When Organic-Rich Turbidites Reach 5000 m: “Cold-Seep Like” Life in the Congo Deep-Sea Fan

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The Congo canyon, located on the west coast of Africa, is a unique example of a canyon directly connected to a major river (The Congo River). Turbidites are responsible for a large input of terrestrial organic matter at depths up to 5000 m. These high inputs led to global high organic matter mineralization rates, with very localized hot spots that were visually observed and specifically sampled with a ROV. These hot spots, featuring substantial concentration of reduced compounds, mainly methane and sulfides, were recognizable in surface by the presence of reduced sediment patches, bacterial mats, and/or vesicomyid bivalves that host bacterial endosymbionts able to process H2S. In this paper we present geochemical sediment profiles of sulfate, methane, sulfide and dissolved iron together with phylogenetic diversity of 16S rRNA communities. This will give a first understanding of biogeochemical processes occurring in this peculiar ecosystem, mainly sulfate reduction, surficial methanogenesis and subsequent anaerobic oxidation of methane with bacterial and archaeal assemblages similar to cold seeps environments. Dissolved sulfide produced through the reduction of sulfate is reoxidized through several pathways depending on the habitat. These pathways include vesicomyids uptake (adults or juveniles in the bacterial mats habitats), reoxidation by oxygen or iron phases within the reduced sediment, or reoxidation by microbial mats. Sulfide uptake rates by vesicomyids measured in sulfide-rich sea water were similar to sulfide production rates obtained by modelling the sulfate profile with different bioirrigation constants, highlighting the major control of vesicomyids on the sulfur cycle in their habitats.