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Lipid patterns of methane consuming microorganisms in diverse seepage environments. Nile deep-sea fan, Eastern Mediterranean.

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A comprehensive study of fluid seepage through the seabed has been performed during the NAUTINIL cruise (September-October 2003) in the Nile deep-sea fan (NDSF). Three mud volcanic provinces, the Eastern, Central and Western, were investigated with detailed observations and subsampling using the mini-submersible *Nautil*. These observations revealed various seepage environments, escaping-structure morphologies, associated carbonate precipitants and chemosynthetic symbionts. The venting activity within the study area can be grouped according to the geographical location of the explored seepage sites and mud volcanoes. Our goal was to identify and compare the occurrence of specific archaeal and bacterial lipids in the sediments collected from different seepage environments with different emitted products (methane, wet gas, oil, sulfide, brines, etc.). Via biomarker study, we aim to characterize the environments and the microbial processes based on the oxidation of methane and its regional or sequential variability.

The biomarker study from mud volcanic deposits (mud breccia), gas saturated pelagic sediments, brine fluids, mud brines and authigenic carbonates show significant difference in compositions, concentrations and carbon isotopic signatures of bacterial/archaeal lipids as well as compounds indigenous to the erupted sediments. Archaeal biomarkers [pentamethylicosane, archaeol, hydroxyarchaeol, glycerol dibiphytanyl glycerol tetraethers (GDGTs)] were found in all investigated settings with different distribution patterns among the studied locations. Other biomarkers such as diplopterol (aerobic methanotrophic bacteria), tetrahymanol (bacterial ciliates) were also found and great abundances where the wide occurrence of brine fluids emitted to-

gether with methane and other hydrocarbons. Such fluid venting environments result in new ecosystems discovered during the cruise. The unexpected co-occurrence of specific sterols, previously found in cultures of aerobic methanotrophic bacteria *Methylococcus capsulatus* (Bird et al., 1971) and *Methylosphaera hansonii* (Schouten, et al., 2000), diplopterol, archaeol and hydroxyarchaeol was detected in these sediments. The δ^{13}C values of the sterols, diplopterol, and archaeal lipids are all substantially depleted (-60‰ to -90‰), indicating that carbon from methane is used for biomass production.

Currently obtained data revealed different sources of fluids, contrasting venting activity and migrated constituents which all together substantially influence on the chemosynthetic strategies of archaea and bacteria. The key factors determining the biogeochemical pathways and microbial mutual benefits in the various seepage environments are still not fully understood. This presentation will discuss newly found association of prokaryotic biomarkers and lipid signatures of AOM in relation to diverse fluid venting environments within the NDSF area.

References:

Schouten, S., J.P Bowman, W. Irene C. Rijpstra, J.S.Sinninghe Damsté. 2000. FEMS Microbiology Letters 186: 193-195.

Bird C.W., J.M. Linch, F.J.Pirt, W.W.Reid. 1971. Nature 230: 473.