
Abstracts

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Two-dimensional determination of dissolved manganese in sediment pore waters with 2D-DET combined with a colorimetric method

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This study presents a new gel based technique to describe the pore water manganese distribution through the sediment-water interface in two dimensions at a millimetre scale. We used a combination of a colorimetric method based on Cd substitution by Mn in a Cd(II)-T(4-CP)P complex catalysed by imidazole with diffusive equilibrium in thin films (DET). After diffusive equilibration of the gel probe with Mn standard solutions, or pore waters within the sediment, a colorimetric reagent gel is set on the gel probe. 30 minutes of cross diffusion allows the development of a yellowish colour characteristic of the newly formed Mn(III)-T(4-CP)P complex. A common flatbed scanner is used to get images analysed by ImageJ® software through the blue channel. This protocol allows to obtain a measurement range from 0 to 300 µM and a detection limit of about 16 µM. Interferences of iron and salinity were examined. A field validation was then realized in a tidal mudflat of the French Atlantic coast by comparison with conventional pore water extraction and ICP-OES analysis. Another application was realized with homogenized sediment where polychaetes were added. In the first few millimetres of sediment, where oxygen was still present, the 2D image of dissolved Mn indicated preferential transport of dissolved Mn into the supernatant water. These features corresponded to macrofaunal burrows and underline the contribution of bioirrigation to Mn fluxes towards water column. The present technique has a reasonable cost and presents a great interest to examine the importance of microenvironments to early diagenetic processes and better estimate benthic fluxes in bioturbated ecosystems.