

EGU2020-5214

<https://doi.org/10.5194/egusphere-egu2020-5214>

EGU General Assembly 2020

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Drilling into mid-Pleistocene sediments in the overdeepened Aare Valley, CH

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Overdeepenings are common bedrock features that were formed within the Alps and their forelands during repeated glaciations. Here, we present a total of 208.5 m of sediment core recovered during a scientific drilling campaign in spring 2019. The drilling is located on the Swiss Plateau (CH) close to the terminus of the overdeepening that was formed by the Alpine Aare glacier. The drilling reached the Molasse bedrock at an elevation of 362.5 m a.s.l. This is the first time in the middle Aare Valley that a scientific drilling fully recovered the sedimentary fill of the overdeepening.

The retrieved material comprises an alternation of silt- and sandbeds, and massive as well as cross-bedded gravel layers. We divide the suite into two packages reflecting sedimentation within a fluvio-glacial environment. The first package starts with a glacial till, c. 15 m thick, which is overlain by an 89 m-thick succession of cross-bedded sandy and gravelly layers and mud interbeds reflecting deposition at the toe of a prograding delta. At c. 104 m depth, the succession is interrupted by a till sequence, c. 20 m thick, which forms the base of the second package. This package records a fining-upward trend, starting with massive sand beds at the base and ends with massive silt layers at the top. Mapping has shown that the core section is overlain by a sand layer with soft-sediment deformation structures reflecting the occurrence of a mouth bar environment. The sequence ends with fluvial gravels. The entire sediment core thus records a shallowing-up sequence that is interrupted by a glacial till.

Optical stimulated luminescence dating (IRSL; Buylaert et al., 2009) yielded a minimum age of c. 200 ka for the mouth bar deposits, which is in accordance with reported Late-Middle Pleistocene ages of corresponding sequences in the region (Preusser et al., 2005). We therefore assign the upper package in our drilling to the MIS 7/8 glacial-interglacial cycle, and to the MIS 9/10 for the basal package. The sediments in our drilling thus record a crucial time interval when glacial erosion in the Alps (Haeuselmann et al., 2007) and in the northern foreland (Schluchter, 2004) occurred at the highest rates.

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