1. Introduction

The ability to determine the responses to changes in external or controlling factors in the form of cause-and-effect relations is the corner stone for management of a natural lake system like Lake Abaya. One of the main aims of this study is to obtain quantifiable parameters which directly or indirectly indicate the variable physical processes in space and time on the lake system. As a baseline study to understand the principles of the lake system, it is the objective of this study to characterize lower and upper bound values of physical variables in the study site. The spatial distribution characteristics of surficial sediments and profiles of water quality parameters are used to characterize the lake response to external forcing.

It is well recognized that understanding of the mean circulation of a lake is important for many ecological and management issues because it strongly influences the transport pathways and depositional zones of sediments with variations in composition reflecting changes in inputs from different sources. The understanding of lake sediment process (erosion – transportation – accumulation) is a continuing need in Lake Abaya, as it is the major problem threatening the quality of the water body. Excessive deliveries of solids into the lake by rivers and their transport within the lake by currents and waves have environmental, economic and aesthetic impacts.

The prime objective of this study is to understand the dynamics of sediment transport and lake water circulation in the large and shallow natural Lake Abaya using a combination of field and laboratory techniques. It is based on extensive field work (July 2003 – November 2004) to learn about the system behaviour by observing conditions both internal to the system and forces exerted externally on the system. The field investigation component involved experimental arrangement and accomplishment of focused objective surveys of water quality parameters at regular time intervals from fixed monitoring stations and water depths. Surficial sediment samples were collected throughout the lake from predefined sampling sites. Methodology for laboratory analyses included identification of mineralogical and chemical compositions of lake floor samples and determination of water quality parameters of lake water samples. Additionally, the effect of the spatial variation of atmospheric forcing and its interaction with lake water circulation and the associated transport process is assessed.

Simplified conceptual model for mean water circulation in Lake Abaya is constructed in order to account for the processes reflected in recently observed field data and past records of hydrometeorological variables as well as for those concepts that are most consistent with the measured data and observations.