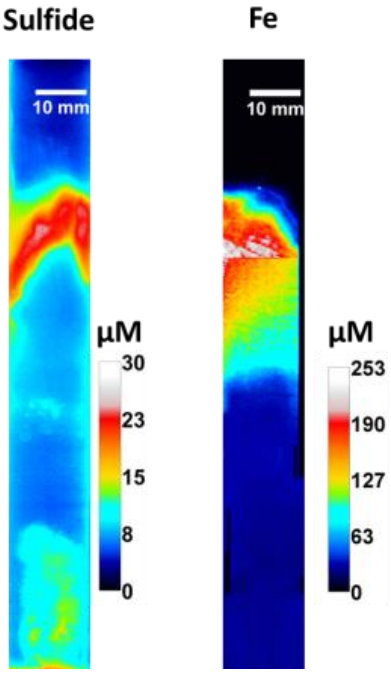
Two dimensional and high resolution profiling of sulfide and metals in sediment pore waters

By Chunyang ZHOU

Co-authors: Camille GAULIER, Ehab ABDULBUR ALFAKHOURY, Martine LEERMAKERS and Yue GAO

Sediments are highly heterogeneous mixtures of mineral phases and organic matters, after microbial colonization, the rapid mineralization of these organic matters could take place at very small scale (sub mm level) and then induce mobilization of metals and sulfide. While traditional 1D sediment core slicing (usually every 2 cm) will definitely miss these small scale processes, so 2D and HR profiling are required to accurately investigate these small scale processes. Diffusive Gradients in Thin-films (DGT), as a widely used passive sampling technique, can be applied to solve this technical problem and achieve 2D and HR profiling.



Here are the several ways to do it. Firstly, by slicing the resin gel, then each sliced gel square represents one point, in this case, the resolution goes to around 5*5 mm, depending on how small you can slice. The second way is scanning the resin gel by Laser Ablation and then determining the mass by ICP-MS, in this case, the resolution goes to around 100*100 µm, it depends on (1) The bead size of your resin; (2) Spot size and speed of your laser beam. The third way is by Computer Imaging densitometry (CID) technique. It can help to transform the greyscale image, which is obtained by scanning the resin gel with a scanner, to the concentration profile. In this case, the resolution goes to 20*20 µm, depending on the resolution of the greyscale image.

2D and HR profiles provide much more information both vertically and horizontally compared with 1D profile, especially in terms of small scale processes. Meanwhile, 1D slicing has a great risk to underestimate the real concentration in pore waters because it gives only horizontal averaged values.