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Weathering, soil formation and ecosystem evolution along the soil chronosequnce of the Damma Glacier, central Alps, Switzerland: The BigLink Critical Zone Observatory.

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Soil is the product of a complex suite of chemical, biological and physical processes. In spite of the importance of soil for human society and for sustaining life on earth, our knowledge of many aspects of its genesis and evolution is still limited. For example, rates of soil formation, the influence of biological activity on weathering rates and the response of soil carbon stocks to climate and environmental change are still poorly constrained. To unravel the complexities of soil systems, collaborative interdisciplinary science is needed. Although many aspects of soil genesis have been studied individually, there is a lack of comprehensive coordinated studies which include all biological, geochemical, mineralogical hydrological and geological aspects and upscaling from the micro- to the watershed scale.

In this contribution we will present the approach and first results of the project BigLink: Biosphere-Geosphere interactions: Linking climate change, weathering, soil formation and ecosystem evolution. funded by the Competence Center Environment and Sustainability (CCES) of the ETH-Domain, Switzerland, with contributions by ETH-Zürich, the Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), the Swiss Federal Institute for Snow and Avalanche Research (SLF) Swiss Federal Institute of Aquatic Science and Technology (EAWAG) and the Swiss National Science foundation. BigLink is a multidisciplinary study aiming at developing a novel integrated approach to characterize the complex processes controlling soil formation. We are combining field, laboratory and modeling studies and developing new geochemical tools to understand weathering and soil formation processes with a particular focus is on the initial phase of soil formation.
The research site is located in the Central Alps at the terminus of the Damma glacier, in the canton of Uri, Switzerland, $\tilde{2}$100 m above sea level. The climate in this area is characterized by a short vegetation period, and $\tilde{2}$400 mm of precipitation per year. The front of NE exposed Damma glacier has retreated at an average rate of $\tilde{1}$0 m per year since the beginning of systematic measurement in 1921 creating a soil chronosequence that comprises about 150 years. The site has been instrumented with meteorological and runoff stations to characterize the water and element mass balance at catchment-scale. In addition a set of 23 representative sampling sites has been established along the chronosequence to carry out coordinated measurement campaigns of chemical, biological and physical parameters in the soils. We will discuss some the first results and highlight the potential of this Critical Zone Observatory for improving the understanding of soil evolution in its initial stages.