



Voltammetric analysis of dissolved iron speciation in hydrothermal plumes: Evidence for organic iron complexation.

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Hydrothermal inputs have long been hypothesised as a potential source of iron to the deep ocean iron budget. These chemosynthetic environments emit metal rich end member fluids with high mM dissolved iron concentrations. On contact with surrounding oceanic waters, the iron oxidises and forms inorganic precipitates which sink to the sea floor. However, it has been suggested that the presence of organic complexation could provide a means of retaining a soluble iron fraction within the hydrothermal plume and ultimately providing a significant proportion of the total global flux of iron to the deep ocean.

For the first time, Competitive Ligand Exchange - Cathodic Stripping Voltammetry (CLE-CSV) has been used to look for the presence of organic iron complexation within buoyant and neutrally buoyant hydrothermal plumes. In laboratory experiments we have shown that the high α -coefficient used in the CLE-CSV approach out competes the inorganic iron fraction in the samples. Consequently, we only observe organic iron complexation.

Results for samples collected from hydrothermal plumes in the South Atlantic (5°S) have shown that only on the very edge of the plume do we observe an excess of organic iron complexing ligand, comparable to organic ligand concentrations found in the deep ocean. Within the plume any organic ligands occurred at lower concentrations than dissolve iron (i.e. saturated by iron). We propose that hydrothermal end member fluids provide little, if any, organic ligands that complex iron and therefore organic iron complexation will only occur with ligands already present in the deep ocean.