Geophysical Research Abstracts
Vol. 15, EGU2013-6036, 2013
EGU General Assembly 2013

Investigating biogeomorphic dynamics in the forefield of an actively retreating alpine glacier

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Glacier forefields are highly dynamic environments characterized by active paraglacial processes and simultaneous vegetation succession. Interest in these environments and their development has recently increased especially considering sediment delivery and natural hazards. While the dynamics are accelerating due to recent climate change, interactions between vegetation and geomorphic processes and components and the resulting patterns are only partly understood. In recent studies, geomorphic-engineer species were identified in fluvial biogeomorphic systems and their influence can be considered as well known. Furthermore, the decadal biogeomorphic evolution and change in a floodplain were described using the concept of biogeomorphic succession. This detailed knowledge of biogeomorphic evolution is yet missing for glacier forefields, though they are supposed to be main focus areas in biogeomorphology as they are particularly affected by climate change.
The presentation is related to an interdisciplinary project ('Biogeomorphic dynamics in the Turtmann glacier forefield, Valais, Switzerland', BIMODAL) set in the alpine environment of a glacier forefield in the Turtmann valley, Switzerland. Previous studies here show a paraglacial impact on vegetation succession that could be differentiated according to degree of geomorphic activity. Corresponding geomorphic activity and vegetation patterns were found and interpreted using the concepts of geomorphic-engineer species and biogeomorphic succession. Based on these results, the key targets of the project are (a) to analyse geomorphic-engineer species with their plant functional traits in relation to their impact on geomorphic processes and (b) to thoroughly investigate the mutual geomorphic and vegetation development (biogeomorphic succession). The combination of results from these micro- and mesoscale approaches serves (c) to understand the decadal development of the biogeomorphic glacier forefield system including controls and boundary conditions. Our future research will be carried out using a combination of traditional and new techniques from geomorphology and vegetation ecology, including in-field shear tests on moraines, terrestrial laser scanning and vegetation monitoring and mapping using relevées and remote sensing. The project aims to combine approaches and knowledge from geomorphology and vegetation science and will give a first insight into the biogeomorphic dynamics, interactions and evolution of highly dynamic glacier forefields.

References:
Eichel, J., Krautblatter, M., Schmidtlein, S. & R. Dikau: Biogeomorphic interactions in the Turtmann glacier forefield, Switzerland, Geomorphology, submitted.