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Quantifying Fe-OC associations in sediment using dithionite in Flow-Through Reactors (FTR)

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In sediments, the carbon and iron cycles are tightly interconnected. Organic molecules can adsorb onto Fe(III) oxyhydroxides surface but also co-precipitate with dissolved Fe forms to create organo-mineral associations (Fe-OM). These processes are believed to preserve OM from mineralization and participate to the burial of organic carbon in sediments. Globally, approximately 21.5 ± 8.6% of total organic carbon in sediment is believed to be bound within Fe-OM according to the citrate-bicarbonate-dithionite (CBD) extraction [1]. However, this method has some limitations. Chief among those is the need to run a “blank” extraction to evaluate the innocuity of high ionic strength used in the CBD method on the stability of loosely bound OC in sediment. Here we propose to use Flow-Through Reactor [2] to quantify Fe-OM in sediment. With respect to the classical CBD extraction, this setup presents several advantages: (i) it allows to work at a much lower concentration of Na-dithionite which limits the “salt-effect’ on bound OC (ii) and it avoids the use of citrate as Fe(II)-ligand. As the FTR setup preserves very well the natural structure and the physico-chemical condition of the sediments, it also permits to explore the fate of Fe-OM under changing environmental conditions. We will discuss the first results obtained with our new FTR-dithionite method on Fe-OM from sediment collected in the Scheldt Estuary (Belgium).

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