

# Breaching the largest Holocene landslide dam in the Alps: Reconstructing the history of Lake Ilanz, dammed by the Flims landslide

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## Background

Lake Ilanz was a lake, dammed by the deposits of the Flims landslide in the Alps in eastern Switzerland. The landslide occurred approximately 9'500 years BP (Deplazes et al., 2007; Ivy-Ochs et al. 2009). The resulting lake flooded the Surselva Valley and reached a depth of more than 100 m. Two separate lake levels at 820 m (Fig. 1) and 785 m have been observed in outcrops of delta sediments (von Poschinger, 2005; Pfiffner 2022). The lake was possibly drained in one or several catastrophic outburst floods that reached Lake Constance (Pfiffner, 2022; Schaller et al. 2022), but no precise temporal reconstruction has been made.

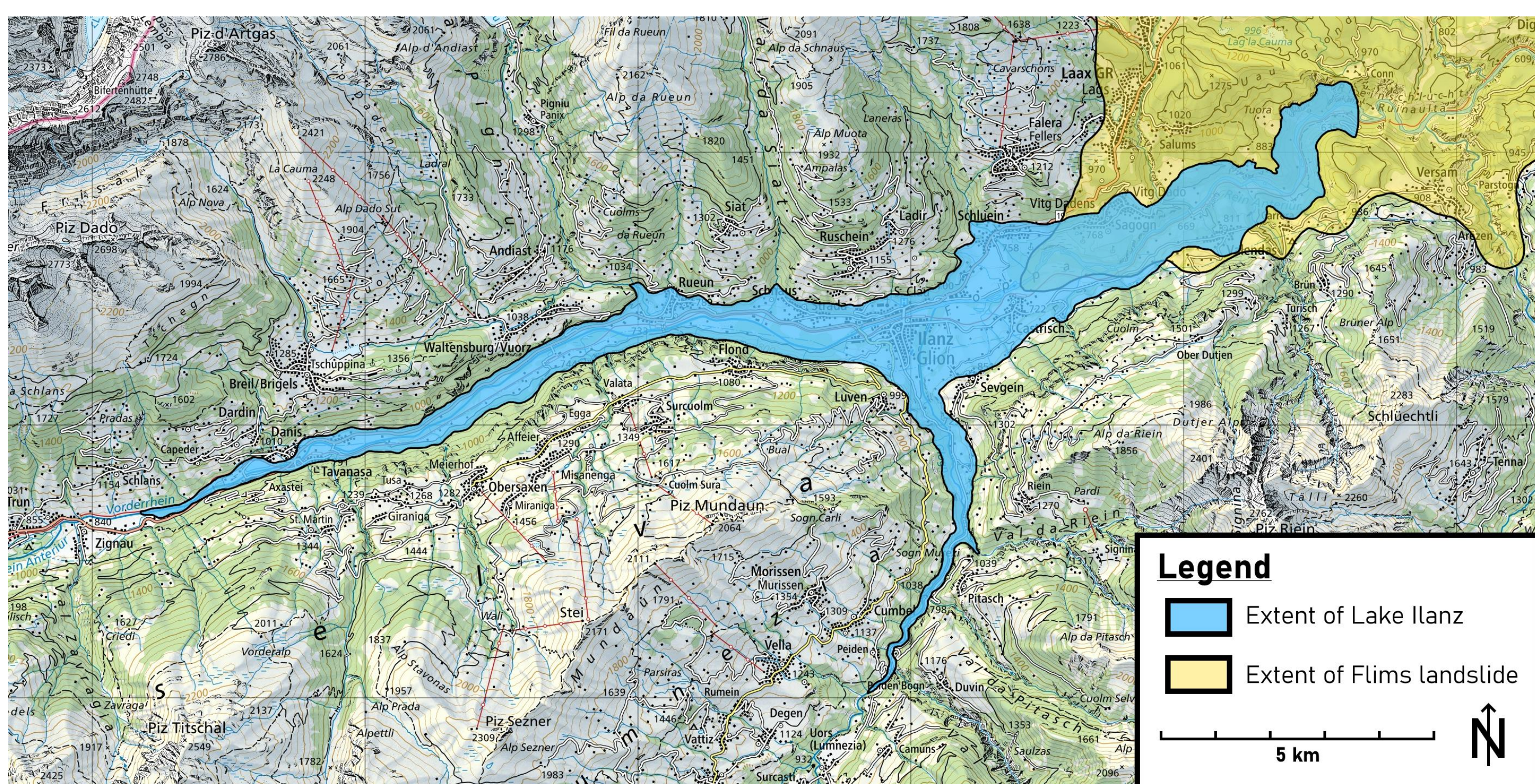


Fig. 1: Approximate extent of Lake Ilanz at a lake level of 820 meters above sea level (modified from swisstopo, 2023)

## Reconstruction Approaches

### Approach 1

- Field mapping of morphological structures from previous publications (Heim, 1891; von Poschinger, 2005)
- Collecting documented findings of lake sediments (e.g. drill cores, outcrops)
- Outcrop description and dating of fine layer in Rabiuis (900 m asl) with possible link to maximum lake level

→ Reconstruction of long-lived lake levels and extent



Fig. 2: Foreset and topset deposits of a paleodelta in a gravel pit in Sevegin (height of outcrop ca. 20 m)

### Approach 2

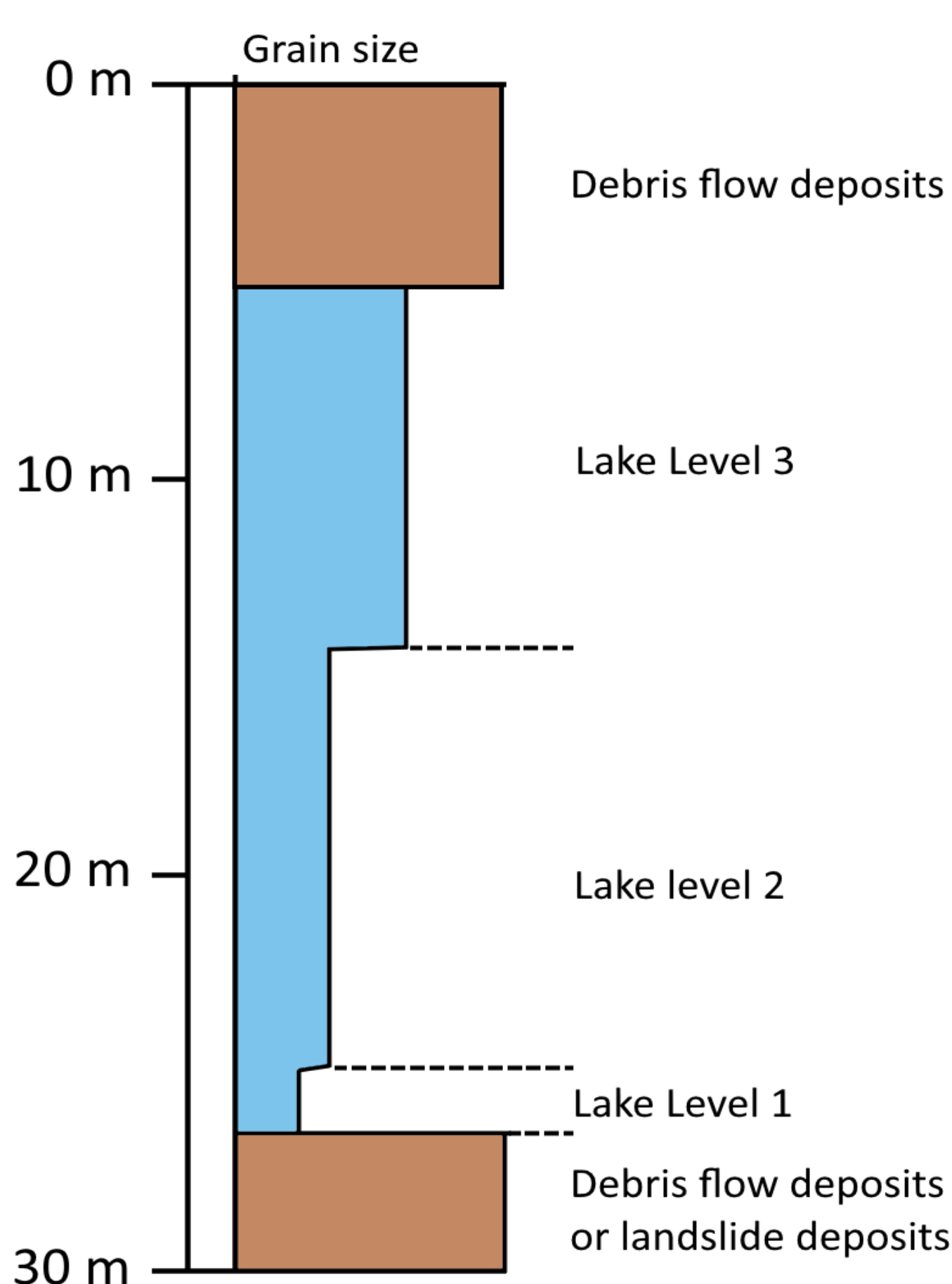
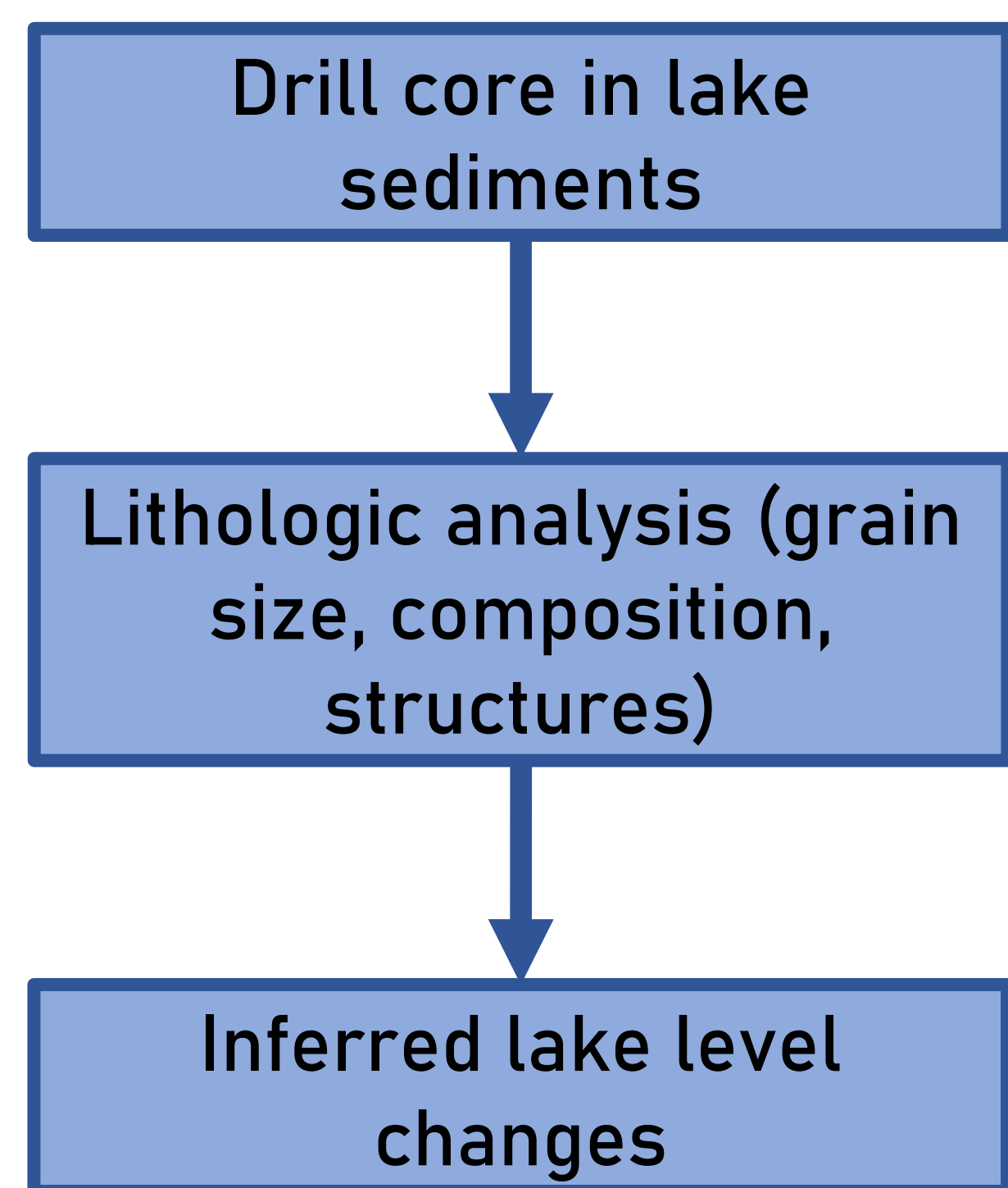


Fig. 3: Schematic profile as illustration of the methodology used for lake level reconstruction

## Preliminary Results (Rabiuis)

In a gravel pit in Rabiuis, a layer consisting of sands and fines was described sedimentologically (Fig. 4). This layer could possibly be linked to a short-lived, early high lake level. Carbon dating of organic material in the fines and the gravels gives an age estimate of approximately 3'500 - 4'000 y. BP. A deposition during an early high stand of the lake is unlikely, as the lake likely drained around 9'000 y. BP (Pfiffner, 2022). The sand layer is therefore interpreted as distal overbank deposits in a debris flow cone.

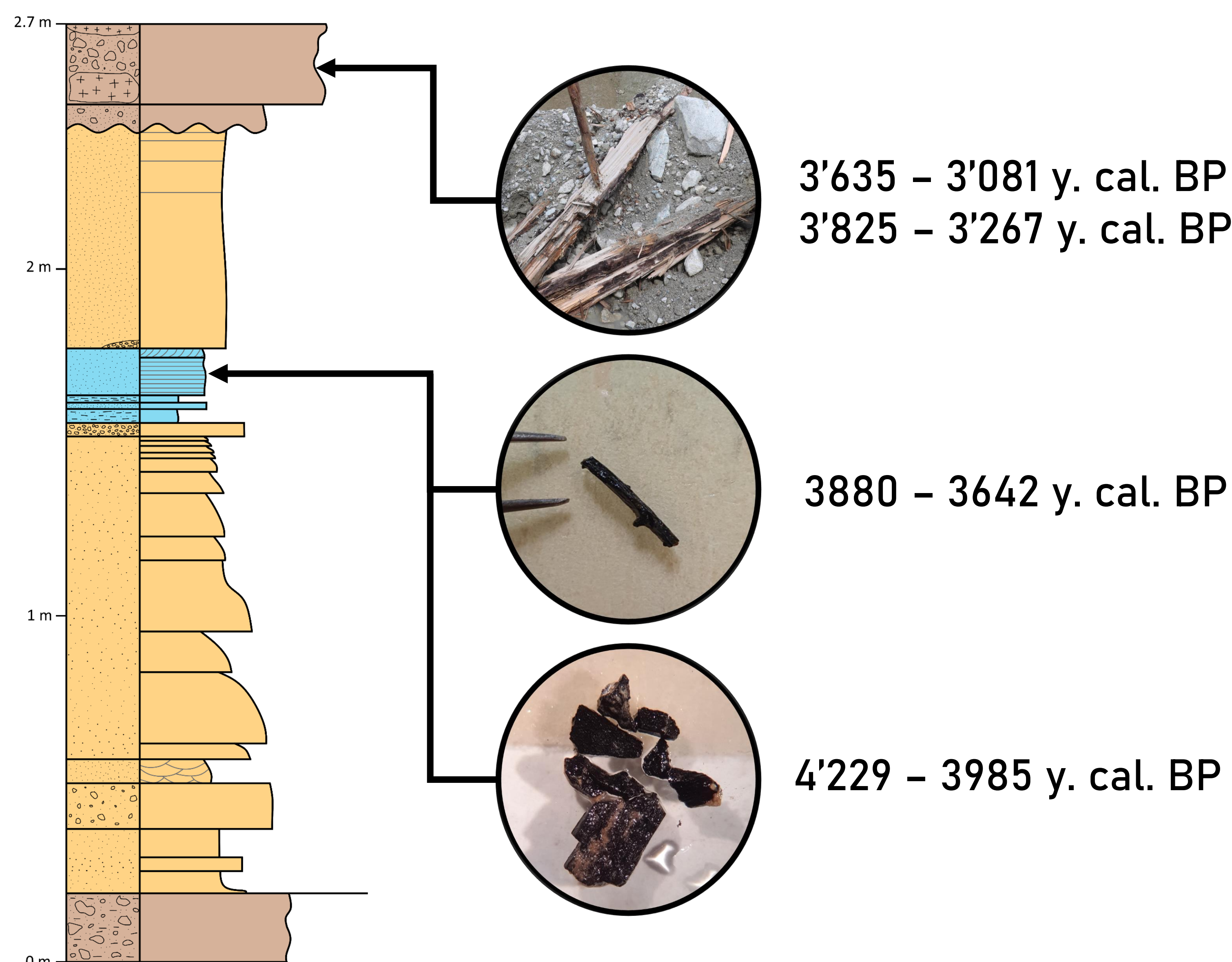


Fig. 4: Sedimentological profile of the sand layer in Rabiuis including the samples used for radiocarbon dating with their calibrated ages. The graded sand layers (yellow) contain a layer of fines consisting of silt and clay (blue). The sand is underlain and covered by debris flow deposits (brown)

## Outlook (Drilling in Castrisch)

A core drilling is planned in the village of Castrisch. The location was chosen, as it represents the deepest lake basin, where lake sediments are still preserved. Due to topography, it can be assumed, that the lake sediment stack was neither heavily disturbed nor eroded. The drilling campaign will take place in April 2024. The core will be analyzed with core scanning techniques (MSCL, CT), described sedimentologically (grain size) and geochemically (inorganic and organic carbon). Carbon dating which will then be used to create a sedimentological model.

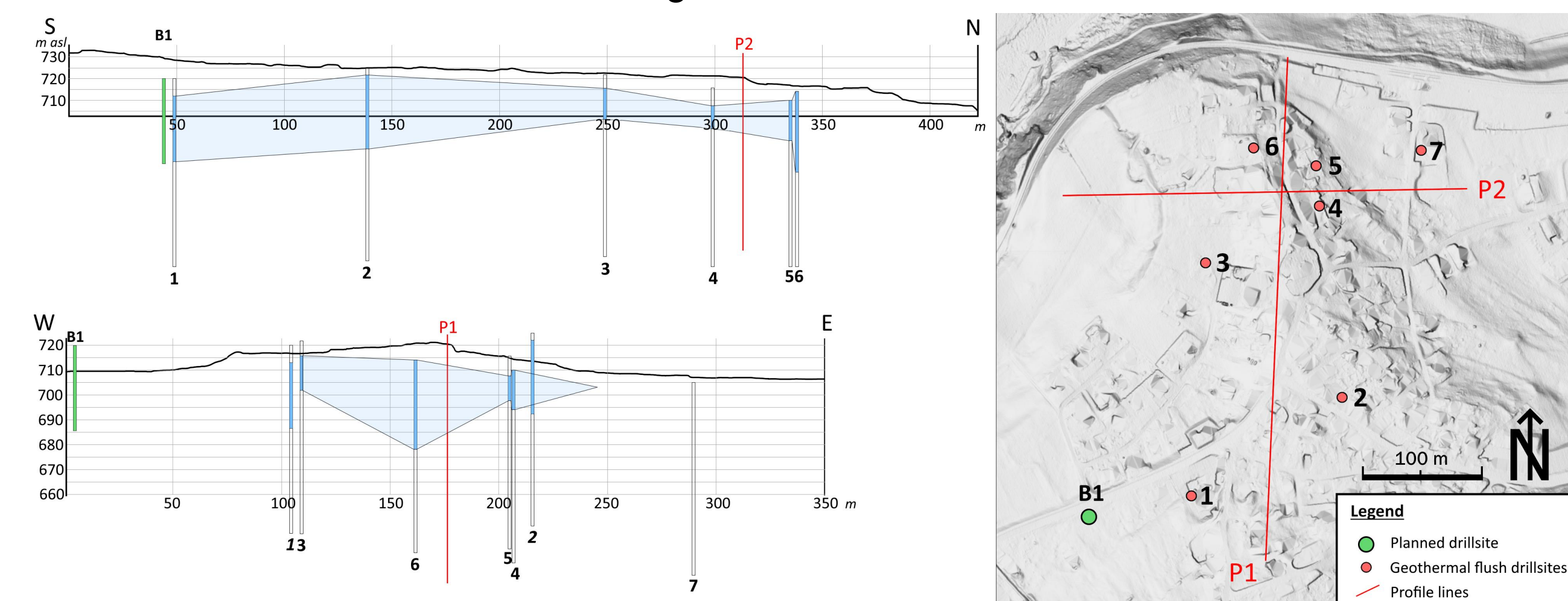


Fig. 5: Profile view through the hill of Castrisch based on drill cores for geothermal flush drillings. The lake sediments are marked in light blue. The planned drill site for this study B1 is marked in green. In the W-E profile P2, data from the sites 1 and 2 were not used in the extrapolation of the lake sediments, due to their distance to the profile section. Hillshade map modified after swisstopo (2023)

## References

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