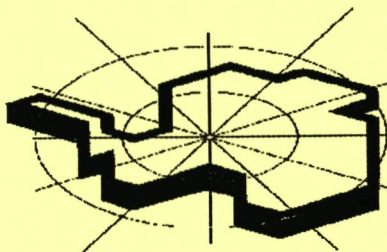


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**ANTARCTIC TREATY
EXCHANGE OF INFORMATION
IN ACCORDANCE WITH
ARTICLES III(1) & VII(5)
AND RECOMMENDATION VIII(6)**

***BELGIAN ANTARCTIC ACTIVITIES
PLANNED FOR 1997-98***



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INTRODUCTION

The *Belgian Scientific Research Programme on the Antarctic* was initiated in 1985 by the Council of Ministers with a view to giving tangible form to Belgium's commitment towards the strengthening of the scientific knowledge of the area covered by the Antarctic Treaty. The programme is funded, managed and co-ordinated by the Federal Office for Scientific, Technical and Cultural Affairs (OSTC). Research-work is implemented by means of 3-years projects undertaken by university-based scientists. All research costs (personnel, equipment, travel, working and overheads) are financed by OSTC. The total budget of *Phase IV of the Programme (1997-2000)* amounts 236,000,000 BEF (about 6,600,000 US\$). In addition the OSTC is contributing a sum of 20,000,000 BEF (about 563,000 US\$) to the operational costs of the *European Project for Ice Coring in Antarctica (EPICA)*.

Such research effort aims at contributing to the development of the knowledge required for a science-based conservation and management of the Antarctic environment and to the assessment of the mechanisms through which the Antarctic and the global climate interact. Emphasis is given on a multi-disciplinary approach of the dynamics of the global functioning of Antarctic main natural systems and of their evolution and interactions. The Programme comprises eight research lines under three priority areas. They are:

- ▶ MARINE BIOTA AND GLOBAL CHANGE
 - ▷ Structure, functioning and resilience of key ecosystems
 - ▷ Ecofunctional biodiversity
 - ▷ Biogeochemical cycle of carbon and global changes
- ▶ DYNAMICS OF THE SOUTHERN OCEAN
 - ▷ General circulation in relation to the formation of deep waters
 - ▷ Dynamics of the marginal sea ice zone
 - ▷ Dynamics of the Antarctic Polar Front
- ▶ PALAEOENVIRONMENTAL RECORDS
 - ▷ Ice cap (EPICA)
 - ▷ Marine sediments

Belgian activities are embedded in scientific expeditions organized by other Antarctic Treaty member countries (in 1997-98: Australia, France, Germany, New Zealand and U.S.A.). Research teams are implementing joint-research projects with teams from those countries.



**ACTIVITIES FOR 1997-98****I. DETAILS OF SHIP, AIRCRAFT AND OTHER VEHICLES**

No national Belgian expedition will go to the Antarctic in 1997-98. Belgian scientists will participate in campaigns organized by other countries.

II. EXPEDITION ITINERARY

Nil.

III. DETAILS OF STATIONS

Nil.

IV. PERSONNEL**A. SUMMER PERSONNEL**

Name	Institute	Project #	Period	Discipline	Expedition, Ship, Organizer
PROJECTS FUNDED BY THE OSTC - ANTARCTIC PROGRAMME					
S. Becquevort	ULB	A4/DD/B12	Oct/97-Dec/97	Marine biota and Global Change (biogeochemistry)	Process 4, RV N.B. Palmer, USA
R. Lorrain	ULB	A4/DD/E02	Dec/97-Feb/98	Palaeoenvironmental records (glaciology) EPICA	Antarctica New Zealand 97-98, New Zealand
H. Jong Lee	RUG	A4/DD/B01	Jan/98-Mar/98	Marine biota and Global Change (meio-benthic biodiversity)	EASIZ-II, RV Polarstern ANT XV/3, Germany
J. Van De Velde					
Cl. De Broyer	RINS	A4/DD/B02		Marine biota and Global Change (macro-benthic biodiversity)	
Y. Scailteur					
F. Dehairs	VUB	A4/DD/B11	Feb/98-Mar/98	Marine biota and Global Change (biogeochemistry)	SAZ-98 Voyage 6, RV Aurora Australis, Australia
M. Elskens					
B. Delille	ULg	A4/DD/B14			



Name	Institute	Project #	Period	Discipline	Expedition, Ship, Organizer
PROJECT FUNDED BY OTHER SOURCES					
L. Beyens	RUCA	—	Nov/97- Jan/98	Palaeoecology (in cooperation with IFRTP and CNRS)	RV Marion Dufresne, France
W. De Smet					
B. Van De Vijver					

B. WINTER PERSONNEL

Name	Institute	Project #	Period	Discipline	Expedition, Ship, Organizer
PROJECT FUNDED BY THE OSTC - ANTARCTIC PROGRAMME					
J.-L. Tison	ULB	A4/DD/E02	Apr/98- Jul/98	Palaeoenvironmental records (glaciology) EPICA	Cruises 98-3/99-1, RV N.B. Palmer, USA

V. PERSONAL ARMAMENTS

Nil.

VI. PROGRAMME OF WORK

A. RESEARCH PROJECTS OF THE SUMMER PARTY

1. PROJECT : A4/DD/B11

TITLE : AN INTEGRATED APPROACH TO ASSESS CARBON DYNAMICS IN THE SOUTHERN OCEAN — PART I : NEW AND EXPORT PRODUCTION

SCIENTIFIC LEADER : DR F. DEHAIRS (VUB) ...

Research work : The project aims at improving our understanding of the following aspects of Southern Ocean biogeochemistry :

- ✓ The impact of nutrient species, nutrient availability and phytoplankton assemblage on type of primary production (new versus recycled). Special attention will go to the understanding of the possible role played by enhanced ammonium contents on inhibiting nitrate uptake (new production) and on reducing carbon fixation.
- ✓ The estimation of export production via the use of the natural barite tracer. To optimise this approach we will verify different aspects of barite biogeochemistry, including : uptake of Ba (and other possible minor components of barite, such as Sr, Nd and Th), from the ambient solution; formation of barite in micro-environments consisting of decomposing plankton detritus; assessing barite saturation conditions; assessing barite settling fluxes.



These different aspects will inform on the robustness of the barite approach to estimate export production. Eventually export production estimates will be improved. Estimates of nutrient control on new production, and possible improvements of export production estimates will be used to constrain outputs from a 1-D biogeochemical model which is developed by others partners in the network. The following analyses will be carried out :

- uptake experiments using ^{15}N labelled inorganic (nitrate, nitrite, ammonium) and organic (ureum) compounds; synchronous ^{15}N and ^{13}C uptake experiments; ammonium mineralisation and inhibition experiments;
- assessment of plankton composition;
- dissolved and particulate Ba and barite along vertical water column profiles;
- model assessments of barite saturation and conservative versus non-conservative control on dissolved Ba variability;
- uptake of Ba, Sr, Nd by phytoplankton and by mesopelagic organic detritus using isotope dilution techniques.

2. **PROJECT : A4/DD/B12**

TITLE : AN INTEGRATED APPROACH TO ASSESS CARBON DYNAMICS IN THE SOUTHERN OCEAN — PART II : STUDY AND MODELISATION OF THE PLANKTONIC WEB

SCIENTIFIC LEADER : DR C. LANCELOT (ULB)

Research work : The project aims at understanding factors controlling organic matter export from the surface waters and its transformation during the transfer through the water column to the sediment. Particular attention is given to the mechanisms controlling diatom versus Phaeocystis blooms development, the formation of their derived aggregates and their transformation by micro-organisms. Experiments will include :

- ✓ Physiological studies of the carbon and silicon metabolism of Phaeocystis- and diatom- dominated surface phytoplankton.
- ✓ Physico-chemical and biological characterisation of aggregates sampled at different depths of the upper 500m-deep water column making use of specific dyes and bio-markers.

Microbial process measurements will be conducted in parallel and will include : (i) ectoenzymatic (protease, glucosidase, lipase) activity of aggregate-attached and free-living bacteria and (ii) bacterial and biomass production of aggregate-attached and free-living bacteria.

3. **PROJECT : A4/DD/B14**

TITLE : AN INTEGRATED APPROACH TO ASSESS CARBON DYNAMICS IN THE SOUTHERN OCEAN — PART IV : AIR/SEA EXCHANGES

SCIENTIFIC LEADER : DR M. FRANKIGNOULLE (ULG)

Research work : The aim of this research is to study the distribution of partial CO_2 pressure (pCO_2) in surface seawater in order to identify sources and sinks for atmospheric CO_2 . In the Global Change framework, this is a key study because very few data are available from the Southern Ocean. Indeed, available data are limited to confined regions and, as a result (i) the meaningfulness of the Southern Ocean as a source or sink for atmospheric CO_2 is so far not clear, (ii) there are great lacunas about the spatial and temporal distributions of pCO_2 in surface water.



Moreover, because the Southern Ocean is site of important physical stresses that affect the magnitude of the air-sea flux, small gradients are liable to generate relatively high fluxes compared to other oceanic areas.

Understanding the effective role of the Southern Ocean in the global carbon cycle is now recognized as an international priority. During Marine Science Voyage 6 (RV Aurora Australis) cruise we will measure :

- the pCO₂ in surface water by the direct method (equilibrator coupled to an IR detector);
- the pCO₂ in surface and deep water by the indirect method (Ph and alkalinity determinations);
- the dissolved oxygen concentration using both polarographic electrode and the Winkler method.

Such data set, coupled to biological and physical parameters, should allow us to identify source/sink areas for atmospheric CO₂ in relation with processes generating air-sea exchanges.

4. **PROJECT : A4/DD/B01**

TITLE : MEIOBENTHIC BIODIVERSITY AND FLUXES WITHIN THE ANTARCTIC BIOGEOCHEMICAL ENVIRONMENT

SCIENTIFIC LEADER : DR M. VINCX (RUG)

Research work : One of the major topics of the project is the (re)-establishment of diversity in association with ice-berg scouring in shallow and deep Antarctic waters. As the sublittoral zone along Kapp Norvegia is regularly abraded by calving icebergs from the ice shelf, the effect of disrupted sediment on the depauperation, (re)distribution and (re)colonization will be investigated. Sediment samples in and near an ice-berg track at about 200 to 500 m depth off Kapp Norvegia will provide the needed information. For a meiofaunal diversity study *sensu stricto* sediment samples of typical polar biotopes (specialities like sponge mats and sponges, fluff, bryozoan mats,..) will be taken. Additional effort will be done to sample deep stations (> 2000 m) and stations along a latitudinal gradient at the southern slope of the Drake Passage. Finally, sediment samples will be taken to gather living meiofauna for later laboratory studies (respiration, grazing, isotopic analysis). Part of the samples will be deep-frozen, the other part fixed with formaldehyde solution.

The study of the meiofauna and ambient environment are needed for the evaluation of the importance of structural and functional biodiversity for the productivity of polar ecosystems. The deep-sea programme is tightly linked to the former EASIZ program (RV Polarstern ANT XIII/3 campaign) where sediment cores were processed in a way that the vertical and horizontal microbial, biogeochemical and the meiofaunal distribution profiles are studied simultaneously. The construction of the trophic position of the meiofauna (isotopic analysis) will be used in a trophic food web of the SE Weddell Sea.

For all study topics sediment samples are to be taken for the investigation of meiofauna distribution and diversity, and for the analysis of environmental variables such as interstitial nutrients, organic matter, sediment texture, pigments, bacteria and diatoms.



5. **PROJECT : A4/DD/B02**

TITLE : ECOFUNCTIONAL BIODIVERSITY OF BENTHIC CRUSTACEAN TAXOCOENOSSES IN THE SOUTHERN OCEAN

SCIENTIFIC LEADER : DR C. DE BROYER (RINS)

Research work : The goal of the field work to be carried out during the RV Polarstern ANT XV/3 campaign concerns two aspects of the biodiversity of the amphipod taxocoenoses : ecofunctional and structural biodiversity. We project to characterize and to quantify the trophodynamic role of the amphipod taxocoenoses, in the southern Weddell Sea shelf region and to compare it on a latitudinal scale with the eastern Weddell Sea (Kapp Norvegia, the West Antarctic (Admiralty Bay system) and the Magellan area. This campaign would contribute by taxonomical material and distributional and ecological data to the preparation of the "Synopsis of Antarctic Amphipods" and the development of the first "EASIZ-SA 2000 Antarctic Biodiversity Research Reference Center".

Amphipods specimens, collected by way of trawls, dredge and traps, will be fixed or kept alive.

The specific topics that will be investigated are:

- description of the faunistical, distributional and ecological traits
- identification of diet composition;
- estimation of food consumption (by feeding experiments) of selected species;
- trophic structure, especially the role of the amphipod trophic guilds;
- evaluation of the importance of amphipods as preys for other macrobenthos components and demersal fishes.

6. **PROJECT : A4/DD/E02**

TITLE : EPICA BASAL ICE - EASTERN ANTARCTICA

SCIENTIFIC LEADER : PROF. R. SOUCHEZ (ULB)

Research work : This research-work makes part of the EPICA project. It is conducted in collaboration with Dr S. Fitzsimons (University of Otago, Dunedin, NZ). Its main theme is the study of basal processes under cold-based glaciers in relation with frontal and marginal lakes.

The basal part of polar ice sheets, as shown by the bottom section of deep ice cores or visible along the ice margins, exhibit debris-loaded ice layers, some of them being deformed. The classical models developed to explain debris incorporation at the base are inappropriate in the cases where the basal temperature is well below the freezing point. Several glaciers flowing into the Dry Valleys, although cold based, show in their basal part blocks of frozen sediments with primary structures still visible. These glaciers are in contact with lakes at their front or along their margin.

The present research is conducted on one of these, located in Taylor Valley and called Sues Glacier.

Last year, a twenty meter long tunnel was dug by one of the senior scientists (S.F.) at the ice-bedrock interface from the front of this glacier. This tunnel is a unique opportunity to study the "basal ice layer" (BIL) not only along the cliffs limiting the glacier snout but, what is rather unusual, below the ice mass, at places where sediments are picked up and entrained by the glacier.

Sampling the BIL for its chemical characteristics, gas content and composition, ice-fabrics and for its stable isotope composition is the main purpose of the field



work. Ice cores and ice blocks will be retrieved from the glacier surface and from the tunnel. Lake ice and lake water will also be sampled in the adjacent lake(s). All the samples will be transferred in the frozen state to the cold laboratory in Brussels.

B. RESEARCH PROJECTS OF THE WINTER PARTY

1. PROJECT : A4/DD/E02

TITLE : EPICA BASAL ICE - EASTERN ANTARCTICA.

SCIENTIFIC LEADER : PROF. R. SOUCHEZ (ULB)

Research work : This aspect of the EPICA sub-project is a collaborative research-work with Dr M. Jeffries, University of Alaska Fairbanks and Dr D. Garrison, University of California, Institute of Marine Sciences. It addresses the physico-chemical and biological properties of the sea ice cover in the Ross Sea during the winter 1998. Sea ice transects will be performed on a daily base during a meridional two months (April-May 1998) cruise on the RV Nathaniel B. Palmer in the Ross Sea, from the Marginal Ice Zone to the Ross Ice Shelf Barrier and return. The following physico-chemical measurements will be performed in-situ :

- ✓ sea ice transects for snow and ice basic physical properties (thickness, draft, temperatures,...);
- ✓ sea ice coring in selected locations of the transects for :
 - discriminating ice types (thick sectioning);
 - chemical sampling (salinity, major ions...);
 - stable isotopes sampling (oxygen-18);
 - total gas content measurements;
 - gas composition measurements (carbon dioxide, oxygen, nitrogen).

Our laboratory will mainly provide the gas analyses on twinned ice cores stored below -25°C and brought back to Belgium. Toepler pump extraction will be used for total gas content measurements and gas chromatography for gas compositions. Additional ice textures and fabrics (c-axes) measurements will also be performed in the Laboratory.

The aims of the study is to provide a comprehensive data set of gas properties of winter sea ice, how it depends on ice types and structures and how it interacts with the primary production and the microbial activity under the ice cover.



VII. SCIENTIFIC EQUIPMENT

Marine Biota and Global Change :

- On deck flow through incubation system
- Two spectrophotometers
- PAR profiling system
- Large volume sampling bottle (Snatcher) for sampling of bio-aggregates
- Six Niskin type sampling bottles
- Large volume filtration devices
- Vacuum pressure pumps
- Four laptop computers
- IR CO₂ spectrophotometer (Licor 6252)
- Standard gas cylinder
- Self-made air-sea gas equilibrator
- Titration set
- pH and O₂ polarographic electrodes
- One unit of autonomous trap system comprising : one remote command TT 203 Oceano Instruments, two acoustic release AR 221 and AR 661, one set of deep sea floaters Benthos
- One set of 50 cool water aquaria with pumps and filtration systems
- Epifluorescence microscope and automated camera
- Thermostatic cabinet
- Fluorometer
- Tissue culture bottle roller
- Manifold filtration units
- Binocular

Palaeoenvironmental Records (Glaciology) :

- Two electric powered ice-core augers (7.5 cm diameter, 40 m length) and an electric chain saw
- A computerized temperature recorder for monitoring temperature in the drilling holes
- Lightweight electro-mechanical hand-drilling system (220 V, 1200 Watts)
- Conditioning equipment for ice cores storage

VIII. TRANSPORTATION FACILITIES AND COMMUNICATION EQUIPMENT

Nil.

IX. FACILITIES FOR RENDERING ASSISTANCE

Nil.

X. NOTICE OF EXPEDITIONS TO THE ANTARCTIC NOT ORGANIZED BY THE PARTY BUT ORGANIZED IN, OR PROCEEDING FROM, THE PARTY'S TERRITORY

No expeditions will be organized, or proceed from, Belgium in 1997-98.



- XI. DESCRIPTION OF UNOCCUPIED REFUGES**
Nil.
- XII. ANNUAL RETURN OF THE NUMBER OF EACH SPECIES KILLED OR CAPTURED**
Nil.
- XIII. NOTICE OF INTENDED USE OF RADIO-ISOTOPES IN SCIENTIFIC INVESTIGATIONS**
Nil. (All isotopes introduced by Belgian scientists in the Antarctic Treaty area, namely ^{30}Si , ^{15}N , ^{135}Ba , ^{86}Sr and ^{148}Nd , are all stable and non-radioactive.)
- XIV. NOTICE OF INTENDED USE OF SCIENTIFIC ROCKETS**
No rockets will be used in the Belgian projects in 1997-98.
- XV. NOTICE OF OCEANOGRAPHIC RESEARCH SHIPS**
No Belgian research vessels will travel the Antarctic Treaty area in 1997-98.
- XVI. ACTIVITIES OF TOUR ORGANIZERS**
Unsupported crossing of Antarctica from the Queen Maud Land coast to the Ross Sea through the Pole (4,000 km) by A. Hubert and D. Dansercoer (November 1997 - February 1998).



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**ABBREVIATIONS AND ACRONYMS**

CNRS	Centre National de la Recherche Scientifique (France)
EASIZ	Ecology of the Antarctic Sea Ice Zone (SCAR)
EPICA	European Project for Ice Coring in Antarctica
IFRTP	Institut Français pour la Recherche et la Technologie
OSTC	Federal Office for Scientific, Technical and Cultural Affairs
PAR	Photosynthetically Active Radiation
RINS	Belgian Royal Institute of Natural Sciences
RUCA	Universitaire Centrum te Antwerpen
RUG	Universiteit Gent
ULB	Université Libre de Bruxelles
ULg	Université de Liège
VUB	Vrije Universiteit Brussel

