

## AFI 4/13

### Biogeochemical particle flux Study in Marguerite Bay, Antarctic Peninsula

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#### *General Overview*

The overall aim of this AFI project is to calculate a salt, heat and nutrient budget for Marguerite Bay – the embayment which is adjacent to Rothera research station. This is achieved by a combination of long-term moorings deployed from research ships in Marguerite and Ryder Bay and small boat work throughout the year at the Rothera biogeochemical Time Series (RaTS) site in the centre of Ryder Bay.

#### *Cruise work*

Sea ice, as for our previous field season, made cruise work challenging. The sea ice in Marguerite Bay, which almost prevented the relief of the base in mid-December, resulted in a delay in the mooring recovery cruise. The cruise to recover and redeploy the moorings was therefore delayed until 15<sup>th</sup> February 2006 and the planned second turnaround cruise in March postponed until next season. On this cruise, moorings deployed in the previous season were successfully recovered from the two mooring sites in Marguerite Bay. This was great news and the result of a lot of hard work by the UKORS mooring team and the ship's officers and crew. The mooring sites are shown in figure 1 and were at the relatively shallow Rothera biogeochemical Time Series site (Site A; 500m depth) in Ryder Bay and also at a deeper site further west in Marguerite Bay (Site B; 800m depth).

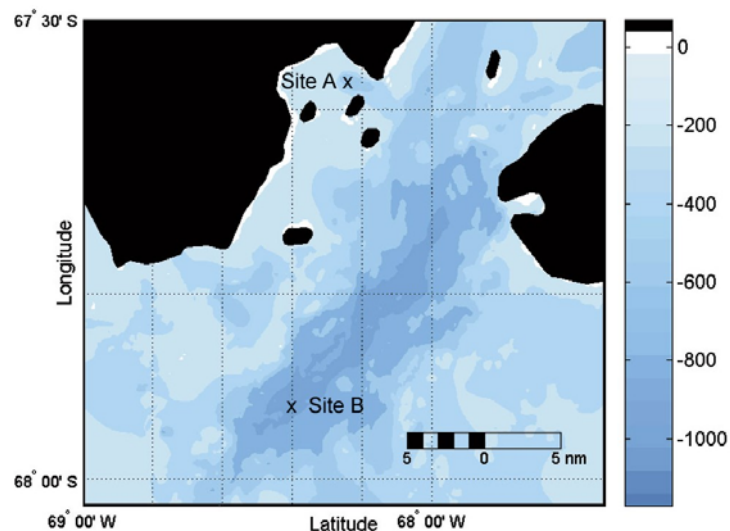


Fig. 1: Location of moorings in Marguerite Bay

Each mooring had an array of oceanographic instrumentation to measure water properties such as salinity, temperature and current velocities at various depths throughout the year. In addition there were two sediment traps on each mooring to measure biogenic flux from surface waters to the seafloor and quantify changes down the water column. Figure 2 shows the cycle of this biogenic flux due to plankton growth over the course of one year in the upper trap (at 200m depth) of the deep mooring. These samples will be used to help calculate the mass balance of the region and also used for palaeoclimatic proxies by other AFI projects.



Fig. 2: Sediment trap sample collection bottles after surviving a year in the Antarctic coastal waters at the deep mooring site. Bottle 1B is sample collected throughout January 2005, Bottle 10B is October 2005, bottle 18B is ~January 2006 and bottle 20B is February 2006.

### ***Rothera-based work***

For work based in the Bonner laboratory at Rothera research station from November 2005 to March 2006 fieldwork focussed solely at the RaTS site at the location of the shallow mooring. Samples were collected in the upper water column at selected depths where there was sufficient light and nutrients for phytoplankton to grow and bloom in these highly productive waters.

Sampling events were from small inflatable boats (Fig 3) and we were expertly aided by the Rothera boatmen Bernard Meehan and Andrew Wilson enabling us to sample roughly 2 times every 3 weeks after the sea ice had blown out in December. This was of course highly dependent on the weather with 10 sampling events for this project achieved for the summer sampling season.

This project complimented the BAS baseline measurements, e.g. chlorophyll and nutrients, at the RATS site which have been running since 1997 with our measurements of primary, new and regenerated production. Our results will enable us to relate the bloom of the phytoplankton to how it is transported down the water column as measured by the mooring sediment traps. Samples were also taken for other AFI biogeochemical projects, e.g. water column trace gas measurements, during these sampling at the RaTS site and the interlinking of all these AFI projects will result in a detailed understanding of the biogeochemistry in Antarctic coastal waters.

Finally we would like to especially thank the Rothera Marine Assistants Paul Mann and Helen Rossetti, who maintain the RaTS sampling in winter and summer. They have been a pleasure to work with, accepted and completed every challenge set with good humour and enthusiasm.



Fig. 3: The CTD boat setting off to the RaTS site in unusually still conditions.  
Note the CTD hand winch in the centre of the boat.