

Tuesday, October 9

Poster Session 2

10:30–12:30

Poster 257

UNEXPECTED LACK OF PHYTOPLANKTON BIOMASS IN NATURALLY IRON FERTILIZED WATERS NEAR HEARD AND MCDONALD ISLANDS IN THE SOUTHERN OCEAN

Phytoplankton are responsible for about 50% of global primary production and for the sequestration of carbon in the ocean through the biological pump. The Southern Ocean is the largest high-nutrient low-chlorophyll (HNLC) region in the global oceans, where the phytoplankton primary production is mostly controlled by the availability of iron. The Kerguelen Plateau is one of the regions in the Southern Ocean where massive algal blooms occur as a result of natural iron fertilization. However, time series analysis of a consistent ocean colour climate data record (OC-CCI), from 1997 to 2015, revealed chlorophyll concentrations located close to Heard and McDonald islands are much lower than on the central Kerguelen Plateau. Further investigation of these waters was undertaken during the HEOBI (Heard Earth-Ocean-Biosphere Interactions) voyage onboard RV Investigator between 8th January and 26th February 2016. Surface chlorophyll concentrations derived from HPLC confirmed that low phytoplankton biomass persists in the vicinity of the islands, as observed in the ocean colour data, despite high levels of iron prevailing. The analysis of pigment and optical data also revealed a shift in the phytoplankton size structure in this region, from a microphytoplankton to nanophytoplankton dominated community. We explore a number of possible explanations for this high nutrient, high iron (Fe), low chlorophyll (HNHFeLC) phenomenon, including dilution of biomass by deep mixing, light limitation, zooplankton grazing, local circulation and sinking enhanced by the presence of resuspended sediments and draw conclusions on the implications for ocean modelling estimates of ocean carbon fixation and sequestration.

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