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Using cosmogenic nuclides to date the stabilisation age of relict rockglaciers

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Active rockglaciers are periglacial landforms which are creeping down mountain slopes due to plastic deformation of the interstitial ice. The occurrence of active rockglaciers is an indicator of Alpine permafrost. Relict rockglaciers are not moving anymore because the ice melted, but they give evidence for the earlier existence of permafrost. In the Alps, relict rockglaciers can often be found below today's tree line raising the question of when these landforms have last been active. Judging from the present position of the relict rockglaciers, the lower permafrost limit during the time of their activity must have been hundreds of meters lower than it is today. Already in the early days of rockglacier research, the potential of relict rockglaciers as a paleoclimate proxy was recognised (Barsch 1977, Haeberli 1985). However, obtaining absolute ages on relict rockglaciers has always been a major difficulty. Lately it has been shown that with cosmogenic nuclides it is possible to date the stabilisation age of relict rockglaciers, but it has been applied only in a few cases (Ivy-Ochs et al. 2009).
According to Reitner (2007), the lowest relict rockglaciers of the eastern Alps, the Tandl rockglaciers, are located in the Province of Carinthia (Austria). The Tandl rockglaciers are a complex series of rockglaciers spanning from around 2300 m down to 1220 m a.s.l. Due to their low position and based on modelling estimates on permafrost distribution in the area (Avian & Kellerer-Pirklbauer 2012), it is plausible that these low rockglaciers were active even prior to the Younger Dryas. Therefore, samples from the entire rockglacier series were taken for 10Be exposure dating. Furthermore, the close proximity of the rockglaciers to moraines associated to the Gschnitz stadial allow comparing the dating results to equilibrium line depression reconstructions. Less than 10 km to the southwest, a second rockglacier series, the Norbert rockglaciers, was sampled. In contrast to the Tandl rockglaciers, which are facing towards the northeast, the Norbert rockglaciers face towards the southwest. This provides an exceptional opportunity to elucidate the influence of the aspect to the rockglacier evolution and the regional paleoclimate variations.

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