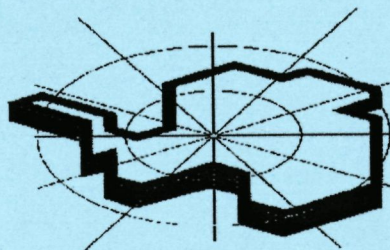


PRIME MINISTER'S SERVICES
FEDERAL OFFICE FOR SCIENTIFIC, TECHNICAL
AND CULTURAL AFFAIRS
(OSTC)

VLIZ (vzw)
VLAAMS INSTITUUT VOOR DE ZEE
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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 1998-1999



Serial # ANTAR/98/5

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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 235,000,000 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 1998-1999 : France, Germany and Spain). Research teams are implementing joint-research projects with teams from those countries.



**ACTIVITIES FOR 1998-1999****I. DETAILS OF SHIP, AIRCRAFT AND OTHER VEHICLES**

No national Belgian expedition will go to the Antarctic in 1998-1999. Belgian scientists will participate in campaigns organized by other countries (see table under item IV).

II. EXPEDITION ITINERARY

Nil.

III. DETAILS OF STATIONS

Nil.

IV. PERSONNEL**A. SUMMER PERSONNEL**

| Name | Affil. | Project # | Period | Discipline | Expedition, Ship, Organizer, Area |
|---|--------|-----------|-------------------|--|--|
| PROJECTS FUNDED BY THE OSTC - ANTARCTIC PROGRAMME 1997-2000 | | | | | |
| E. Libert | ULg | A4/DD/B14 | Nov/98- Dec/98 | Marine biota and Global Change (biogeochemistry) | TAAF France Kerguelen |
| B. Delille | ULg | A4/DD/B14 | Jan/98- Feb/99 | Marine biota and Global Change (biogeochemistry) | ANTARES 4 RV Marion Dufresne II France Sun-Antarctic and Polar Front zone in the Crozet-Kerguelen sector |
| J.-M. Theate | | | | | |
| M. Elskens | VUB | A4/DD/B11 | | | |
| Th. Cattaldo | | | | | |
| M. De Batist | RUG | A4/DD/G01 | Jan/99- Mar/99 | Palaeoenvironmental records (marine sediments) | GEBRA-99 BIO Hesperides Spain Bransfield Basin, Antarctic Peninsula |
| K. De Rycker | | | | | |
| Y. Imbo | | | | | |
| V. Schoemann | ULB | A4/DD/B12 | Mar/99- May/99 | Marine biota and Global Change (biogeochemistry) | ANT XVI/3 RV Polarstern Germany Nazareth Sea |



| Name | Affil. | Project # | Period | Discipline | Expedition, Ship, Organizer, Area |
|---|--------|-----------|-------------------|------------------------------|--|
| PROJECTS FUNDED BY OTHER SOURCES | | | | | |
| L. Beyens W. De Smet B. Van De Vijver | RUCA | — | Nov/99- Dec/99 | Ecology and Palaeoecology | RV Marion Dufresne II France Crozet Island |

B. WINTER PERSONNEL
Nil.

V. PERSONAL ARMAMENTS
Nil.

VI. PROGRAMME OF WORK

A. RESEARCH PROJECTS OF THE SUMMER PARTY

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 :

- Study of the biological carbon pump and its potential to export carbon from the mixed surface layer to the mesopelagic and deep water column.
- Study the potential of particulate excess-Ba and barite concentrations and fluxes in the water column to trace export production. Assessment of spatial variability of particulate and dissolved Ba concentration profiles in the water column and of fluxes as sampled by free floating sediment traps, in relation to phytoplankton composition and relative importance of new and recycled production. Study of the uptake of Ba and Sr by plankton and plankton-detritus in and below the surface mixed layer and of the barite formation process during the decay of plankton detritus.
- Study of the relative importance of new and regenerated production; study of the ammonification; study of the processes controlling new production including nutrition inhibition and selection.
- Modelling of the nitrogen uptake and release processes by phytoplankton.

INTERNATIONAL COOPERATION :

- Dr M. Denis, Centre d'Océanologie de Marseille, Laboratoire d'Océanographie et de Biogéochimie, UMR6535, Marseille, France.



- Dr C. Jeandel and Dr M. Roy-Barman, Observatoire Midi Pyrénées, Laboratoire LEGOS, CNES-CNRS, Toulouse, France
- Dr M. Fiala, Laboratoire ARAGO, Banyuls-sur-Mer, France
- Dr R. Sempéré, Laboratoire de Microbiologie Marine (LMM) - CNRS UPR 223, Marseille, France
- Dr E. Kopczynska, Department of Antarctic Ecology, Polish Academy of Sciences, Warsaw, Poland
- Dr R. Watson and Dr B. Griffiths, CSIRO Marine Laboratories, Hobart, Tasmania, Australia

PROJECT # : **A4/DD/B12**

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

SCIENTIFIC LEADER : DR CH. LANCELOT (ULB)

RESEARCH WORK :

- Recent literature reveals the complex interplay of silicate and iron limitation in regulating diatom blooms and related biogeochemical cycles in the Southern Ocean. In particular, it has been shown that iron limitation sustains highly silicified diatoms characterized by a higher sinking rate compared to diatoms growing under replete Fe. The synergetic effect of iron and silicate limitation and its incidence on the diatom silification level and its related sinking rate will be addressed by running shipboard experiments under different iron concentrations.
- The iron and silicate phytoplankton stoichiometry will be determined during the exponential growth phase and their sinking rate will be determined using Setcol methodology.
- Iron and silicate physiology will be investigated by using radiotracer techniques. The effect of iron limitation on silicon and carbon metabolism will be investigated by determining the maximum specific growth rate and Si assimilation as well as the half-saturation constant of Si uptake under replete and deplete iron conditions.
- The mechanisms of overwintering phytoplankton and their associated biochemistry will be addressed in taking advantage of the cruise period, namely the period of ice formation. At different time, during the cruise, natural assemblages will be sampled and their C metabolism will be measured using ^{14}C radiotracer methodology.
- All the results gained on phytoplankton physiology will be integrated for their incorporation in the SWAMCO model of Lancelot et al. (1997) further developed for its application at the scale of the Southern Ocean and over seasonal cycles in the scope of the Belgian BELCANTO (A4/DD/B11) and the EC CARUSO projects.

INTERNATIONAL COOPERATION :

- Dr V. Smetacek, Alfred-Wegener-Institute for Marine and Polar Research, Bremerhaven
- Dr U.V. Bathmann, Alfred-Wegener-Institute for Marine and Polar Research, Bremerhaven
- Dr H.J.W de Baar, Netherlands Institute for Sea Research, Texel



PROJECT # : **A4/DD/B14**
TITLE : AN INTEGRATED APPROACH TO ASSESS CARBON DYNAMICS IN THE
SOUTHERN OCEAN - PART III : AIR/SEA EXCHANGES
SCIENTIFIC LEADER : DR M. FRANKIGNOULLE (ULG)

RESEARCH WORK :

- Study of the distribution of partial CO₂ pressure (pCO₂) in order to identify sources and sinks for atmospheric CO₂ in surface water of subantarctic front north of Kerguelen Island, and coastal area around Kerguelen Island. Currently, contribution of coastal area in the global carbon cycle is enhanced. Thus, we aim to assess the role (sink/source) of subantarctic coastal area and of subantarctic front area with regard to atmospheric CO₂.
- Particular attention will be paid to interactions between bacterioplankton, phytoplankton and CO₂ in subantarctic coastal area.
- Influence of river input on carbonate system in the fjords of Kerguelen Island will be investigated with an approach similar to estuaries studies.
- 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);
 - the dissolved oxygen concentration using both polarographic electrode and the Winkler method.
- Such data set, coupled to biological (particularly bacterio and phytoplankton) and physical parameters should allow us to identify source/sink areas for atmospheric CO₂ in relation with processes generating air/sea exchange.

INTERNATIONAL COOPERATION :

- Dr Daniel Delille (CNRS), MICROBIOKER project funded by IF RTP.
- Dr M. Denis (CNRS), ANTARES project (French contribution to SO-JGOFS).

PROJECT # : **A4/DD/G01**
TITLE : ANTARCTIC SHELF-SLOPE DYNAMICS : AN INNOVATIVE GEOPHYSICAL
APPROACH
SCIENTIFIC LEADER : PROF. M. DE BATIST AND DR J.-P. HENRIET (RUG)

RESEARCH WORK :

- During the GEBRA-99 Expedition, the sedimentary processes, architecture and stratigraphy of the Bransfield Basin continental shelf and slope will be investigated. The information obtained from studying the sedimentary record will be used for reconstructing the glacial - and hence climatic - history of the Northern Antarctic Peninsula. Special emphasis will be put on retrieving a high-resolution sedimentary record pertaining to the last climatic cycle.
- The areas to be investigated during the GEBRA-99 Expedition will be complementary to those studied in previous expeditions (GEBRA-93, GEBRA-96), and in particular the shallower shelf areas and the area around GEBRA Valley will be targeted.



- Efforts will also be made to complete studies of the geological evolution of Bransfield Basin: heat-flow of the basin, slope instabilities in the basin, etc.
- Methods and techniques to be used are :
 - swath bathymetry mapping and side scan sonar;
 - high-resolution reflection seismic profiling and sub-bottom profiling;
 - magnetic, gravimetric and heat-flow measurements;
 - sediment coring.
- The Belgian participants will be mostly involved in the high-resolution reflection seismic profiling.

INTERNATIONAL COOPERATION :

- Dr J. Baraza (chief scientist), Instituto de Ciencias del Mar, CSIC, Barcelona, Spain.
- Dr M. Fernandez, Instituto de Ciencias de la Tierra, CSIC, Barcelona, Spain.
- Dr F. Chiocci, CNR Roma, Italy.

PROJECT # : (none)

THEME : POST-GLACIAL EVOLUTION OF TERRESTRIAL ECOSYSTEMS IN
SUBANTARCTIC ISLANDS

SCIENTIFIC LEADER : PROF. L. BEYENS (RUCA)

RESEARCH WORK :

- Experiments on the dispersal of diatoms, testate amoebae and chrysophycean cysts and the colonisation of terrestrial and freshwater habitats.
- Coring and sampling of peat deposits which will be analyzed for the diatoms, testate amoebae and chrysophycean cysts.

INTERNATIONAL COOPERATION :

- Dr Y. Frenot, CNRS URA 696, Station Biologique de Paimpont, France.

B. RESEARCH PROJECTS OF THE WINTER PARTY
Nil.

VII. SCIENTIFIC EQUIPMENT

Marine Biota and Global Change :

- Adapted filtration device, Vel; 2 units.
- Air/sea gas equilibrator, self-made; 1 unit.
- Deck incubator, variable light, self-made; 1 unit.
- Deck incubator, constant light, self-made; 1 unit.
- Incubator for indoor incubations, variable light, self-made; 1 unit.
- IR CO₂ spectrophotometer (LICOR 6262); 1 unit.



- Laboratory Quantum Scalar Irradiance meter, SN 1365, Biospherical instruments; 1 unit.
- Large volume (1.5 m³) on-deck incubator for plankton incubations; 1 unit.
- Large volume filtration device (12 units of 30 L and 12 units of 14 L).
- Marine Snow Catcher Large volume (100 L) sampler designed for sampling delicate organic detritus and aggregates; 1 unit.
- Millipore filtration device, Millipore; 1 unit.
- Niskin type sampling bottle; 1 unit.
- Peristaltic pump, Vel; 1 unit.
- pH and O₂ polarographic electrodes.
- Rolling table, Vel; 1 unit.
- Standard gas cylinder; 1 unit.
- Titration sets.
- Vacuum pump, Millipore; 2 units.

Palaeoenvironmental Records :

- Delph2 seismic acquisition system; 1 unit.
- EG&G capacitor bank; 1 unit.
- Seismic EG&G power supply; 1 unit.
- SIG-sparker (high-resolution seismic source); 1 unit.

Palaeoecology :

- Soil analysis coring equipment.

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 1998-1999.

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**

^{14}C (as NaHCO_3), ^{55}Fe (as FeCl_3) and ^{32}Si (as $\text{Si}(\text{OH})_4$). To be used in project A4/DD/B12 for the parallel investigation of iron, silicate and carbon phytoplankton physiology.

XIV. NOTICE OF INTENDED USE OF SCIENTIFIC ROCKETS

No rockets will be used in the Belgian projects in 1998-1999.

XV. NOTICE OF OCEANOGRAPHIC RESEARCH SHIPS

No Belgian research vessels will travel the Antarctic Treaty area in 1998-1999.

XVI. ACTIVITIES OF TOUR ORGANIZERS

Nil.



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**PROGRAMME'S RESPONSIBLE AUTHORITY**

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**ABBREVIATIONS AND ACRONYMS**

| | |
|----------|---|
| CNR | Consiglio Nazionale delle Ricerche |
| CNRS | Centre National de la Recherche Scientifique (France) |
| EPICA | European Project for Ice Coring in Antarctica |
| GEBRA | Evolución Geológica de la Cuenca de Bransfield y de la Dorsal Sur del Mar de Scotia |
| IFRTP | Institut Français pour la Recherche et la Technologie Polaires |
| JGOFS | Joint Global Ocean Flux Study |
| OSTC | Federal Office for Scientific, Technical and Cultural Affairs |
| RUCA | Universitair Centrum te Antwerpen |
| RUG | Universiteit Gent |
| SO-JGOFS | Southern Ocean Joint Global Ocean Flux Study |
| SWAMCO | Seawater Microbial Community Model |
| TAAF | Territoire des Terres Australes et Antarctiques Françaises |
| ULB | Université Libre de Bruxelles |
| ULg | Université de Liège |
| VUB | Vrije Universiteit Brussel |

