Intact polar lipids in the Black Sea and its sediments: microbial life above and below the seafloor

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The Black Sea is the world's largest anoxic basin where the water below 100 m and the sediments are devoid of oxygen. FS Meteor cruise M84/1 (DARCSEAS) [1] investigated site GeoB 15105 in the SW Black Sea. Using state-of-the-art analytical protocols, we traced intact polar lipids (IPL) of the planktonic and sedimentary microbial communities in a unique set of samples spanning the water column and extending 8 m deep into the sediment. The resulting IPL profiles were examined in relation to geochemical data from pore-water and water column samples, gene-based methods including total cell counts, and sedimentological description.

We found abundant archaeal and bacterial glycosidic and phosphatidic IPLs in all samples; total sedimentary IPL concentrations closely mirrored total microbial cell counts, suggesting a relatively low impact of fossil IPLs. Use of several recently developed liquid chromatographic separation protocols provided an unprecedented view of a rich lipid diversity from planktonic and subseafloor Archaea and Bacteria. Depth distributions of recently identified lipids such as unsaturated glyceroldialkylglyceroltetraethers (GDGT) and butanetriol-containing tetraether lipids (BDGT) are consistent with production by anaerobic archaea and the presence in sediments can be confidently linked to sedimentary microbes. Detailed examination of cyclization and alkyl chain length in the core lipid structures and polar head group-specific ratios of intact to core lipid concentrations allowed to distinguish between planktonic and benthic microbial sources and link these compounds to distinct geochemical regimes in the Black Sea and its sediment.

[1] Zabel *et al* (2013) RV METEOR, *Cruise Report* **M84/1**, DFG.