The impact of Fe and Cu on the natural phytoplankton communities and on the complexing organic ligand pool through incubation experiments at the vicinity of Kerguelen Islands (Southern Ocean)

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Shipboard natural incubations were carried out during the KEOPS 2 cruise around Kerguelen Islands from 10 October to 20 November 2011 aboard the R.V. Marion Dufresne II (TAAF/IPEV) at three different stations: R2, A3-1, E-3. R2 was an upstream high-nutrient low-chlorophyll reference station). A3-1 was located on the central Kerguelen plateau within the plateau bloom. E-3 was located East of Kerguelen Islands in a downstream bloom within a quasi-stationary recirculation area close to the polar front. At A3-1, no biological response to the addition of Fe and/or Cu was observed. This station was characterized by high levels of particulate Fe and organic ligands. At stations R2 and E-3, additions of Fe or Fe-Cu significantly increased concentrations of chlorophyll-a, biogenic silica and nano-eukaryotes. This indicates Fe limitation of diatoms and small phytoplankton. Copper organic speciation measurements by voltammetry showed low levels of free Cu controlled by high concentrations of copper-binding ligands (L_{Cu}) The low levels of free Cu in the incubations, even with the addition if Cu, should not have any oxidative stress on the Cu-sensitive micrograzers or help increasing Fe bioavailability. This may explain why the additions of Cu did not produce any effect on the biological response compared to the control.