Comparison of three 1D lake models for reproducing the vertical distribution of temperature in the deep pre-alpine Lake Geneva, Switzerland.

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The aim of this study is to evaluate the changes of the thermal structure of Lake Geneva, Switzerland, in a warmer climate using a one-dimensional (1D) lake model. A comparison between different 1D lake models turned out to be necessary.

As the 3D hydrodynamic lake model require large computational resources, 1D lake models whose vertical distribution of temperature has been proven in numerous studies, have been preferred. Among the selected models, two turbulent lake models, DYRESM and k-ε and one diffusive lake model developed by S. Hostetler have been chosen. The models have first been subject to a calibration procedure before the simulated data are compared with observations. The interest of this work is to show that the 1D lake model validated for small to medium size lakes can also be applied to large deep lakes, taking some precautions.

The first part of this project highlights the most appropriate model for reproducing the conditions present in one of the deepest lakes of Europe. Based on this model, it is then possible to show what will be the evolution of the strength of the stratification with higher temperature, a potential increase of the cloud cover and more frequent episodes of strong winds.

Basic words: one-dimensional lake model, deep lake, vertical distribution of temperature