

Interactions between geomorphology and vegetation in the Western Swiss Alps: first investigations

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The influence of earth surface processes can modify the microhabitat conditions and the species richness, composition and distribution patterns of plant communities. It is therefore important to understand how geomorphology affects the distribution of plant species to predict future vegetation evolution in a context of climate change.

To better analyse the influence of geomorphology on vegetation growth in the alpine periglacial belt, we are studying various geomorphological processes (e.g. cryoturbation and solifluction), permafrost, nivation and ground surface characteristics at three focus sites of the Vaud Alps (Western Swiss Alps). The sites are located at an altitude range comprised between 2000 and 2600 m a.s.l. The geomorphology is characterized mainly by the presence of small glaciers, large moraine deposits, rock glaciers and debris slopes. Monitoring of the ground surface temperatures, permafrost mapping, vegetation survey and drone flights have been carried out to investigate in detail the environmental variables.

Initial results show a heterogeneous vegetation cover depending on time since deglaciation, debris size, ground stability and soil age. Debris pioneer species are present on moraines, rock glaciers and debris slope; grassland are developed in zones not affected by LIA glacier advances or other interfering processes such as avalanches. The high-resolution images obtained from drone flights (5 cm/pixel) allow a detailed study of the granulometry.

In order to use such geomorphological information on a wider area of interest, the local data acquired on focus sites have to be spatialized to a regional scale. This is accomplished by developing an approach based on remote sensing and multiple-point geostatistics that performs a semi-automated geomorphological mapping (SAGM). The SAGM is based on a training image composed by a geomorphological map yet existent, an orthophoto, the slope, the aspect, the curvature, the granulometry classification and the NDVI. The SAGM will be first elaborated for the focus sites and will then be extended to the entire Vaud Alps above 2000 m a.s.l. This information will be used to better understand the geomorphology-vegetation interactions and their spatialization.