Geophysical Research Abstracts
Vol. 15, EGU2013-8467, 2013
EGU General Assembly 2013

Relict rock glaciers in alpine catchments: A regional study in Central Austria

Andreas Kellerer-Pirklbauer (1,2), Marcus Pauritsch (1), and Gerfried Winkler (1)

(1) Institute for Earth Sciences, University of Graz, Austria, (2) Institute of Remote Sensing and Photogrammetry, Graz University of Technology, Austria

Alpine catchments represent an important freshwater source in many regions. Catchments in the subalpine to nival altitudinal levels are generally characterised by higher precipitation, lower evapotranspiration and consequently higher discharge rates compared to lower elevated areas of the montane and foothill levels of the same region. Particularly in crystalline mountain regions in the mid- to high latitudes glacial and periglacial sediments cover larger areas and form important aquifers in alpine catchments. Typical periglacial landforms in mountain areas are rock glaciers. Relict rock glaciers consist of sediment accumulations without permafrost at present. This rock glacier type has a strong influence on water storage capacities and discharge behaviour of the catchments. The hydraulic properties of rock glaciers have a positive impact on flood-risk reduction and the riparian ecology below rock glacier springs during dry periods. Furthermore, the exceptional high discharge rates at springs at the front of relict rock glaciers compared to nearby non-rock glacier springs are also of economic interest. Knowledge about morphometric characteristics of rock glacier catchments helps to increase the understanding of the groundwater system and discharge dynamics of rock glaciers. In this context the main objectives of our study are (a) to assess and quantitatively describe rock glacier catchments at a regional scale by analysing different morphometric parameters of the catchments and (b) to combine the rock glacier catchment properties with water balance data. In doing so, at first an inventory of 295 rock glacier catchments was established for the 2440 km^2 large study area (Niedere Tauern Range, Styria) in Central Austria ranging from 590 to 2862 m a.s.l.. In a second step, the inventory data were combined with area-wide precipitation, discharge and evapotranspiration data. Results reveal that 108 km^2 or 4.4% of the entire study area belongs to rock glacier catchments. This proportion increases to 8.6% for areas above 1500 m a.s.l. and even to 23% for areas above 2000 m a.s.l.. Results for a 626 km^2 large subunit (Seckauer Tauern Range) reveal that even 15.6% of the area above 1500 m a.s.l. and more 42% above 2000 m a.s.l. are influenced by relict rock glaciers as aquifers. A total water volume of 4240 Mio m^3 is precipitated annually (mean value for the normal period 1971-2000) in the entire study area. 22% of this water is evapotranspirated and the remaining water is the discharge of the catchments. Despite the fact that 8.6% of the entire Niedere Tauern Range above 1500 m a.s.l. belong to rock glacier catchments, about 9.5% of the total discharge and 9.2% of the total precipitation originates in the rock glacier catchments. In contrast, only 7.9% of all precipitated water is evapotranspirated in these catchments. In the subunit Seckauer Tauern Range the same figures for rock glacier catchments are substantially higher and more pronounced in their differences with 15.6% for area, 16.8% for precipitation, 14.5% for evapotranspiration and even 17.3% for discharge. These figures exemplarily show that rock glaciers and their catchments are highly relevant in the alpine water cycle of the study area.