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Subglacial deformation, till formation and deformable bed conditions: The Late Pleistocene sequence of Einödgraben (Aurach, Kitzbühel Alps, Austria)

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Knowledge of subglacial conditions is of great relevance in understanding glacier dynamics. A combination of micro- and macrosedimentological analysis of diamictons and deformation structures can form the basis for the reconstruction of past subglacial conditions. We present the results of such a study on subglacial tills, within an Alpine environment, at Einödgraben in the Kitzbühel Alps (Tyrol/Austria; Reitner & Menzies, 2024). The Late Pleistocene succession there (MIS 5d-MIS 2) shows great diversity in facies from wood-bearing alluvial to glaciolacustrine to subglacial deposits. Two glaciogenic diamictons (tills) within the sequence were analysed at the microscale and are correlated to the Last Glacial Maximum (LGM; Würmian Pleniglacial) and the early Lateglacial phase of ice decay. The first deformation phase of pre-LGM deposits occurred most likely in a subglacial setting close to the advancing glacier margin and resulted in diapir-like glaciotectonic macro-structures, which are unique for an inneralpine area. Subglacial erosion over these structures occurred and later pre-LGM emplaced deposits underwent deformation and partial homogenisation immediately beneath the glacier base leading to diamictons, indicative of subglacial deformable bed conditions. The tills of the LGM and the Würmian Lateglacial show a range of microfacies and deformation structures evidence of close and rapid changes in till rheology and stress field dynamic in the subglacial environment. Our study demonstrates the need for a reinvestigation of deposits occurring in the proximity of past active ice interfaces. The paleoglaciological evidence assembled from the detailed and spatially close research on the microsedimentology of till at Einödgraben reflects our increasing comprehension and understanding of till microsedimentology in Alpine environments. An awareness is also shown of the need for much further research on the glacial depositional mechanics in mountainous terrains that are different from those in the immense lowland plains of the extensive paleo-ice sheets of North America and Northern Europe.

Reference:

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