



## **Isotope biogeochemistry of sulfur cycling by the deep biosphere of Porcupine Seabight Coral Mounds (IODP Leg 307)**

M.E. Böttcher (1, 2) and T.G. Ferdelman (2)

(1) Leibniz Institute for Baltic Sea Research, Warnemünde, Germany, (2) Max Planck Institute for Marine Microbiology, Bremen, Germany (michael.boettcher@io-warnemuende.de)

Sulfur cycling in carbonate-dominated sediments may provide an important environment with extreme and probably unique deep biosphere microbial communities. IODP Expedition 307 drilled the Challenger Mound in the Porcupine Seabight (SW Ireland continental margin) with the goal of unveiling the origin of and diagenetic processes within one of these intriguing sedimentary structures. Challenger Mound, located at 800 meters water depth on the eastern margin of the Porcupine Basin, is one of several mound structures in the Belgica mound province. In addition to the mound, one site immediately downslope of Challenger Mound and an upslope site were drilled.

The project studies the diagenetic processes in the deep biogeochemical sulfur-iron-carbon-manganese cycle of the 307- sediments to identify by means of high-resolution inorganic and stable isotope geochemical pore water and solid phase investigations those reactions that characterize the microbial sulfur transformations. The project focusses on the potential of the contents and sulfur and oxygen isotopic composition of ore water sulfate and sulfide minerals as well as iron speciation to reflect the history of geomicrobial reactions in deeply buried marine sediments. The study also addresses the question of the role of the Miocene sediments underlying the carbonate mound for driving ongoing diagenesis by a deep biosphere via methane as intermediate substrate.

Microbial sulphate reduction is indicated by  $\delta^{34}\text{S}$  values in residual pore water sulphate up to +73 per mil versus V-CDT (Site 1316), +70 per mil (Site 1317), and +69 per mil (Site 1318). The product of dissimilatory sulphate reduction is fixed in sedimentary reduced sulphur species as AVS (acid volatile sulfides) and pyrite. For

example at Site 1317,  $\delta^{34}\text{S}$  values for AVS range between -15 and -33 per mil, and for pyrite between -45 and + 16 per mil. Besides microbial processes in the reductive and oxidative parts of the sulphur cycle, transport reactions of sulphur species with corresponding diagenetic modifications of geochemical proxies are indicated.

The authors acknowledge financial support from Deutsche Forschungsgemeinschaft, IOW, and Max Planck Society.