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Constraining the LGM in the Drau-Glacier Area by Single-Grain-Feldspar Luminescence Dating - Implications for reconstructing Ice Dynamics in the European Alps

Christopher Lüthgens[1], Jürgen Reitner[2]
[1]University of Natural Resources and Life Sciences (BOKU), Vienna, Institute of Applied Geology, Vienna, Austria.
[2]Geological Survey of Austria, Sedimentary Geology, Vienna, Austria

Abstract

The area of the former Drau glacier system is located in the south-eastern sector of the Alps, and is characterized by extensive sedimentary archives of the last glacial cycle. These can be traced from LGM terminal moraines and proglacial outwash cones to areas close to modern glaciers. This offers the opportunity to constrain glacial chronology and dynamics of the LGM (last glacial maximum), and close the gap in knowledge between the northern and southern flanks of the Alps.

Previous efforts in establishing and improving glacial stratigraphy in the Alps have predominantly been focused on the northern flank of the Alps and its foreland (e.g. Preusser, 2004). However, recent progress in constraining the timing of the LGM was achieved on the southern flank (e.g. Monegato et al., 2007). Despite the progress, even for the short time span of the LGM, our understanding of e.g. climatic gradients across the Alps and their implications for the LGM ice dynamics of the Alpine ice sheet as a function of paleoclimatic forcing factors is still limited due to sparse data especially in the inner alpine areas.

The focus of this study lies on constraining the chronology of proglacial aggradation at the onset and during the climax of the LGM and during Termination I. Recent studies applying optically stimulated luminescence dating techniques to glaciofluvial sediments in the European Alpine foreland (e.g. Rades et al. 2018) highlighted the obstacles, but also the chances in deciphering the chronology of processes during the Late Pleistocene period by using numerical dating methods. We present luminescence ages from the tongue basin of the Drau glacier and its forefield, based on single-grain measurements of potassium-rich feldspar, using a post infrared infrared (pIRIR) luminescence SAR (single aliquot regenerative) dose protocol at stimulation temperatures of 50°C (IR50) and 225°C (pIRIR225). Despite methodological challenges, these ages may allow constraining the timing of advance and retreat of the Drau Glacier. In addition, these new results emphasise the urgent need for a synoptic review of available numerical age data from the last glacial cycle of the European Alps and their process-specific (re)interpretation, in order to provide a more robust framework for the reconstruction of over-regional ice dynamics in the context of paleoclimatic change.

References:

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