Geophysical Research Abstracts
Vol. 17, EGU2015-13422-1, 2015
EGU General Assembly 2015

Nitrogen isotopes in lake sediments (Tiefer See, NE Germany) and their potential for paleoenvironmental and human impact reconstruction

Birgit Plessen, Ulrike Kienel, Nadine Dräger, and Achim Brauer
(birgit.plessen@gfz-potsdam.de)

The light stable isotopes of nitrogen and carbon can be widely used to reconstruct past paleoenvironmental conditions, agricultural landscape development, and industrial pollution. They may reflect human impact by extensive land use, manure, sewage input, and atmospheric nitrogen compounds. To understand the lake nitrogen cycle depending on natural variability and anthropogenic forcing, we study the sediment record of Lake Tiefer See (Mecklenburg/NE-Germany) together with the recent input and productivity monthly monitored in sediment traps in the hypo-, meta- and epilimnion.
The monitoring of the dimictic to monomictic Lake Tiefer See (62.5 m water depth) over the last three years clearly shows high δ15N (+7 to +14‰), and low δ113Corg (-28 to -33‰) values of the deposited matter mainly corresponding to internal organic productivity driven by nutrient loading and the development of anoxia in the hypolimnion. Compared to that, surface soil and terrestrial plant materials are characterised by lower δ15N (+3 to +6‰), and higher δ13Corg (-28 to -25‰) values. Recent high δ15N values of the phytoplankton in the lake water reflect assimilation of dissolved nitrogen compounds enriched in 15N, whereas the lower δ15N of surface core sedimentary matter indicate partly decomposition of organic matter in the anoxic zone and release of 15N enriched components into the lake water. We furthermore identified in the lake sedimentary record a continuous increase in δ15N from +3 to +8‰ over the last 400 years interrupted by short term phases of decreasing 15N enrichment implying an intrusion of human activity in the nitrogen cycle starting at ca. AD 1590.
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.