

## **Factors controlling the distribution of microbial lipids in marine subseafloor sediments**

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Cellular lipids serve as valuable indicators of the size and composition of microbial communities in the deep biosphere. As part of our efforts to understand the geomicrobial and geochemical processes that shape the inventories of microbial lipids in marine sediments, we have systematically examined sediment samples from eight sediment stations in the Western and Eastern Mediterranean Sea, Marmara Sea and Black Sea. These sites represent diverse environmental systems with varying inputs of terrestrial material, contrasting seafloor redox conditions and sedimentation rates, and encompass a sediment age range from current to 170 kya. Using state-of-the-art analytical protocols, we quantified 786 distinct microbial lipids in the sample set, of which 162 are shared between all samples. Accordingly this is one of the most comprehensive datasets of microbial lipids in environmental samples ever acquired. We analyzed this dataset together with microbial diversity data based on the V6 region of the 16S rRNA gene, the molecular composition of dissolved organic matter, sedimentological parameters, an extensive set of geochemical parameters and concentrations of microbial cells. Our analyses show that broad-scale changes in lipid classes across environments are multifactorial and not a simple proxy for microbial community composition. The depositional regime strongly influenced lipid inventories, suggesting that microbial adaptation and/or allochthonous sources shape sedimentary lipid profiles in addition to the composition of resident microbial communities. Age-dependent patterns in taxon distributions are apparent across the entire sample set and identify taxonomic units which appear dominant in the deep biosphere, irrespective of site-specific characteristics. Our lipid data revealed the pervasiveness of diether-based glycerolipids in more deeply buried sediments, suggesting that these compounds may be widely distributed among bacterial members of the deep biosphere, despite their rarity in cultured bacteria. In this lecture, we will identify factors shaping the microbial lipidome in marine sediments and decode information regarding the lifestyles and adaptive mechanisms utilized by members of this vast microbial habitat.