Abstract

This study has attempted to investigate experimentally the distribution of surficial sediment and variation of water quality parameters under major influences of wind forcing and major rivers inflows in Lake Abaya, the largest Ethiopian Rift Valley Lake. A field study in Lake Abaya was conducted to understand and conceptualize better the lake dynamic process and functioning of main factors. Comprehensive field data consisting of water quality measurements, lake bed sediment grab samples and meteorological observations along the western shoreline have been obtained from Lake Abaya. Spatial and temporal variability of physical parameters are presented and the interrelationships between variables are discussed. Results indicate that the lake basin can be viewed as consisting of two main physiographic units, defined as sub basins, with behaviour defined by their response to external forcing over time.

Distribution pattern of lake bottom sediments bears information about the interaction of physical processes and the resultant motion that controls the transport and distribution of suspended solids. The relationship between sediment texture and bottom topography was discussed. The distribution pattern of sediments was interpreted in the light of the different energy zones and major rivers loading. The spatial distribution diagrams of major minerals found in recent deposits on the lake bottom show that understanding of the sedimentary pattern is of vital importance for proper interpretation of the dynamic process operating on the lake. The downstream tendency of fine sediments suggested the general wind-controlled circulation pattern of the top layer to the north and the return flow in the bottom layer southwards.

As well the inflow current of the tributary rivers as wind driven wave energies have an important influence on the spatial distribution of sediments. Persistent wind energy continuously mixes the lake water vertically and transports sediment in suspension horizontally resulting homogenous water column and extremely high turbidity throughout the whole open water zone. The intense wind mixing together with shallow depth apparently result an essentially homogenous water column.

The observed spatial and temporal variability of physical variables allowed estimating general circulation pattern. The results were discussed in terms of the direction and magnitude of wind forcing, nature of sediment distribution, bathymetry (water depth and bottom slope), and major inflow that determine possible pattern and strength of circulation.