Geophysical Research Abstracts
Vol. 21, EGU2019-3778, 2019
EGU General Assembly 2019

Isotopic evidence for seasonal and long-term nitrogen cycling in a subtropical basin of Southern China

Yingxue Xuan (1), Changyuan Tang (2), and Yingjie Cao (3)

(1) School of Geography and Planning, Sun Yat-Sen University, Guangzhou, China (xuanyx@mail2.sysu.edu.cn), (2) School of Geography and Planning/School of Environment Science and Engineering, Sun Yat-Sen University, Guangzhou, China (tangchy3@mail.sysu.edu.cn), (3) School of Environment Science and Engineering, Sun Yat-Sen University, Guangzhou, China (caoyingj@mail.sysu.edu.cn)

Knowledge about the origin and transformation of nutrients at different temporal scales in the river ecosystem could provide a better understanding of nitrogen (N) cycles in the rivers and have important implications for regional and global N cycling. In this study, a multi-isotope approach (δ^{13}C, δ^{15}N and ^{210}Pb) was used to investigate the factors affecting seasonal and long-term changes in N sources apportionment and N biogeochemical processes in the Beijiang River located in the Pearl River Basin, China. Sources apportionment by a Bayesian model (Stable Isotopic Analysis in R, SIAR) showed significant seasonal variations. During the flood season, the dominated origins were non-point sources such as soil N for dissolved nitrogen (DN, accounting for 38%), soil organic matter for particulate organic matter (POM, 58%) and sedimentary organic matter (SOM, 31%) due to intense precipitation. During the non-flood season, fertilizer dominated in nitrate source (48%) and effluent detritus predominated in the POM (47%) and SOM (32%) pools. N transformation between the DN, POM and SOM was influenced by seasonally variable hydrology. Our data suggested low discharge was more favorable for vertical mixing of the water column and sedimentation, which was evidenced by similar δ^{15}N values in the DN, POM and SOM in the non-flood season. A sedimentary history record of 65 years (1951-2015) showed the variation of nitrogen in sediment was mainly affected by human activities. From 1999 to 2005, a decrease trend in δ^{15}N value was observed due to promotion of aquatic plants growth after impoundment of reservoir. From 2005 to 2011, the enrichment in δ^{15}N was caused by an increased in sewage and waster emission due to the development of tourism industry. From 2011 to 2015, the rising of pollution treatment fund by government improved water environment, resulting in δ^{15}N-depleted in sediment. At 65-years temporal scale, increasing temperature and CO_2 concentration had less impact on N cycles in river ecosystem, however, high discharge could increase N contents and flood events might increased δ^{15}N values in sediment. The results also indicated that δ^{15}N was more effective than δ^{13}C on source distinguish at 65-years temporal scale. This study provided more detail information regarding the nutrients sources and improved our understanding of the N cycling processes at different temporal scales in the river ecosystem, providing a better understanding for N cycles in the river ecosystem and a scientific basis for water environment management.