

Spatio-temporal variations in rockglacier kinematics: significance and challenge.

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Active rockglaciers represent typical indicators for the present occurrence of permafrost in high mountain geosystems. Due to their characteristics, the kinematics of these landforms implies important information on their sensitivity to climate-induced changes within the geosystem.

Monitoring data on kinematics is compiled for a number of rockglaciers in the Turtmanntal, a meso-scale geosystem (area: 110 km²) in the central Swiss Alps. The measurements are realised by the application of ground-based and photogrammetric techniques (Roer et al. 2005a) and thus represent information on horizontal and vertical movements over a period of 30 years (1975 – 2006).

In spite of differences in origin, geological and geomorphological setting of the single landforms, the photogrammetric data indicate for all active rockglaciers a distinct increase in horizontal movement rates between 1993-2001, compared to the period 1975-1993 (Roer et al. 2005b). Regarding the annual measurements between 2001 and 2006, highest horizontal velocities are observed in the years 2003/2004 and 2004/2005, while values are clearly lower in 2005/2006.

In order to interpret the observed variations in rockglacier kinematics, some geomorphic and climatic parameters are investigated for their individual influence on rockglacier movement. According to the current knowledge of rockglacier rheology, parameters such as differences in ice content and thickness, ice temperature, changes in slope as well as the flow law or a combination thereof, control their kinematics (Kääb et al. in press). These parameters are influenced by the input of water (precipitation, meltwater), debris supply, snowcover characteristics (duration, thickness, etc.), and temperature variations.

Even if the correlations are rather simple and will not allow for a well-defined deduction of ongoing processes or dynamics within this complex system, they improve the knowledge on major controls and indicate that the observed kinematics are related to the recent climate in the Alps.

Finally, future objectives in monitoring rockglacier kinematics - in order to better understand their dynamics – are defined.

REFERENCES

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