



Archeal lipids in speleothems and the calibration of TEX₈₆ in a new terrestrial archive

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There are very few proxies that can be applied in terrestrial archives to obtain quantitative climatic reconstructions. Some of those recently proposed are derived from the distribution of glycerol dialkyl glycerol tetraethers (GDGTs), which are membrane-spanning lipids synthesized by bacteria and archaea. The distribution of these lipids has been shown to correlate to water temperature in lake sediments and to air temperature in soil samples, among other applications. However, the terrestrial records shown so far are restricted to lakes, which cover a small part of the continental surface.

We report the occurrence of GDGTs in a new terrestrial archive with a potential for high-resolution sampling, the speleothems. In order to investigate a possible climatic influence on the GDGT distribution in the speleothems, we have analysed samples from 4 different climatic regimes, with mean annual air temperatures ranging from 6 to 21°C. The ratio of GDGTs to calcareous material in the stalagmites varies, with higher GDGT concentrations in “warm” samples and low concentrations in “cold” samples. Comparing reconstructed and observed temperatures, the index TEX₈₆, usually applied to estimate surface water temperatures, shows great potential for climatic reconstruction in speleothems. On the other hand, the index MBT, previously shown to correlate with mean annual air temperature in soil samples, shows little correlation with observed air temperatures in the studied speleothems. In some samples from warm areas, the concentration of GDGTs is high enough to envisage the potential for quantitative temperature reconstruction on land with decadal resolution. This initial

calibration of GDGT distribution in speleothems further extends the field of application of the index TEX_{86} , highlighting its relevance and potential in a new terrestrial archive.