**Pylake Physics**

Pylake is a python library to compute various physical parameters from raw measurements in lakes.

Here we give some background about the physics and equations used in functions.

**Computing specific conductivity from raw conductivity**

* From ionic composition (if available) compute according to Wüest et al. (2019)
* Assuming salinity consisting entirely of calcium carbonate (good approximation in many lakes) and compute according to Wüest et al. (2019)

**Computing salinity from specific conductivity**

* From ionic composition (if available) compute according to Wüest et al. (2019)
* Assuming salinity consisting entirely of calcium carbonate (good approximation in many lakes) and compute according to Wüest et al. (2019)

**Computing density from water temperature and salinity**

* According to Wüest et al. (2019), taking freshwater density from Chen & Millero (1986)
* According to Chen & Millero (1986), implemented in the python freshwater library by Daniel Robb

**Solubility of dissolved oxygen**

Oxygen solubility is computed according to Benson & Krause (1984) but ignoring the effect of salinity, which is negligible in freshwater.

The effect to atmospheric pressure (altitude) on oxygen saturation is computed assuming a standard atmospheric decrease of pressure with altitude and by including humidity.

**References**

Benson, B. B., & Krause Jr, D. (1984). The concentration and isotopic fractionation of oxygen dissolved in freshwater and seawater in equilibrium with the atmosphere 1. Limnology and oceanography, 29(3), 620-632.

Chen, C. T. A., & Millero, F. J. (1986). Thermodynamic properties for natural waters covering only the limnological range 1. Limnology and Oceanography, 31(3), 657-662.

Wüest, A., Piepke, G., & Halfman, J. D. (2019). Combined effects of dissolved solids and temperature on the density stratification of Lake Malawi. In *Limnology, Climatology and Paleoclimatology of the East African Lakes* (pp. 183-202). Routledge.