Links between iron and humic substances biogeochemistry in the Ocean

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We present the distribution of electroactive humic-like substances (eHS) in relation to the iron distribution in two contrasting marine systems: the Mediterranean Sea[1], and the Western Atlantic along two GEOTRACES-sections (GA02, GA04). Across the different biogeochemical domains, concentrations of eHS (normalized to Suwannee River Fulvic Acid) ranged from 11 µg L^{-1}, to 142 µg L^{-1}. The vertical distributions were similar to those previously reported for dissolved organic carbon and we estimate that eHS account for a relatively small fraction of dissolved natural organic matter (2-20%). Despite these low concentrations, eHS could influence considerably marine biogeochemistry through their key roles in complexation and solubility of trace nutrients (e.g. iron and copper). We found a correlation between dissolved iron (DFe) and eHS concentrations (DFe/eHS = 13 ± 2.5 nmol/mg SRFA) that compared relatively well with the complexing capacity of SRFA (16.7 ± 2 nmol/mg SRFA[2]) and estimate their contribution to the iron binding ligand pool. Our result strongly supports complexation of DFe by eHS, both in the Western Atlantic and the Mediterranean Sea. Key processes controlling the concentration of eHS were identified (biologically mediated production, photodegradation, degradation by heterotrophic bacteria, sediments release,…) and linked to Fe biogeochemistry[1]. Our results suggest the existence of links between the cycles of eHS and DFe in the ocean, demonstrating that dissolved organic matter and trace element chemistry are tightly coupled in the ocean.

[1] Dulaquais, et al. 2018 *Journal of Geophysical Research: Oceans* 123.8 (2018): 5481-5499.

[2] Laglera, L. M., & van den Berg, C. M. (2009). *Limnology and Oceanography*, *54*(2), 610-619.