



Biogeochemistry of sulfide-oxidizing and iron-oxidizing bacterial mats at the Chefren mud volcano

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In the framework of the ESF EUROCORES EUROMARGIN project MEDIFLUX, we investigated the biogeochemistry of two differently colored bacterial mats (white and orange) on the surface sediments of the Chefren mud volcano, in the Nile Deep Sea Fan, using biogeochemical and microbiological tools. These two different types of mats were in close proximity and were often interspersed, but had differing biogeochemical properties. Both were brine impacted, but brine was only observed flowing across the white mat, not the orange. White granular particles were visible on the surface of the white mat. Phase contrast microscopy and scanning electron microscopy (SEM) revealed filamentous sulfur strands reminiscent of those produced by the sulfide-oxidizing bacterium *Arcobacter* sp.. Fluorescence In Situ Hybridization (FISH) confirmed the presence of *Arcobacter* sp. within the surface of this mat. Sulfate reduction rate measurements, Fe²⁺ measurements, as well as visual observation indicated that sulfide was present near the surface of this mat in the form of iron sulfides and possibly HS. Our measurements suggest that the sulfide was partially transported with the brine, but that a significant fraction could also have been derived from anaerobic oxidation of methane. In contrast, the orange mat had orange precipitates on its surface that resembled iron oxides. Sulfate reduction rate and Fe²⁺ measurements, as well as visual observation suggested that sulfide was removed well below this mat. Fe²⁺ concentrations were very high near the surface of this mat. Mi-

microscopic as well as elemental analysis of this mat showed the presence of numerous iron oxide encrusted sheaths, resembling those described for aerobic, neutrophilic iron oxidizer *Leptothrix ochracea*. 16S rDNA analysis indicated that both types of mats hosted very diverse microbial communities, capable of various types of C, Fe, and S transformations. The orange “iron-oxidizer” mat was only found in association with subsurface brine seepage at Chefren and may reflect a transient ecosystem related to oxidation of previous brine and methane seepage-impacted sediments. In contrast, the white “sulfide-oxidizer” mat was found to cover vast areas of brine pools at Eastern Mediterranean mud volcanoes.