Iron and hemoprotein abundance in the Atlantic Ocean; link to global biogeochemical cycles and climate change

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Hemoproteins make up approximately 40% of the intracellular iron pool in phytoplankton whilst heme *b* is an iron-containing cofactor in hemoproteins that participates in the fundamental processes of photosynthesis and respiration [1]. Heme *b* concentrations typically decline in waters with low iron concentrations [2] but due to lack of field data, the distribution of heme *b* in particulate material in the ocean is poorly constrained. This study reports particulate heme *b* distributions across the Atlantic Ocean (59.9°N to 34.6°S). Heme *b* concentrations in surface waters ranged from 0.10 to 33.7 pmol L^{-1} (median=1.47 pmol L^{-1}, n=974) and were highest in regions with a high biomass. The ratio of heme *b* to particulate organic carbon (POC) exhibited a mean value of 0.44 µmol heme *b* mol^{-1} POC. Our analysis suggests that the ratio of 0.10 µmol heme *b* mol^{-1} POC is the cut-off between heme *b* replete and heme *b* deficient (anemic) phytoplankton. By this definition, we observed anemic phytoplankton populations in the Subtropical South Atlantic and Irminger Basin. Our large-scale observations of heme *b* relative to biomass demonstrate the impact of changes in iron supply on phytoplankton iron status. Given that oceanic environments change dynamically and are subject to alterations in iron supply from desert dust [3] and anthropogenic inputs, this information can help us assess how oceanic iron availability will impact carbon sequestration patterns and in extent the climate.

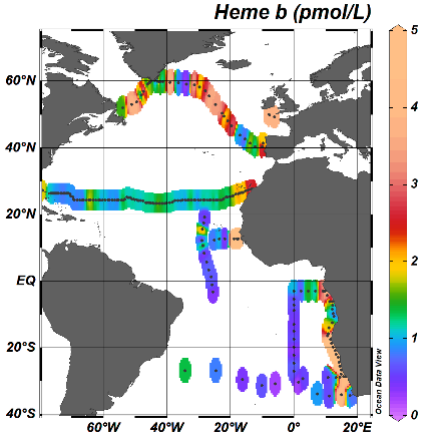

Figure 1: Heme *b* abundance in the Atlantic Ocean.

References:

1. J. A. Raven, *New Phytol*. **116**, 1–18 (1990)
2. D. J. Honey et al, *Mar. Ecol. Prog. Ser*. **483**, 1–17 (2013)
3. T. D. Jickells, *Science*, **308**, 67–71 (2005)