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## Drilling Overdeepened Alpine Valleys (ICDP-DOVE): Age, extent and environmental impact of Alpine glaciations

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The sedimentary infill of glacially overdeepened valleys (i.e. eroded structures below the fluvial base level) are, together with glacial geomorphology, the best-preserved (yet underexplored) direct archives of extents and ages of past glaciations in and around mountain ranges. ICDP project DOVE (Drilling Overdeepened Alpine Valleys) Phase-1 investigates five drill cores from glacially overdeepened structures at several complementing locations along the northern front of the Alps and their foreland. Two of these drill sites, both in the former reaches of the Rhine Glacier, have been successfully drilled in 2021 with excellent core recovery of 95 %: i) The borehole in Basadingen in Northern Switzerland reached a depth of 253 m, and ii) The Tannwald site in Southern Germany consists of one cored borehole to 165 m and two nearby flush boreholes; all three sites will allow a series of crosshole geophysical experiments. Three previously drilled legacy cores from the Eastern Alps are included in the DOVE Phase-1: iii) a core from Schäftlarn, located in the Isar-Loisach glacier catchment, was drilled in 2017 down to a depth of 199 m; iv) the Neusillersdorf drill site, located in the southern German Salzach Foreland glacier area, recovered a sequence down to 136 m (incl. 116 m of Quaternary strata); and v) the drill site Bad Aussee in Austria is located in the area of the Traun Glacier at an inneralpine location. It recovered almost 900 m of Quaternary sediments.

All the sites will be investigated with regard to several aspects of environmental dynamics during the Quaternary, with focus on the glaciation, vegetation, and landscape history. For example, the geometry of overdeepened structures will be investigated using different geophysical approaches (e.g. seismic surveys) to better understand the process of overdeepening. Sedimentological analyses in combination with downhole logging, investigation of biological remains and state-of-the-art geochronological methods will allow to reconstruct the filling and erosion history of the troughs. We expect significant and novel data relating to the extent and timing of the past Alpine glaciations during the Middle-to-Late Quaternary glacial-interglacial cycles. Besides these basic scientific goals, this proposal also addresses a number of applied objectives such as groundwater resources, geothermal energy production, and seismic hazard assessment.

A successful DOVE Phase-1 will lay the ground for an upcoming Phase-2 that will complete the panalpine approach. This follow-up phase will investigate paleoglacier lobes from the western and southern Alpine margins through drilling sites in France, Italy and Slovenia.

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