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Meromixis, anthropogenic impact and climate change

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The deep recirculation is the crucial event for the distribution of dissolved substances in enclosed water bodies. It controls the supply of deep waters with oxygen and the transport of nutrients and other substances from the deep waters. As a consequence the evolution of the biocenosis found in a lake is strongly affected by the circulation pattern of the respective lake. Anthropogenic impact and climate change have been known to change circulation patterns. Traces of such changes in lake sediments can be quantified. Temporal variability within the records can be correlated with climatic and environmental conditions at the time of formation. The presence of varves, their thickness as well as objects and minerals contained provide clues about past water chemistry.

Purely temperature stratified lakes show circulation patterns from thermobaric stratification to oligomixis depending on the climatic conditions of their location in winter. Under certain conditions, changing climate might alter the circulation of the lake [Boehrer and Schultze, 2008]. We show where we expect changing circulation pattern if winters become warmer, and where the circulation patterns may be impacted less dramatically. A small number of geochemical cycles sustains permanent stratification of lakes. Geochemical transformations, e.g. precipitation, remove dissolved substances from the upper water layers (mixolimnion) and transfer them to the deep water (monimolimnion), where under favourable conditions they can re-dissolve. A considerable number of lakes are known, where anthropogenic impact, or changing weather conditions have altered the circulation pattern of lakes.

Boehrer and Schultze (2008): Stratification of Lakes, Rev. Geophys. (in press)