Geophysical Research Abstracts
Vol. 20, EGU2018-8200, 2018
EGU General Assembly 2018

[U+F064]15N record of anthropogenic nitrogen deposition from the recent sediments of Tianchi Lake on the Chinese Loess Plateau and its implications for alpine ecosystems

Jie Chen (1), Jianbao Liu (1), Fahu Chen (1,2)

(1) Lanzhou University, College of Earth and Environmental Sciences, Key Laboratory of Western China's Environmental Systems, China (chenjie13@lzu.edu.cn), (2) Institute of Tibetan Plateau Research, Chinese Academy of Sciences

Human activity over the past hundred years has fundamentally changed the biogeochemistry of nitrogen. For example, increased nitrogen deposition causes lake acidification and eutrophication and thus it can significantly influence the productivity and stability of lake ecosystems. Records of anthropogenic nitrogen deposition from alpine lakes are sparse in China, which limits our understanding of the effects of human activities on lake ecosystems in remote alpine areas. Here, we used multiple geochemical proxies, including total nitrogen (TN), C/N ratio and nitrogen stable isotopes ratios (δ15N), as well as a biological proxy (chlorophyll a), from a well-dated sediment core spanning the last $\sim$200 years, from Tianchi Lake. Tianchi is an oligotrophic alpine lake in the Liupan Mountains, part of the National Nature Reserve in the central Chinese Loess Plateau (CLP). We use the data to reconstruct the history of anthropogenic nitrogen deposition and its influence on the lake ecosystem over the past 200 years. We found that δ15N was stable prior to 1985, but it decreased significantly thereafter. The timing of the decrease coincides with increased nitrogen deposition since 1980 in China, indicating that it was caused by the enhanced deposition of depleted nitrogen from anthropogenic sources. Primary productivity at Tianchi Lake was low during AD 1800-1850 and AD 1975-1990, and then increased significantly. The timing of the increase is synchronous with a temperature record but not with regional nitrogen deposition, suggesting that temperature was likely the main factor driving lake primary productivity and that nitrogen deposition did not play an important role in the local alpine lake ecosystems. This conclusion is supported by the fact that phosphorus is a significant limiting factor for productivity in alpine lakes on the CLP. We conclude that human activities have had minimal influence on alpine lake ecosystems in the remote regions of northern China. However, lake ecosystems in the region may still be impacted by global warming which appears to play a more important role in their recent evolution.