Nitrous oxide (N_2O) fluxes were measured in a major tributary backwater of Three Gorges Reservoir (TGR)

Y.C.WANG[1,2], M.M.HU[1,2]

[1] China Institute of Water Resources and Hydropower Research, Beijing 100038, China

[2] State Key Laboratory of Water Cycle Modeling and Controlling, Beijing 100038, China

As one of the largest agricultural regions in the world, China consumes large quantities of inorganic N fertilizer each year. The corresponding increase in N loads affects regional N cycles, and the atmospheric budget of N_2O, a radiatively important greenhouse gas. Increased N loading to aquatic ecosystems affects the exchange of N_2O between water and the atmosphere. Greenhouse gas balances have been documented in aquatic ecosystems, such as rivers, lakes and wetland and so on, but the role of reservoirs aquatic ecosystems has been neglected. Nitrous oxide (N_2O) fluxes were measured in a major tributary (Daning River) backwater and its littoral zone of Three Gorges Reservoir (TGR) on the Yangtze River in China. Large temporal variations were recorded for N2O fluxes, ranging from 12.06μg m-2 h-1 in the pelagic zone to 96.08μg m-2 h-1 in the drawdown zone, with the highest N_2O emissions observed during the summer. Wide spatial variation in N_2O fluxes occurred in the littoral zone responding to water-sediment variables, while such variation was not found both in the pelagic zone and in the land zone. In the drawdown zone where was the “hotspot” of N_2O emissions of reservoir, the air temperature, redox condition, and nitrogen (N) sources controlled the N_2O fluxes, whereas the influences of these parameters on N_2O fluxes were weak in both the pelagic zone and land zone. This difference indicated that N cycling was more intensive in the littoral zone (i.e. the drawdown zone) during water level change with TGR operation than in the pelagic zone. A multiple linear regression model against principal components indicated that water-sediment denitrification and the carbon (C) and N contents of the sediment affected the N_2O exchange in the drawdown zone.