



Rockglacier Surface Kinematics over a 50-years Period - Examples from the South Tyrolean Alps (Italy)

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Permafrost research in the Rieserferner-Ahrn natural park (South Tyrol/Italy) takes place under cooperation of the Autonomous Province Bozen-Südtirol administration. The area of interest is located at the most southern foothills of the Hohe Tauern range, where rockglaciers are exclusively developed in igneous- and sedimentary gneiss. Basic results of the permafrost environment during the Lateglacial and Postglacial were gained from the research of so far 50 rockglaciers.

Since 1992 field studies focus on active rockglaciers, and comprise flow rate measurements (tape and laser distance measure), temperature and electrical conductivity measurements of permafrost springs, and BTS measurements (e.g. using data loggers). Remote sensing techniques and GIS are applied for reconstruction of longtime changes in creep and deformation of two rockglacier surfaces. The analysis of airborne photographs and orthophotos, comprising images of 1956, 1985, 1992 and 1999, is based on geomorphologic flow indicators. The evaluation includes 40 - 220 points. Flow rates were calculated for two periods (1956-1985 and 1985-1999). Furthermore, since 1993 annual terrestrial measures derived from several measuring points are available.

Mean surface flow rates are between 2 - 49 cm a⁻¹ (1956-1985) and 2 - 54 cm a⁻¹ (1985-1999) respectively, dependent on the observed surface position. During 1956 - 1999 the total mean displacement amounts to 6 - 8 m. In all, a maximum increase of an annual mean surface flow rate of 24 - 65 % results from these investigations.

The mean displacement rates of front wall sites were about 13 - 18 cm a⁻¹ in the 1st period and 18 - 23 cm a⁻¹ between 1985 and 1999 in consideration of photogrammetry. During the later period the movement increased at 28 - 36 %. Front wall flow rates derived from terrestrial measurements amount to absolute 10 - 80 cm a⁻¹ and as a mean to 28 cm a⁻¹ since 1993, exceeding the value of 1956 - 1992 by 73 %.

The rates vary significant among the measuring points as well as they vary from one year to the next. In several years they show peaks of acceleration, especially in 1992-93, 1997-99 and 2003-04. The outstanding warm summer of 2003 was followed by a mean displacement of 37 cm a^{-1} at the front wall, which overtopped the rate of the period 1956 - 1992 by 150 %.

References

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