-1300s CE; ca. 1755–1785 CE; ca. 1828–1859 CE; ca. 1889–1908 CE)</li> <li><b>Eastern Australia:</b> (ca. 1100–1300 CE; ca. 1174–1212 CE; early 1500s; late 1700s; early 1800s)</li> <li><b>Southeast Asia:</b> (mid 1300s CE; early 1400s CE)</li> </ul>
Supervisor	Prof. Dr. Stefan Brönnimann, room 506, <a href="mailto:stefan.broennimann@giub.unibe.ch">stefan.broennimann@giub.unibe.ch</a>


Title	Homogenising long Swiss meteorological series
Level	MSc
Prerequisites	climatology, R, statistics
Methods	Statistical analyses
Description	Switzerland has several long meteorological series. The longest four series from Basel, Geneva, Bern, and Zurich reach back to the 1750s. These were re-digitised and homogenised in a recent project. In that project we digitised many more series, most of them short. However, long records could also be generated for Schaffhausen (starting 1794), Aarau (1807), St. Gall (1812), Fribourg (1822), and Lucerne (1826). The task would be to process and homogenize the series to obtain another set of long meteorological series of pressure and temperature.
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# History

Title	<b>Landschaftswandel Schweiz</b>
Level	MSc/BSc
Prerequisites	BSc Geography
Methods	Vergleichende Studien mit Glasdiasammlung, Archivarbeit
Description	Das Geographische Institut verfügt über eine Sammlung von gegen 10'000 Glasdias, die in den letzten Jahren digitalisiert wurden, ebenso über eine umfangreiche Kartensammlung. Anhand dieser Bilder und Karten sowie weiterer Quellen soll der Landschaftswandel in der Schweiz, insbesondere im Kanton Bern charakterisiert und genauer dargestellt werden.
	
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Title	<b>Caecilie von Rodt and our Glasdia collection</b>
Level	BSc
Prerequisites	Human Geography
Methods	Archive and literature work
Description	Caecilie von Rodt was a Bernese traveller, photographer and author. Between 1890 and 1908 she travelled around the world three times and undertook many other, long voyages, often alone. She published several books and numerous articles. A note found in the Bern Historical Museum say that she had given her photographs to the Institute of Geography. A quick look through our (nearly undocumented) collection of Glasdias shows only few matches. The goals of this thesis would be a more systematic search of the traces of Caecilie von Rodt in our collection and at the same time a contribution to a better documentation of our collection.
	
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Title	<b>Does the GIUB have a colonial history?</b>
Level	MSc/BSc
Prerequisites	Human Geography
Methods	Archive and literature work
Description	<p>In 2024/5 the Geographical Society has organised four excursions related to the colonial history of Switzerland and the role of geography. Even in Switzerland geography engaged with the science in colonial countries, participated in expeditions and perpetuating colonial thinking through presentations and publications. Does geography in Bern have a colonial history? Based on some preliminary work on the Geographical Society of Bern, the scope could be expanded to a more systematic study and to the Institute of Geography.</p>
	 <p style="text-align: right;">Tafel II.</p>
Supervisor	Prof. Dr. Stefan Brönnimann, room 506, <a href="mailto:stefan.broennimann@giub.unibe.ch">stefan.broennimann@giub.unibe.ch</a> PD Dr. Jeannine Wintzer

Title	Erwin Genge – ein Geologiestudium Anfang des 20. Jahrhunderts
Level	BSc or MSc
Prerequisites	Geology
Methods	Science history
Description	Erwin Genge studierte an der Universität Bern Geologie im Sekundarlehramt von 1914 bis 1918, war danach Sekundarlehrer in Erlenbach. Seine Notizbücher zeigen, wie vor hundert Jahren in Bern Geologie unterrichtet wurde.
	<p><u>Terebranchiata</u>      Schale äusserlich, gekammt &amp; gew. in einer Ebene      spirälz. (planspiral) aufgerollt. (Anm: <math>\text{D} \text{H} \text{O}</math>)      gew. leicht, gerade, schmal</p> <p>Bei den rezenten Formen (Nautilus) sind 4 Kiemen,      bei den ant. nicht nachgewiesen.</p> <p>Nautilo-Ord: <u>Nautiloidea</u>      Ammono-Ord: <u>Ammonoidea</u></p> <p><u>Nautiloidea</u>      Eingruppierung zugehörige Terebranchiata.      Schale: Eine Wohnkammer (gross) viele Luftkammern      gefüllt mit Gas. Ventralseite ist die äussere Seite.      Plei einziger Palaeo. Ammon. soll es umgekehrt sein.      90 Tentakel um den Mund. Trichter &amp; Fuss.      Fühlbein auch Hautbestandteile.</p> <p><u>Wohnkammer</u> (4 Kieme)      rezenten Nautiloidea: involut.      prähist. " - : evolut.</p> <p><u>Fossile Formen:</u>      genannt <u>Physcholithen</u>.      Nautilus bairhoratus      Man hat Physcholithen 4 gestellt = Nautil. Schmal (Bliekhufe)      Hadrochertes? L. b. r.</p> <p>Siphon (Blutgefäss)      Siphonal diaphragm      m. nicht richtig      Dim. Höhlen.      dorsale Seite      innere      Kopf kappen d. Mantels.      90 Tentakel (degenerieren Mund)</p> <p>Schale (Scheitel)      Nautil.      Mantel      geöffnet      ventral.      Seite.      evolut.</p> <p>Abwärts von Nautilus      von der Seite      von der Seite unten.</p>
Supervisor	Prof. Dr. Stefan Brönnimann, room 506, stefan.broennimann@giub.unibe.ch