

## Abstract

This study focuses on sediment exchange in the degraded Mwache mangrove forest wetland located in southern Kenya. It involved measurement of total and particulate organic suspended sediment concentrations (TSSC and POSC), tidal water elevation and current velocities. Results showed that in the heavily degraded backwater zone mangrove forest, the ebb and flood tide total sediment fluxes were of same order of magnitude, however, flood tide sediment fluxes were slightly higher than the ebb ones. In the moderately degraded frontwater zone mangrove forest, the flood tide sediment fluxes were more than 50% higher than the ebb tide fluxes. The peak net sedimentation in the highly degraded backwater zone was  $4 \text{ g m}^{-2} \text{ tide}^{-1}$  but that in the moderately degraded frontwater zone was  $63 \text{ g m}^{-2} \text{ tide}^{-1}$ . In the frontwater zone of the mangrove forest, the peak instantaneous ebb tide sediment flux was  $3206 \text{ kg tide}^{-1}$  equivalent to  $35.6 \text{ g m}^{-2} \text{ tide}^{-1}$  and the flood one  $8574 \text{ kg tide}^{-1}$  ( $95 \text{ g m}^{-2} \text{ tide}^{-1}$ ). The peak instantaneous flood and ebb tide particulate organic sediment (POS) fluxes in the frontwater zone mangrove forest were  $1316 \text{ kg tide}^{-1}$  ( $15 \text{ g m}^{-2} \text{ tide}^{-1}$ ) and  $587 \text{ kg tide}^{-1}$  ( $6.5 \text{ g m}^{-2} \text{ tide}^{-1}$ ), respectively. The peak ebb and flood tide sediment fluxes in the backwater mangrove forest were  $3206 \text{ kg tide}^{-1}$  ( $36 \text{ g m}^{-2} \text{ tide}^{-1}$ ) and  $3305 \text{ kg tide}^{-1}$  ( $36.7 \text{ g m}^{-2} \text{ tide}^{-1}$ ), respectively. In case of POS fluxes in the backwater zone mangrove forest, the peak flood period POS flux was  $969 \text{ kg tide}^{-1}$  ( $10.7 \text{ g m}^{-2} \text{ tide}^{-1}$ ) while the ebb period one was  $484 \text{ kg tide}^{-1}$  ( $5.4 \text{ g m}^{-2} \text{ tide}^{-1}$ ). In both highly degraded backwater and moderately degraded frontwater zone of the mangrove forest, there is net import of sediments. However, the net import is relatively lower in the backwater zone forest where the trapping efficiency is 27%. In the moderately degraded frontwater zone of the mangrove forest, the sediment trapping efficiency is 65%. The net sediment import occurs mainly in periods of high river discharge in both neap and spring tides, but occurs only in spring tides during dry season. The net accretion rates in the backwater and frontwater zone mangrove forests are  $0.25$  and  $3.5 \text{ cm year}^{-1}$ , respectively.