EGU21-10832
https://doi.org/10.5194/egusphere-egu21-10832
EGU General Assembly 2021

Quantification of soil erosion (using 239+240Pu) on periglacial chronosequences reveals the importance of vegetation cover in soil stabilisation

Alessandra Musso[1], Michael E. Ketterer[2], Konrad Greinwald[3], Clemens Geitner[4], and Markus Egli[5]

[1]Department of Geography, University of Zurich, Zürich, Switzerland (amusso@geo.uzh.ch)
[2]Department of Chemistry and Biochemistry, Northern Arizona University, Flagstaff, USA (michael.e.ketterer@gmail.com)
[3]Department of Geobotany, Albert−Ludwigs University Freiburg, Freiburg, Germany (konrad.greinwald@biologie.uni-freiburg.de)
[4]Institute of Geography, University of Innsbruck, Innsbruck, Austria (clemens.geitner@uibk.ac.at)
[5]Department of Geography, University of Zurich, Zürich, Switzerland (markus.egli@geo.uzh.ch)

High mountainous areas are are strongly shaped by redistribution processes of sediments and soils. Due to the projected climate warming and the continued retreat of glaciers in the 21st century, we can expect the area of newly exposed, highly erodible sediments and soils to increase. While soil and vegetation development is increasingly well understood and quantified, it has rarely been coupled to soil erosion. The aim of this study was to assess how soil erosion rates change with surface age. We investigated two moraine chronosequences in the Swiss Alps which were situated in a siliceous and calcareous lithology and spanned over 30 – 10'000 yrs and 110 – 13'500 yrs, respectively. We used $^{239+240}$Pu fallout radionuclides to quantify the average soil erosion rates over the last 60 years and compared them to physico−chemical soil properties and the vegetation coverage. At both chronosequences, the erosion rates were highest in the young soils. The erosion rates decreased markedly after 3−5 ka of soil development to reach a more or less stable situation after 10−14 ka. This decrease goes hand in hand with the development of a closed vegetation cover. We conclude that depending on the relief and vegetational development, it takes up to at least 10 ka to reach soil stability. The establishment of a closed vegetation cover with dense root networks appears to be the controlling factor in the reduction of soil erodibility in periglacial areas.