Cable bacteria protect seasonal hypoxic basins from euxinic conditions

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Cable bacteria give rise to a whole new type of "electro-active" microbial ecosystems in the seafloor. These long, filamentous bacteria couple the oxidation of sulfide in deeper sediment to the reduction of oxygen in the upper millimeters by long-distance electron transport, and thus endow an electrical field upon the sediment. The metabolic activity of cable bacteria strongly impacts the sedimentary iron and sulfur cycling, and recently, it was proposed that this impact can extend to the basin scale. In a seasonal hypoxic basin, it was shown that cable bacteria build up a large pool of iron(hydr)oxides in the sediment in spring. These iron(hydr)oxides then can act as a chemical "firewall" in summer, inhibiting or delaying the release of toxic sulfide from the sediment, and thus preventing bottom water euxinia (Seitaj *et al.*, 2015).

Here, we tested this firewall hypothesis by seasonally sampling sediment cores, and artificially inducing anoxia in these cores. Subsequently, we monitored the solute fluxes until euxinic conditions were reached. Cores collected in spring showed intensive cable bacteria activity, and revealed high concentrations of iron(hydr)oxides in the upper sediment. These cores did not show an efflux of sulfide for up to 80 days, thus demonstrating the "firewall" mechanism. Given the global distribution of cable bacteria, our results suggest that the "firewall" mechanism could be an essential ecosystem function in seasonally hypoxic coastal systems.