Geophysical Research Abstracts, Vol. 8, 06942, 2006
SRef-ID: 1607-7962/gra/EGU06-A-06942

Influence of weather on lake thermal stratification: A case study by model simulation from 1953 to 2005 on the Danish lakes Esrum Sø and Store Gribsø

R. M. Closter (1,2) and A. Guldberg (2)

(1) Freshwater Biological Laboratory, University of Copenhagen, Helsingørsgade 51, DK3400 Hillerød, Denmark (2) Danish Meteorological Institute, Lyngbyvej 100, DK2100 Copenhagen, Denmark. (rmc@dmi.dk)

Danish freshwater lakes are fully mixed in spring until temperature stratification commences. Date of stratification, stratification strength and duration are dependent of external factors such as air temperature and wind and internal factors such as depth, surface area, morphometry and transparency. Thermal stratification separates warm lighter surface water (epilimnion) from cold heavier bottom water (hypolimnion), and very little or no exchange of water and solutes takes place between the two layers. Light availability in hypolimnion is usually insufficient for phytoplankton production, and only oxygen consumption takes place. This can lead to severe anoxia in hypolimnion, as is the case for the Danish lakes Esrum Sø and Store Gribsø. If future climate changes alter the mixing regime of a lake, it might lead to serious consequences for lake ecology.

To investigate consequences of expected future climate changes on oxygen depletion and anoxia in lakes we need to describe the influence of weather on lake temperatures and thermal stratification. This can be done with a physical lake model, which combines the effects of external and internal factors. The 1-dimensional lake model PROBE has been setup for the two lakes and subsequently forced with observed meteorological data from 1953 to 2005. The 53 years of model output are analysed with respect to monthly, seasonal and yearly trends in weather parameters, lake temperatures, and onset, duration and strength of thermal stratification. This analysis will reveal the sensitivity of thermal stratification in the two lakes to climate changes.