



Cosmogenic nuclide dating of glaciofluvial deposits: insights from the Alps

Naki Akcar (1), Susan Ivy-Ochs (2), Vasily Alfimov (2), Anne Claude (1), Regina Reber (1), Marcus Christl (2), Christof Vockenhuber (2), Fritz Schlunegger (1), Meinert Rahn (3), Andreas Dehnert (3), and Christian Schlüchter (3)

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

Cosmogenic ^{10}Be and ^{26}Al can be employed to reconstruct the chronology of sediment layers. Accumulation of these can be used to exposure date the sediment layer as the variation of cosmogenic nuclide concentration with depth can be modeled. Decay of ^{10}Be and ^{26}Al in the samples from a well-defined single bed in a deposit enables the modeling of the post-burial component and the determination of the $^{26}\text{Al}/^{10}\text{Be}$ at the time of burial. The isochron-burial age can then be calculated from the initial and the measured ratios.

In this study, we focus on the depth-profile and isochron-burial dating of the oldest Quaternary deposits of the Alpine Foreland. These are called Swiss Deckenschotter (cover gravels) as they build mesa-type hill tops on the Mesozoic or Cenozoic bedrock of the Swiss Alpine forelands. Deckenschotter consists of glaciofluvial gravel layers intercalated with glacial and/or overbank deposits. Although previously morphostratigraphically correlated with Günz and Mindel glaciations of Penck and Brückner, the Swiss Deckenschotter is likely much older, and their chronostratigraphy is not well constrained. In order to reconstruct the chronology of these deposits, we studied two Deckenschotter outcrops in abandoned gravel pits in Mandach (507 m a.s.l.) and Siglistorf (530 m a.s.l.) in canton Zurich. We collected four samples from Mandach for ^{10}Be analysis and more than 30 clasts of different lithology, shape and size from a single stratigraphic horizon in Siglistorf among which we processed 19 clasts for ^{10}Be and ^{26}Al analysis.

^{10}Be concentrations of the Mandach samples vary between 10000 and 30000 at/g. Based on these, we calculated a modal depth-profile age of around 1.0 Ma. Among Siglistorf samples, four did not yield successful ^{26}Al measurements and two were unsuccessful for ^{10}Be . Most of the samples have low nuclide concentrations, i.e. <20000 ^{10}Be at/g and <150000 ^{26}Al at/g. The $^{26}\text{Al}/^{10}\text{Be}$ ratio of eight samples was above the surface ratio of 6.75, therefore they were excluded from the age calculations. Finally, using the $^{26}\text{Al}/^{10}\text{Be}$ ratio of the five remaining samples we calculated an isochron-burial age of around 1.3 Ma. Reconstructed chronology of the deposits in studied sites correlates well within the morphostratigraphic context. Our results from this study indicate that glaciofluvial sediments can well be time-calibrated with both depth-profile and isochron-burial dating despite the low cosmogenic nuclide concentrations.