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DISTRIBUTION OF BACTERIOHOPANETETROL AND FLUID CIRCULATION IN SLOPE SEDIMENTS, GULF OF MEXICO, IODP EXP 308

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More than 90 % of prokaryotic biomass is assumed to be in oceanic and terrestrial subsurface biosphere (Whitman et al., 1998). The presence of subsurface biosphere is especially expected in the area where fluid circulation provides energy and carbon sources necessary for the survival of microbes. For example, at Site 1229 on the continental margin of Peru, ODP Leg 201, high cell concentrations occur in two subsurface sulphate-methane interface (SMI) formed by SO_4^{2-} introduction at depth by upward diffusion from ancient brine along much of the Peru Shelf (D'Hondt S. et al., 2004). In the Gulf of Mexico, high sedimentation rates have been observed and strong geohydrological activity was expected. In the present study we investigate the relationship between bacterial distribution and fluid circulation system in subsurface at the Gulf of Mexico characterized by rapid sedimentation.

IODP Exp 308 was programmed to focus on the study of overpressure and fluid flow on the continental slope of the Gulf of Mexico (Expedition 308 Scientists, 2005). The drilling was conducted at two different depositional environments. Brazos-Trinity Basin #4 is a classic area for analysis of turbidite depositional environments. Site U1319 is located on the southern flank of the basin where turbidite deposits are more condensed. Ursa Basin consists of continental slope sediments. Site U1324 is the westernmost site drilled in Ursa Basin during Exp 308.

Biohopanoids, such as bacteriohopanetetrol (BHT), are a group of pentacyclic triterpenoids synthesized by a variety of bacteria as cell membrane constituents (Rohmer et al., 1984). Biohopanoids are rapidly transformed to diagenetic products called geohopanoids after the death of bacteria. Detection of biohopanoids in sediments, therefore, can show the presence of living or recently dead bacteria. In the present study, the sediment samples from IODP Exp 308, Sites U1319 and U1324 were used for biomarker analyses

BHT was detected in most of the sediment samples form Sites U1319 and U1324. At Site 1319, the concentrations of BHT are high at the depth from 20 to 40 meter below sea floor (mbsf) and then decrease with depth. The concentrations are below the detection limit in the samples deeper than 100 mbsf. Although the concentrations of BHT in the sediment from Site U1324 decrease with depth, the concentration of the deepest sample (230 mbsf) analysed

in the present study is *ca.* 40 ng/g dry sediment. BHT concentrations in the sediment from U1324 are comparatively higher than those from Site U1319. It is not consistent with the result from direct observation under the microscope. The SMI depths of Sites U1319 and U1324 are 15 and 94 mbsf. This difference is mainly driven by the higher sedimentation rates at Ursa basin compared to Brazos-Trinity Basin #4. The number of cells decreases with depth at both sites. Cell density is in the order of 10^4 to 10^5 cells/ml below SMI depth at Site U1319 while cell density is below detection limit within 100 mbsf at Site U1324.

The pore water cation (Na^+, Ca^{2+}, Mg^{2+} etc.) concentration profiles indicate that lateral fluid flow is restricted in the shallow subseafloor at Site U1319, while significant fluid flow occurs in the deep subsurface as well as in the shallow subseafloor at Site U1324. The concentrations of BHT are higher in sediments from Site U1324 where fluid flow circulation is more active. These results show that the distribution of bacteria capable of synthesising hopanoids is closely related to the fluid circulation in the continental slope at the Gulf of Mexico. Labile bacteriohopanetetrol in deep subsurface sediments from the Gulf of Mexico is mainly derived from in situ living bacteria which utilize energy and carbon supplied by the subsurface fluid flow.

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