

SIPEX 2: Sea Ice Physics and Ecosystem eXperiment 2

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Sea ice is a structuring component of the Southern Ocean and plays a pivotal role in the biogeochemical cycles of Antarctic marine ecosystems. The SIPEX-2 expedition will explore the sea ice zone around Antarctica in September-October 2012 and will investigate relationships between the physical sea ice environment and the structure of Southern Ocean ecosystems. The expedition will be aboard Australia's icebreaker RV *Aurora Australis* in the region of East Antarctica west of 110°E (64-65°S).

The main objectives of the project are:

- To identify how biological primary and secondary productivity is affected by winter sea ice extent and properties, and by ocean circulation
- To obtain large-scale information on sea ice biological (sea ice algae distribution and under-ice krill distribution) and physical parameters (sea ice thickness distribution, under-ice velocity field)
- To obtain biogeochemical data on sea ice with a special focus on the trace metal biogeochemistry in sea ice.

Contamination-free ice coring sampling equipment will be used (Figure 1; Lannuzel et al., 2006). Water samples for trace element measurements will be collected from 15 m down to 4000 m depth using an autonomous 1018 intelligent rosette system specially adapted for trace metal work and deployed on a Kevlar hydroline (General Oceanics, USA).

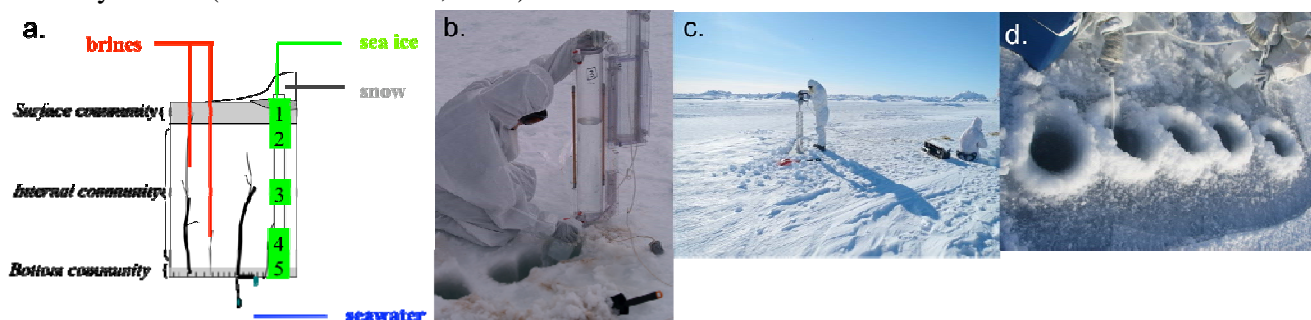


Figure 1: a. schematic of the collection of snow, sea ice, brines and under-ice seawater samples b. deployment of Helmond-Byrne polycarbonate seawater sampling bottle c. sea ice coring and d. sack-hole brine collection

Melted sea ice, brine, snow and seawater will be processed onboard and stored for analysis in the home laboratory. A suite of key GEOTRACES trace element and isotope (TEI) parameters will be analysed using the high resolution inductively coupled plasma magnetic sector mass spectrometry (HR-ICP-MS; Element 2) housed at the University of Tasmania. Dissolved elements (Fe, Mn, Cu, Zn, Ba, Al, Cd and Co) will be quantified using a method adapted from Milne et al. (2010) while 15 elements in the particulate fraction (Al, P, Ti, V, Mn, Fe, Co, Cu, Zn, Ga, Mo, Ag, Cd, Ba and Pb) will be measured following Bowie et al. (2010). Iron isotope fractionation in sea ice, brine, snow and seawater will be assessed in NIOZ laboratory following the method developed by de Jong et al. (2010).

Standard physico-chemical and biological parameters such as sea ice and snow thicknesses, ice temperature, sea ice and brine salinities, ice texture, chlorophyll *a*, macro-nutrients (nitrate, phosphate, silicic acid), particulate and dissolved organic carbon and nitrogen will also be determined in each sample.

The Chief Scientists agree that SIPEX-2 can be endorsed as a GEOTRACES Process Study.