Geophysical Research Abstracts,
Vol. 11, EGU2009-1107, 2009
EGU General Assembly 2009

Long term stratification changes in the Sea of Galilee, Israel – climate change or water usage pattern change?

A. Rimmer

Israel Oceanographic & Limnological Research, Yigal Allon Kinneret Limnological Laboratory, Migdal, Israel
(alon@ocean.org.il, +972 4-6724627)

Analysis of long-term records of temperature profiles in the subtropical warm monomictic Lake Kinneret (Sea of Galilee, north of Israel in the Syrian-African Rift Valley) was conducted on data from the period 1969-2007. Data used include 1800 weekly measurements of temperature profiles from the central sampling station (station A, 44-m depth, l-m intervals). For each profile, stratification patterns were calculated using a simple empirical temperature-depth function, which accurately defines the temperature gradient, the depth of the thermocline, and the widths of the epilimnion, metalimnion, and hypolimnion. The results were then averaged over each month (4-5 profiles). The analysis revealed that during these 38 years average epilimnion depth decreased by 2 meters (5 cm/year), metalimnion thickness decreased by between 1.5 m (December) to 3 m (April), and average temperature of the epilimnion increased by 1 deg.C (0.028 deg.C/year). Moreover, average hypolimnetic temperature remained constant (15 deg.C), so that the density gradient across the metalimnion increased. On the other hand, the average duration of the stratification period (290 days) remained unchanged.
Previous analyses conducted during the 1990's hypothesized that such changes appear to be related to either global climate change, such as long-term decline in mean winter air temperatures (during the mixing period), or alternatively to long term changes in global radiation. However, during the tested period no significant changes were found in either of these parameters in the Lake Kinneret area, and therefore their influence is under serious doubt. Here we suggest that the most probable causes for the changes in the stratification pattern are 1. constant and significant reduction of annual inflows to the lake (from $\tilde{5}$00 million m3 during the late 1960's, reduced to $\tilde{4}$00 million m3 currently), and 2. the increasing dependency between inflows and outflows, specifically artificial pumping (a variable which was calculated by the monthly difference between them). It is suggested that the reduction in colder water inflows from the lake tributaries, and the accompanied decrease in warm epilimnetic pumping are changing the stratification pattern in the lake. Both causes are related to changes in water demand and usage patterns in the watershed, rather than to global climatic changes.