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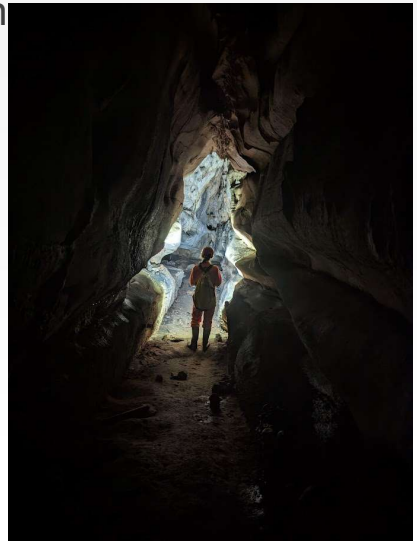
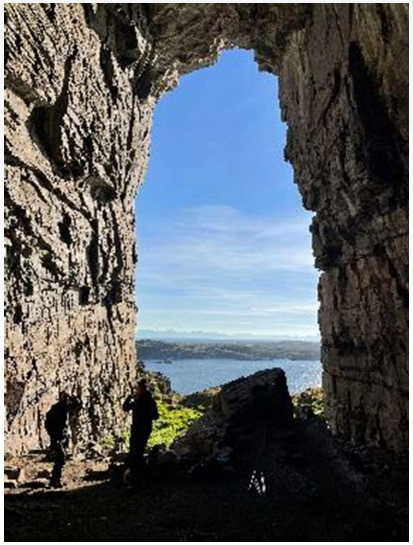
Associate professor in physical geography

Research interests:

- Caves, speleology and landscape development
  - Karst caves and coastal caves
- Groundwater and karst hydrology
  - Hydrodynamic function of underground systems, water supply and contamination issues
- Reconstruction of the deglaciation history, ice-dammed lakes, canyon development and GLOFs
- Water-related geohazards like flooding, slope instability, subsidence and sinkhole collapse
- How climate and environmental changes and human activity impact hydrological systems



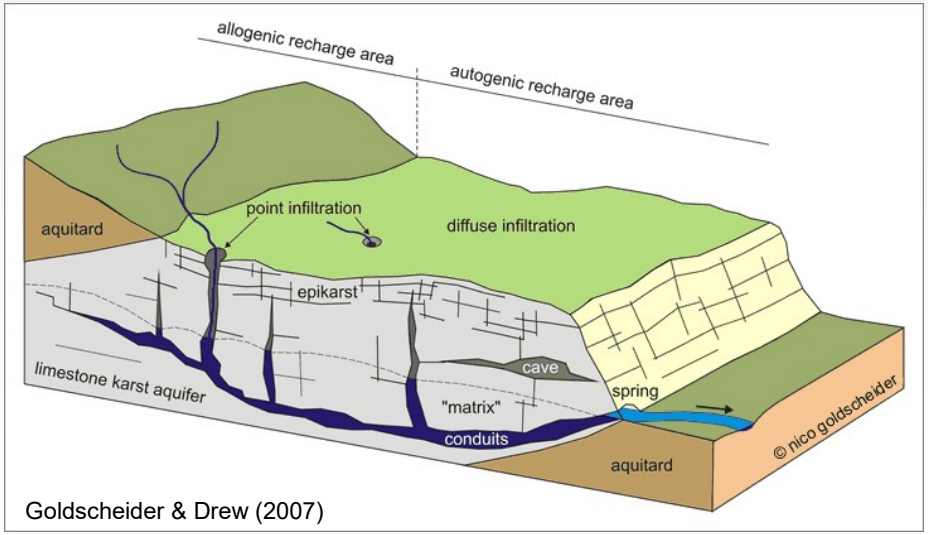


Karst and cave related projects

Background

Karst are landforms developed by dissolving soluble rocks like marble and limestone. Caves contain sediments, speleothems, remnants of animals and plants, unique microbes and pristine surfaces that are a rare resource today. The stable environment with minimal outside influence makes the caves unique depositories for geological, faunal and climatic history. However, it also makes the caves vulnerable to impact since a footprint can remain for thousands of years. Caves are a red-listed nature type in Norway. New constructions such as wind farms and road routes affect new karst areas and can provide easier access to unexplored and vulnerable caves for the general public .

It is possible to work with **various topics within the theme of karst and caves**: speleogenesis (cave development) in a glacial landscape, water resources, geohazards, vulnerability and risk assessment.



Goldscheider & Drew (2007)

Karst and cave-related master's projects

Possible research topics

- Make a plausible model for the cave development based on the cave survey and documentation of cave morphology and deposits, including speleothems, bones and artefacts. Suggest when the cave was last active and if the deglaciation left any traces in the cave.
- Hydrological investigations of active underground systems to assess the system's volume, flow route(s), residence time and dynamic function, water quality and contamination issues related to water supply, and the possible effects of changes in the drainage area.
- Assess the cave's vulnerability and conservation value.
- Map the effect of visitors and tourism on selected objects and document the current condition and physical wear and tear in areas where the growth in the number of visitors is expected due to increased accessibility.

Methods

Cave survey, sediment mapping and analyses, stream basin analysis, U-series dating, radiocarbon dating, hydrological tracing experiments, water flow measurements, monitoring of hydrological and meteorological parameters, water sampling and analyses, GIS, photogrammetry, remote sensing (Lidar and InSAR data), vulnerability analysis, etc.

Field sites: Nordland County, in Fauske, Rana, Gildeskål or Sørfold, depending on the number of students and their interests.

Fieldwork in caves is demanding (cold and dark) and requires at least two persons for safety!

Geohazards in karst

Background

The Norwegian Road Authorities (Statens Vegvesen) has planned a new route for road E6 through Bonnådalen in Sørfold municipality, Nordland. The potential road section will cross several marble layers with cave systems and underground streams. It is of great interest to document the underground hydrological systems in the area to assess how road construction may affect the system. Surveys of existing cave systems may provide valuable data about cave development in these marble layers. Furthermore, we want to assess whether the underground systems are potentially hazardous to the construction work or the finished road.

Objective

- Suggest a plausible model for karst development based on a survey of caves and karst features, such as dolines, sinking streams and springs.
- Trace underground flow routes to estimate aquifer characteristics and hydrodynamic function, assess the chemical and possibly ecological condition of the water bodies following the Water Directive, and assess the vulnerability of the aquifer
- Assess the risk of impact on the underground hydrological systems during and after a possible road construction
- Assess the hazard of sinkhole formation in the area

Methods

Field survey with a focus on karst features, hydrology and marble outcrops. Cave survey, mapping of sinkholes, mapping of structural geological elements, GIS, Lidar and photogrammetry, tracing experiments, discharge measurements, time-series analyses of hydrological and meteorological monitoring data, water sampling, etc.

Possibility for 2 Master's projects

Flood history and hydrodynamic function of Maaras cave, Greece

1-2 master projects **Co-supervisor:** Dr. Christos Pennos

Maaras is an extensive river cave in northern Greece. The cave drains the Nevrokopi polje, a significant karst depression with a flat floor, and the cave is the spring of the Aggitis River, which drains through the Drama basin. Maraas cave is surveyed to a total length of about 12 km, and the trunk passage comprises a series of cave chambers connected by siphons that are accessible during the dry season. More than 30 m of sediment is deposited on the cave floor, and terraces of fluvial deposits are present along the cave stream.

Objective: Understand the hydrodynamic function of the extensive river cave and how and when sediments are deposited and transported through this system. Reconstruction of flood history and potential causes.

Make a conceptual model for the flood function of the cave system and the role of back flooding.

Methods: Analyses of hydrological data from automatic monitoring stations, maybe analyses of water samples, stratigraphical investigations of sediments in terraces, sediment analyses, dating of cave deposits by applicable methods (OSL, ^{14}C or U-series), ERT data, etc.

Fieldwork: 5-10 days (Challenging conditions, no claustrophobia!)

Glacier and meltwater history of Tylldal-Rendalen, Eastern Norway

Supervisors: Svein Olaf Dahl and Rannveig Skoglund

Background:

In Tylldal in Eastern Norway, there are impressive amounts of glacial lake deposits and landforms related to glacial meltwater drainage. During the deglaciation, the ice divide was situated south of Southern Norway's main water divide. The Scandinavian Ice Sheet was cold-based in this area and waned through vertical downwasting. Accordingly, the northern parts of Østerdalen and its tributaries became glacier-dammed lakes with outlets northwards. Glacial lake deposits, deltas, terraces, shorelines and canyons are preserved traces of glacial meltwater drainage. The cold-based ice sheet complicates the investigations because old deposits and landforms are preserved and may exist below or adjacent to features and deposits from the deglaciation. This project is part of a large project to reconstruct the glacial history of the northern part of Eastern Norway (Indre Østlandet) during the last glaciation (Weichsel). This master project is field-intensive though analyses of high-resolution DEMs are also essential.

Objective:

Reconstruct and date processes and landforms related to glacial lakes and meltwater drainage in Tylldal and Rendalen.

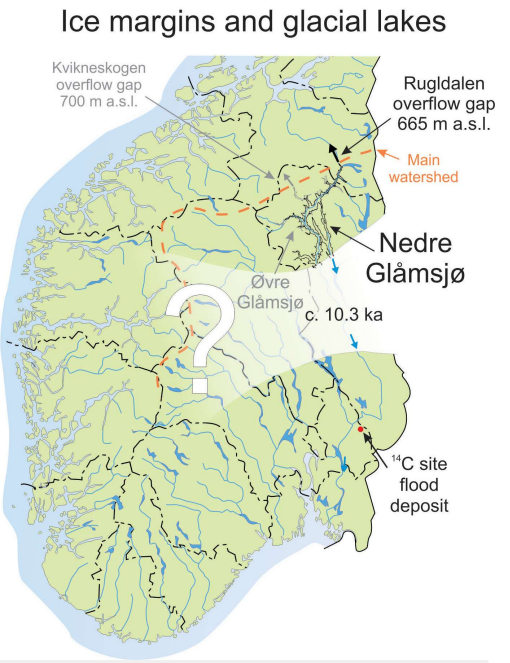
Suggest a history of the glacial lakes and meltwater drainage in Tylldal-Rendalen during the last glaciation.

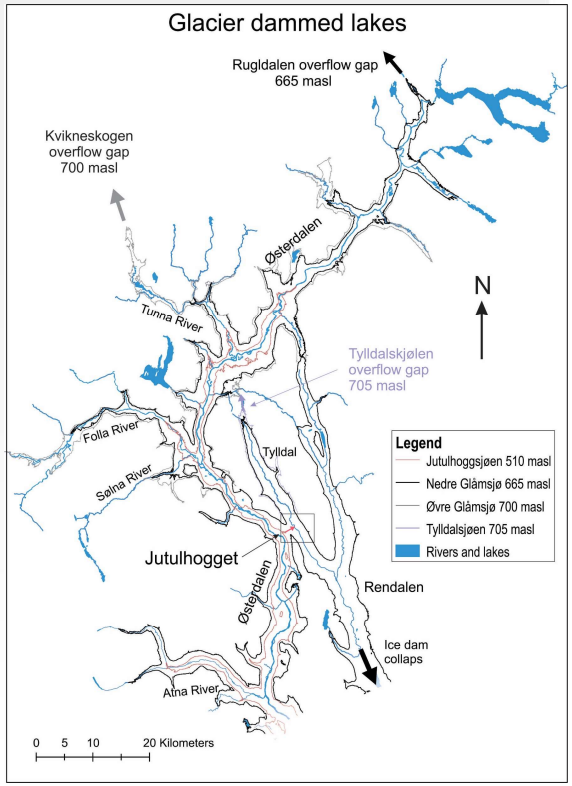
Methods:

Quaternary geological mapping, stratigraphic logging of sediment sections, GIS and remote sensing, OSL-dating, radiocarbon-dating, analyses of existing GPR data, etc.

Fieldwork: 3-4 weeks; car access is a necessity

Possibly **2-3 projects**. At least 2 master students should be working in the area.





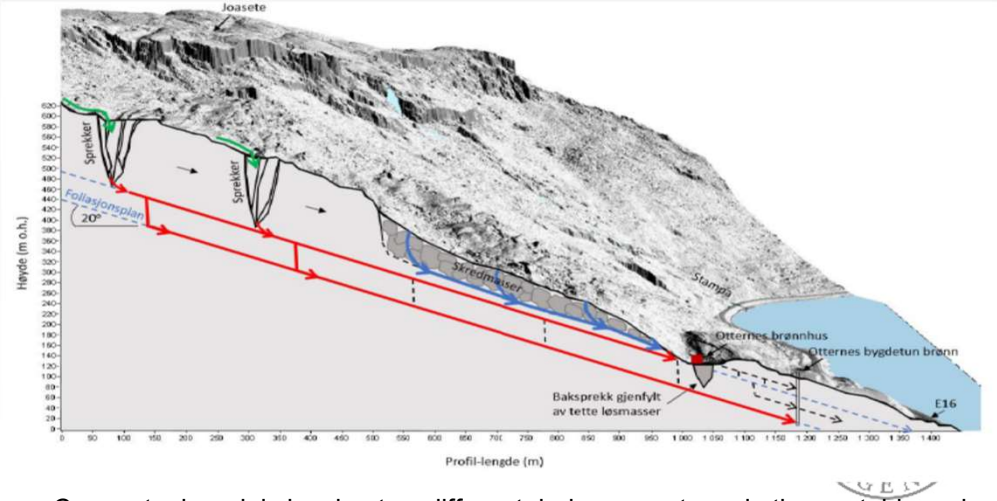
Groundwater projects

- If you are interested in working on projects related to groundwater issues such as water supply, contamination, subsidence, slope instability, etc., please get in touch with me.
- Previous collaborators include COWI, Norconsult, NGU (Geological Survey of Norway), Voss municipality and Western Norway University of Applied Sciences in Sogndal.

Former masterstudent Kjetil Bø Omarstrand measuring electric conductivity in a spring in Osa.

Recommended protection zones surrounding the water works at Bømoen, Voss, a new reserve water supply for Voss municipality. Map made by former masterstudent Line Haukanes, 2018.

Suceptilbility map showing areas i Bergen that are subciding. Data from InSAR. Made by former masterstudent Joakim Haukedal, 2017.



Conceptual model showing two different drainage systems in the unstable rock slope of Joasete-Høgsete in Flåm. Model developed by former masterstudent Berit Soldal, 2018.

If you are interested in a master project on water- or karst-related topics, don't hesitate to get in touch with me at:
rannveig.skoglund@uib.no
or visit me at Room 717, Dep. of Geography, SV-building