# List of topics for master/bachelor theses - autumn semester 2016

## Physical Geography

1. **HAUCK: Quantitative analysis of the influence of the local snow cover on the future sensitivity of permafrost in model simulations (climate change) and reality (observations)** [**SNOW, PERMAFROST, CLIMATE CHANGE**].
    - Analysis of maximum snow height and snow cover duration/timing for different permafrost stations in the Swiss Alps
    - Linear feedback analysis.
    - Identifying of snow regimes and mountain sites which are more sensitive to model and therefore prediction errors.
2. **HAUCK/HOELZLE: Effect of surface and soil moisture on evaporation and energy balance in mountainous terrain** [**EVAPORATION, ENERGY BALANCE, SOIL MOISTURE**]
    - Evaluation of field data and potentially soil model data
    - Comparison of evaporation processes in low, middle and high altitude terrain (field and literature data)
3. **HAUCK/HOELZLE: Ice content and thermal regime in rock glaciers/talus slopes/rocks: a comparative case study from the Murtèl-Corvatsch area, Upper Engadine** [**PERMAFROST MODELLING, CLIMATE**]
    - COUP model simulations in different permafrost landforms
    - Preparation of 2D input data maps (porosity, ice content, soil type, water content etc) for a test site in the Upper Engadine based on geophysical data from the (finished) SPCC and TEMPS projects
4. **HAUCK: Distributed permafrost modelling in the Swiss Alps using the soil model COUP** [**SPATIAL MODELLING, PERMAFROST, SOIL**]
    - Work with a calibrated version of the soil heat and mass transfer model COUP to analyse the permafrost distribution in one of the permafrost regions included in the national permafrost monitoring network PERMOS. Meteorological data and spatially measured soil temperatures and parameters, as well as topographic data, will be used as input data for the simulations.
5. **HAUCK: How can different geophysical methods be combined to determine ice-, water and air (porosity) contents of the subsurface (Geoelectrics, Seismics)?** [**GEOPHYSICS, ICE CONTENT, WATER CONTENT**]
    - Improvement of the 4-phase model (Hauck et al. 2011) using published relations between the geophysical properties (such as electrical resistivity, seismic velocity and porosity).
    - Analysis of the improvement by comparing the new and the old version
    - Validation using data from Svalbard, Antarctica, Norway, Switzerland and Italy
6. **HILBICH: Characterisation of the permafrost distribution at selected sites in the Bernese Alps with geophysical surveys** [PERMAFROST, GEOPHYSICS]

- Analysis of available data (e.g. geophysics, permafrost probability distribution (modelling), GST data, etc.) regarding permafrost probability and distribution at a selected site (different possibilities in the Bernese Alps)
- additional field surveys and data analysis to refine the interpretation
- optional: synthetic modelling of geophysical data to plan field measurements and to test/verify hypotheses
- verification of modelled permafrost distribution

7. **HOELZLE: Englacial temperature measurements on Central Asian glacier.**
   - Most glacier in Central Asia are polythermal glaciers. The evolution of the thermal regime in a glacier is quite complicated as it is related to a) the surface energy balance and b) to the dynamics of the glaciers. Several models exist that allow modelling the temperature evolution within a glacier. However, measurements are scarce and only on selected glaciers available. Especially for mass balance glaciers the englacial temperature evolution can be important and influence the total mass balance of a glacier in a considerable way. Therefore, the precise measurement of englacial temperature in the ablation as well as in the accumulation area of some glacier should be carried out and analysed.
8. **HOELZLE: Building up of a world-wide database containing englacial temperatures from different mountain glaciers and ice caps**
   - Englacial temperatures are an important climatic indicator. However, only a few, non-systematic measurements exist. The task of the MSc would be to collect all published data and bring them in standardized way into a database, which would allow an interesting analysis of the temperature related to different climatic zones of different mountain regions.
9. **HOELZLE: Analysis of mass balance gradients and their long-term evolution based on data of the World Glacier Monitoring Service**
   - Mass balance gradients are important representatives for climatic environments. In maritime areas such as New Zealand or Patagonia mass balance gradients are very steep, the contrary is the case in dry continental regions where mass balance gradients are flat. With the ongoing climatic change in several mountain ranges precipitation and temperatures has been changed and influence a transient change of the mass balance gradients. The MSc should evaluate the evolution over time at different glaciers with their different mass balance gradients.
10. **HOELZLE: Using a high resolution energy balance model to evaluate different important parameters used in degree-day and simple energy balance models**
    - This study should focus on the comparison of different model approaches at same object (glaciers or permafost areas) to test the influence of different parameters on the sensitivities of the models and their corresponding uncertainties.
11. **HOELZLE: Evaluation of turbulent latent heat fluxes over dry rock surface in permafrost areas**
    - There is little knowledge about the turbulent latent heat fluxes over dry rock surface in high mountain permafrost areas. Different approaches of measurements and modelling exists. The proposed work should consist of an in-depth evaluation of the existing approaches.

12. **HOELZLE, BARANDUN, NAEGELI: Analysis of historical and recent albedo data from Abramov Glacier, Kyrgyzstan (MSc)**
    - Several publications exist with historical and recent albedo data from Abramov glacier in Kyrgyzstan, Central Asia. The proposed work should compare the different existing measurements and their results and may use existing satellites products to extract first albedo products.
    - *Supervisor: M. Hoelzle / Contact: M. Hoelzle; K.Naegeli; M. Barandun*
13. **HUSS: Glacier-dammed lake outburst event of Lac des Faverges, Plaine Morte (MSc)**
    - Consistent analysis of lake outbursts at Lac des Faverges 2011-2015 to get a better understanding of hydrological and glaciological processes. Why the outburst did only started in 2011? What is the future development? (Includes measurements and field visits at the glacier during summer).
14. **HUSS: The potential of GPR for mapping the internal structure of the snowpack on glaciers (MSc)**
    - 1.6GHz GPR measurements on Swiss (or other?) glaciers and interpretation of internal reflectors. This could give insides into internal structure of the snowpack (single precipitation events). Can the internal reflectors be correlated over large distances? How are they contacted to the weather development?
15. **MACHGUTH, KRONENBERG: Snow/firn properties from GPR on abramov glacier, Pamir-Alay, Central Asia (MSc)**
    - The proposed MSc is based on an extensive Ground Penetrating Radar (GPR) survey on Abramov glacier, Central Asia. The collected radars signals should then be interpreted in relation to ice core measurements taken in the upper accumulation area. Based on the calibration results at the ice core sites, the accumulation rates and history should be extrapolated to the whole accumulation area based on the collected GPR traces. This MSc includes the participation on fieldwork on Abramov glacier
    - *Supervisor: H. Machguth / Contact: H. Machguth; M. Kronenberg*
16. **MACHGUTH, KRONENBERG: Surface melt extent and evolution derived from Sentinel-1 Satellite images (MSc)**
    - The proposed MSc Theses investigates for the first time the snow melt evolution based on Sentinel-1 satellite data on remote glaciers in the Pamir Alay, Central Asia. The project is developed in collaboration with David Small, RSL, University of Zurich. Time series of snow melt evolution a relatively high resolution in time and space are derived from Sentinel-1 data, a very new satellite product of the European Space Agency (ESA) satellite data.
    - *Supervisor: H. Machguth / Contact: H. Machguth; M. Kronenberg*
17. **MACHGUTH/HUSS/LINSBAUER: Calculating the thickness of all glaciers in the world (MSc)**
    - Estimating glacier ice volume is essential to quantify potential change in sea level. Furthermore, glacier bed topography, albeit often unknown, is a crucial quantity in modelling glaciers' response to climate change. Models interfering glacier bed topography from glacier surface properties constitute an option to address these issues. A number of such models has recently been developed and their skills are currently evaluated in an

international experiment (called ITMIX, Farinotti et al, in preparation). The experiment shows that individual models inaccurately reproduce measured ice thickness while a model ensemble achieves superior accuracy.
    - The ITMIX members currently plan to run a set of models for all ~200'000 glaciers in the world to form a global ensemble-estimate of ice thickness. One of the models suitable for global application is the so-called "GlabTop2" model (Frey et al., 2014) which should be applied globally in the framework of the proposed MSc thesis.
    - The thesis comprises two parts. Firstly, the ice thickness parametrization within GlabTop2 should be improved by adapting an existing approach to calculate glacier flow lines (Machguth and Huss, 2014). Secondly, the model should be run on a global scale using the global glacier data compilation by Huss and Farinotti (2012). A strong interest in programming is essential for a successful MSc candidate.

  *Supervisor: Horst Machguth (UniFr); Daniel Farinotti (VAW-ETH), Holger Frey (UZH), Matthias Huss (VAW-ETH and UniFr), Andreas Linsbauer (UZH, UniFR)*
  *Contact: H. Machguth*
18. **BRAILLARD: Géotopes géomorphologiques et géologiques du canton de Fribourg (MSc)**
    - Actualisation de l'inventaire des géotopes géomorphologiques du canton de Fribourg et définition des géotopes d'importance cantonale.
    - Réalisation des fiches de l'inventaire des géotopes géologiques d'importance cantonale (inventaire d'expert à compléter)
    - Transposition des inventaires dans les instruments de l'aménagement du territoire
      *Travaux à réaliser en collaboration avec le service de la nature du paysage (SNP) du canton de Fribourg.*
19. **BRAILLARD: Reconstitution paléo-environnementale de la région du Sanetsch au Tardiglaciaire (MSc)**
    - Analyses géomorphologique (cartographie) et stratigraphique (lithostratigraphie, datations OSL).
20. **BRAILLARD: Ablation karstique (MSc or Bachelor)**
    - Détermination des taux d'ablation karstique dans le Jura, les Préalpes et les Alpes sur la base de mesures au micromètre
    - Rôles du substrat (types de calcaire), du climat (précipitations), et de la topographie (altitude, exposition).
21. **BRAILLARD: Erosion fluviatile sous-glaciaire (MSc or Bachelor)**
    - Rôle de l'érosion fluviatile sous-glaciaire (« tunnel valleys ») sur la topographie du toit de la molasse dans le canton de Fribourg au Nord des Préalpes.
22. **KUMMERT/DELALOYE: Spatio-temporal variability of the debris flows on the GrabenGufer debris cone derived from the analysis of webcam images**
    - Use of the monoplotting tool to orthorectify oblique webcam images
    - Cartography of the different debris flow events since 2009
    - Analysis of the spatial and temporal patterns characterizing these processes
23. **KUMMERT/DELALOYE: Reconstruction of the long term evolution of rock glaciers using photogrammetry (different sites in Valais)**

- Orthorectification of old aerial images
- Reconstruction of the movements and the morphological evolution through time
- Possible additional development: creation of DEM based on the images and volumetric changes analysis; Use of image correlation techniques to produce surface velocity fields;…

24. **KUMMERT/DELALOYE: Evaluation of the sediment fluxes in the Perroc catchment (Arolla, VS) based on LiDAR data and comparison with GIS-based approach for connectivity assessment**
    - LiDAR data processing to create multitemporal DEM
    - Analysis of DEM's of difference to infer sediment fluxes and connectivity
    - Comparison with GIS-computed connectivity indexes

## Human Geography

1. **Urban housing policies**: what tools do progressive urban policy makers have at hand to produce affordable housing in a situation of limited budgets?
2. **Geographies of (distant) suffering**: all research questions welcome about the relationship between sufferers (human, non-human) and spectators.
3. **Rural Kyrgyzstan** – research topics related to agriculture, cooperation in agriculture, work organisation, rural development, development intervention, participation, gender relations, etc.
4. **Sustainable settlements in humanitarian situations** – camps, local integration, or other options
5. **The role of non-state actors in driving and responding to (internal) displacement**
6. **IDPs and refugees –do/should humanitarian responses differ in these contexts?**
7. **Changing trends in refugee-hosting (developed vs. developing countries)**
8. **Post-conflict reconstruction, reconciliation, and returnee livelihoods in the African Great Lakes region**
9. **Participatory Irrigation Management (PIM):** governing the commons or neo-liberalization of water?
10. **Community-Based Conservation (CBC):** Quelle participation pour quelles "communauté locales"?
11. **Cooperatives / alternative economies:** Cooperative organisation / the cooperative movement in Switzerland: work organisation, organisational structure, motivations, values, affect; Alternative economies: e.g. cooperatives, share economy, exchange, volunteer work
12. **Historical geographies:** Oral histories of rural/mountain communities (agriculture and pastoralism, rural economy, migration, relation to the environment and environmental resources) in Switzerland or in Kyrgyzstan
13. **Development topics:** Representing poverty and need: campaigns and public documents of (N)GOs, donation patterns in Switzerland; Ethnographies of

development workers: international development workers of medium to large Swiss (N)GOs or small/quasi amateur NGOs in Switzerland

14. **Les jardins du port : du projet temporaire à l'aménagement pérenne ?** (réflexions sur la mise en œuvre du jardin participatif temporaire mais qui devrait durer... on peut aussi intégrer les autres pôles du projet pour définir des sujets à savoir le bistro et le pôle culturel)
15. **La marche : un outil de durabilité ?** (ville et santé, convivialité), l'exemple du dispositif PEDIBUS = système d'accompagnement des enfants à pied à l'école, sous la conduite des parents
16. **Fribourg : ville "contaminée" ?** (question de la pollution aux métaux lourds, notamment dans basse ville)
17. **Le pont de la Poya : un aménagement toujours en cours...?** (réflexions sur bilan du trafic et mesures d'accompagnement mises en place printemps 2016)
18. **La relation entre le loup et l'homme:** symbole des changements de paradigmes historiques de la perception de la nature par l'homme
19. **L'essor du "craftivisme" dans les espaces urbains d'Europe de l'ouest et d'Amérique du Nord**
20. **Les groupes "Stitch & Bitch", "Knit and natter" et l'évolution des féminismes.**
21. **Spatial imaginaries and practices of French- and German-speaking communities in the city of Fribourg**
22. **History of "empty spaces" in colonial, development and modernization discourses**
23. **Representations of the Steppe in the Russian Empire and the Soviet Union in "Western" writing** (scientific, journalistic and literary)
24. **Global change and environmental conflict:** a return to the scarcity-violence debate?

For **TR in Human Geography** please contact Christine Bichsel (christine.bichsel@unifr.ch)
For **Master theses in Human Geography** please contact Magali Bonne-Moreau (magali.bonne-moreau@unifr.ch), Bruno Meeus (bruno.meeus@unifr.ch), and Christine Bichsel (christine.bichsel@unifr.ch).