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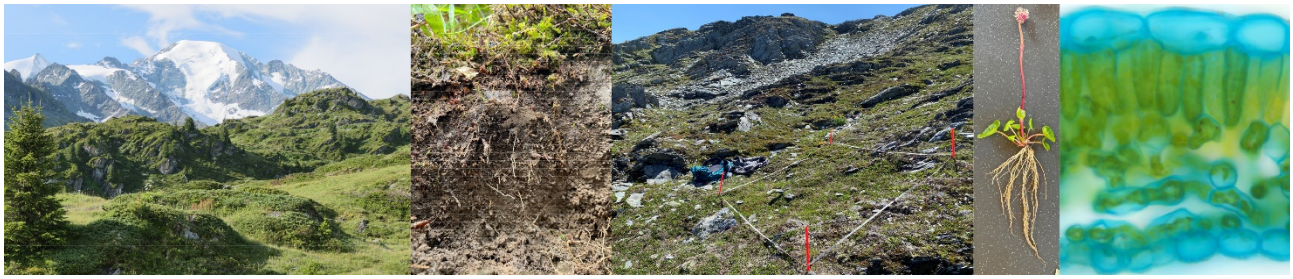

Responses to climate change in the species composition and functional ecology of alpine meadows

Research context and objectives:

In response to temperature increases about 1.6x faster in the Swiss Alps than in the Northern Hemisphere, the alpine meadows have been experiencing rapid changes in their species composition. The stability of these fragile ecosystems and their environmental functions are thus threatened by ongoing climate change. Some 18 years ago, the Global Observation Research Initiative in Alpine Environments (GLORIA, www.gloria.ac.at) was initiated to monitor responses in the alpine belt to quickly changing environmental conditions, with three target regions defined in the Western and Eastern Swiss Alps. During a previous master thesis performed in acidophilous alpine meadows below the Western GLORIA summits, potential responses to climate change in the soil, plant communities and functional traits were evaluated, using a space-for-time approach. The main objectives in the current master thesis are to analyze the importance of edaphic properties regarding the responses of plant communities and functional traits to warmer climatic conditions, this time selecting calcareous alpine meadows below one eastern GLORIA site and comparing findings with those previously obtained, applying the same methodology. The ultimate goal is to increase our mechanistic understanding of tolerance and resilience of alpine ecosystems in a warmer world.

Research program:

The foreseen study site is located at the back of largely pristine Val Plavna, GR, within the UNESCO Biosfera Engiadina Val Müstair preserve and along the Swiss National Park (SNP) outer limits. Similar to the Western Alps, two altitudinal gradients, with North and South aspects, will be established and the soil properties, plant communities and functional traits above- and belowground in selected hemicryptophytic species will be assessed during summer field campaigns. At each research plot, the humus and soil types will be determined, based on soil profiles and analyses of soil properties, once back to the lab. The species of interest will be selected, based on replicated vegetation releves performed at each plot. Root and foliar morpho-anatomical traits characterizing the species responses to environmental drivers will be assessed in material freshly sampled and after processing at the laboratory. The whole research program will be conducted in coordination with the SNP team. This master thesis is especially suited for students interested in interdisciplinary research in alpine environments, in the framework of biodiversity and climate change science. A driving license and outdoor skills are required. Some funding support for technical work and housing costs in Zurich is available and further funding by SNP and UNESCO biosphere preserve will be looked for, to cover the field costs.

References:

Matteodo et al. (2018). Decoupling of topsoil and subsoil controls on organic matter dynamics in the Swiss Alps. *Geoderma, 330,* 41-51.
Pauli et al. (2012). Recent plant diversity changes on Europe's mountain summits. *Science, 336,* 353-355.
Pellissier et al. (2010). Plant traits co-vary with altitude in grasslands and forests in the European Alps. *Plant Ecology, 211,* 351-365.

Keywords: climate change, alpine ecosystems, GLORIA initiative, vegetation science, site ecology, functional traits,

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Work place: UNIL, Swiss Federal Institute for Forest Snow and Landscaoe Research WSL, site of Birmensdorf/ZH, SNP Zernez

Language: French, English, German

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