# PROJECT: DELIVERING OXYGEN INTO THE DEEP WATERS

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Motivation: Vertical transport of oxygen from the surface and nutrients from the bottom is made difficult in the natural aquatic environments due to the vertical density variations that are caused by temperature and/or salinity distributions. In shallow bodies of water, such as lakes and coastal marine environments, inhibited vertical transport can result in low dissolved oxygen levels in the bottom layers, which could lead to fish kills and negatively impact aquatic life. Processes that increase vertical transport and mixing can alleviate this problem. Among those, double diffusion can be an important mechanism for mixing across density layers.
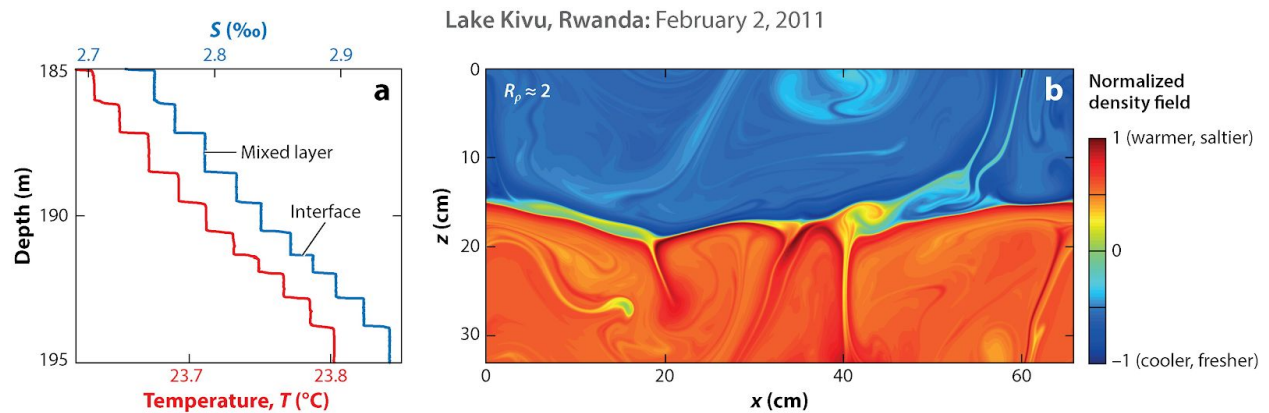
Project: Double diffusion is relevant where there are competing effects on density from temperature and salinity distribution. The awardee will conduct a suite of numerical experiments to examine under what regimes (e.g. temperature/salinity profiles, density layer thickness) double-diffusive processes are sufficient in supplying oxygen to the bottom waters. Through this project, the student will learn about fluid dynamics, non-linear physics, ocean processes, and gain familiarity with scientific computing.

Requirements: All levels are welcome, as numerical codes will be provided. Knowledge of Python and/or familiarity with coding is beneficial.

Background reading:
Holtermann, P. L., Prien, R., Naumann, M., Mohrholz, V., & Umlauf, L. (2017). Deepwater dynamics and mixing processes during a major inflow event in the central B altic Sea. *Journal of Geophysical Research: Oceans*, 122(8), 6648-6667.

Bouffard, D., & Wüest, A. (2019). Convection in lakes. *Annual Review of Fluid Mechanics*, 51, 189-215.