The impact of oxic degradation on the novel long chain diol temperature proxy

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Recently, the Long chain Diol Index (LDI) was proposed as a novel marine organic temperature proxy, based on the C_{30} 1,15-diol abundance relative to those of C_{28} 1,13-, C_{30} 1,13- and C_{30} 1,15-diols [1], lipids probably produced by eustigmatophyte algae. In order to assess the impact of oxic degradation on long chain diols and the LDI-based temperature proxy, we examined the differences in diol concentration and distribution in surface sediments (0-0.5 cm) with different bottom water oxygen concentrations (<3 to 83 μmol . L^{-1}). Surface sediments were sampled from 900 to 3000 m water depth on a seamount (Murray Ridge), whose summit protrudes into the oxygen minimum zone of the Arabian Sea, allowing to determine the effect of oxygen exposure on algal biomass produced in surface waters. Alkenones, used in the $U^{K'}_{37}$ temperature proxy, were also analyzed.

Diol concentrations and LDI values decrease with increasing oxygen exposure, but values increase again in the two deepest sediments with the most oxygenated conditions. The change in LDI values is caused by a more rapid degradation of the C_{30} 1,15-diol compared to the C_{28} and C_{30} 1,13-diols. The overall changes correspond to a change in reconstructed temperature of ca. 2°C. In comparison, alkenone concentrations and $U^{K'}_{37}$ values do not show a substantial change. This suggests that oxic degradation may affect temperature reconstruction using the LDI, while the $U^{K'}_{37}$ seems less affected in this marine setting. Long chain keto-ols, which have previously been proposed as oxic degradation products of diols, were also identified. However, the C_{30} 1,15-keto-ol/diol ratio does not substantially change, suggesting that keto-ol formation from diols did not take place in the sediment but in the surface waters.

[1] Rampen *et al* (2012), *Geochim. Cosmochim. Acta* **84**, 204-216.