Possible topic for a master thesis:

Thermobaricity in a 1D Lake Model:

Thermobaricity refers to processes connected to the shifting temperature of maximum density under pressure. This effect controls the deep water renewal in deep lakes in temperate and cold climates. Deep lakes show temperatures considerably lower than 4°C in the deep layers. Thermobaricity impacts the deep recirculation a lot and must be also included in deep lakes where the consequences are not that easily visible. So far, numerical lake models have not yet included this effect. The Master student would be the first to produce a proper 1 dimensional lake that could represent thermobaric effects.

We have a DFG-funded project on this topic, and the master student could greatly profit from the environment. Within this project, we have collected data from Lake Shikotsu that is ideally suited for the demonstration of the necessity and the feasibility of including thermobaricity in a 1D lake model. We choose GLM (General Lake Model) as a commonly used model and change stability consideration that they include thermobaricty.

The work would consist of some programming in the source code. The implementation of Lake Shikotsu data and the critical discussion of features that are well or less well represented. The thesis should result in a scientific publication.

see also https://egusphere.copernicus.org/preprints/2025/egusphere-2025-1195/

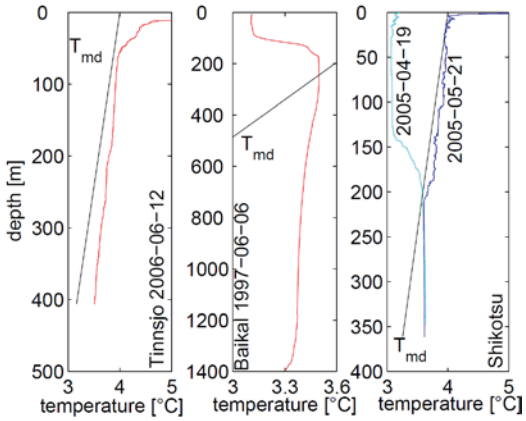

Figure: *measured temperature profiles of thermobarically stratified lakes: Tinnsjø in Southern Norway, Lake Baikal in Siberia / Russia, Lake Shikotsu on Hokkaido / Japan and the temperature of maximum density versus depth (black line); accuracy of the measurements in the range of millikelvin (From Boehrer and Schultze 2008). These three lakes will represent the prototypes in our study.*

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