The Methylation index of Branched Tetraethers (MBT) as a temperature proxy in lakes: investigation, calibration, and validation

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Microbial membrane tetraether lipids (GDGTs) are an increasingly important tool used to reconstruct past environmental variations on the continents. Previous work has shown that temperature controls the structures of GDGTs preserved in sediments in soils and the marine environment, however; there has been little work investigating GDGTs in terrestrial sedimentary environments such as lakes. Our work investigates how the abundances of nine branched GDGTs, pictured at right, relate to surface air temperatures using sediments from tropical lakes. We have developed a new method for quantitative air temperature reconstruction using these sediments, and applied this calibration to develop the first quantitative temperature reconstruction from small tropical lakes based on GDGTs. This work has the potential to unravel the thermal evolution of numerous terrestrial environments across Earth history. Notable outcomes from our work include:

- Surface air temperature controls the dominant structures of branched GDGTs preserved in 110 lakes in tropical East Africa (below left)
- GDGT variations can be statistically calibrated and applied to reconstruct past temperature variations in different lake sediments (below right)