Electrogenic bacteria leave a unique geochemical footprint in marine sediments

Burdorf Laurine[1], Sairah Malkin[1,2], Dorina Setaj[1] and Filip Meysman[1,2]

[1] Koninklijk Nederlands Instituut voor Onderzoek der Zee (NIOZ), Workgroup Ecosystem Studies
Korringaweg 7, 4401NT, Yerseke, the Netherlands
E-mail: laurine.burdorf@nioz.nl

[2] Analytical and Environmental Chemistry, Earth System Sciences, Vrije Universiteit Brussel (VUB), Pleinlaan 2, 1050 Brussel, Belgium

Recently, it has been discovered that filamentous bacteria are capable of transporting electrons over centimetre distances in marine sediments (Nielsen *et al.*, 2010; Pfeffer *et al.*, 2012). This long-distance electron transport equips these bacteria with a unique metabolic lifestyle: they can couple two spatially separated redox reactions, i.e., the reduction of O_2 near the sediment-water interface is electrically coupled to the oxidation of H_2S in deeper sediment. This way, these electro-filaments obtain a competitive advantage for energy-substrates in the seafloor.

Originally discovered in laboratory incubations, our research group has now documented the activity of these electro-filaments under natural conditions at several sites in the North Sea (Malkin *et al.*, in review). Their activity imposes a typical geochemical footprint on the sediment, recorded as a set of micro-electrode depth profiles (O_2, pH and H_2S). In particular, the pH depth profile is unique, with an immediate increase below the sediment-water interface, followed by a strong pH minimum deeper down in the sediment. Based on microbiological assays we are confident that these pH profiles correspond to the presence of the filamentous bacteria.

In my PhD research project, I am focusing on how the presence of these electro-filaments impacts the sediment geochemistry. We are approaching this question combining detailed micro-electrode profiling with reactive transport sediment-models.

References

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