Amundsen Sea Polynya International Research Expedition (ASPIRE): Patchiness and significance of microbial communities controlling the Southern Ocean carbon cycle

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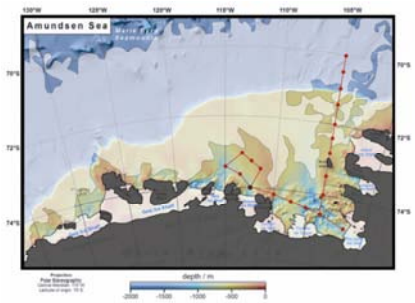
For the 2010/2011 cruise to the Southern Ocean we plan for a strictly open-water-sampling project in the Amundsen Polynya. We request 3 berths onboard the NBP.

We will collaborate with a team of US and Swedish scientists with the aim of investigating carbon fluxes in the extremely productive Amundsen Sea Polynya. Our project complements and is integrated within the American ASPIRE project, and concerns assessment of specific processes within the microbial loop, which are important for the flux of carbon. We will assess the significance of several processes mediated by bacteria and viruses, which are not addressed within ASPIRE, and will significantly strengthen knowledge on the importance of microbes for carbon flux in the Amundsen Polynya.

Briefly, our project contains 3 main parts: 1) The importance of "the viral shunt" where viral cell lysis transforms biomass to dissolved detritus, increase pelagic respiration, and decrease the vertical carbon export, 2) bacterial uptake and turn-over of key carbon substrates, 3) chemoautotrophic carbon fixation, which may complement photosynthesis, particularly in low-light conditions. For selected stations we will examine how these processes relate to microbial community composition. We have extensive experience with the methodology required within the 3 project parts. The acquired data will be valuable for the carbon budgets established within the ASPIRE project, but in addition these data report on processes not hitherto examined in this oceanic region.

The Amundsen Sea Polynya is a high-productivity region, which was confirmed by the high local chlorophyll a values and high viral and bacterial abundances that we measured in December 2007. The region is therefore of particular interest if carbon fluxes in the Antarctic are to be addressed. Consequently, it is a main emphasis within the ASPIRE project to examine the spatial and temporal (e.g., diel) variability of biomasses and processes regulating carbon flux in this productive region. Our examination of important microbe-driven biogeochemical processes is integrated in this program. Therefore, our samplings follow the scheme outlined in the ASPIRE proposal (Figure below) including both transects and drift-studies. Our program includes exclusively pelagic sampling.



Map showing the proposed cruise track planned in cooperation with all collaborating groups within the ASPIRE project.

Logistic issues

Project parts 2 and 3 will concern uptake of radioactive tracers to estimate uptake rates of organic (Part 2) and inorganic (bicarbonate, Part 3) carbon compounds. This requires space in the van dedicated to radioactive isotope work. Part 1 requires space in a wet lab for filtering water.
An incubation chamber, preferably free-flowing surface seawater, is needed for incubations.
Samples need to be stored at -20˚C and at -80˚C.