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Influence of topographic and climatological characteristics on rock glacier creep rates in the Western Austrian Alps

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Recent advances in remote sensing technologies and data analysis tools resulted in detailed monitoring activities of rock glacier surface kinetics. In combination with geophysical methods and numerical modeling the remotely sensed data led to an increased process understanding of rock glacier creep dynamics. However, the number of studies where such method combinations are carried out is limited to a rather small number of rock glaciers.
With our study we aim to contribute to an improved understanding on the significance of topographic and climatological variables on rock glacier creep rates. Therefore, creep rates of 347 intact rock glaciers in the Western Austrian Alps (Tyrol) are calculated. According to the new Tyrolean rock glacier inventory 200 of them are active and 147 inactive. In contrast to other studies, where often a few rock glaciers are investigated in detail, the 347 rock glaciers represent all rock glaciers within the study area of 887 sqkm.
For the calculation of creep rates, the Open Source image-correlation software IMCORR is used and implemented into an automated work-flow. Input data for the image correlation are shaded relief raster maps with 0.5 m spatial resolution, which were obtained form airborne laser scanning data acquisition campaigns carried out in 2006 and 2010.
By comparing the calculated creep rates with results from differential global positioning system data, an absolute accuracy of 0.30 m (standard deviation) could be determined. Thus, reliable interpretations can be made for creep rates > 0.30 m between 2006 and 2010. In such cases, statistical correlations between the rock glacier creep rates and topographic parameters of the rock glacier, e. g. surface gradient, thickness, length, area, elevation, aspect, potential solar radiation and surface roughness (also indicator for geological properties), as well as climatological parameters, e. g. temperature are calculated. Spatial descriptive statistics on the calculated creep rates, as well as the significance of individual topographic and climatological variables on rock glacier creep will be presented.