Lessons to learn from amino acid distribution in POM of Lake Baikal

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Lake Baikal offers a unique opportunity to study water column processes in a freshwater system with conditions similar to oceanic systems. With a maximum water depth of ~1640 m, Lake Baikal is the deepest lake on Earth and due to efficient vertical mixing, oxygen concentrations are high throughout the water column.

Furthermore, although Lake Baikal receives considerable input of suspended particles via rivers, primary production in the surface waters is the major source of carbon and energy for organisms in deeper water layers and in the sediments.

Sediment trap material from Lake Baikal, collected at 18 different water depths (50-1350 m), has been investigated for total hydrolysable amino acids (THAA) and amino acid D- and L-enantiomers. The THAA flux decreased by 50% in the upper 500 m and remained constant below this depth, indicating that organic matter (OM) degradation was mostly restricted to the upper water column.

We additionally measured nitrogen isotopes on THAA (POM) from different water depths that allowed for determination of source and food web changes.

The dependence of ^{222}Rn air-water partitioning on water temperature and water salinity

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Radon (^{222}Rn) is used as natural aquatic tracer for many applications. A prominent example is its use as indicator for submarine groundwater discharge (SGD) processes.

On-site radon-in-water detection is performed by means of a mobile radon-in-gas monitor and radon extraction from the water into a closed circulating air volume. For converting the detected radon-in-air concentration into radon-in-water values the water/air partition coefficient ($K_{w/air}$) needs to be known.

$K_{w/air}$ depends on two water parameters that are easily attainable on site: temperature and salinity. Possible values for $K_{w/air}$ cover a range between about 0.50 (cold fresh water) and 0.03 (hot saline water). The temperature dependence of $K_{w/air}$ applies for all environments (terrestrial and marine) and is generally taken into consideration. The 'salting out' of radon, however, is often underestimated or not accounted for at all, potentially leading to an erroneous data interpretation.

Theoretical considerations that are based on reported data as well as on an extensive own dataset resulted in the easily applicable equation shown below. The equation allows for uncomplicated consideration of the dependence of $K_{w/air}$ on both, temperature (T [K]) *and* salinity (S [‰]) (see Fig. 1).

$$\ln\beta = -56.90 + 92.49(\frac{100}{T}) + 22.24\ln(\frac{T}{100}) + S\left\{-0.219 + 0.138(\frac{T}{100}) - 0.022(\frac{T}{100})^2\right\}$$

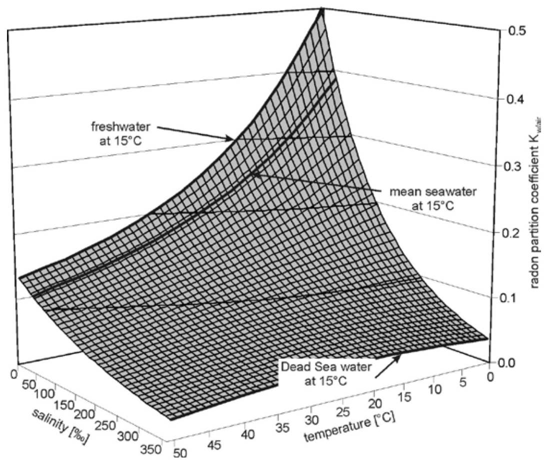

Figure 1: Dependence of the air/water partitioning coefficient ($K_{w/air}$) of radon on water temperature and salinity (*cf.* Eq. 1)