«GreetingLine»

Project title:
Iron speciation and Lead in Amundsen Sea: Study of the relative importance of sea and glacial ice sources
Principal Investigator: Kuria Ndungu, Department of Applied Environmental Science, Stockholm University

Project description

Primary productivity and the associated uptake of carbon over large areas of the Southern Ocean including coastal Antarctica, is thought to be co-limited by the micro nutrient iron (Fe) and light. The main aim of the proposed project will be to study the source(s) of Fe and other trace metals in the virtually unexplored Amundsen Sea and how its (Fe) chemical speciation affects biogeochemical processes and phytoplankton dynamics in the region. We will accomplish this by determining Fe speciation and lead (Pb) isotope signatures on sea and glacial ice meltwater to help understand the sources of atmospheric metals to sea ice and, via seasonal melting, to the Amundsen Sea Polynya. The study will be based on two major hypothesis:

(i) That aeolian deposition is a significant source of Fe that fuels the high productivity observed at ASP and that organic complexation dominates Fe speciation in sea-ice and glacial-ice melt water helping keep Fe in solution. This plays a major role on its (Fe) cycling and bioavailability.

(ii) Lead in the Amundsen surface sea-ice and glacial-ice and Amundsen Sea Polynya water will have a South American industrial aerosol signature. Thus Pb isotope data can be used as a tracer to elucidate if South America is a source of Aeolian transport of other trace metals including Fe to the Amundsen sea. The information obtained from the study will help us understand trace metal input into the Amundsen Sea and to derive potential impacts of climate change on the biogeochemistry of this region. The project will be carried out in close collaoboration with with the Amundsen Sea Polynya International Research Expedition (ASPIRE), an international multidisciplinary team made up of trace metal and carbon chemists, phytoplankton physiologists, microbial and zooplankton ecologists. Polynyas, are foci for both energy and material transfer between the atmosphere and the polar ocean. The broader aim of ASPIRE is therefore to investigate why and how the coastal Antractic Polynya in the Amundsen Sea is so much more productive than other polynyas, and whether interannual variability can provide insight to climate-sensitive mechanisms driving carbon fluxes there. Thus the source of nutrients, especilly Fe, that fuel the high productivity in ASP is a key biogeochemical question of this project and the multidisciplinary ASPIRE study.