Dear participants of the Pangeo Austria 2024,

Please find information for the upcoming Workshop: **Earth Surface Dynamics**

(Wednesday, 25.9.2024, 8:30 am – 6 pm, HS 434)

Here is a brief explanation of how the workshop day will proceed. The 25 contributions to the workshop are thematically divided into the three thematic blocks "Mass movements", "Water, weathering and fluxes" and "Landscape evolution".

8:30 – 12:00 > Presenting study outcomes

- Each of the three thematic blocks will be opened with a 12 (+3) minute keynote lecture.
- In the following short impulse presentations (3 minutes), the contributions will be briefly presented with selected highlights. Please prepare 2–5 slides (PPT, PDF) showing the highlights of your poster presentation. To ensure a smooth running of the session, please upload the short presentation to the presentation computer before the session starts. The staff will be in the lecture room from 8 a.m. to support you.
- After the coffee break, we will have 1.5 hours for the subsequent poster session in which the studies will be discussed in detail in front of the posters. We encourage the participants of the afternoon workshop to include the poster contributions and to ensure a lively exchange between the groups.

14:00 – 18:00 > Converging spheres – working together

The afternoon workshop is dedicated to collaborative work, with a focus on supporting young scientists. We will start with two break-out sessions to discuss current issues related to the thematic blocks “Water, weathering and fluxes” and “Landscape evolution”. The topic of mass movements will be incorporated into both blocks. There is no strict timetable or agenda, and it is possible to switch between the two groups or even attend a presentation in a parallel session at any time. To trigger a dynamic working atmosphere, we have prepared several overarching questions for each of the two break-out sessions (see below). We will present the results of the workshop in the plenary session on Thursday morning. This means that we will put together the presentation during the workshop :-)! Please bring laptops and work-in-progress materials (images, analyses, interim results) that you already want to show and discuss and fits with the overarching questions. To the early career scientists: please use this opportunity to discuss your scientific problems with a variety of experts who can offer solutions through modern laboratory, field, or numerical methods, which you may not have thought of yet.

We are already looking forward to meeting you at Pangeo 2024

Michi Strasser, Jörg Robl, Sylke Hilberg

Water, weathering and fluxes

1. Influence of climate change on alpine groundwater systems

Temperatures and precipitation characteristics change significantly more in mountainous regions than in other parts of the world. The Alps are also the largest and most important water reservoirs in Europe. The question of how climatic changes will affect the water supply in the medium to long term remains open. Which influencing factors play the biggest role? Which aquifer types or types of catchment areas are better or less able to compensate for changes in recharge conditions?

2. Weathering processes in mountain regions –chemical weathering and influencing factors

Chemical weathering plays an important role in alpine erosion. Dissolution rates differ significantly depending on the lithologies in the catchment areas, the structural composition of the bedrock and climatic conditions. Dissolved carbonates can be chemically sedimented again in the short term, depending on the environmental conditions. Depending on the type of mineral, the dissolution of minerals leads to binding or release of CO_2. Chemical weathering is thus significantly involved in the CO_2 budget of the atmosphere. How can dissolution and precipitation rates be systematically quantified depending on the geological conditions of the catchment areas?

3. Human impact on alpine environments and groundwater systems and how to analyze and quantify it

The Alpine region has been shaped by human activity for thousands of years. Pasture and forestry farming, later road construction and touristic infrastructure as well as protection plants against natural hazards have changed the natural dynamics of near-surface processes such as erosion, sedimentation and groundwater recharge. In addition, during the last few decades very rapid climate change influences earth surface processes. Do forecasts and models for landscape development and for the future water supply must take this anthropogenic influence into account? If so, how can it be implemented in existing models? What data that has not yet been considered would need to be collected and quantified?

Long-term Landscape Evolution

1. **Rates across scales (uplift, erosion, exhumation) - how to bring them together.**

Recently measured uplift and erosion rates often contradict long-term exhumation and the topographic pattern of mountain landscapes. Can this contradiction be explained in terms of changing climatic or tectonic forcing, or are rates being compared that reflect processes of different temporal scales and are therefore not directly comparable? Do time series of recently measured uplift rates (e.g. GPS) show tectonically controlled long-term uplift, uplift due to deglaciation and isostatic compensation, or possibly the discrete movement at a fault? How strongly do individual events (floods, debris flows, landslides) affect measured erosion rates (e.g. sediment budgets, cosmogenic nuclides)? On what temporal and spatial scales can we switch from the observation of individual events to continuous landscape development?

2. **From topography snapshots to the evolution of landscapes**

The topographic patterns of a transient landscape show only one “time step” in the evolution towards a morphological steady state. How far an equilibrium has already been approached is difficult to determine and can vary from region to region depending on onset and rate of uplift and lithology. How can one derive information about the state of the landscape and its future evolution by analyzing topographic patterns and what additional information could be useful?

3. **Combining field observations / morphometry and numerical models**

Numerical models are powerful tools that can describe the evolution of landscapes for a variety of processes. Models require assumptions and simplifications, and it is challenging to combine the results of field studies and the analysis of digital elevation models with time series results from numerical models. What is the best approach to gain a deeper understanding of landscape-forming processes and their interactions?

4. **From outcrops to large scale landscape evolution**

Field work and the documentation of outcrops form the basis for understanding large-scale landscape evolution in the competition between uplift and erosive surface processes. Valuable information for the reconstruction of the uplift history is obtained from uplifted relicts of (marine) deposits, river terraces or caves and their sediments. But which key parameters should be acquired, and which methods applied to make statements about uplift and erosion of entire mountain ranges based on individual outcrops? Where are the pitfalls?