

# Electrogenic sulfur oxidation drives trace metal cycling in sediments from the Belgian Coastal Zone

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Recently, a novel process of microbially mediated sulfide oxidation has been discovered [1]. In this process, named electrogenic sulfur oxidation (e-SOX), long filamentous cable bacteria couple the reduction of oxygen near the sediment-water interface to the oxidation of free sulfide and iron sulfides in deeper sediment layers via electrical currents that run over centimetre-wide distances [1,2]. This spatial decoupling of redox reactions generates a distinct pH profile with an alkaline peak just below the sediment water interface and an acidic pH minimum in the deeper sediment layers. These strong alkalinity gradients have been shown to significantly influence the elemental cycling of iron, manganese and carbonate minerals in the upper ~5 cm of the seafloor through the acidic dissolution of pH-sensitive minerals such as iron sulfides and carbonates [3,4]. Metal oxides and sulfide minerals are primary drivers for trace metals cycling [3,5] and thus, e-SOX will likely affect trace metal cycling. Yet, the impact of e-SOX on trace metal cycling is still largely unknown

Here we present results from *in situ* sampling (November 2014), and laboratory sediment incubations from the Belgian Coastal Zone (BCZ, Station 130). By combining the results of the microsensor profiling, pore water analysis and sequential solid phase extractions for trace metals and inorganic sulfur, it is shown that e-SOX is the primary driver of the biogeochemical cycles of cobalt and arsenic in the BCZ. Trace metal cycling is driven by the dissolution of sulfide minerals at depth and the reprecipitation of iron and manganese oxides near the sediment-water interface.

Keywords: electrogenic sulfur oxidation; cable bacteria; trace metal cycling

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