

Hydrothermodynamics of a small Alpine lake

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Abstract

The present research is aimed at investigating the hydrothermodynamic properties of small alpine lakes, with specific reference to the case of lake Tovel (Trentino, Italy). The lake was subject to a spectacular reddening which had been occurring each year until 1964, when the phenomenon suddenly ceased.

The work has been developed within the framework of the multidisciplinary research project "SALTO", funded by "Provincia Autonoma di Trento" which is oriented to the study of different ecological, biological and physical aspects of lake Tovel, along with his historical development.

The present thesis is divided in three parts.

In the first part we summarize the fundamental processes which characterize the physical limnology, with specific reference to those aspects that we have also investigated through field measurements.

In the second part a detailed report is given on the procedures and results of the field campaign performed during the year 2003 on lake Tovel. In particular, the experimental techniques are illustrated along with the data post-processing procedures. The temperature data measured by thermistor chains and velocity data collected through current meter and profiler are then analysed to provide a quantitative estimate of the main circulations that may develop within the lake, due to different meteorological conditions.

Finally, the third part is devoted to numerical modelling. Results of a 1-D vertical model and of a 3-D model are discussed. The former model (DYRESM), developed in Western Australia University, has been used to study the seasonal evolution of the lake; the latter has been specifically developed in the framework of this project to investigate the hydrodynamic behaviour of small lakes on short time scale.