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The sedimentological anatomy of a landslide in Embach, Salzburg

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Quaternary deposits are widely distributed across areas of Austria and some of the outcrops are densely inhabited. South of Salzburg, at least 50 m thick gravels and sands are undergoing active mass movement, threatening the adjacent village of Embach. This proposed study, as the core of my Masters thesis, will analyse the sedimentary architecture of these deposits and develop a depositional model.
The deposits, which are overlain by a poorly exposed till of the Last Glacial Maximum (LGM), themselves have excellent exposure over a few hundred metres. They comprise poorly sorted gravels and well bedded sands, organised into sub horizontal beds, some with cross stratification. They appear to be interrupted by sharp discontinuities which are identified by a change in grain sizes and colour.
To date, very little to nothing is done regarding the depositional environment and sedimentological framework in the planned study area.
The Embach succession is thought to record ice build-up by the former Salzach Glacier prior to the Last Glacial Maximum (LGM) (Reitner, 2022). Le Heron et al. (2023) reported similar deposits to the east, where a proglacial lake was interpreted. Thus, given the exposure quality, it is hoped that detailed study will shed light on the build-up of LGM glaciers in the Province of Salzburg. Principal aims are (i) to characterise the sedimentary succession in as much detail as possible and (ii) to establish a depositional model, integrating the outcrop data with borehole data to be provided by GeoSphere Austria and the Province of Salzburg. Determining the stratal geometries and lithological heterogeneities has wider implications for understanding factors influencing future risk of mass movement.
Currently, there are three different hypotheses that may explain the sedimentary architecture at Embach, these are first, a fluvial system, second, a deltaic system and third a hybrid of these two depositional environments with feeder channels (fluvial) and a subaqueous part (foreset). These three different hypotheses will be tested by integrating traditional sedimentological field observations in concept with digital methods. Reconnaissance work reveals large foresets reminiscent of a Gilbert-type delta. If so, careful analysis, including the documentation of stratal geometries, might reveal base level changes charting proglacial lake evolution. Lithological description, sedimentary logging and clast fabric analysis will be performed together with photogrammetry to produce a realistic 3D model of the outcrop, as a foundation for interpretative correlation panels. Although the sands and gravels are expected to yield significant new results owing to the quality of exposure, the overlying till deposits are almost entirely overgrown and exposure is poor to non-existent. To put the deposits into a regional context, the fieldwork will be supplemented by geomorphological mapping of 1 m resolution laser scan data in order to determine the LGM-ice flow directions more precisely. These data reveal excellent evidence for features such as drumlins and large scale glacial lineations.

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