

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 20/1	Graz 2014
PANGEO AUSTRIA 2014		Graz, 14. September 2014 – 19. September 2014	

ERT-monitoring of water fluctuations during freeze-thaw processes in alpine rock walls

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The detachment of rock fragments from alpine rockwalls is mainly assigned to frost weathering. However, the actual process of frost weathering as well as the contribution of further weathering processes (e.g. hydration, thermal fatigue) is poorly understood. Rock moisture distribution during freeze-thaw events is key to understanding weathering. As freeze-thaw cycles of different duration and intensity can contribute to rock shattering, these events can only be adequately investigated by means of a continuous monitoring program. To achieve this aim, small-scale geoelectric survey lines (ERT) are installed in three study areas (Gesäuse, Dachstein, Kitzsteinhorn) in the framework of the ROCKING ALPS project. The survey lines are maintained over a period of at least one year each. Considerably different freezing behavior between north- and south-facing sites, as well as between permafrost and non-permafrost sites is observed.

Very short-term moisture fluctuations (e.g. those induced by freeze-thaw events) cannot be accurately recorded by geoelectric profiling. Thus, additional temperature and moisture measurements at higher temporal resolution are carried out. Two techniques of moisture measurement are applied. (1) Transitional resistivity measurements providing reliable time series enabling detailed observation of water displacement and freezing. (2) Novel moisture sensors using the heat capacity of the surrounding rock which is governed by water content. These sensors give point readings from a defined depth and are independent from soluble salt contents.