Geophysical Research Abstracts, Vol. 9, 06504, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06504

Production and occurrence of specific organic iron complexes: siderophores in the Atlantic Ocean

E. Mawji, M. Gledhill, and E.P. Achterberg

School of Ocean and Earth Science, University of Southampton, Southampton SO14 3ZH, UK, ezm@noc.soton.ac.uk

While iron concentrations in the open ocean are found at very low levels ($<$0.5nM) their importance in marine primary production and biodiversity is well documented. However, little is known about the chemical speciation of iron in seawater although this has a critical influence on both its solubility and availability to marine organisms. Dissolved iron is thought to be predominantly complexed by organic ligands ($>$99%) of unknown origin that may influence the uptake of iron by microbiota. The nature of these ligands has not been identified but they exhibit high conditional stability constants with regards to iron and are thought to be produced by biological activity. Stability constants indicate potential candidate compounds including porphyrin and siderophores. Siderophores are defined as low molecular mass, strong iron (III) chelators, their main function being to mediate iron transport into cells[1].

In this work the production of siderophores by marine phyto- and bacterioplankton across the biogeographical regions of the Atlantic Ocean (Atlantic Meridional Transect Programme) is reported. Using our incubation conditions[2] two distinct siderophores groups were identified (ferrioxamines and the amphilbactin). The oligotrophic gyre regions showed the least siderophore production, while the more productive waters of the north, south and Equatorial Atlantic produced the widest variety of siderophores.

Furthermore, a novel approach for the quantification of siderophore type chelates isolated from Atlantic seawater is reported. This is achieved by the analysis of gallium complexes by LC-ICP-MS.

[1] Neilands, J. B. (1995). "Siderophore Structure and Function of Microbial Iron Transport Compounds." The Journal of Biological Chemistry. 270.N0.45: 26723-

26726.

[2] Gledhill, M., McCormack, P., Ussher, S.J., Achterberg, E.P., Mantoura, R.F.C., Worsfold, P., (2004). "Production of siderophore type chelates by mixed bacterioplankton population in nutrient enriched seawater incubations." Marine Chemistry 88: 75-83.