A new view of iron cycling in intertidal mudflats: Two-dimensional mapping of iron and phosphorus release at submillimeter scale

A. THIBAULT DE CHANVALON[12*], E. METZGER[1], A. MOURET[1], F. CESBRON[1], J. KNOERY[2], P. LAUNEAU[1], E. GESLIN[1], S. VAN DE VELDE[34] AND F. J. R. MEYSMAN[34]

[1]Université d'Angers, Université de Nantes, OSUNA, LPG-BIAF, UMR CNRS 6112, 49045 Angers, France
[2]Ifremer, LBCM, Rue de l'Ile d'Yeu, 44300 Nantes, France
[3]Department of Ecosystem Studies, NIOZ, 4401 NT Yerseke, The Netherlands
[4]Analytical, Environmental and Geochemistry, Vrije Universiteit Brussel (VUB), 1050 Brussel, Belgium
*correspondence: athibaultdc@gmail.com, aubin.thibaultdechanvalon@etud.univ-angers.fr

Sediment diagenesis generates solute fluxes across the sediment-water interface which can strongly impact biogeochemistry of the overlying the water column. The reductive dissolution of iron (hydr)oxides is an important diagenetic process for the top 20 cm of sediment in the Loire estuary, and probably supplies dissolved phosphate and trace metals to the river. High-resolution two-dimension determination of dissolved phosphorus and iron in porewater by a combined DET-gel/colorimetry technique (200 μm x 200 μm) [1] shows a high vertical and lateral heterogeneity in the surface sediment. Based on the Savitzky Golay filter approach, an original 2D numeric model suitably calculate the first order derivative (providing the flux) and the second order derivative (providing the production rate) of the measured 2D concentration. The subsequent sampling of the adjacent reactive solid phase at a resolution of 10mm allows to estimate the standing stock. The resulting 2D patterns of stocks and productions highlight in an unprecedented way the importance of bioirrigation and labile organic carbon patchiness on iron cycling and phosphorus mobilization in estuarine sediment and intertidal mudflats.

These research was part of RS2E project founded by Région Pays de la Loire.

[1] Simultaneous 2D Imaging of Dissolved Iron and Reactive Phosphorus in Sediment Porewaters by Thin-Film and Hyperspectral Methods, Cesbron et al. (2014), *Environmental Science & Technology* **48**, 2816-2826