Smetacek, Victor; de Baar, Hein JW; Bathmann, Ulrich; Lochte, Karin; Rutgers van der Loeff, Michiel M (1997): Ecology and biogeochemistry of the Antarctic circumpolar current during austral spring: Southern Ocean JGOFS Cruise ANT X/6 of R.V. Polarstern. *Deep-Sea Research Part II-Topical Studies in Oceanography*, **44(1-2)**, 1-21, doi:10.1016/S0967-0645(96)00100-2

Benthic processes
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Sediment data

The sediment data were determined in undisturbed sediment cores obtained by multiple corer at the stations indicated.

Microbiological data are given in the file **Bentbact.xls**

Variables:
1. station = station numbers following the ship's protocol
2. bottom depth = depth of water column (m)
3. sediment layer = sediment horizon sampled (cm)
4. bact.numb. = bacterial numbers (10e8 cells/ml)
5. phospholipids = concentration of phospholipids (nmol/ml)
6. FDA = hydrolysis rate of fluorescein diacetate (micromol/l/hr)

Variables 3)-6) were provided by

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Methods (Karin Lochte):
1. See ships protocol
2. See ships protocol
3. Sediment layer: Sediment cores were segmented into 0.5 cm layers from 0 to 2 cm sediment depth; from 2 to 6 cm they were segmented into 1 cm layers; from 6 to 10 cm they were segmented into 2 cm layers. The sediment layer depth gives the mean depth of the sample.
4. Bacterial numbers: Bacteria were counted microscopically in the sediment samples which had been stored fixed in 2% formaldehyde solution and kept refrigerated at 4 °C. The samples are diluted 1:10000 with filtered seawater, homogenized briefly by ultrasonication, stained 5 min with acridine orange (0.01%), washed with citrate buffer (pH 4) and filtered onto black 0.2 micrometer poresize polycarbonate filters (Nucleopore). The filters are mounted on microscopic slides in Cargille immersion oil and viewed at 1000x magnification (Zeiss Axioscope20, filter system BP450-490/FT510/LP520, oil immersion objective Plan-Neoflar 100). At least 200 cells per sample were counted.
5. Phospholipids: Phospholipids were extracted from the sediments and analysed as described in: Boetius, A., Lochte, K. (1994) Regulation of microbial enzymatic degradation of organic matter in deep-sea sediments. Mar.Ecol.Prog.Ser. 104, 299-307.

6. Hydrolysis rate of fluorescein diacetate: The rate of hydrolysis of fluorescein diacetate was determined in the sediment samples as described in: Meyer-Reil,L.-A., Köster, M. (1992)

Microbial life in pelagic sediments: the impact of environmental parameters on enzymatic degradation of organic material. Mar.Ecol.Prog.Ser. 81, 65-72.

Pore water data are given in the file **Bentpore.xls**

Variables
A) Station, station numbers following the ships protocol
B) AWI, AWI core number
C) Sediment layer, mean depth of sediment horizon sampled (cm)
D) Concentration of nitrite in porewater (µM)
E) Concentration of nitrate in porewater (µM)
F) Concentration of ammonium in porewater (µM)
G) Concentration of phosphate in porewater (µM)
H) Concentration of reactive silicate in porewater (µM)
I) Flux of oxygen into the sediment (mmol/m^2 d)

Variables C)-I) provided by

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Methods (Ola Holby)

C) Sediment layer: Sediment cores were segmented into layers from 0-0.5, 0.5-1, 1-2. 2-3, 3-5, 5-7 and 7-10 cm. Below 10 cm the cores were segmented into 5 cm layers. The sediment layer depth gives the mean depth of the sample.

D)-H) The porewater concentrations of NO_2, NO_3, NH_4, PO_4 and Si, were analysed directly on board with an auto analyser according to Grasshoff et al. (Methods of Seawater Analysis, Verlag Chemie, Weinheim, 419 pp, 1983). No precaution was taken to avoid contact with air.

I) The flux of oxygen into the sediment was calculated with Fick's first law, using oxygen profiles obtained in the ships refrigerated lab with home-built Clark style electrodes (Revsbech, N. P., In situ measurements of oxygen profiles of sediments by use of oxygen microelectrodes. in *Polarographic Oxygen Sensors: Aquatic and Physiological Applications,* edited by E. Gnaiger, and H. Forstner, pp. 265- 273, Springer, 1983)

Further pore water data (alkalinity and pH) as well as data of porosity and sediment composition (Th-234 excess activity, organic carbon and biogenic silica content) and fluxes between sediment and overlying water are available upon request.

Metals concentration in sediments
Bettina Löscher (NIOZ)
BENTMETA.XLS

The particulate matter samples on 142 mm filters were subjected to a sequential chemical leaching treatment in the clean laboratory. They were immersed in 4.5 M Q-acetic acid for 4 h at room temperature, to dissolve adsorbed cations, carbonate phases and reactive oxyhydroxides (LANDING and BRULAND, 1980; 1987). This was followed by a digestion in 2 M Q-HCl/1 M Q-HNO_3 for again 4 h at room temperature to dissolve the more resistant Fe (III) oxyhydroxides (LEWIS and LANDING, 1991). The residual refractory material was taken in clean digestion vessels and totally digested with 3 ml Q-HCl, 1 ml Q-HNO_3 and 1 ml ultra clean HF. After digestion in a microwave oven they were diluted with 5 ml saturated H_3BO_3 to neutralise the strong acid HF (Merck). The last digestion step was tested for total destruction with the reference material calcareous loam (BCR No. 141) and light sandy soil (BCR No. 142) for the metals Cu and Ni. The obtained values agreed with the certified values within the 95% confidence interval. The blanks of Fe ranged between 0.43 and 5.67 pM, and between 0.07 and 1.07 nM for the acetic acid leaching step and the total destruction step, respectively. The blanks for the second leaching step were smaller than 0.01 nM. The detection limits, based on three times the standard deviation of the blanks, ranged between 1.57 and 3.15 pM, 0.6 and 7.8 pM, and 20ÊpM and 0.88 nM for the acetic acid leaching step, the second leaching step and the total destruction, respectively.

For the total particulate Al data, the seawater samples were collected independently by F. Dehairs in the upper 600 m using an all-Teflon coated CTD/Rosette frame with NOEX samplers. Typical depths were 10, 50, 100, 150, 200, 250, 300, 350, 425, 500 and 600 m. The seawater was transferred to 30-l acrylic (perspex) filtration units for filtration on Nuclepore membranes (47 mm, 0.4 µm porosity) using pressure of filtered air. In general between 5 and 24 litres seawater were filtered per sample. After filtration, membranes were dried at 50¡C and stored frozen in Millipore petri dishes until later analysis. At every station one blank membrane was dried and stored as done for the sample membranes. In the home laboratory filter samples were mineralised using a lithium metaborate ($LiBO_2$; Specpure, Johnson & Matthey) fusion technique described in detail in DEHAIRS et al. (1990, 1991). Prior to the fusion of the samples in platinum crucibles at 1100¡C, the polycarbonate matrix of the membrane filters was gently combusted at 400¡C. After fusion the samples were redissolved in hot (80¡C) HNO_3 (Merck, Suprapure) under constant stirring. Final sample solution (10 ml) was 8 % in HNO_3 and 5 % in $LiBO_2$. Al was analysed by simultaneous inductively coupled plasma optical emission spectrometry (Jobin-Yvon 48). Standards were prepared in a similar HNO_3/$LiBO_2$ matrix as the samples.