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Quantitative CT scan analysis: an innovative tool for interpreting ice-contact sediments from overdeepened basins of the northern Alpine foreland

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Overdeepened basins are shaped and filled by the interplay of erosion and deposition during one or more glacial-interglacial cycles. Understanding and correlating the sedimentary infill of overdeepened systems is a key to understanding glacial dynamics in terms of the timing, extent, and character of Quaternary glaciations. Therefore, numerous overdeepened structures in the northern Alpine foreland have been explored by research drilling in recent years, resulting in a large collection of sediment cores of excellent quality, providing a unique opportunity to gain insight into these structures. Exploration of these basins shows that a depositional sequence in the sedimentary record of a glacial overdeepening typically begins with the subglacial deposition of coarse-grained units (diamicts and gravels), reflecting complex ice-bed-interactions during the transition from erosion to deposition. The identification and interpretation of these potential ice-contact sediments is crucial for understanding the glacial sedimentary sequences.

In this study, we use X-ray computed tomography (CT) scanning to identify and quantify sedimentological features and systematically characterise a wide range of potential ice-contact sediments from different levels within the sedimentary record of several overdeepened basins in the northern Alpine foreland. CT scanning provides a powerful tool for the detailed analysis of sedimentary drill cores, particularly in these glacial sediments, where such examinations have never been carried out on a large scale. This study aims to establish a CT analysis workflow and a database of characteristics of ice-contact sediments. This will contribute to the controversial discussion of the relevant processes that form ice-contact sediments and improve our ability to identify ice-contact sediments and their genesis in overdeepened basins.

Session: *Pangeo workshop: Glacial erosion and deposition*

Keywords: *drill-cores, CT-scanning, diamicts, glacial overdeepening*