

Nitrogen isotopes in lake sediments of Tiefer See (NE Germany), from monitoring to the sedimentary record

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Lake Tiefer See (Mecklenburg/Germany) is a deep (63 m) mesotrophic hard-water lake with pronounced summer stratification formed in a NS directed subglacial channel system. To understand the lake productivity and nitrogen cycle, depending on natural variability and anthropogenic forcing, we compare the recent input and productivity, monitored in lake water and sediment traps (5, 12, 50 m water depths, 30 day increment) since 2012 with sub annually laminated (varved) lake sediments. The sedimentary record shows a continuous increase in $\delta^{15}\text{N}$ of up to +10‰ since the late 18th century corresponding with comprehensive land use changes (agriculture, constructions, deforestation).

Nitrogen isotopes of recent particulate organic matter (POM) are interpreted to reflect productivity, influenced by extensive agriculture and life stock farming (manure, sewage). The monthly trapped sediment material clearly shows high $\delta^{15}\text{N}$ values ranging from +7 to +14‰. The seasonal increase of $\delta^{15}\text{N}$ of organic matter corresponds with the productivity and the decrease in dissolved inorganic nitrogen, in principal nitrate. The synchronous strong decrease in NO_3^- and increase in $\delta^{15}\text{N}_{\text{org}}$ is mainly related to seasonal lake nitrate utilization, whereas the correspondence of high $\delta^{15}\text{N}_{\text{NO}_3^-}$ and low $\delta^{18}\text{O}_{\text{NO}_3^-}$ suggest sewage input as a primary source.

This study is a contribution to the Virtual Institute of Integrated Climate and Landscape Evolution Analysis –ICLEA– of the Helmholtz Association; grant number VH-VI-415.