Tracking the pace of onset of glaciations in the Alps

Anne Claude[1], Naki Akçar[1], Susan Ivy-Ochs[2], Fritz Schlunegger[1], Peter Kubik[2], Meinert Rahn[3], Andreas Dehnert[3] and Christian Schlüchter[1]

[1] University of Bern, Institute of Geological Sciences, (anne.claude@geo.unibe.ch),
[2] ETH Zürich, Laboratory of Ion Beam Physics, 3Swiss Federal Nuclear Safety Inspectorate ENSI

The onset of glaciations in the northern hemisphere is attributed to approximately 2.7 Ma (Maslin and Ridgwell, 2005). Since then, the extent of glaciation is marked by oscillating ice volume on a hemispherical scale. Whether this onset in the Alps is synchronous or not, it is still unrevealed. The onset of glaciations must have resulted in a landscape change, which is recorded in the oldest Quaternary deposits in the Alps. This study focusses on these oldest deposits, the Deckenschotter (cover gravels), which are located beyond the limit of the Last Glacial Maximum. These glaciofluvial gravels cover Tertiary Molasse or Mesozoic bedrock and have a reverse stratigraphic relationship, i.e. older deposits are located at higher altitudes and vice versa. For a long time, the glaciation history of Switzerland was correlated to that of southern Germany where Penck and Brückner (1909) differentiated four Quaternary stratigraphic units (LT; Lower Terrace, HT; Higher Terrace, Lower Cover Gravels; TDS and Higher Cover Gravels; HDS) based on their distinct topographical positions. To track the pace of onset of glaciations in the Alps, we reconstruct the chronology of Swiss Deckenschotter and thus contribute to the understanding of the large-scale evolution history of the Alpine Foreland. In order to reveal the extent of paleoglacial catchments we use detailed lithostratigraphy.

To reconstruct the chronology of Deckenschotter, we use two different methods: depth-profile and isochron-burial datings. Depth-profile dating is based on the decay of cosmogenic nuclides with depth, whereas isochron-burial dating relies on the fact that clasts stemming from the same timeline have different pre-burial but same post-burial histories. Here, we present two Higher Deckenschotter sites at Stadlerberg and Irchel, located in the canton of Zurich, at an elevation of 600 m and 670 m a.s.l., respectively. At Stadlerberg, in an abandoned gravel pit 7 sediment samples were taken for depth-profile dating with 10Be and 9 quartz pebbles for isochron-burial dating with 10Be and 26Al. At Irchel, on one hand 9 quartz clasts were collected for isochron-burial dating at the contact between the Deckenschotter and the Molasse. On the other hand, in an old gravel pit, 7 sediment samples for depth-profile dating and 13 quartz clasts for isochron-burial dating were sampled. First results from Stadlerberg reveals that this sequence was accumulated approximately 2 Ma ago during a cold period. Furthermore, the petrography of the pebbles indicates that the Deckenschotter unit at Stadlerberg originates from the catchment of the Rhein-Linth Paleoglacier. Based on

these, we anticipate that the Quaternary glaciations in the Alps should have begun prior to 2 Ma.

Zitate

Maslin, M.A. & Ridgwell A.J. 2005:Mid-Pleistocene revolution and the 'eccentricity myth'. *Geological Society, London, Special Publications* 247: 19-34.

Penck, A. & Brückner, E. 1909. *Die Alpen im Eiszeitalter*. Chr. Herm. Tauchnitz, Leipzig.