Microbial community stratification in TOC-depleted marine subsurface sediments of the Pacific Ocean

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The microbial community compositon of deep marine subsurface sediments has been studied mostly in continental margins and slope sediments that contain abundant organic carbon (up to 5-10 % weight), and are dominated by anaerobic carbon remineralization pathways, i.e. sulfate reduction and methanogenesis [1, 2]. Here we report 16S rRNA and pyrosequencing sequencing results from contrasting marine subsurface sediments that are characterized by low organic carbon content and dominated by the electron acceptors oxygen, nitrate, and oxidized metals: ODP Sites 1225 in the Eastern Equatorial Pacific at 3760 m depth, 1226 in the Equatorial Pacific south of Galapagos at 3297 m depth, 1231 in the Peru Basin at 4813 m depth [3]; and sampling sites SPG 11 and SPG 12 at the Southwestern margin of the ultra-oligotrophic Subtropical Pacific Gyre, at 5076 and 5306 m depth [4].

The microbial communities of organic carbon-depleted sediments have specific characteristics. One of the dominant archaeal groups in surficial sediments and the upper sediment column are Marine Group I (MG1) archaea; sediment MG1 archaea remain phylogenetically distinct from water column MGI lineages, and show a stratified sequence of MG1 subgroups in the sediment column. With increasing sediment depth and changing redox conditions, the proportion of MG1 archaea decreases, and other archaeal lineages take their place. These data sets support the working hypothesis that the stratification of bacterial and archaeal communities corresponds to redox gradients (O_2, NO_3-) within the sediment column. Future work will examine Atlantic deep sediments (North Pond).

[1] Teske (2006) *Geomicrobiol. J.* **23**, 357-368. [2] Fry *et al*. (2008) *FEMS Microbiol. Ecol* **66**, 181-196. [3] D'Hondt *et al*. (2004) *Science* **306**, 2216-2221. [4] D'Hondt *et al*. (2007) *Cruise Report KNOX-02RR*.

Chemical features of organic carbon (OC) that foster oc burial in lake sediments

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Lakes were shown to be important players in the global carbon cycle. In spite of the small areal extent of lakes, their sediments bury about half as much OC as marine sediments. The factors triggering the effective carbon sink in lake sediments are yet unclear. In this study, lakes with different trophic states, oxygen exposure times, and OC sources were compared to decipher which organic components become selectively preserved. Oxygen exposure time and terrigenous OC were found to trigger burial. Indicators for the diagenetic aging of the bulk OC, the Chlorin and Dauwe indices, showed that reactive amino acids and chlorin are removed fast during initial phases of decomposition, whereas non-protein amino acids selectively accumulate. By using ultrahigh resolution mass spectrometry (FT ICR MS) and electrospray ionization it was also found that from autochthonous organic matter, unsaturated compounds undergo abiotic sulfurization and therefore accumulate along aging. Terrigenous organic matter did not form organic S-compound and stayed rather inert during early diagenesis. Results from this study show that OC burial in lakes is mostly driven by a high share of terrigenous organic matter and its inertness to degradation, by selective accumulation of bacterial transformation products, and abiotic sulfurization.