

From the valley floor to the peaks: Stratigraphy and landscape evolution of the Alpine Lateglacial in the Kitzbühel Alps (Tyrol, Austria)

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Our understanding of Alpine landscape evolution and more specifically, chronology of glacier activity during the Alpine Lateglacial (ALG; c. 19 – 11.7 ka) i.e. the timespan between the Würmian Pleniglacial (= Alpine Last Glacial Maximum; AlpLGM) and the beginning of the Holocene, is based on the evidence of only few areas in the Alps. In order to get a better understanding of glaciation and palaeoclimate during this phase, N-S and E-W transects are needed.

The Kitzbühel Alps, which are currently not glaciated, span an area of 1700km² and have peaks that reach c. 2400m a.s.l. They lie at the center of the Eastern Alps on the northern rim, which is more humid than the relatively dry central parts. A modern geological investigation of the ALG record is missing in the Kitzbühel Alps.

In order to overcome this gap of knowledge and to gain a more complete understanding of the ALG landscape development, a pioneering study has been performed in the area of Langer Grund Valley, a tributary valley of the Kelchsau Valley. This was done through detailed field mapping, thereby describing the shape and sediment composition of Quaternary morphological features, such as moraines, landslides and rock glacier deposits. Sedimentary evidence of one short glacial advance and two glacial stadials were identified. In chronological order they were named the: Frommbach advance, the Arnbach (glacier) halt and the Küharn halt. Where possible, palaeoglaciers were constructed using ArcGIS. With the palaeoglaciers, equilibrium line altitudes (ELA) were calculated and compared to ELA values of known glacial stadials in an attempt to correlate the relative local stratigraphy to the Lateglacial stratigraphy. Four methods to calculate ELAs were used; Maximum Elevation of Lateral Moraines (MELM), Toe to Headwall Altitude Ratio (THAR), Area x Altitude (AA) and Accumulation Area Ratio (AAR). Furthermore, the glacial sedimentary sequence of the study area was compared to that of the Gschnitz Valley (following the approach of Reitner et al. 2016). The result of which was that the glacial sedimentary sequences were very similar. Through the comparison of ELAs and sedimentary sequences, the Frommbach advance is correlated to the Phase of Ice-decay. Compared to the data of Reitner (2007) the Frommbach advance represents a second glacier advance in the Kelchsau Valley within this short-lasting phase around 19 ka. The Arnbach halt represents most likely the Gschnitz stadial (16-17 ka). The Küharn halt is correlated to the Younger Dryas-aged Egesen stadial (Younger Dryas; 12.8-11.7 ka).

In addition, the relative timing of the activity of (nowadays relict) rock glaciers and of the onset of deep-seated gravitational slope deformations (DSGSDs) could be constrained based on the overlap of those features with the reconstructed glacial record.

References:

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Reitner, J.M., Ivy-Ochs, S., Drescher-Schneider, R., Hajdas, I., Linner, M., 2016: Reconsidering the current stratigraphy of the Alpine Lateglacial: Implications of the sedimentary and morphological record of the Lienz area (Tyrol/Austria). *E&G Quaternary Science Journal* 65: 113-144.