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Evidence for repeated advances and retreats of the Rhône glacier during the last glaciation in lake Geneva, from 2d and 3d seismic imaging

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Quaternary sediments in Lake Geneva exhibit several types of depositional mechanisms. In the eastern and central region of the lake, the generally molassic substratum is covered by a single succession of till, glaciolacustrine and lacustrine sediments of varying thicknesses. This succession reflects a single Würmian glaciation-deglaciation cycle. However, 2D high-resolution seismic sections gathered offshore the city of Evian along the southern shore of the lake show a different depositional scheme. There, basement is covered by a thin layer of subglacial till overlain by markedly laminated glaciolacustrine sediments. Within this glaciolacustrine unit another till is present.

We interpret these deposits as witnesses of advances and retreats of the Rhone glacier during deglaciation. Along the southern edge of the glacier, a periglacial lake formed where sediments accumulated. When the glacier expanded, the glaciolacustrine body was overridden by ice. As a result, subglacial deposits are observed above glaciolacustrine sediments. The high elevation of this series differentiates it from other glaciolacustrine sediments observed elsewhere in the lake that are associated with proglacial lakes. Sedimentary sequences from on land boreholes located near our seismic lines show striking similarities with our data. According to age dating on plant remains, the glaciolacustrine sequence is older than 32 000 years BP.

The glaciolacustrine sediments of the Evian area may be timely correlated with units observed in western part of Lake Geneva. There, three to four successive units are made of a lower till strata overlied by glaciolacustrine sediments the top of which is an erosional surface.

Our 3D seismic high-resolution data off Evian provide additional information on a relatively limited zone, that allows a more detailed interpretation. For example, the 3D geometry of the top glaciolacustrine deposits shows elongated features typical of glacial erosion. Furthermore, the detailed geometry of glaciolacustrine strata allows us to make assumptions on their direction of deposition and on their origin.