

Spatial and temporal variability of particulate iron and manganese in the Atlantic sector of the Southern Ocean: spring vs winter

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Seasonal variability of the primary production in the Southern Ocean remains unconstrained. This is partly due to poor sampling efforts in winter, especially for trace metal availability such as iron (Fe) or manganese (Mn). These trace metals in the ocean are only present at pico- to nanomolar concentrations in the open ocean and can both limit phytoplankton growth. In addition to the paucity of available data, most studies focused on the dissolved pool of Fe and Mn. Consequently, sources and distributions of the particulate pool are still poorly documented, despite the fact that particulate Fe and Mn often exceed concentrations of the dissolved pool and may constitute a part of the bioavailable fraction for the phytoplankton. Thus, there is a real need to study the seasonal variability of particulate trace metals.

SCALE (Southern Ocean seasonAL Experiment) is a novel multidisciplinary conducted experiment in Atlantic sector of the Southern Ocean from the subtropical zone to the Antarctic zone. In 2019, two cruises were undertaken on-board the South African (SA) Agulhas II polar research vessel in winter (July) and spring (October-November), from 13°E-35°S to 0°E-56°S. From the surface to 4000 m and 2000 m depth in winter and spring respectively, marine suspended particles were collected using GO-FLO bottles and filtered on 0.45 µm porosity Supor filters. Total digestions and SF-ICP-MS analyses were subsequently carried out on land under clean conditions.

Preliminary data from a station located in the subtropical zone suggest higher values by a factor of almost 1.8 of pFe and pMn concentrations during winter compared to spring in surface layers. Both concentrations seem to increase with depth. We will present these first Southern Ocean seasonal data of pFe and pMn as well as particle type and the different hosting phases using Scanning electron microscopy. Physical and biological data acquired in parallel from SCALE cruises will also help to the interpretation of results and will be discussed accordingly.