Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02061, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02061
EGU General Assembly 2008

10 Years of Monitoring the Rock Glacier Kinematic and Surface Temperature at Weissenkar Rock Glacier, Austria (1997-2007)

A. Kellerer-Pirklbauer (1), V. Kaufmann (2), M. Krobath (3), G.K. Lieb (1) and Michael Avian (2)

(1) Institute of Geography and Regional Science, University of Graz, Austria, (2) Institute of Remote Sensing and Photogrammetry, Graz University of Technology, Austria, (3) Umwelt-Bildungs-Zentrum Steiermark, Graz, Austria (andreas.kellerer@uni-graz.at / Fax: +43 316 380-9886 / Phone: +43 316 380-8844)

Weissenkar rock glacier is located in the Schober Mountains, Eastern Alps, Austria (46˚57.5’ N, 12˚45.1’ E). The tongue-shaped rock glacier consists of an upper lobe overriding a lower lobe (polymorphic rock glacier) and is characterized by well developed furrows and ridges at the lower half of the landform, a lower limit at 2615 m a.s.l., a length of 500 m and a maximum width of 300 m, making it one of the larger active rock glaciers of the Central Alps. Two different monitoring methods have been applied for a 10-year period: (1) A geodetic monitoring program was initiated at Weissenkar rock glacier in 1997 and was carried out annually (surveys in August) - except in 2002 - since then. The annual vertical and horizontal displacement rates of 15 (1997-1998) to 18 (1998-2007) objects points distributed evenly over the entire rock glacier were recorded by a total station. (2) Automatic and continuous (most time of the year; 1 hour record interval) measurements of ground surface temperature were started in autumn 1997 using UTL-1 miniature temperature dataloggers (MTDs) focussing on the central part of the rock glacier tongue. During each year for the period 1997 to 2007, one (1997-1999) to three (1999-2007) MTDs were installed during the autumn months and were recollected during the subsequent early to late summer. Technical problems caused a data gap in the period 2001-2004. In addition to geodetic and MTD data, climatic data from the alpine meteorological station Sonnblick (3106 m a.s.l., 18 km to the NE) were used. Our results show that there is no statistical relationship between rock glacier kinematic (vertical change and horizontal velocity) and four climatic parameters (MGST/mean period ground surface temperature, FDD/freezing degree days, TDD/thawing degree days, MAT/mean period air temperature) with underlying data of the identical period. In contrast, the comparison of rock glacier kinematic data with climatic data of each previous year revealed high correlation coefficients and statistical significant results. For example, higher MGSTs caused higher horizontal velocities and higher rates of surface lowering. FDD and TDD have a high correlation with horizontal displacement rates. These findings indicate that interannual velocity changes are strongly related to ground surface temperature condition shifts with a delay of one year caused by their delayed propagation into deeper grounds. Furthermore, surface elevation lowering is better correlated with air temperature conditions of the previous year reflecting again this lag in propagation.