Abstract

The spatial-temporal variability and the behavior of the Estuarine Turbidity Maximum (ETM) zone in the shallow, ephemeral, well-flushed Sabaki estuary located in the northern region of the Kenya coast, were studied during a period of moderate river discharge. The estuary is one of the most turbid estuaries along the coast of East Africa, characterized by high sediment input and high suspended matter (SPM) concentrations. The estuary is completely flushed after every tidal cycle and experiences high salinity and SPM concentrations gradients at high water (HW). The ETM was generated at HW during periods when the river runoff was near the long-term average (63 m3 s -1) and also when it was relatively low (35 m 3 s -1). The SPM concentrations in the ETM zone varied significantly depending on the river sediment input and phase of the semi-diurnal tide, but were on average 50% greater than the river SPM concentrations. The ETM was also located up-estuary during periods when river runoff was around the long-term average and further down-estuary during periods of low river runoff, due to different sediment settling rates. While gravitational circulation tended to cause accumulation of mud in a null zone located below the freshwater- saltwater interface, causing formation of an ETM zone, the ETM was separated from the salt-limit. This separation was attributed to the time lag in the tidally-driven resuspension of bottom mud and subsequent tidally-driven advection of turbid water up-estuary during the flood period. The relatively low current shear and tidal energy dissipation, combined with high horizontal and vertical gradient in eddy diffusivity in the central region of the estuary, tended to favour rapid settling of flocculated sediments, leading to the formation of an ETM. The ETM zone was formed in the region in which inter-tidal mudflats are located and it is postulated that the formation of the intertidal mudflats is related to that of the ETM dynamics.