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Assessing talus Activity Patterns using Lichenometry in the Stubaier Alps - some Results and many Problems

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Talus sheets and cones are widespread features in arctic and alpine areas and their formation is thought to be promoted by intensified frost weathering in periglacial environments. However, the reaction of debris fall rates to climatic fluctuations is poorly understood. While geophysical thickness assessments give an average backweathering rate over a long time span (with considerably changing climate), direct rockfall measurements can only cover a very short time range. As exposures are rare and dating is difficult, lichenometric measurements might contribute to bridge the gap in the intermediate time range of decades or centuries.

The aim of the studies presented was to establish the spatial patterns and the temporal distribution of talus activity back to the Little Ice Age. The investigations were carried out in the Finstertal area in the Stubaier Alps (11°02'E, 47°12'N, 2300-3000 m, gneiss and mica-schist). We mapped the sizes of Rhizocarpon geographicum thalli on boulders and clasts on 20 scree slopes. On a total of c. 250 boulders (>1 m^3), the five largest lichens were mapped. Debris-size values for clasts were investigated in several hundreds of 1m^2 test plots; more than 2500 single values were obtained. In c. 1200 test plots, the percentage lichen coverage was estimated for a rough estimate of talus activity.

The results make it possible to identify processes operating on the individual slopes. Active areas may be concentrated close to the rockwall and in longitudinal stripes (pointing to moderate rockfall and debris-flow activity), evenly distributed (rockfall) or at the apex and at the base (rockfall and avalanches). Slopes with southerly orienta-

tions seem to be generally less active; much higher activity is found under north-facing rockwalls which are probably influenced by degrading permafrost, and in the areas of current glacier retreat.

Assessing the temporal distribution of rockfall and debris fall turned out to be very difficult for several reasons. The age calibration curve derived from buildings and moraines of known age considerably differs from growth curves derived from the literature; there are substantial differences between individual moraines within the study area which were all judged to be "1850" according to the mappings of HEUBERGER. On finer-grained (<0.5m) talus slopes, the turnover rate of the debris is too high; lichen sizes reflect the time it takes until a generation of clasts is buried rather than the actual age distribution. What is more, debris production can not be separated from relocation processes working on the slope. Thus, the aim of obtaining production rates in certain time periods was not reached and is probably not possible.

Boulder falls appear to be almost randomly distributed on the active, north-facing slopes; many fresh (lichen-free) boulders are found at these sites. On the south-facing slopes, almost no fresh boulders are present and there is a broad peak of lichen sizes between 25 and 50 mm. Depending upon the calibration curve used, these diameters correspond to the glacier advance around 1850 or to the early 20th century, after the end of the main LIA cold phases.