Sediment Trap Data Documentation

Introduction

Particle flux measurements through sediment trap deployments formed an important part of the OMEX I data set. In addition to the moored sediment traps deployed along the main Goban Spur section, traps were incorporated into landers and drifting sediment traps were deployed as part of the Norwegian margin study. In all, 63 parameters were determined through the use of sediment traps and are stored in the TRAPDATA table. This document describes the protocols used in their measurement.

To help you find the information you require quickly, the document is subdivided into sections that describe groups of closely related parameters. These are listed below as a series of hot links. Each section starts with the definition of the parameter codes covered, followed by a list of who measured one or more of those parameters by cruise. Next, there is a protocol section describing the methods used by each principal investigator. Finally, there may be comments on data quality that have been noted by BODC or have come to our attention.

Observant readers will have noticed that in the above paragraph the data are listed 'by cruise'. The assignment of trap data to a cruise may seem a little strange. However, it is convenient for two reasons. First, it allows a convenient tool for subdividing the trap data without recourse to convoluted explanations. Secondly, it permits a consistent documentation format across bottle, benthic and trap data making the documentation easier to digest. For the purposes of this document, trap data are assigned to the cruise during which the trap collecting them was deployed.

<TIP> If you want to find out a how a particular parameter was measured and know the parameter code then the fastest way to find the information you require is to use the *Acrobat* 'find' tool to search for the parameter code. Then use the 'find' tool again to search for the name of the principal investigator. This will take you straight to the protocol description you require.

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References

Full references for the papers cited in the protocol descriptions.

Mass, Carbon, Nitrogen and Silica Fluxes

Parameter Code Definitions

CCFXACXX Calcium carbonate flux
Weight loss on acidification of trap material
Milligrams/m^2/day

CCFXICXX Calcium carbonate flux
Acid digestion of trap material then ICP determination of Ca
Milligrams/m^2/day

MSFXDWXX Mass flux
Weighing dry trap material
Milligrams/m^2/day

OCFXCAXX Particulate organic carbon (POC) flux (acidified)
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

OPFXWOXX Biogenic silica (opal) flux
Wet oxidation of trap material
Milligrams/m^2/day

SOCXCAXX Standard deviation of the particulate organic carbon (POC) flux (acidified)
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

STNXCNXX Standard deviation of the total particulate nitrogen ("PON") flux
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

TCFXCNXX Total carbon flux
carbon/nitrogen analyser on trap material
Milligrams/m^2/day

TNFXCNXX Total particulate nitrogen ("PON") flux
Carbon/nitrogen analyser on trap material
Milligrams/m^2/day

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7.

7	Dr. Avan Antia	Kiel University, Germany
14	Dr. Lei Chou	ULB, Brussels, Belgium

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101	Dr. A. Vangriesheim	IFREMER, France

Jan Mayen cruises JM3, JM4, JM5, JM6, JM7, JM9, JM10 and JM11

61	Dr. Paul Wassmann	University of Tromsø, Norway

Originator Protocols

Dr. Avan Antia

The trap samples were collected using the moored traps deployed across the Goban Spur. The trap deployment and sample handling protocols are described in the section on Goban Spur Trap Sampling.

Total mass flux and carbonate were determined by gravimetric techniques.

Particulate biogenic silica was determined by wet oxidation. The data have been corrected for dissolution losses to the supernatant liquid, using dissolved silicate analyses of this liquid before and after deployment.

Particulate organic carbon and total nitrogen were determined using a CHN analyser and material that had been acidified to remove carbonate.

Dr. Annick Vangriesheim

The sediment trap was integrated into the Module Autonome Pluridiscipline (MAP) lander. The trap used was a cylindrical TECNICAP PPS4 with twelve collection bottles installed 2.5 m above the sea bed. The trap aperture had an area of 0.07 m^2 covered with a honeycomb baffle with cells 1 cm diameter and 10 cm deep. The sampling interval was either 24 or 28 days.

Prior to deployment, the sampling bottles were filled with filtered sea water to which sodium borate buffered formalin was added to give a final concentration of 3%. This inhibited in-situ microbial decomposition of the samples. The bottle contents were isolated from ambient sea water except for

the sampling period. After recovery, the samples were stored at 4 °C in the dark until processed.

Back in the laboratory, large swimmers were removed from the particle samples by sieving through a 1 mm mesh. Smaller animals were picked out under a dissecting microscope following the procedure of Michaels et al., 1990. The remaining material was washed with MilliQ water.

The particles were freeze dried and weighed. Total carbon and nitrogen were measured using a Carlo-Erba NA1500 analyser. Organic carbon was measured in a Leco WR12 elemental analyser after removing carbonates using 2N HCl following the protocol of Weliky et al., 1983.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Tromsø Trap Sampling.

The filters were frozen and stored in a freezer. Back in the laboratory, the samples were analysed for organic carbon and total nitrogen on a Leeman Lab. CEC 440 CHN analyser after removal of carbonate by fumes of concentrated HCl.

Dr. Lei Chou

Calcium carbonate was computed from the elemental calcium concentration by multiplying by the molecular weight of $CaCO_3$ and dividing by the atomic weight of calcium. The calcium was determined by Inductively Coupled Plasma emission spectroscopy after complete digestion of the samples by an HNO_3/HCl/HF mixture in a Teflon bomb in a microwave oven.

Isotopic Composition

Parameter Code Definitions

D15NMTST Particulate total nitrogen ("PON") ^{15}N enrichment (delta-^{15}N)
Mass spectrometry on combusted sample (sediment trap material)
Parts per thousand

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7.

7	Dr. Avan Antia	Kiel University, Germany

Originator Protocols

Dr. Avan Antia

The trap samples were collected using the moored traps deployed across the Goban Spur. The trap deployment and sample handling protocols are described in the section on Goban Spur Trap Sampling.

The $\delta^{15}N$ determinations were carried out in collaboration with M. Voss from Institut für Ostseeforschung, Warnemünde. The sediment trap material was suspended and collected on GF/F filters. The filters were combusted in a Fisons NA 1108 CHN element analyser connected to an isotope ratio mass spectrometer (Delta S, Finnigan, MAT). The reference gas was pure nitrogen from a cylinder calibrated against air as a standard following the protocols of Mariotti, 1983.

Trace Metal Fluxes

Parameter Code Definitions

ALFXICXX Aluminium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

BAFXICXX Barium flux
ICP analysis of acid-digested trap material
Micrograms/m^2/day

CAFXICXX Calcium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

CDFXAAXX Cadmium flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

COFXAAXX Cobalt flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

CRFXAAXX Chromium flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

CUFXAAXX Copper flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

FEFXICXX Total iron flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

KXFXICXX Potassium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

MGFXICXX Magnesium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

MNFXAAXX Manganese flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

NAFXICXX Sodium flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

NIFXAAXX Nickel flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

PBFXAAXX Lead flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

SIFXICXX Total silicon flux
ICP analysis of acid digested trap material
Milligrams/m^2/day

SRFXICXX Strontium flux
ICP analysis of acid-digested trap material
Micrograms/m^2/day

ZNFXAAXX Zinc flux
Atomic absorption analysis of acid digested trap material
Micrograms/m^2/day

Originator Code Definitions

Poseidon cruise PS200_7, Meteor cruise M27_1 and Charles Darwin cruise CD85

14	Dr. Lei Chou	ULB, Brussels, Belgium
100	Prof. Frank Dehairs	VUB, Brussels, Belgium

Originator Protocols

Dr. Lei Chou

The trap samples were collected using the moored traps deployed across the Goban Spur. Initial sample handling and distribution was undertaken by Kiel University. See the section on Goban Spur Trap Sampling for further details.

The samples were analysed for trace elements by direct injection of solid samples as slurries using electrothermal atomic absorption spectroscopy in a Varian Spectraa-300 spectrometer with Zeeman correction.

The analytical conditions were as follows:

Cd	Wavelength	228.8nm
	Slit width	0.5nm
	Atomisation support	Platform
	Drying	110 °C to 280°C in 70 seconds
	Ashing	600 °C, 5 second ramp, 20 second hold
	Atomisation	2300 °C, maximum power, 2 second hold, gas stop
	Modifier	Mg/PO_4
Co	Wavelength	240.7nm
	Slit width	0.2nm
	Atomisation support	Tube
	Drying	50 °C to 160 °C in 70 seconds
	Ashing	300 °C, 5 second ramp, 5 second hold, cool to 100 °C
	Atomisation	2600 °C, maximum power, 2 second hold, gas stop
	Modifier	None
Cr	Wavelength	357.9nm
	Slit width	0.2nm
	Atomisation support	Tube
	Drying	50 °C to 165 °C in 60 seconds
	Ashing	1050 °C, 5 second ramp, 20 second hold, cool to 100 °C
	Atomisation	2650 °C, maximum power, 3 second hold, gas stop
	Modifier	None
Cu	Wavelength	324.7nm
	Slit width	0.5nm
	Atomisation support	Tube
	Drying	50 °C to 150 °C in 70 seconds
	Ashing	950 °C, 5 second ramp, 30 second hold
	Atomisation	2500 °C, maximum power, 2 second hold, gas stop
	Modifier	Pd/Mg
Mn	Wavelength	403.1nm
	Slit width	0.2nm
	Atomisation support	Platform

	Drying	110 °C to 400 °C in 80 seconds
	Ashing	1500 °C, 5 second ramp, 20 second hold, cool to 100 °C
	Atomisation	2700 °C, maximum power, 3 second hold, gas stop
	Modifier	Pt
Ni	Wavelength	232.0nm
	Slit width	0.2nm
	Atomisation support	Tube
	Drying	50 °C to 150 °C in 70 seconds
	Ashing	1100 °C, 5 second ramp, 20 second hold, cool to 100 °C
	Atomisation	2600 °C, maximum power, 3 second hold, gas stop
	Modifier	Pd/Mg
Pb	Wavelength	217.0nm
	Slit width	1.0nm
	Atomisation support	Platform
	Drying	110 °C to 370 °C in 70 seconds
	Ashing	800 °C, 5 second ramp, 20 second hold
	Atomisation	2600 °C, maximum power, 3 second hold, gas stop
	Modifier	Pd/Mg
Zn	Wavelength	213.9nm
	Slit width	1.0nm
	Atomisation support	Platform
	Drying	110 °C to 300 °C in 60 seconds
	Ashing	950 °C, 5 second ramp, 20 second hold
	Atomisation	2600 °C, maximum power, 2 second hold, gas stop
	Modifier	Mg

Peak area measurement mode was used for all the above elements.

Major elements were determined by Inductively Coupled Plasma emission spectroscopy after complete digestion of the samples by an HNO_3/HCl/HF mixture in a Teflon bomb in a microwave oven.

If there was insufficient material for the direct injection technique, trace elements were also determined on the digested samples either by ICP, if present in sufficient concentration, or by AA. The parameter codes have been set up to indicate the predominant method for the element.

The trace metal concentrations were converted to fluxes using mass flux data supplied by Avan Antia.

Professor Frank Dehairs

The trap samples were collected using the moored traps deployed across the Goban Spur. Initial sample handling and distribution was undertaken by Kiel University. See the section on Goban Spur Trap Sampling for further details.

The suspended sub-samples were filtered under the pressure of filtered air through 0.4 micron Nuclepore membranes. The filters were rinsed with deionised water and dried at 60 °C and stored at room temperature in polycarbonate petri-dishes until analysed.

The filtered material was transferred to Teflon digestion bombs and dissolved overnight in a mixture of HNO_3, HCl and HF (4:2:1 by volume) at 80 °C. The volume of the acid was reduced by evaporation and the HF was neutralised with boric acid (0.4%). The element concentrations were determined by simultaneous and sequential Inductively Coupled Plasma Atomic Emission Spectrometry (Jobin-Yvon 48 and 38).

The trace metal concentrations were converted to fluxes using mass flux data. It was noted that, for a number of samples, the mass flux values used differed from those supplied to BODC by Avan Antia and used by Lei Chou. These differences are documented below:

Sample ID	Depth	Start	End	Antia	Dehairs
	m			mg/m2/d	mg/m2/d
460/OMEX3A	580	19/07/93 12:00	28/07/93 12:00	69.69	77.1
460/OMEX3A	580	28/07/93 12:00	06/08/93 12:00	110.36	97.6
460/OMEX3A	580	06/08/93 12:00	15/08/93 12:00	35.56	36.4
460/OMEX3A	580	15/08/93 12:00	24/08/93 12:00	44.66	79.6
460/OMEX3A	580	24/08/93 12:00	02/09/93 12:00	61.44	85.3
460/OMEX3A	580	02/09/93 12:00	11/09/93 12:00	39.04	47.1
460/OMEX3A	580	11/09/93 12:00	20/09/93 12:00	31.29	30.2
460/OMEX3A	580	20/09/93 12:00	29/09/93 12:00	59.59	69.5
460/OMEX3A	580	29/09/93 12:00	08/10/93 12:00	62.79	75.1
460/OMEX3A	580	08/10/93 12:00	17/10/93 12:00	18.56	27.6
460/OMEX3A	580	17/10/93 12:00	26/10/93 12:00	60.09	72.4
460/OMEX3A	580	26/10/93 12:00	04/11/93 12:00	42.45	40.7
460/OMEX3A	580	04/11/93 12:00	13/11/93 12:00	9.03	9.2
460/OMEX3A	580	13/11/93 12:00	23/11/93 12:00	9.03	9.2
460/OMEX3A	580	23/11/93 12:00	03/12/93 12:00	8.54	14
460/OMEX3A	580	03/12/93 12:00	13/12/93 12:00	8.54	14
460/OMEX3A	580	13/12/93 12:00	23/12/93 12:00	7.94	14
460/OMEX3A	580	23/12/93 12:00	02/01/94 12:00	5.89	5.6
OMEX3B	1440	26/04/94 00:01	08/05/94 00:01	194.77	195.4

Sample ID	Depth	Start	End	Antia	Dehairs
	m			mg/m2/d	mg/m2/d
OMEX3B	3260	10/01/94 00:01	24/01/94 00:01	84.11	67.7
OMEX3B	3260	07/03/94 00:01	21/03/94 00:01	44.53	42.1
OMEX3B	3260	21/03/94 00:01	02/04/94 00:01	54.83	48
OMEX3B	3260	14/04/94 00:01	26/04/94 00:01	37.87	39.5
OMEX3B	3260	01/06/94 00:01	13/06/94 00:01	244.48	232.5
OMEX3B	3260	25/06/94 00:01	07/07/94 00:01	329.60	232.5
OMEX3B	3260	11/08/94 00:01	23/08/94 00:01	172.80	150.4

The data were supplied to BODC in units of nmoles/m^2/day (Ba, Sr) and μmoles/m^2/day (Ca, Al). They were converted to μg/m^2/day and mg/m^2/day respectively by dividing by the atomic weight and multiplying by 1000. The atomic weights used were:

Al	26.982
Ba	137.34
Ca	40.08
Sr	87.62

Comments on Data Quality

It is reported in the OMEX I final report that ULB participated in the QUASIMEME intercalibration exercise and obtained the following results. The certified values are given in brackets.

	North Sea	Baltic
Al (%)	3.46 (3.5)	6.1 (6.4)
Cd (ppb)	1.487 (1.425)	0.120 (0.123)
Cu (ppb)	26.02 (24)	20.8 (19.1)
Pb (ppb)	44.6 (45)	45.7 (44.9)
Zn (ppb)	172 (170)	112 (123)

The good agreement with the certified values gives confidence in the ULB particulate trace metal data.

Pigment Fluxes

Parameter Code Definitions

CLFXHPXX HPLC chlorophyll-a flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

CLFXFMXX Fluorometric chlorophyll-a flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

CPFXHPXX Chlorophyll-a plus phaeophorbides flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

PHBXHPXX HPLC phaeophorbides flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

PHFXFMXX Fluorometric phaeopigment flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

PTFXHPXX HPLC phaeophytins flux
HPLC assay of acetone extract from trap material
Micrograms/m^2/day

SCLXFMXX Standard deviation of the fluorometric chlorophyll-a flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

SPHXFMXX Standard deviation of the fluorometric phaeopigment flux
Fluorometric assay of methanol extract from trap material
Micrograms/m^2/day

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7

7	Dr. Avan Antia	Kiel University, Germany

Charles Darwin cruise CD86 and Pelagia cruise PLG93

95 Prof. Peter de Wilde NIOZ, Texel, the Netherlands

Jan Mayen cruises JM3, JM4, JM5, JM6, JM7, JM9, JM10 and JM11

61 Dr. Paul Wassmann University of Tromsø, Norway

Originator Protocols

Dr. Avan Antia

The trap samples were collected using the moored traps deployed across the Goban Spur. The trap deployment and sample handling protocols are described in the section on Goban Spur Trap Sampling.

Sub-samples of trap material were suspended, filtered through GF/F filters, frozen and taken to Plymouth Marine Laboratory for analysis. Pigment concentrations were determined by reverse phase HPLC following the protocols described in Barlow et al. (1993a). Frozen filters were extracted in 90% acetone, sonicated and centrifuged to remove debris. An aliquot (300 µl) of clarified extract was mixed with an equal volume of 1M ammonium acetate and 100 µl of this mixture was injected into a Shimazdu HPLC system incorporating a 3 micron C18 Pecosphere column (3.3 x 0.45 cm, Perkin Elmer) heated to 30 °C.

Pigments were separated by a linear binary gradient changing from 0% B to 100% B over 10 minutes, followed by an isocratic hold at 100% B for 7.5 minutes, at a flow rate of 1 ml per minute. Solvent A consisted of 80:20 (v/v) MeOH : ammonium acetate. Solvent B contained 60:40 (v/v) MeOH : acetone.

The spectral identification of the chromatogram peaks was conducted on a Waters PDA 991 photo-diode array at Kiel University.

Professor Peter de Wilde

Single-cup sediment traps were mounted on the BOLAS free-fall lander (Tengberg et al., 1995 and Tahey et al., 1996) approximately 4 m above the sea floor. The traps were closed during the descent and ascent of the lander. Sample accumulation was over a period of between half a day and two days.

The samples were freeze dried before being extracted into acetone containing a fixed volume of water. Pigments were assayed by HPLC using eluents, gradients and column similar to those described in Wright et al., 1991. Detection was by a photodiode array coupled with a fluorometer and the pigments were quantified as described in Tahey et al., 1994.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Tromsø Trap Sampling.

The filter papers were extracted into methanol and fluorometrically assayed following the protocols of Holm-Hansen et al. (1965) on board ship.

Alkenone Fluxes

Parameter Code Definitions

A01XGCXX Heptatriaconta-15E,22E-trien-2-one (C37:3) flux
GC analysis of solvent extract from trap material
Micrograms/m2/day

A02XGCXX Heptatriaconta-15E,22E-dien-2-one (C37:2) flux
GC analysis of solvent extract from trap material
Micrograms/m2/day

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7

7	Dr. Avan Antia	Kiel University, Germany

Originator Protocols

Dr. Avan Antia

The trap samples were collected using the moored traps deployed across the Goban Spur. The trap deployment and sample handling protocols are described in the section on Goban Spur Trap Sampling.

Lipids were extracted ultrasonically from the sediment trap material using dichloro-methane-methanol (2:1). The solvent extracts were partitioned between the dichloromethane and the aqueous methanol phase by adding 0.05 M KCl solution and the organic phase was evaporated to near dryness.

Phospholipids and glycolipids were removed by liquid chromatography on 30% deactivated silica with dichloromethane as eluent. The polar lipid-free extract was further separated by high pressure liquid chromatography on a 200 mm x 4 mm i.d. silica column (Nucleosil 100-5; Macherey-Nagel) into hydrocarbon, FAME, and alkenone fractions.

Gas chromatographic analyses of the alkenone fractions were performed on a 30 m x 0.32 mm i.d. apolar DB-5 fused silica capillary column (film thickness 0.25 µm; W Scientific) using a Carlo Erba 5160 gas chromatograph

equipped with an on-column injector and a flame ionisation detector. The oven temperature was programmed ballistically from 60 °C to 210 °C at a rate of 30 °C/min, from 210 °C to 275 °C at a rate of 13 °C/min, from 275 °C to 300 °C at a rate of 5 °C/min, and finally kept at 300 °C for 45 min. The carrier gas was H_2 with a flow rate of 2.5 ml/min. Alkenone contents were determined by adding internal standards prior to analysis (10-nonadecanone, C36, and C40).

Taxon Fluxes

Parameter Code Definitions

PCFXMIAF Algal fragment carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMICB Cyanobacteria carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMICC Coccolithophoridae carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIDF Dinoflagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIFL Flagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIHL Halosphaera carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMIPZ Protozoa carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMISF Silicoflagellate carbon flux
Optical microscopy
Milligrams/m^2/day

PCFXMITD Total diatom carbon flux
Optical microscopy
Milligrams/m^2/day

PNFXMIAF Algal fragment flux
Optical microscopy
Number/m^2/day

PNFXMICB Cyanobacteria cell flux
Optical microscopy
Number/m^2/day

PNFXMICC Coccolithophoridae cell flux
Optical microscopy
Number/m^2/day

PNFXMICD Centric diatom cell flux
Optical microscopy
Number/m^2/day

PNFXMIDF Dinoflagellate cell flux
Optical microscopy
Number/m^2/day

PNFXMIFL Flagellate cell flux
Optical microscopy
Number/m^2/day

PNFXMIHL Halosphaera cell flux
Optical microscopy
Number/m^2/day

PNFXMIPD Pennate diatom cell flux
Optical microscopy
Number/m^2/day

PNFXMIPZ Protozoa cell flux
Optical microscopy
Number/m^2/day

PNFXMISF Silicoflagellate cell flux
Optical microscopy
Number/m^2/day

PNFXMITD Total diatom cell flux
Optical microscopy
Number/m^2/day

PNFXMITL Tintinnid loricae cell flux
Optical microscopy
Number/m^2/day

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7.

7	Dr. Avan Antia	Kiel University, Germany

Jan Mayen cruises JM2, JM3, JM4, JM5, JM6 and JM7

61	Dr. Paul Wassmann	University of Tromsø, Norway

Originator Protocols

Dr. Avan Antia

The trap samples were collected using the moored traps deployed across the Goban Spur. The trap deployment and sample handling protocols are described in the section on Goban Spur Trap Sampling.

The microscopic analysis of the samples was conducted using an inverted light microscope after settling a known volume of trap material sub-sample following the protocol of Utermöhl, 1958.

Dr. Paul Wassmann

Samples were collected using a drifting sediment trap array and processed as described in the section on Tromsø Trap Sampling.

The plankton taxa were counted using a non-inverted light microscope furnished with a counting stage following the protocols of Semina, 1978.

The whole samples were gently mixed and the picoplankton and most abundant nanoplankton were counted at 400x magnification in a Fuchs-Rosental counting chamber.

The samples were then allowed to settle for a week. The supernatant liquid was slowly decanted off using a glass tube covered with two layers of fine mesh nylon gauze. After gentle mixing, the remaining sample was removed using an eye pipette and placed in an 0.05 ml chamber. The cells in this were counted at 200x magnification.

Larger, usually rare, forms were counted using a special 1 ml chamber at 10x magnification. This was the highest power magnification that could be used with this cell due to its thickness.

Cell volumes were calculated from the volume of appropriate stereometrical bodies (Smayda, 1978) and the average cell size of each group was used to compute the carbon content of the cells according to Strathmann, 1967.

All the identifications were carried out on the wet samples on the basis of the shape of cells and colonies only. It was not possible to distinguish between autotrophic, mixotrophic and heterotrophic cells.

Trap Material Grain Size

Parameter Code Definitions

PRSCSSSI Proportion of sediment in the >98 micron size class
Sieving and setting tube method
Per cent

PRSCSSSJ Proportion of sediment in the 63-98 micron size class
Sieving and setting tube method
Per cent

PRSCSSSK Proportion of sediment in the 16-63 micron size class
Sieving and setting tube method
Per cent

PRSCSSSL Proportion of sediment in the 5-16 micron size class
Sieving and setting tube method
Per cent

PRSCSSSM Proportion of sediment in the <5 micron size class
Sieving and setting tube method
Per cent

Originator Code Definitions

Charles Darwin cruise CD85, Meteor cruise M27_1 and Poseidon cruise PS200_7

98 Dr. J-M Jouanneau University of Bordeaux, France

Originator Protocols

Dr. Jean-Marie Jouanneau

The trap samples were collected using the moored traps deployed across the Goban Spur. Initial sample handling and distribution was undertaken by Kiel University. See the section on Goban Spur Trap Sampling for further details.

Grain size analysis was performed using the classic method of sieving and settling tubes.

The data were supplied to BODC as cumulative frequencies. These were converted to size class percentages by simple subtraction.

Goban Spur Trap Sampling

Trap Moorings

Long-term, bottom-tethered moorings incorporating sediment traps, current meters and transmissometers were deployed along a section over the Goban Spur from July 1993. The moorings were designed to have a nett positive buoyancy of approximately 600 kg to ensure that the mooring lines remained vertical and that the instruments remained at constant depth throughout the deployment.

The positioning of the traps within the water column was designed to avoid placing traps in boundary layers. Deeper traps were placed far enough away from the sea bed (at least 400 m) to prevent the collection of locally resuspended benthic material. The shallowest traps were placed below the depth of winter mixing (600 m) to quantify the primary particle flux from the surface pelagic community. The intermediate trap at the OMEX3 site was placed at 1440 m to be both below the depth of intrusion of Mediterranean water and to coincide with level of a nearby slope break.

The trap sampling is believed to be relatively free from hydrodynamic artefacts. The current meter records showed that current speeds exceeded 15 cm/s for no more than 15 per cent of the deployment time. Maximum current speeds encountered were between 16 and 33 cm/s. An inclinometer was attached to the frame of the sediment trap at 580 m on site OMEX2, which was subjected to the highest currents. This showed a maximum inclination of approximately 4 degrees.

Sample Collection

Sinking particles were collected using large-mouth particle interceptor traps of the 'Kiel' type (Fa. AQUATEC) with an opening area of 0.5 m^2. Each trap was fitted with an automated rotating carousel capable of collecting up to 20 samples over pre-determined periods. Sampling intervals varied from 7 days in spring to 28 days in winter.

Prior to deployment, the sampling cups were filled with water collected from 1000 m over the Goban Spur, poisoned with 0.14% $HgCl_2$. On recovery, 0.07% $HgCl_2$ solution was added to the samples to compensate for poison loss during the deployment. Samples were stored in the cold and dark until processed in the laboratory.

Sample Processing

After the supernatant fluid was siphoned off, the sediment trap samples were manually picked to remove swimmers. The samples were split using a Plexiglas splitting chamber with tested precision and the sub-samples distributed for analysis.

The supernatant fluid was analysed for dissolved nutrients.

Tromsø Trap Sampling

Drifting sediment trap rigs were deployed on nine of the eleven Jan Mayen cruises in 1994 and 1995. The rig had traps every 10 m from 20 m to 100 m and every 20 m from 100 m to 200 m for the 1994 deployments and every 20 m from 20 m to 200 m for the 1995 deployments. The traps were parallel cylinders (0.072 m diameter and 0.45 m high) mounted in a frame which ensured that the cylinders were kept vertical and never shaded each other. The rig was held vertical in the water by a weight at the base and sub-surface buoyancy.

The drifting trap array was deployed at approximately the same location on the shelf break on each cruise. The ship followed the rig, maintaining a record of its position and making water column measurements in the vicinity of the traps. Each deployment lasted for approximately 24 hours. No poison was used during the trap deployments. Consequently, modification of the trap material through grazing and bacterial decomposition during the deployment might have occurred.

After recovery, the trap material was transferred to bottles and kept cold and dark. Sub-sampling was done within 6 hours of recovery by thoroughly mixing the sample and splitting it with a bird pipette.

Duplicate sub-samples were filtered through Whatman GF/F filters for pigment, POC and PON determinations. Copepods were removed from the filters using forceps.

Sub-samples for microscopic examination were fixed with ethanol glutaraldehyde Lugol solution.

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