

A STUDY OF GLYCEROL DIALKYL GLYCEROL TETRAETHERS (GDGTS) IN SPANISH LAKES

Emma J. PEARSON¹, Marina ESCALA², Blas VALERO-GARCÉS³ and Antoni ROSELL-MELE^{2,4}

1. School of Geography, Politics & Sociology, University of Newcastle, Newcastle upon Tyne, NE1 7RU, UK.

2. ICTA, Autonomous University of Barcelona, Bellaterra 08193, Catalonia, Spain..

3. Instituto Pirenaico de Ecología, Zaragoza 50080, Spain.

4. ICREA, Passeig Lluís Companys, 23, Barcelona 09010, Catalonia, Spain

Crenarchaeotal membrane lipids (glycerol dialkyl glycerol tetraethers or GDGTs) have been used with success to reconstruct past sea surface temperatures via use of the molecular temperature proxy TEX₈₆ (Schouten *et al.*, 2002; 2003) and to record inputs of terrestrial material to marine environments via the BIT index (Hopmans *et al.*, 2004). TEX₈₆ has also been applied with success to a limited number of lake environments (Powers *et al.*, 2004; 2005; Escala *et al.*, 2006), although potential problems with its application can arise from an abundance of terrestrially-derived tetraethers being present in lake sediments which can bias the TEX₈₆ index (Weijers *et al.*, 2006).

We have analysed a series of GDGTs in sediments from a suite of over forty modern day lakes in Spain which span a wide range of depths, salinities and environmental settings. The aim of the research is to examine relationships between GDGTs and their use as environmental indicators in these diverse environments. In particular we examine relationships between GDGT compositions and environmental factors including temperature, depth, salinity and lake type. Here we present the results of GDGT distributions and relationships in our dataset, including regional calibration results for TEX₈₆, the adjusted TEX₈₆' index (Sluijs *et al.*, 2006) and BIT (see preliminary results in Fig. 1) and discuss the implications of the use of GDGTs for palaeoenvironmental studies in these lakes.

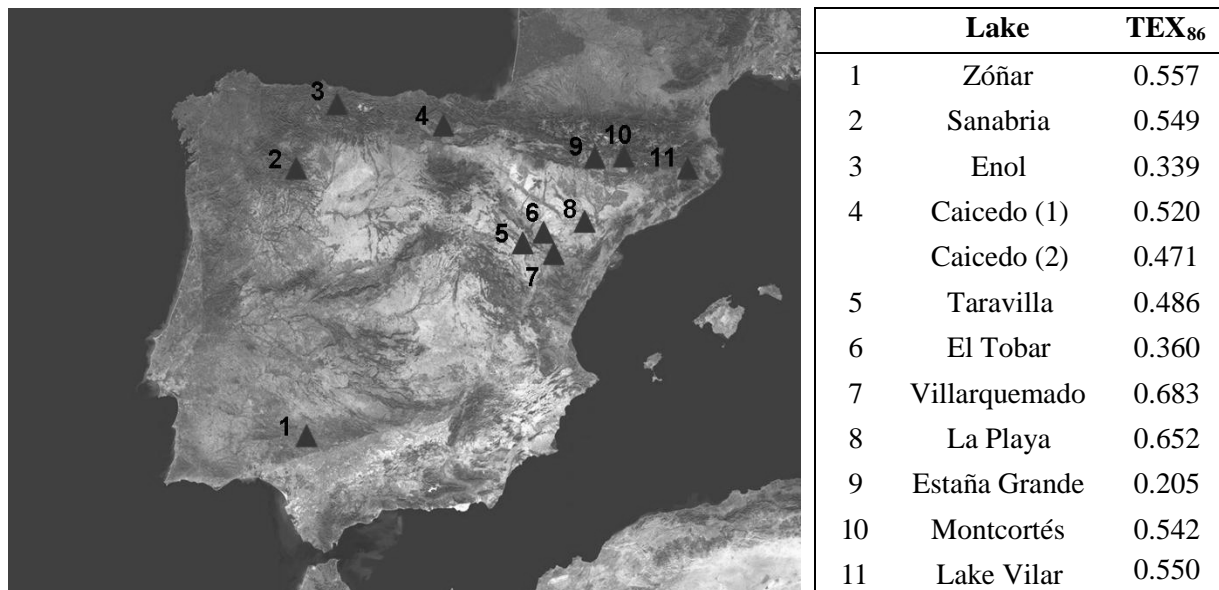


Figure 1. Location of some of the Spanish lakes studied and preliminary results of the sedimentary TEX₈₆ GDGT distributions.

REFERENCES

- Escala, M., Rosell-Melé, A., Masqué, P. 2006. Rapid screening of glycerol dialkyl glycerol tetraethers in continental Eurasia samples using HPLC/APCI-ion trap mass spectrometry. *Organic Geochemistry* doi:10.1016/j.orggeochem.2006.08.013.
- Powers, L.A., Werne, J.P., Johnson, T.C., Hopmans, E.C., Sinninghe Damsté, J.S., Schouten, S., 2004. Crenarchaeotal membrane lipids in lake sediments: a new palaeotemperature proxy for continental paleoclimate reconstruction? *Geology* 32, 613–616.
- Powers, L.A., Johnson, T.C., Werne, J.P., Castanada, I.S., Hopmans, E.C., Sinninghe Damsté, J.S., Schouten, S., 2005. Large temperature variability in the southern African tropics since the Last Glacial Maximum, *Geophysical Research Letters* 32, LO8706.
- Schouten, S., Hopmans, E.C., Schefuß, E., Sinninghe Damsté, J.S., 2002. Distributional variations in marine crenarchaeotal membrane lipids: a new tool for reconstructing ancient sea water temperatures? *Earth and Planetary Science Letters* 204, 265–274.
- Schouten, S., Hopmans, E.C., Forster, A., Van Breugel, Y., Kuypers, M.M.M., Sinninghe Damsté, J.S. 2003. Extremely high sea-surface temperatures at low latitudes during the middle Cretaceous as revealed by archaeal membrane lipids. *Geology* 31, 1069-1072.
- Sluijs, A., Schouten, S., Pagani, M., Woltering, M., Brinkhuis, H., Sinninghe Damsté, J.S., Dickens, G.R., Huber, M., Reichert, G.-J., Stein, R., Matthiessen, J., Lourens, L.J., Pedentchouk, N., Backman, J., Moran, K., & the Expedition 302 Scientists, 2006. Subtropical Arctic Ocean temperatures during the Palaeocene/Eocene thermal maximum, *Nature* 441, doi:10.1038/nature04668.
- Weijers, J.W.H., Schouten, S., Spaargaren, O.C., Sinninghe Damsté, J.S., 2006. Occurrence and distribution of tetraether membrane lipids in soils: Implications for the use of the TEX₈₆ proxy and the BIT index. *Organic Geochemistry* doi:10.1016/j.orggeochem.2006.07.018.