Sources of Polar GDGTs from the Deep Sediments in the South China Sea

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Glycerol dialkyl glycerol tetraethers (GDGTs) are lipid biomarkers for Archaea, which have been utilized widely in paleoenvironment and deep biosphere investigations. Here we report both core and polar GDGT distributions in the deep marine sediments (ca. 350 to 700 meters below seafloor) of the South China Sea. The sediments exhibited two different kinds of lithology (dark clay versus carbonate rich clay). The absolute abundances of total core lipids ranged from about 60 to 2,830 ng/g, whereas those of polar lipids ranged from 1 to 187 ng/g. The absolute abundances of both core and polar lipids showed no variation with lithology. The abundances of polar- and core lipids were positively correlated ($R^2 = 0.47$), which was much stronger (R^2 0.88) when the samples characterized by bioturbation were removed. We hypothesize that core lipids were reutilized into polar lipids by archaea or that fractions of both core- and polar lipids are from archaeal remains buried in the sediments. However, the profiles of core lipids were significantly different from those of polar lipids; the former were mainly contributed by crenarchaeol (~60%) whereas the latter mainly consisting of GDGT-0 (~60%). This suggests that the sources of core lipids and polar lipids are dramatically different with polar lipids likely being originated from archaeal cells residing in the sediments.