Abstract

Variability in physico-chemical water column structure along a gradient between Nyanza Gulf and Lake Victoria was characterized, and the exchange between the two basins estimated. Specific conductivity (SC) measurements between March 2005 and March 2006 identified three morphologically distinct zones, the inner-gulf, the connecting Rusinga Channel and the main lake basin. The relatively shallow, wide and river-influenced inner-gulf had higher turbidity and SC compared to the channel and the main lake. The deep, narrow and more wind-exposed mid-channel area was significantly cooler than the rest of the study areas. Observational data revealed "density-driven" underflow of the cooler channel water into the main lake and compensatory surface flow into the gulf as well as seasonal patterns of gulf-main lake exchange in relation to variation in tributary input. The wind field was dominated by a diurnal lake-land breeze which resulted in wind-driven diurnal reversal of water flow in and out of the gulf, where the constriction of flow within the channel induced strong currents. The exchange between the gulf and the main lake was estimated using a box model, with SC as a conservative tracer. A net annual residual water flow of 35 $m^3 s^{-1}$ occurred from the gulf into the main lake although during months with low tributary discharge the flow was towards the gulf. The daily flow in and out of the gulf resulted in relatively high exchange flux compared to residual flow across the Rusinga Channel leading to the development of the well-defined physicochemical gradient along the Rusinga Channel.