Abstract

Measurements of nutrient concentrations and physicochemical parameters were carried out monthly between March 2005 and March 2006 along a transect between the Nyanza Gulf and the open waters of Lake Victoria to evaluate spatial and seasonal variations in nutrient fluxes and ecosystem metabolism. Nutrient concentration gradients were observed between the deep and seasonally stratifying main lake basin and the large, shallow river-influenced Nyanza Gulf, which are connected by the relatively deep and narrow Rusinga Channel. Nutrient gradients were steepest in the Rusinga Channel where there was always a strong gradient in electrical conductivity. A mixing-box model used to quantify nutrient fluxes and ecosystem metabolism along the gulf and the channel showed that nutrients entering the gulf through river inflows and municipal sources were largely retained in the gulf, with only a small fraction transferred into the main lake. In contrast, the main lake was a net exporter of dissolved inorganic phosphorus to the gulf (110 mg P m^{-2} yr^{-1}), which is in contrast to the paradigm that the gulf is a major contributor to the increasing nutrient enrichment and, hence, eutrophication of the greater Lake Victoria. The channel had net regeneration of dissolved nutrients indicating net heterotrophy; whereas in the gulf, there was net consumption of dissolved nutrients, resulting in high estimates of net ecosystem production (570 mg C m^{-2} d^{-1}) and, hence, net autotrophy. Nitrogen balance ranged from +3 to +15 mg N m^{-2} d^{-1}, indicating dominance of nitrogen fixation over denitrification in both the gulf and the channel, which are both well-oxygenated.