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Monitoring of Rock Glacier Äußeres Hochebenkar (Austria): an Overview

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Past and current interdisciplinary research at the rock glacier at Äußeres Hochebenkar in the Ötztal Alps are presented. Hochebenkar rock glacier (HK) is one of the most intensely studied rock glaciers in Austria with flow velocity measurements starting in the late 1930s. The current monitoring comprises measurements of surface flow, surface and subsurface temperature, local meteorology, runoff as well as water temperature and chemical composition of the rock glacier stream. During recent projects, extensive geological mapping has been carried out. Geological mapping shows that the bedrock of the drainage area is part of the Ötztal-Stubai Complex and consists mainly of paragneiss and mica schist. Ground penetrating radar measurements show a smooth bedrock surface without pronounced ridges or bumps. A maximum thickness of 49 m was recorded. On the surface a layer of coarse debris covers more fine grained material, which is exposed at the front and the margins of HK rock glacier. The average grain size of the debris mantle varies between 0.35 and 0.58 m.
Velocities (horizontal displacements) of HK rock glacier culminated in the early 1960s with a maximum value of 3.9 m/yr near the front, followed by a period of low movement with velocities less than 0.5 m/yr until the early 1990s. A second peak is observed in 2004. While a positive correlation of surface movement and air temperature has been found until the early 2000s, recent data suggest a more complex or even reverse relation of surface displacement and air temperature.
To determine the thermal regime of HK rock glacier, temperature loggers were installed across the rock glacier at an altitude of 2650 m. The temperature at the bottom of the winter snow cover (BTS) was found to decrease from the lateral parts towards the centre of HK rock glacier. Field campaigns carried out 2010 and 2011 to investigate the spatial distribution of BTS at HK rock glacier and surrounding areas suggest that the extent of permafrost ground decreased since a previous survey in 1976.
The hydrological regime of HK shows high diurnal and seasonal variability. The melting of the winter snow pack typically causes discharge peaks during June, single peaks during summer are caused by heavy precipitation events. A high amount of solutes is released from HK during summer rising by a factor of 2 to 5 from the beginning of the melting season until autumn.