changing climate such extreme vertical accumulation rates can have an unexpectedly strong impact on infrastructure in alpine regions.

2.1.4
Lab results on rock moisture movement during freezing cycles

Andrew Mitchell (1), Oliver Sass (1)
(1) University Bayreuth, DFG

As a key part of landscape evolution and a hazard to people in Alpine terrain, rock weathering leads to the breakdown and weakening of rock, causing rock fall and ultimately slope failure. Rock moisture availability is a major factor in these processes. It is understudied, partly due to a lack of reliable measurement techniques. Understanding weathering regimes in a changing climate are key to mitigating Alpine hazards and to understand long-term landscape evolution.
As part of the CLIMROCK project, Wettersteinkalk blocks were used in a series of laboratory based experiments in a climate chamber to look at rock moisture movement and it's weathering effect in alpine rock walls. Experiments: (1) slow frostcracking cycles on 40x40x20cm blocks with a water reservoir and equipped with 4 time domain reflectometry (TDR) and 2 acoustic emission (AE) sensors attached to measure cracking events as a proxy for weathering; (2) Diurnal freeze-thaw experiments on blocks of the same size, this time equipped with 9 Electrical Resistance (ER) sensors and 4 AE sensors; (3) small blocks (10x10x10cm) with AE sensors at different saturations (0, 25, 50, 75 & 100%) and temperature cycles.

In experiment (1), probable evidence of rock moisture movement to the freezing front and refreezing events occurred. Due to accuracy achievable with (1), only a qualitative link between moisture movement and acoustic events triggered by subcritical cracking was possible. Experiment (2) enabled more accurate locating of cracking events and moisture movement through the block.
Converse to initial hypothesis, it appears the samples with a lower volumetric water content (VWC) show increased cracking events during freezing cycles. This was seen in both experiments (1) and (3). Findings from these laboratory experiments will be applied to the interpretation of field rock moisture movement observations in the Bavarian and Austrian Alps.

2.1.5
Detecting interannual and seasonal variability in rock glacier movement using a feature tracking approach

Lisa Rehn (1), Carla Tapia Baldis (2), Jan Blöthe (1)
(1) Universität Freiburg, Institut für Umweltsozialwissenschaften und Geographie, Schreiberstraße 20, 79098 Freiburg
(2) Instituto Argentino de Nivología, Glaciología y Ciencias Ambientales, CCT CONICET, 5500 Mendoza, Argentina

Permafrost degradation induces changes in water availability and runoff as well as slope instabilities in alpine regions. A thorough quantification of the degradational processes is therefore important for society in the immediate region and beyond, as it helps deepening our understanding and ultimately allows anticipating future trajectories of the alpine cryosphere. However, permafrost being an underground phenomenon makes quantification and temporal differentiation of the degradation processes inherently difficult. Active rock glaciers have become a prime research object as internal permafrost degradation induces changes in their kinematic behaviour.
In our study, we investigate the surface kinematics of the Kaiserberg rock glacier in the Austrian Kaunertal

on different timescales. To derive interannual surface displacement rates, we rely on UAV-derived digital topography from 2019-2022. In addition, we installed a time-lapse camera that records daily images of the rock glacier in July 2022 to resolve rock glacier movement at a higher temporal resolution. For both data sets, we use a feature-tracking approach as implemented in the environmental motion tracking software EMT. Preliminary results show differentiated velocity fields on the rock glacier surface with the southern lobe moving significantly faster than the larger northern lobe. Mean movement rates (2019-2022) are around 0.58 m yr-1 for the southern lobe where maximum movement rates range up to 1.80 m yr-1. In contrast, mean movement rates for the northern lobe are only 0.1 m yr-1 with maximum rates of 0.36 m yr-1. Similar to earlier studies, we find a general increase in surface velocities over the past years that points to ongoing permafrost degradation. The pending analysis of the daily time lapse photos will provide an insight into how much of the annual movement occurs in summer and how the kinematics vary within a single season. As the timing of data acquisition varied each year, this knowledge can then also be used to refine the interpretation of interannual movement rates.

2.1.6
Glaciological Investigation of the Stubacher Sonnblickkees in the Upper Stubach Valley, Salzburg, Austria

Andreas Gschwentner (1), Karl Krainer (2), Andrea Fischer (1)
(1) Österreichische Akademie der Wissenschaften (ÖAW) - Institut für Interdisziplinäre Gebirgsforschung (IGF)
(2) Innsbruck University- Institue of Geology and Paleontology

The present study aims at investigating and describing diverse quaternary phenomena of the upper Stubach valley (High Tauern range, Salzburg, Austria). In particular, glacier mass balance measurements on Stubacher Sonnblickkees (SSK) and the investigation of a suspected rock glacier, located northeast of the Medelzscharte, are presented here. BTS and electrical conductivity measurements at the rock glacier have shown that this morphological feature is built up of permafrost-saturated debris, originated after the retreat of a former glacier. However, whether an embryonic rock glacier will develop from it remains debatable, as this depends strongly on future climate evolution. Between 2016 and 2021 glacier mass balance measurements on SSK have shown that in the year 2016/17 the glacier suffered a mass loss of 751·103 m3 water equivalent (w.e.) and a specific mass balance of -829 mm w.e. In the period of 2017/18, the mass loss was 1764·103 m3 w.e. with a specific mass balance of -1946 mm w.e., and was thus more than twice as high as in the previous measurement period. During the following years, the mass balance tended to more positive values. In 2019/20, SSK achieved the best annual balance since measurements began in 2017. The SSK is an east-facing glacier in the eastern Granatspitz Group. It extends from an altitude of about 3.050 m (accumulation zone), in the summit region of Granatspitze (3.086 m) and Stubacher Sonnblick (3.088 m), to 2.650 m a.s.l. (altitude of terminus). The glacier has been retreating since 1850, with only brief advance periods around 1920 and 1980. Since H. Slupetzky began annual measurements of length changes in 1960, an average 160 m retreat has been recorded. Due to ongoing climate warming and the low elevation of the glacier, it is only a matter of time before the glacier will completely retreat and disappear.

2.1.7
Paraglacial landform dynamics at the forefield of the Obersulzbach glacier (Austria)

Sabine Dietel (1), Jan-Christoph Otto (1)
(1) Department of Environment and Biodiversity, University of Salzburg, Salzburg, Austria