

## **Bacterial tetraether membrane lipids in soils and their application in palaeoenvironmental studies**

JOHAN W.H. WEIJERS, STEFAN SCHOUTEN AND JAAP S.  
SINNINGHE DAMSTÉ

Royal Netherlands Institute for Sea Research (NIOZ),  
P.O. BOX 59, 1790 AB Den Burg, Texel, the Netherlands  
(jweijers@nioz.nl)

Branched Glycerol Dialkyl Glycerol Tetraethers (GDGTs) are membrane lipids synthesized by ostensibly anaerobic bacteria that thrive in soils and peat bogs (Weijers et al., 2006). Multiple types of branched GDGTs exist, differing in the amount of methyl branches and cyclopentanyl moieties in their carbon chains. Analysis of branched GDGTs in >150 soils indicated that soil bacteria use these differences to adapt their cell membrane to ambient temperature and soil pH conditions, which is necessary to keep the membrane in an optimal liquid crystalline state (Weijers et al., 2007a).

Upon soil erosion, branched GDGTs are transported by rivers to the marine environment. In conjunction with bulk geochemical proxies, the relative abundance of branched GDGTs in a marine sediment core located near the Congo River outflow showed that soil organic matter input varied over the last deglaciation by up to a factor 5. In addition, the degrees of methylation and cyclisation of the branched GDGTs were used to reconstruct a Congo Basin integrated soil pH and temperature record. These records reveal a gradual deglacial warming of 4°C in tropical Africa and a co-variation of soil pH with African humidity over this time interval (Weijers 2007b). This latter result might be explained by enhanced soil leaching processes with increased precipitation and vice versa.

### References

- Weijers J.W.H. et al., (2006), *Environ. Microbiol.* **8**, 648-657.  
Weijers J.W.H. et al., (2007a), *Geochim. Cosmochim. Acta* **71**, 703-713.  
Weijers J.W.H., Schefuß E., Schouten S. and Sinninghe Damsté J.S., (2007b), *Science* **315**, 1701-1704.