Marine Group II Euryarchaeota only produce GDGT-0 in the marine water column

MARC A. BESSELING[1]*, ELLEN C. HOPMANS[1], MICHEL KOENEN[1], MARCEL T.J. VAN DER MEER[1], SANNE VREUGDENHIL[1], JAAP S. SINNINGHE DAMSTÉ[1,2], AND LAURA VILLANUEVA[1]

[1]NIOZ, Royal Netherlands Institute for Sea Research, Department of Marine Microbiology and Biogeochemistry, and Utrecht University, P.O. Box 59, NL-1790 AB Den Burg, The Netherlands.
(*correspondence: marc.besseling@nioz.nl).

The archaeal community in the marine water column is dominated by three main groups: marine group I (MG-I, Thaumarchaeota) and MG-II and -III Euryarchaeota. MG-I synthesize isoprenoid glycerol dibiphytanyl glycerol tetraethers (GDGTs) with 0 to 4 cyclopentane rings and crenarchaeol (exclusively found in MG-1), used in the paleotemperature proxy TEX_{86} to calculate sea surface temperatures. Due to lack of cultures, the lipid composition of MG-II/III is unknown, as well as their potential confounding effect on the TEX_{86} paleothermometry.

We analyzed intact membrane lipids (IPL) of living archaea by high-resolution accurate LC/MS and analysis of IPL-derived core lipids (CL), and the archaeal diversity by 16S rRNA gene amplicon sequencing in suspended particulate matter (SPM) in the North Atlantic and in the coastal North Sea. Members of MG-II dominated the archaeal communities in epipelagic SPM, which coincided with the presence of IPL-derived GDGT-0 with an as yet-unknown polar head group and the absence of any other IPL-GDGT. This indicates that MGII synthesize only this GDGT, ruling out the synthesis of crenarchaeol by this archaeal group, in contrast to earlier suggestions (Lincoln et al., 2014), and suggesting that the TEX_{86} paleotemperature proxy would not be affected by the contribution of the MGII in surface waters.

Lincoln, S. et al., (2014). Planktonic Euryarchaeota are a significant source of archaeal tetraether lipids in the ocean. PNAS, 111(27), 9858–63. doi:10.1073/pnas.1409439111