Subaquatic moraine amphitheatre in Lake Thun

Stefano C. Fabbri*, Benedikt J. Weiss**, Christian Hübscher**, Heinrich Horstmeyer***, Cédric Schmelzbach***, Marius W. Buechi****, Marco Herwegh*, Fritz Schlunegger*, Flavio S. Anselmetti****

*Institute of Geological Sciences, University of Bern, Baltzerstr. 1+3, CH-3012 Bern (stefano.fabbri@geo.unibe.ch)
**Institute of Geophysics, University of Hamburg, Bundesstr. 55, D-20146 Hamburg
***Institute of Geophysics, Dept. of Earth Sciences, ETH Zürich, CH-8092 Zürich
****Institute of Geological Sciences and Oeschger Centre for Climate Change Research, University of Bern, Baltzerstr. 1+3, CH-3012 Bern

The combination of a recently acquired high-resolution multibeam bathymetric dataset with 2D multichannel reflection seismic data from perialpine Lake Thun reveals new insights into the evolution of the lake basin upon deglaciation and a so far unknown subaquatic moraine. These new data improve our socomprehension of the landforms associated with the ice-contact zone, the facies architecture of the sub- to proglacial units, the related depositional processes, and thus the retreat mechanisms of the Aare Glacier.
The overdeepened basin of Lake Thun was formed by a combination of tectonically predefined weak zones and glacial erosion during the last glaciation periods. Seismic stratigraphic analysis of the new data indicates that below the outermost edge of a morphologically distinct platform in the southeastern part of the lake basin (‘Bödeli’), a complex ridge structure marked by strong reflection amplitudes occurs. This structure is interpreted as a stack of several subaquatic terminal moraine crests, most likely created by a slightly advancing or stagnant and grounded Aare Glacier during its overall retreat phase. Packages of overridden moraine crests are distuinguishable, which smoothly transform downstream into prograding clinoforms with foresets with internally recognisable layering. They dip steeply towards the deepest part of the basin, eventually transforming into bottomsets. This stacked succession of subaquatic glacial sequences is overlain by lacustrine deposits formed by Late-Glacial and Holocene laminated muds comprising intercalated turbidites (Wirth et al. 2011).

Little is known about the exact timing and behaviour of the retreating Aare Glacier between its recessional phase from the Alpine foreland to the deglaciation of the inner-Alpine ice cap, mostly due to the lack of well-developed moraines that indicate glacier stabilization or slight readvance. Radiocarbon-dated calcareous clay gyttja of Late-Glacial Lake Amsoldingen, located adjacent to the water outlet of Lake Thun, shows a ~16.3 ka BP age (Lotter, 1985), providing a minimum age for the formation of the postglacial small lake. Higher up in the catchment, the oldest ^{10}Be exposure ages from the Grimsel area, the accumulation area of the Aare Glacier, indicate ice-free conditions around 14-11.3 ka BP (Kelly et al., 2006; Wirsig et al., 2016). The emplacement of the subaquatic moraine complex of the Aare Glacier must have occurred between these age constraints, implying high sedimentation rates in the lake basin.

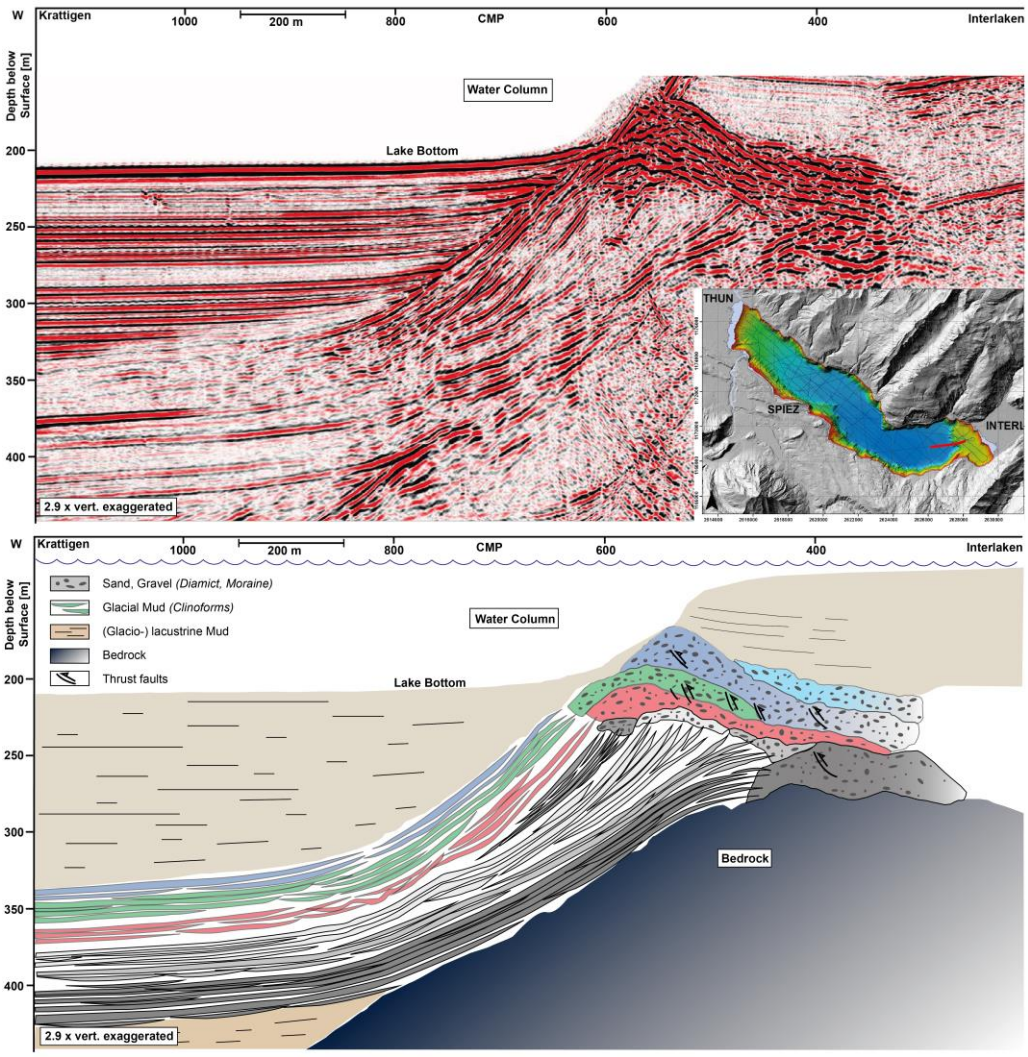

Figure 1. Top: Seismic reflection profile from the shallow subaquatic platform close to Interlaken to the main basin of Lake Thun. Bottom: Seismic sequence stratigraphic analysis indicating different stages of a retreating Aare Glacier as documented by a stack of several depositional sequences representing subaquatic moraine deposits, which translate into prograding clinoforms towards the center of the basin.

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