Intergovernmental Oceanographic Commission
Reports of Governing and Major Subsidiary Bodies

IOC Regional Committee for the Southern Ocean

Fifth Session

Paris, 9-12 June 1987

Unesco

In this Series	*Languages*
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ANNEXES

1. OPENING

1 The Chairman of the Regional Committee for the Southern Ocean, Prof. D. Sahrhage, opened the Session and welcomed the participants.

2 Dr. Mario Ruivo, Secretary of IOC, welcomed the participants. He pointed out that during the recent years national and multinational investigations in the Southern Ocean, the water ring around Antarctica, had been intensified. He noted in this regard the "BIOMASS" programme carried out under the auspices of SCAR and SCOR, preparation of the proposals and recommendation for future research in the field of the General Circulation of the Southern Ocean by SCOR WG 74, planning of the World Ocean Circulation Experiment (WOCE) by the Scientific Steering Group for WOCE, Meeting of experts on oceanography related to the dynamics of the Antarctic ecosystem (organized by IOC jointly with SCOR in Kiel, Federal Republic of Germany, 1984) and the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill, organized in co-operation with SCAR and SCOR in Paris, 2-6 June 1987.

3 He also emphasized those scientific programmes and service activities of IOC which are relevant to the activities of the Regional Committee and in particular: development of global ocean observing system (GLOSS, IGOSS XBT ship-of-opportunity programme (jointly with WMO); Drifting buoy programme (jointly with WMO)); international oceanographic data and information exchange system (IODE), Global Investigation of the Pollution in the Marine Environment (GIPME); and Ocean Science and Living Resources (OSLR) (jointly with FAO).

4 The Secretary IOC drew the attention of the Committee to the Resolution of the fortieth Session of the UN General Assembly (Resolution 41/88 A of 4 December 1986 "Question of Antarctica"), which emphasizes "the significance of Antarctica to the international community in terms, inter alia, of international peace and security, economy, environment scientific research and meteorology".

5 He invited the Committee to consider and formulate proposals for the development of regional components of global ocean observing and oceanographic data and information exchange systems, as well as for future co-operative research in the Southern Ocean in collaboration with other organizations concerned (e.g. WMO, CCAMLR, SCAR) and SCOR, as one of the scientific advisory bodies of the Commission.

2. ADMINISTRATIVE ARRANGEMENTS

2.1 ADOPTION OF THE AGENDA

6 The Committee adopted the Agenda which is Annex I to this Report.

2.2 DESIGNATION OF A RAPPORTEUR

7 The Delegate of the United Kingdom, supported by the Delegate of the Federal Republic of Germany, proposed Dr. X. Verlencar as Rapporteur for the Session. The Committee accepted this proposal, and Dr. Verlencar agreed to take on this responsibility.

2.3 CONDUCT OF THE SESSION

8 Dr. A. Tolkachev, Technical Secretary of the Committee, provided the Committee with some information on administrative arrangements, timetable and documentation for the Session. The List of Participants is given in Annex VII, hereto.

3. REPORT ON INTERSESSIONAL ACTIVITIES

9 The Chairman of the Committee presented Document IOC/SOC-V/6 "Report of the Chairman of the IOC Regional Committee for the Southern Ocean on Intersessional Activities". The following ocean science activities were highlighted:

(i) The Fourth Session of the IOC Programme Group for the Southern Oceans was held in Paris in March 1983. The summary report of that Session was published in June 1983 and is available as document IOC/SOC-IV/3.

(ii) The various Recommendations made by PG/SOC during that Session were followed up by the Chairman in collaboration with the IOC Secretariat and others concerned.

(iii) The Report of the Fourth Session was presented to the Seventeenth Session of the IOC Executive Council in Paris in February 1984. The Executive Council accepted the Summary Report and instructed the Secretary to proceed further in strengthening the collaboration with organizations relevant to the SOC region, particularly with SCOR, SCAR and CCAMLR.

(iv) As part of the renewal of its activities in this region, the IOC provided support to a SCAR Symposium on Antarctic Biology held in Bariloche, Argentina, in June 1983.

(v) During the intersessional period contact was maintained with the Chairman of SCOR Working Group 74 which prepared an extensive report on "General Circulation of the Southern Ocean; Status and Recommendations for Research" (Document WCP-108; WMO/TD-86).

(vi) Following the recommendation of the Fourth Session of PG/SOC, a meeting of experts on oceanography related to the dynamics of the Antarctic ecosystem was organized by IOC and held in Kiel, FRG, on 18-19 May 1984 in conjunction with the second meeting of SCOR Working Group 74. A Summary Report of the meeting of experts is available in Document IOC/INF-609. During the meeting the recommendations made by SCOR Working Group 74 were reviewed and it was discussed what oceanographic processes related to the dynamics of the Antarctic marine ecosystem should be studied through international co-operation as part of, or supplementary to, the ongoing BIOMASS Programme. A preparatory meeting of BIOMASS observers to the meeting of SCOR Working Group 74 identified as the most essential supplement to the ongoing BIOMASS oceanographic research a quantitative description of the geographic and temporal variation in the contribution of Weddell Sea waters, S.E. Pacific Antarctic and Sub-Antarctic waters, and Bellingshausen Sea waters to the Branfield Strait and Scotia Sea (and similar contributions to the waters of Prydz Bay in the southern Indian Ocean), and of the atmospheric forcing involved.

(vii) In connection with the observed large annual and seasonal variations in the distribution and abundance of Antarctic krill, plans were developed after the Kiel meeting to organize a "Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill". The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) agreed to co-sponsor such a Seminar with IOC, and co-operation from both SCAR and SCOR was arranged. The Seminar was held in Paris from 2 to 6 June 1987. A report on this Seminar was made available to the meeting as Document IOC/SOC-V/9.

(viii) During its Fourth Session the PG/SOC decided to form an ad hoc Task Team on Data Management for the Southern Oceans to examine, during the intersessional period, the data-management requirements for the SOC region, including the need and terms of reference for an eventual RNODC. The Task Team, with Dr. H.A.C. Jones (Canada) as Chairman, met during the Eleventh Session of the Working Committee on IODE in New York, 10-18 January 1984. The Task Team agreed that any research programme would benefit from the services provided by one or more RNODC(s). The Task Team then worked by correspondence to specify the data-management services and products needed to support physical and chemical oceanographic programmes in the SOC region, and to draft sample terms of reference for any RNODC-SOC. On the basis of this work and with advice from the Chairman of PG/SOC, the Working Committee on IODE during its Twelfth Session in Moscow, 8-17 December 1986, considered these aspects further and recommended (IODE-XII.1) that an RNODC for the Southern Oceans be established in Argentina.

(ix) As a follow-up on PG/SOC recommendations concerning the ship-of-opportunity programme, the promotion of sea-level measurements, and satellite studies, the Chairman of PG/SOC had contacts with

the Chairman of the IOC/WMO Working Committee for IGOSS, and with the IOC Secretariat. Member States were made aware of the various activities in these fields, and the IOC Secretariat will report to the Session on the progress achieved and plans made for the promotion of the SOC component of the ocean observing system (Agenda Item 5.3).

10 The Technical Secretary provided some other information regarding the IOC activities relevant to the study of the Southern Ocean, namely development of the Global Sea-Level Observing System (GLOSS), IGOSS XBT Ship-of-Opportunity programme, Drifting buoy programme, OSLR, GIPME and IODE activities.

4. REVIEW OF SCIENTIFIC RESEARCH CONDUCTED IN THE SOUTHERN OCEAN SINCE THE FOURTH SESSION BY MEMBER STATES AND OTHER INTERNATIONAL ORGANIZATIONS

11 Presentations on the scientific research conducted in the Southern Ocean since 1983 were made by the Delegates of the Federal Republic of Germany, Brazil, India, United Kingdom, Chile, People's Republic of China, Japan and the USSR.

12 Reports on the activities of the international governmental and non-governmental organizations in the Southern Ocean were submitted by WMO, CCAMLR, IWC, SCOR and SCAR.

13 Those reports described various types of national and international activities dealing with the physical oceanography, marine biology, marine chemistry, marine meteorology and climate related studies. The reports submitted to the Regional Committee are given in Document IOC/SOC-V/7.

14 The Committee recommended that those reports be circulated to Member States and other international organizations involved in the Southern Ocean studies. It also recommended that preparation of national reports on Southern Ocean Studies should be co-ordinated between different international organizations concerned (WMO, SCAR, SCOR, etc.) and that IOC should consult with other organizations on this matter.

15 The Committee recommended that IOC establish closer links with WMO-SCAR EC Working Group on Antarctic Meteorology and the Antarctic Treaty in the interest of promoting scientific co-operation in the studies of the Southern Ocean.

5. FUTURE SCIENTIFIC ACTIVITIES OF THE REGIONAL COMMITTEE

5.1 OCEAN DYNAMICS AND PROCESSES: GENERAL CIRCULATION OF THE SOUTHERN OCEAN: STATUS AND RECOMMENDATION FOR RESEARCH

16 The Committee reviewed the recommendations on future research related to the study of the General Circulation of the Southern Ocean, as proposed by the SCOR Working Group 74 in its report "General Circulation of the Southern Ocean: Status and Recommendations for Research" (Document WCP-108, WMO/TD-No. 86, October 1985). They include proposals on further studies in the following fields:

(i) Interactions between the Southern Oceans and Subtropics
(ii) Antarctic Circumpolar current
(iii) Subpolar zone
(iv) Shelf-slope processes and deep water formation
(v) Sea level observations
(vi) Air-sea-ice interactions

17 The Committee noted that some of the above-mentioned problems had been addressed in planning of the World Ocean Circulation Experiment (WOCE) and were given further consideration, in particular at the Planning meeting on WOCE Core Project 2 "The Southern Ocean" (Bremerhaven, Fed. Rep. of Germany, 20-23 May 1986). Report of this meeting was made available to the participants. This Committee reviewed particularly further research required for study of the Antarctic Circumpolar Current, Meridional Flux and Air-Sea-Ice Interaction.

18 Some problems, identified by SCOR WG-74, were studied within the framework of national and/or multinational programmes, carried out during the period 1984-86 as given in national reports presented to the Session.

19 With regard to development of ocean observing system in the Southern Ocean, as recommended by SCOR WG-74, it was noted that it will be discussed under the Agenda Item 5.3.

20 Dr. J. Crease, representing the SSG for WOCE, presented a report on the World Ocean Circulation Experiment (WOCE) and in particular Core Project 2 "The Southern Ocean", being planned by the Working Group, established by the SSG for WOCE. The group will report to SSG for WOCE by autumn 1987 and its conclusions will be included in the WOCE Draft Implementation Plan to be discussed at the International Scientific Conference on WOCE to be held in Paris, October 1988, under the joint co-sponsoring of IOC, WMO, ICSU and SCOR. Scientific Plan for the World Ocean Circulation Experiment (Document WCP-108; WMO/TD No. 86) was made available to the participants.

21 The WOCE Core Project 2 "The Southern Ocean" is directed at the dynamics and thermodynamics of the Southern Ocean. The scientific plan for Core Project 2 includes:

- circumpolar circulation: interaction exchange, dynamic balance of the ACC

- meridional fluxes: eddy fluxes across the ACC; cyclonic gyres; shelf-slope exchange; deep boundary currents

- ocean-atmosphere fluxes: water mass modification; mixed layer; thermodynamics and dynamics of sea ice; ocean-glacial ice fluxes

22 The methods and technology that would be employed in the Southern Ocean studies will include:

- moorings and pressure sensors
- satellite surface drifters
- hydrographic/chemical tracer sections
- tide gauges
- satellite remote sensing
- satellite telemetry
- acoustic current profilers
- voluntary observing ships
- ships-of-opportunity
- models (sea ice, coarse and eddy resolving)

23 The Committee, noting that the main phase of WOCE was envisaged for the period 1990-1995, pointed out that it was prepared to play an active role in promoting international activities related to ocean observing system development needed in support of WOCE Core Project 2 in co-operation with SSG for WOCE as well as in co-ordinating certain research field activities. The Committee also noted that the advice of experts will be needed to formulate specific research activities by SOC to assist in WOCE implementation.

5.2 ACTIVITIES RELEVANT TO IOC/FAO OCEAN SCIENCES AND LIVING RESOURCES (OSLR) PROGRAMME

5.2.1 Recommendations of the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill

24 Prof. D. Sahrhage, the Seminar Convenor, presented the Executive Summary and recommendations of the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill (Document IOC/SOC-V/9) organized in co-operation with SCAR and SCOR which took place from 2 to 6 June 1987 at the Unesco Headquarters. About 80 scientists from 18 countries participated in the Seminar in their personal capacity. 32 scientific contributions were presented and discussed during the Seminar. The Seminar provided a forum for discussion of the following major topics:

- Meso/large scale variability in the environment
- Meso/large scale variability in the biota (related to the environment
- Krill variability in relation to the environment
- Krill variability detected from predator studies

25 The Delegate of Brazil emphasized that the report and recommendations of the Seminar should be submitted to the next Session of the IOC Executive Council.

26 The Executive Summary and Recommendations of the Seminar are given in Annex III.

27 The Committee congratulated Prof. D. Sahrhage and the Members of the Steering Group for successful preparation and conducting of the Seminar.

28 The Committee emphasized that the outcome of the Seminar would serve as a scientific basis for the development of future international programmes related to the study of Antarctic ocean variability in relationship to marine living resources and felt that further careful consideration of the results of the Seminar would be required in this connexion. The Committee was informed that the Report of the Seminar will be made available in near future to Member States of IOC, CCAMLR as well as to SCAR and SCOR, and that the scientific contributions will be published in a book entitled "Antarctic Ocean and Resources Variability" later in 1988.

29 The Committee reviewed the recommendations of the Seminar and fully supported the conclusion of the Seminar that closer collaboration between meteorologists, physical and biological oceanographers should be promoted at all levels. Recognizing that some of the recommendations of the Seminar dealing with observing systems will be discussed under appropriate agenda items and that some of them are included in planning WOCE Core Project 2, the Committee recommended that particular attention should be given to Recommendation on interdisciplinary process studies of the upper mixed layers and to the vertical stability of the water column.

5.2.2 Environmental Aspects of the BIOMASS Programme and Possible Follow-up Activities

30 Prof. S.Z. El-Sayed, Chairman, BIOMASS Executive Committee, presented a report on "The International BIOMASS Programme and Follow-up Activities". This report (Document IOC/SOC-V/10) is reproduced as Annex IV. Publication on "Biological Studies of the Southern Ocean Research Plans and International Coordination" (by Prof. S.Z. El-Sayed) was also made available to the participants.

31 The BIOMASS programme "Biological Investigations of Marine Research Antarctic Systems and Stocks" was the first major international collaborative effort initiated in 1976 under the sponsorship of SCAR, SCOR, IABO and ACMRR (FAO), to study the Antarctic marine ecosystem and to provide the necessary information for the wise management of the marine living resources. With the successful implementation of FIBEX (FIRST BIOMASS EXPERIMENT) and SIBEX (SECOND BIOMASS EXPERIMENT) and the establishment of the BIOMASS Data Center, the programme has now entered a new phase of data analysis and data interpretation.

32 A series of workshops will be held in 1987-1988 to process information and reports on findings, both disciplinary (e.g. krill, fish, birds, etc.) and interdisciplinary (e.g. ecosystem modelling). A final meeting to evaluate the decade of BIOMASS programme (1976-1986) is planned for 1990 (Annex IV).

33 More focussed post-BIOMASS programmes, either being implemented or proposed include:

- International Target Strength Study
- International Krill Physiology Project
- International Weddell Sea Winter Studies

Other "Spin-off" research programmes from the BIOMASS programme might include:

- Krill biology and its relation to the environment
- Methodology for abundance estimates of krill
- Research on other dominant components of the ecosystem

Relevant to BIOMASS programme are:

- the complementary research programme with CCAMLR
- Antarctic Sea Ice Studies
- World Ocean Circulation Experiment (WOCE)
- SCAR Group of Specialists on Southern Ocean Ecology

34 The Committee noted with satisfaction research activities under the BIOMASS programme, covering the wide spectrum of biological studies of marine resources and ecosystem in the Antarctic oceans in relation to the marine environment. It noted that the activities of the BIOMASS Data Center are expected to be extended beyond 1990, and that this will require financial support from participating countries and international organizations. The Committee emphasized the importance of the maintenance of the BIOMASS Data Center for completion of data collection and further data analysis and recommended that links be established between the BIOMASS Data Center and World Data Centers (Oceanography) in the form of exchange of marine physical and chemical data, and inventories of available data.

35 Having reviewed and discussed the activities under the BIOMASS programme, planned activities of the World Ocean Circulation Experiment (WOCE) and recommendations of the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill, national and international research activities in the Southern Ocean, the Committee recommended that IOC organize in consultation with other international organizations expert consultations with a view of preparing future international research projects (see under Agenda Item 6. below).

5.2.3 Other activities

36 The IOC Senior Assistant Secretary, Mr. Ray C. Griffiths, introduced the IOC-FAO Programme on Ocean Science in relation to Living Resources (OSLR). He briefly reviewed the basis of this Programme: to advance understanding of the relationship between environmental variability and the abundance of marine organisms, particularly those of commercial or ecological interest. He described the two main thrusts of the Programme:

(i) the International Recruitment Programme, which has two main subdivisions (a) Sardine/Anchovy Recruitment Project and (b) Tropical Demersal Recruitment Project; and

(ii) Toxic and Anoxic Phenomena Associated with Algal Blooms.

The IOC Senior Assistant Secretary suggested that any follow-up of BIOMASS should include co-operation with the IOC-FAO Guiding Group of Experts on Ocean Science Living Resources (OSLR) which is in a particularly good position, by value of its high level scientific membership and its mandate, to provide advanced technical advice on OSLR methods. He invited the Regional Committee to consider OSLR activities in the Southern Ocean.

37 The Committee noted that some aspects of the problem had been evoked or identified at the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill and could be taken up in due course in the light of the results of such studies as BIOMASS and others when preparing for research projects to be submitted together with the report of the Session to the Executive Council.

5.3 REGIONAL COMPONENTS OF THE OCEAN OBSERVING SYSTEM

5.3.1 Regional Component of the Global Sea-Level Observing System

38 The IOC Senior Technical Secretary, Dr. A. Tolkachev, introduced this subject. He reviewed the present state of implementation of the Global Sea-Level Observing System (GLOSS), particularly of its component in the Southern Ocean. Documents IOC/SOC-V/8 Annex 1 "IOCSOC Regional Component of the Global Sea-Level Observing System (GLOSS) and IOC/INF-663 rev and IOC/INF-663 rev. corr.1 were submitted to the participants.

39 The importance of sea-level measurements in the Southern Ocean to improve our understanding of the tidal regime of the ocean, to assess the variability of circulation in the Antarctic Circumpolar Current, to determine climatic trends in both sea-level and in ocean currents, to assess water exchange between the oceans, and to calibrate future satellite altimetry observations was emphasized.

40 The Committee noted that the proposals on the establishment of sea-level observation network in the Southern Ocean had been made by the Programme Group for SOC at its Fourth Session (1983), by SCOR WG-74 (1985), the SSG for WOCE and the SCAR WG on Solid Earth Geophysics (1982).

41 The proposed locations of sea-level stations in the Southern Ocean within the framework of GLOSS and present state of their implementation is shown in Annex V.

42 The Delegate of the United Kingdom informed the participants that the British Antarctic Survey (BAS) was exploring with the Proudman Oceanographic Laboratory, Institute of Oceanographic Sciences (IOS), the possibility of a collaborative venture within the GLOSS programme, starting in the 1988/1989 season. BAS would assist in the installation of near-shore, pressure-sensor sea-level gauges at its bases on Signy Island, South Orkney Islands, and Bird Island, South Georgia. When installed BAS would assume the responsibility for maintaining and servicing the equipment, and the daily transmission of data to UK. A desirable extension of this project is the deployment of mid-ocean bottom pressure recorders and inverted echosounders in the Scotia Sea to investigate variations in the Antarctic Circumpolar Current; BAS again providing the facilities, the Proudman Laboratory the instrumentation.

43 The Delegate of the Federal Republic of Germany informed the participants that the Alfred-Wegener-Institut fuer Polar- und Meeresforschung was preparing for long-term sea level and current measurements in the Weddell Sea which are planned to start in 1988. Sea level gauges and current meter moorings are planned to be stationed near Bouvet Island and near Vestkapp. Both will form the initial part of a Joint FRG/Norwegian research programme of long-term measurements at the near bottom outflow from the Filchner shelf-ice where a large part of the bottom water of the world ocean seems to be formed. It is hoped to complete the measuring system in time so that adequate data can be obtained during the central phase of WOCE 1990-1995.

44 The Delegate of Chile informed the participants that the Hydrographic Institute maintains sea-level stations in Puerto Montt, since 1945, in Puenta Arenas, since 1944, and Puerto Williams, since 1964. In 1983 tide gauge was installed at Base Prat. All these stations are included in the GLOSS.

45 The Committee noted with satisfaction national activities of the United Kingdom, Federal Republic of Germany, Chile and others and strongly supported the development of SOC regional component of GLOSS. However, it recognized the extreme technical difficulty in establishing and operating sea-level gauges at Southern Oceans area and therefore the Committee recommended that Member States working in the Antarctic area be requested to provide the IOC Secretariat, by March 1988, with information on their experience, the methods and technology used in sea-level measurements in such hostile conditions, including development of new technology for such measurements. The Secretariat was then requested to send this information to Member States participating in the SOC regional component of GLOSS. The Committee also recommended that the outcome of the discussion on this matter

and the problem of installation and maintenance of tide gauges in the Southern Ocean be brought to the attention of the IOC Task Team of Experts on the Global Sea-Level Observing System (GLOSS).

46 The Committee then discussed the proposal of the IOC Executive Council on the designation of a regional co-ordinator for GLOSS. The Committee felt that at this stage co-ordination of GLOSS development in the Southern Ocean could be provided by the Secretariat jointly with the IOC Task Team of Experts on GLOSS.

5.3.2 Regional component of IGOSS XBT Ship-of-Opportunity Programme

47 Mr. J. Withrow, IGOSS Co-ordinator, introduced this subject (Document IOC/SOC-V/8 Annex 2 "Regional component of IGOSS XBT Ship-of-Opportunity Programme"). He reviewed the developments in the IGOSS since 1983, and particularly the implementation of the IGOSS XBT Ships-of-Opportunity Programme, which was considered at the International XBT Ships-of-Opportunity Meeting, held in Seattle, Washington, USA, from 9 to 13 September 1983. He pointed out that the total number of BATHY messages in March 1987 in comparison with March 1983 has increased of 48%, and TESAC messages by 16%. However, the total number of reports from the Southern Oceans remained at only 143 for all of 1986, which is not satisfactory for the purpose of product preparation or other scientific endeavours. Distribution of BATHY messages for 1986 in the Southern Ocean is shown in Annex VII.

48 Service ARGOS and IFREMER (France) have combined their efforts in the development of a satellite transmission package for XBT's which is in the test and evaluation stage. Service ARGOS has also formed a special development group for processing of XBT and other subsurface data and its insertion onto the GTS. This will be particularly useful in the Southern Ocean, much of which is outside of the GOES footprint.

49 The Committee noted that the IOC Secretariat (jointly with WMO) is preparing a letter to all Member States, and in particular the signatories of the Antarctic Treaty with the aim to urging them to increase submission of subsurface thermal data for international exchange.

50 The Committee noted with concern that despite many appeals the volume of BATHY and TESAC messages transmitted from the Southern Ocean was still very low, although the ships operating in Antarctic waters were increasing in number every year. It wished to urge again Member States, and individual scientists working aboard research and supply vessels to make every effort to provide these observations for international exchange within the IGOSS Programme.

51 The Committee also requested the Secretariat to undertake an evaluation on the number of ships operating during the last few years and number of reports transmitted for international exchange in order to asses the major problems in this area. It recommended that this evaluation should accompany the Circular Letter being prepared by IOC and WMO.

52 The Committee noted that the Second International XBT Ship-of-Opportunity Meeting was scheduled to be held in Patricia's Bay, Sidney, British Columbia, Canada, 5-8 August 1987 and the WOCE Regional Workshop on Physical Oceanography of the Southern Ocean, with emphasis on the South Atlantic, South Pacific and Argentina Basin will be held in Sao Paulo, Brazil, from 20 to 22 July 1987. The Committee requested the Secretariat to bring to the attention of the participants of those meetings, the concern expressed by the Committee with regard to decreasing volume of BATHY/TESAC reports from the Southern Ocean and to urge their participants to intensify their efforts regarding regular transmission of such observations for international exchange.

53 The Committee adopted Recommendation SOC-V.1.

5.3.3 Drifting buoy activities in the region

54 The IOC Assistant Secretary, Mr. Y. Treglos, introduced this agenda item (Document IOC/SOC-V/8 Annex 4 "Drifting Buoy Activities in the Southern Ocean"). He recalled actions undertaken by IOC and WMO to set up an international mechanism for co-ordinating drifting buoy activities, up to the establishment of the Drifting Buoy Co-operation Panel. The Technical Co-ordinator had began working on 1st of June 1987, and the Panel was expected to assess the usefulness of the position within the coming two years.

55 As far as drifting buoy observations were concerned, it was to be noted that, since mid-1983, the number of drifting buoys handled by CLS (Collecte - Localisation - Satellite)/Service ARGOS had roughly doubled, and the amount of drifting buoy reports circulating on the Global Telecommunication System (GTS) of WMO had increased roughly four-fold. The trend was therefore encouraging, even if still some 60% of the buoys were not submitting their observations for circulation onto the GTS.

56 Mr. C. Billard (France), Chairman of the Drifting Buoy Co-operation Panel, presented the activities related to drifting buoys of the French National IGOSS Center and SOC for drifting buoys since late 1986. These consist in an archive of all data collected from the GTS and RTH Paris with some information and compression of some post processing in order to remove non drifting buoy data. Dotted maps and charts of density of observations are issued on a monthly basis. Around 60% of the observations are located south of 30°S as part of the TOGA programme. A slight but regular increase of the number of observations received can be observed. IGOSS Center of Paris does not take into account presently any quality control in this archive but plans to implement some procedures in this matter, in a near future in connection with the ARGOS Processing Center of Toulouse and the DBCP Technical Co-ordinator. Samples of distribution of drifting buoys in the Southern Ocean for July 1986 and February 1986 are shown in Annex V.

57 The Representative of WMO, Dr. E. Sarukhanian, informed the participants that the Tenth Congress of WMO emphasized the importance of the Joint WMO/IOC Drifting Buoy Co-operation Panel for co-ordination and expansion of drifting buoy deployment and the monitoring and quality control of drifting buoy data in support of the WWW, the WCRP and other major WMO and IOC programmes. It encouraged as many Member States as possible to belong to the panel and to contribute actively to its work and in this regard noted the need for expanding the exchange of drifting buoy data over the GTS for the purposes of the WWW and IGOSS. The WMO Congress expressed satisfaction that the recruiting of the Technical Co-ordinator for the Drifting Buoy Co-operation Panel had been completed and thanked those Member States who were contributing to the funding of this important position. It also expressed its appreciation to the IOC for its efforts in managing the funds for the Technical Co-ordinator's position.

58 The Committee expressed concern with the rather low percentage of drifting buoys submitting reports for circulation onto the GTS. It recognized that the Drifting Buoy Co-operation Panel was not actually in a position to impose any obligation in this field to the buoy deployers and that it had to take into account scientists' concern to make themselves use of those data first in order to publish scientific papers. On the other hand, it expressed the view that geophysical sciences were entering a new era where all data had to be shared in order that progress could be achieved. It considered that it was the responsibility of Member States to decide whether or not they would take compelling measures for having drifting buoy observations put onto the GTS and urged Member States to consider taking such measures.

59 More specifically, the Committee recalled projects under the World Climate Research Programme to establish a network of drifting buoys; the Southern Hemisphere on a more or less permanent basis. It considered that such a network would greatly benefit to research programmes in the Southern Ocean and recommended that its view be taken into account when planning for climate-related experiments.

5.3.4 Satellite observations

60 The Committee reviewed the present and future activities of Member States related to meteorological and oceanographic satellite observations to be of particular importance for the areas of the Southern Ocean, both for, living resources and climate studies.

61 The Representative of WMO presented information on present and future meteorological satellites. The space-based sub-system comprised near-polar-orbiting satellites and geostationary satellites. Only the former had the capability to meet the requirements over the polar regions. The polar-orbiting satellites (800-1000 km near polar orbit) comprised the NOAA series TIROS-N (USA) and the METEOR-2 system (USSR). The third generation of the USA near-polar-orbiting operational satellite system, continues to provide data for operational and research purposes. The sensing equipment of these satellites were the TIROS Operational Vertical Sounder (TOVS) and the Advance Very High Resolution Radiometer (AVHRR). The

METEOR-2 satellites are equipped with camera systems and scanning radiometers to provide visual and infra-red images of cloud as well as snow and ice cover. The METEOR-2 satellite system also provides cloud-top temperatures and height, temperatures and values of outgoing long-wave radiation and reflected solar radiation. These data are processed and distributed over the GTS in pictorial and other forms. Data from satellites are made available to Members by means of satellite receiving equipment through the Direct Sounding Transmission (DST), Automatic Picture Transmission (APT) and High Resolution Picture Transmission (HRPT) services. In addition, the TIROS-type satellites have a Data Collection System (DCS) to receive data from fixed and moving platforms and to process and store the data from later transmission to a central processing (ARGOS) facility. The Indian geostationary satellite (INSAT) has the facility to collect data from fixed platforms and later transmit it to Meteorological Data Utilization Centre (MDUC), New Delhi. China plans to launch an experimental polar-orbiting meteorological satellite prior to 1990. China also expressed an interest in further co-operation on meteorological satellites. Australia informed the Congress that it is investigating ways to contribute more to the global network of meteorological satellites such as through co-operation with China or participation in other bilateral or multilateral arrangements for the development of satellite sensors. Brazil is planning to launch an experimental satellite with a data collection mission before 1990.

6.2 The Committee was also informed on the future satellite missions planned by a number of countries in support of the World Climate Research Programme, and in particular the World Ocean Circulation Experiment, which includes high accuracy altimeter mission TOPEX/POSEIDON (USA/France), ERS-1 (ESA) planned to be launched in 1991 and 1990 respectively, and scatterometer missions aboard ERS-1 and MOS-2 (Japan).

6.3 The Committee was also informed that the IOC Working Committee for IODE at its Twelfth Session (Moscow, USSR, December 1986) gave particular attention to the matter of international exchange of satellite derived oceanographic data and development of internationally recognized methods and procedures in this field.

6.4 The Committee noted the progress in this field and wished to reemphasize the importance of meteorological and oceanographic observations in the Southern Ocean in view of the great logistic difficulty and expense in carrying out effective surface based research programmes.

5.4 OCEANOGRAPHIC DATA MANAGEMENT AND EXCHANGE OF INFORMATION

6.5 The Technical Secretary for the Session introduced the document "Promotion of data exchange and products for the SOC Region" (Document IOC/SOC-V/8 Annex 3), prepared by the Secretariat. It includes review made by MIAS (United Kingdom) on a number of research ships visiting each part of the ocean during a typical year (see Annex V). In accordance with the information received from WDCs A and B (Oceanography) very few data had been submitted to the WDCs from the Southern Ocean for the last three years, although the extensive research had been carried out by many Member States.

66 The Committee noted that the international oceanographic data management is of importance for the World Ocean as a whole, and is of particular importance for the Southern Ocean, where due to various historical and geographical reasons the series of oceanographic and meteorological observations are rather short in comparison with other regions of the World Ocean. It, therefore, reemphasized the importance of timely submission of data for international exchange by all countries and scientific institutions and urged Member States to consider ways and means to ensure full and timely data exchange through National Oceanographic Data Centers or Designated National Agencies. This becomes of particular importance in view of the implementation and planning of large-scale and long-term international programmes in the Southern Ocean, organized under the auspices of IOC, WMO, CCAMLR, SCAR, and SCOR.

67 The Committee considered the Recommendation IODE-XII.1 "RNODC-Southern Ocean (SOC)" of the Twelfth Session of the IOC Working Committee for IODE (Moscow, USSR, 10-17 December 1986) by which the Committee was requested to review carefully the proposed responsibilities of the RNODC for SOC, to be established in Argentina, so that the accreditation of an RNODC can be made during the middle of 1987 in accordance with existing procedures.

68 The Chairman of the Committee reminded the participants that this recommendation is based on the proposal made by the Programme Group for SOC at its Fourth Session. He pointed out that presently there are two data centers concerned with marine data from the Southern Ocean:

- CCAMLR Data Center in Hobart (Australia)
- BIOMASS Data Center in Cambridge (UK)

The BIOMASS Data Center in addition to biological data is handling physical and chemical oceanographic data from FIBEX and SIBEX activities.

69 Prof. S.Z. El-Sayed, Chairman of the BIOMASS Executive Committee, informed the Committee that although there are restrictions for 5 years period for some biological data, obtained during FIBEX and SIBEX, there is no restriction for exchange of physical and chemical data. The Committee invited the BIOMASS Data Center to establish links with the WDCs A and B and the new RNODC for SOC.

70 The Committee agreed with the proposed terms of reference of the Responsible National Oceanographic Center for the Southern Ocean (RNODC-SOC), as proposed in the Recommendation IODE-XII.1. It however recommended that RNODC for SOC should co-operate with the BIOMASS Data Center, regarding exchange of data and inventories, as well as other data products.

71 The Committee then discussed the exchange of information among Member States regarding implemented and planned research activities and cruises in the Southern Ocean. The Committee urged Member States to ensure timely submission to IOC of NOP (National Oceanographic Programmes) providing brief descriptions of cruises (ship name, period, area, programme description, responsible institute or agency, scientist name, and remarks). Recognizing that this information of interest for other international

organizations involved in Southern Ocean studies (CCAMLR, SCAR, SCOR, etc.), the Committee requested the Secretary to consult those organizations regarding co-ordination in mutual exchange of such information on Antarctica ocean research provided by Member States. The Committee also invited Member States to provide in a timely manner ROSCOP forms (inventory form for description of implemented cruises) through the IODE mechanism.

5.5 CO-ORDINATION AND CO-OPERATION WITH OTHER OBSERVATIONAL AND RESEARCH PROGRAMMES IN THE SOUTHERN OCEAN

72 Under this Item the Committee was informed on the other relevant programmes of the IOC of interest for the investigations of the Southern Ocean.

73 Mr. V. Sedov, IOC Senior Technical Secretary, introduced ocean mapping activities of the Commission. He outlined, in particular:

- Preparation of the Sixth Edition of the General Bathymetric Chart of the Ocean (GEBCO) (Fifth Edition was published in 1982), both in traditional form (printed on sheets) and in the form of electronic charts

- Preparation of the Geological/Geophysical Atlases for the Pacific and Atlantic Oceans

- Preparation of Regional Bathymetric Charts (for the Mediterranean Sea (IBCM), Caribbean Sea, Western Indian Ocean, Central Eastern Atlantic, Red Sea and Gulf of Aden)

74 The Committee emphasized the need for high quality bathymetric charts in the Southern Ocean required both for scientific research and practical purposes (navigation and fisheries) in this area and recommended that the IOC Executive Council at its next session consider steps for the preparation of Bathymetric Charts for the Southern Ocean region.

75 The Technical Secretary for the Session informed the Committee on the GIPME Programme (Global Investigation of the Pollution in the Marine Environment). He outlined, in particular, those aspects of GIPME Programme which will need co-operation between the Regional Committee for SOC and the IOC Working Committee for GIPME:

(i) Open Ocean Baseline Studies comprises a major component of the mass balance approach of the comprehensive plan for GIPME (IOC Technical Series No. 14, 1976 and No. 25, 1984). Up until now, as a first step, deep ocean baseline studies on trace metals have been planned for the North and South Atlantic (IOC/WC-GIPME-VI/3). Taking into account the fact that the Southern Ocean is one of the less polluted areas of the globe, it would be very advantageous if the planned network of sampling stations could be extended, with stations in the Atlantic part of the SOC region.

(ii) The IMO-FAO-UNESCO-WMO-IAEA-UN-UNEP Joint Group of Experts on Scientific Aspects of Marine Pollution (GESAMP) is currently preparing the Second Global Review of the Health of the Oceans. IOC was designated technical co-ordinator for the preparation of certain regional reviews, including the one for the Southern Oceans.

76 The Delegate of the Soviet Union brought to the attention of the Committee the proposal of the Union of Soviet Socialist Republics on the organization of an International System of Marine Meteorological Services to Navigation in the Southern Ocean. This proposal was submitted by the USSR to the Fourteenth Consultative Meeting of the Antarctic Treaty to be held in October 1987 in Rio de Janeiro. The document "The Basic Principles of Organization of International System of Marine Hydrometeorological Services to Navigation in the Southern Ocean" was made available to the participants as Document IOC/SOC-V/INF-1.

77 Recognizing that this proposal has not yet been formally submitted to WMO and IOC, and that it will be considered first by the Fourteenth Consultative Meeting of the Antarctic Treaty later this year, the Committee nevertheless emphasized the importance of improved marine meteorological services to navigation in the Southern Ocean. The Committee felt that for improved sea-ice forecasts in the area subsurface thermal data will be needed and therefore suggested that IOC be involved in developing international marine meteorological services particularly through the Joint IOC-WMO IGOSS Programme. The Committee requested the Soviet Delegate to pass this opinion to the Soviet Delegation at the Consultative Meeting of the Antarctic Treaty.

78 The Committee encouraged specialists working aboard research vessels to provide weather services to other ships working in this area and welcomed the early preparation of a "Handbook for Marine Hydrometeorological Services to Navigation in the Southern Ocean".

79 In considering co-ordination of activities and programmes in the Southern Ocean, the Committee felt that there are two aspects of such co-ordination:

(i) Co-ordination within IOC amongst the relevant scientific and technical subsidiary bodies, including IOC TC/IODE, IOC-WMO WC/IGOSS, IOC SC/GIPME, IOC PG on OPC, SCOR-IOC CCCO and SSG for WOCE.

(ii) Co-ordination of activities with other international organizations involved and/or interested in the studies of the Southern Ocean. These include Antarctic Treaty, CCAMLR, FAO/ACMRR, IWC, SCAR, SCOR, WMO, ICSU and others. It is well indicated in the diagram, published in "Organizational Structure of the Southern Ocean: Research Plans and International Co-ordination" by Prof. S.Z. El-Sayed, September 1986.

80 The Committee emphasized the need for close collaboration of IOC with those organizations to avoid duplication of national efforts and resources.

6. FUTURE PROGRAMME OF WORK OF THE REGIONAL COMMITTEE

81 Recognizing the importance of further international collaboration in the studies of the Southern Ocean, the Committee recommended that expert consultations be organized by IOC (in consultation with other international organizations concerned) during 1987-1988 to prepare proposals on future international research projects.

The Committee adopted Recommendation SOC-V.2.

82 The Committee agreed that it should play an active role in encouraging Member States participation in the World Ocean Circulation Experiment currently being planned by SSG for WOCE and urged Member States conducting oceanographic research in the Southern Ocean to participate actively in the International WOCE Scientific Conference to be held in Paris, in October 1988.

83 The Committee recommended that special attention during the next intersessional period be also given to:

(i) implementation of the regional component of GLOSS,

(ii) development of XBT Ships-of-Opportunity Programme in the Southern Ocean,

(iii) active participation of Member States in the expansion of the Drifting Buoy Programme in the Southern Ocean,

(iv) initiation of activities of the RNODC for SOC in co-operation with WDCs and BIOMASS Data Center,

(v) regular and timely exchange of information on planned and implemented national oceanographic programmes in the Southern Ocean (through IOC),

(vi) improvement of international oceanographic data exchange through the IGOSS and IODE Systems.

7. ELECTION OF OFFICERS

84 Dr. D. Sahrhage informed the Committee that due to personal reasons he would not be able to continue serving as the Chairman of the Committee. The Committee thanked him for his contribution to the activities of the Group.

85 The Committee unanimously elected Dr. Vladimir O. Ivchenko (USSR) as Chairman of the Committee, following his nomination by the Delegate of the United Kingdom, seconded by the Delegate of India.

86 Dr Izabel Maria Gurgel (Brazil) was unanimously elected as Vice-Chairman of the Committee, following her nomination by the Delegate of Chile, seconded by the Delegates of Argentina, China and India.

8. DATES AND PLACE OF THE SIXTH SESSION OF THE REGIONAL COMMITTEE

87 The Committee recommended that the intersessional period should not exceed 3 years and proposed that the Sixth Session of the Committee should be held not later than 1990. The Committee proposed that the Sixth Session be held in Paris, Unesco Headquarters, unless one of the Member States offered to host it.

9. ADOPTION OF THE SUMMARY REPORT

88 The Committee reviewed and adopted the Summary Report and Recommendations.

10. CLOSURE

89 The Chairman of the Committee closed the Session on 12 June 1987, at 13h00.

90 The Committee expressed its appreciation to Prof. D. Sahrhage for his outstanding contribution as Chairman to the activities of the Committee since 1983 and for successful conducting of the Session and also wished to thank the Rapporteur and the Secretariat of IOC for excellent arrangements for the Session.

ANNEX I

AGENDA

1. OPENING

2. ADMINISTRATIVE ARRANGEMENTS

   2.1 Adoption of the Agenda
   2.2 Designation of a Rapporteur
   2.3 Conduct of the Session

3. REPORT ON INTERSESSIONAL ACTIVITIES

4. REVIEW OF SCIENTIFIC RESEARCH CONDUCTED IN THE SOUTHERN OCEAN SINCE THE FOURTH SESSION BY MEMBER STATES AND OTHER INTERNATIONAL ORGANIZATIONS

5. FUTURE SCIENTIFIC ACTIVITIES OF THE REGIONAL COMMITTEE

   5.1 Ocean dynamics: General Circulation of the Southern Ocean: Status and Recommendation for Research

   5.2 Activities relevant to the IOC/FAO Ocean Science and Living Resources (OSLR) Programme

      5.2.1 Recommendations of the IOC-CCAMLR Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill

      5.2.2 Environmental Aspects of the BIOMASS Programme and Possible Follow-up Activities

      5.2.3 Other activities

   5.3 Regional components of the Ocean Observing System

      5.3.1 Regional Component of the Global Sea-Level Observing System (GLOSS)

      5.3.2 Regional Component of IGOSS XBT Ship-of-Opportunity Programme

      5.3.3 Drifting buoy activities in the region

      5.3.4 Satellite observations

5.4 Oceanographic data management and exchange of information

5.3 Co-ordination and co-operation with other observational and research programmes in the Southern Ocean

6. FUTURE PROGRAMME OF WORK OF THE REGIONAL COMMITTEE

7. ELECTION OF OFFICERS

8. DATE AND PLACE OF THE SIXTH SESSION OF THE REGIONAL COMMITTEE

9. ADOPTION OF THE SUMMARY REPORT

10. CLOSURE

ANNEX II

RECOMMENDATIONS

Recommendation SOC-V.1

REGIONAL COMPONENT OF IGOSS XBT SHIP-OF-OPPORTUNITY PROGRAMME

The IOC Regional Committee for the Southern Ocean,

Noting the sparsity of IGOSS Subsurface Thermal Data (BATHY/TESAC) collected in the Southern Ocean region,

Also noting the letter being drafted by the IOC and WMO secretariats to Member States and signatories of the Antarctic Treaty at the request of the Joint Working Committee for IGOSS urging them to increase their submission of Subsurface Thermal Data from the Southern Ocean,

Felt that there was a need to amplify the contents of the above letter by providing information on the ships available within the region,

Requests the IOC and WMO secretariats to include in the above letter a comparison of the number of ships submitting ship weather reports (SHIP) with the number of ships submitting subsurface reports (BATHY/TESAC) from the region.

Recommendation SOC-V.2

PREPARATION OF RESEARCH PROJECTS FOR FUTURE INTERNATIONAL CO-OPERATION

The IOC Regional Committee for the Southern Ocean,

Having reviewed the recommendations of the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill; and the proposals on future research as follow up of the BIOMASS Programme,

Recognizing that the large-scale oceanographic investigations in the Southern Ocean (including field programme and ocean modelling) will be conducted within the framework of the World Ocean Circulation Experiment (WOCE),

Noting that marine biological investigations in the Southern Ocean during the last decade have led to the conclusion that:

(i) the mixed layer development in ice-covered and open water areas;

(ii) the turbulent mixing processes in the oceanic surface layer (including sea-ice development); and

(iii) the convection penetrating into the deeper layers of the water column;

seems to significantly affect the phytoplankton and zooplankton (including krill) development in the Southern Ocean;

A

Recommends that IOC in consultation with other international organizations concerned organize in 1987/1988 an expert consultation for the preparation of an interdisciplinary research plan for field and model investigations of the above-mentioned processes on the spatial and temporal variabilities in the upper part of the water column;

The expert consultation should include specialists in physical, chemical and biological oceanography. The experts will be requested to develop an interdisciplinary research programme for field and model investigations of the mixed layer (in ice-covered and open-water regions), turbulent and convection zones with a view of studying their influence on phytoplankton, zooplankton (including krill) development.

B

Noting that analysis of the historical (i.e. DISCOVERY Investigations) and recent data collected during FIBEX and SIBEX has shown that for a better understanding of the distribution and abundance of the krill population, an assessment of the water masses exchanged between the Bransfield Strait and adjacent waters is needed;

Noting also that there is a great need to develop a physical model of the Bransfield Strait and adjacent waters that takes into account the effect of inflow and outflow, and the effect of this has on the distribution and abundance of the krill population;

Recommends that the IOC in consultation with other organizations concerned organize an expert consultation with the following tasks:

(i) to develop a monitoring programme to study the extent of the inflow of the water masses in the Bransfield Strait (from the Bellingshausen and Weddell Seas) and their outflow;

(ii) to study the influence of the topographic features in the Bransfield Strait on the movement and exchange of the water masses with particular reference to the distribution and abundance of the krill larval stages;

(iii) to identify gaps in our knowledge and to recommend research plans needed to fill in these gaps;

C

Noting that phytoplankton, zooplankton (including krill) and ichthyoplankton investigations carried out in recent years have shown that frontal zones, eddies and cold-core rings are important loci for concentrations of the above organisms and that the physical, chemical and biological mechanisms involved are neither well known nor fully understood;

Recognizing that there is a need to study the development and decay of the eddies and cold-core rings (which are spun off the Polar Front Zone) and their influence on the distribution of the planktonic components of the ecosystem (including krill);

Recommends that IOC in consultation with other international organizations organize an expert consultation in order

(i) to develop research plans to study the physical factors contributing to the formation and dispersal of the cold-core rings, eddies and their influence on the distribution of the planktonic components;

(ii) to investigate the abiotic factors contributing to the enhancement of the phytoplankton and zooplankton biomass in the frontal zones;

D

Recommends that the interim reports on the above expert consultations be submitted to the Twenty-first Session of the IOC Executive Council together with the Report of the Fifth Session of the Regional Committee for consideration and approach in order to initiate detailed planning of the proposed projects and as far as possible their implementation during the intersessional period.

Recommendation SOC-V.3

INTERNATIONAL OCEANOGRAPHIC DATA AND INFORMATION EXCHANGE IN THE SOUTHERN OCEAN AREA

The IOC Regional Committee for the Southern Ocean,

A

Having reviewed the present status of oceanographic data exchange on real, near-real and non-real time basis;

Notes with concern the low volume of oceanographic data provided from the Southern Ocean for international exchange both through IGOSS and IODE systems, despite the increasing operation of vessels in the Southern Ocean;

Urges all Member States to consider ways and means to encourage scientists working in this area to increase oceanographic data submission through IGOSS and IODE systems;

Requests the Secretary of IOC to bring this matter to the attention of the Second International XBT Ship-of-Opportunity Meeting, the IOC-WMO Technical Committee for IGOSS and the IOC Technical Committee for IODE in order to identify ways and means to improve international data management activities in the region;

B

Having considered the recommendation IODE-XII.1 "RNODC - Southern Ocean (SOC)" by which the Working Committee for IODE recommended the establishment of the Responsible National Oceanographic Center for the Southern Ocean in Argentina and proposed terms of reference for RNODC for SOC;

Accepts the proposed terms of reference for RNODC for SOC as given in Recommendation IODE-XII.1;

Recommends that RNODC for SOC initiate its actions without delay and establish contact with the BIOMASS Data Center;

Urges Member States to submit oceanographic data and inventories to RNODC for SOC;

C

Having received information on the activities of the BIOMASS Data Center;

Recognizing the importance of its activities for preparation of a unique data sets of marine biological, physical and chemical data for the Southern Ocean;

Recommends that further support be provided by Member States and international organizations for this Center;

Recommends also that BIOMASS Data Center establish links with WDCs (Oceanography) and RNODC for SOC with regard to marine physical and chemical data and data inventories exchange;

D

Recognizing the importance of timely information of Member States on implemented and planned national research programmes, and the need to co-ordinate this information exchange with other international organizations (CCAMLR, SCAR, SCOR, etc.);

Urges Member States involved in the studies of the Southern Ocean to provide the National Oceanographic Programmes Announcement (implemented and planned research programmes) to IOC for circulation to the Member States and interested international organizations;

Requests the Secretary of IOC to consult with other international organizations involved regarding the unification procedures for presentation of national reports to various organizations concerned so as to avoid unnecessary workload and costs for Member States and to improve the usefulness of the reports.

ANNEX III

EXECUTIVE SUMMARY AND RECOMMENDATIONS OF THE SCIENTIFIC SEMINAR ON ANTARCTIC OCEAN VARIABILITY AND ITS INFLUENCE ON MARINE LIVING RESOURCES, PARTICULARLY KRILL

(submitted by the Convenor of the Seminar, Dr. D. Sahrhage)

The Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill was held from 2 to 6 June 1987 at Unesco Headquarters in Paris. The Seminar was jointly sponsored by the Intergovernmental Oceanographic Commission (IOC) and by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), in co-operation with the Scientific Committee on Antarctic Research (SCAR) and the Scientific Committee on Oceanic Research (SCOR). About 80 scientists from 18 countries participated in the Seminar in their personal capacity.

The Seminar provided a forum for the presentations of scientific contributions and for the discussion of results on the following major aspects:

- What is known on the variability in the Antarctic Ocean circulation system?
- What are the possible causes for such variations?
- To what extent and how does this ocean variability influence primary productivity, zooplankton and other organisms?
- To what extent and how does this ocean variability influence krill distribution and abundance?
- What are the effects on krill predators (seals, penguins, fishes, etc.)?

32 scientific contributions were presented and discussed during four main sessions (Appendix). Furthermore sufficient time was available for discussions on the conclusions and recommendations for future research. The contributions will be published in a book entitled "Antarctic Ocean and Resources Variability" presumably later in 1988.

1. MESO/LARGE SCALE VARIABILITY IN THE ENVIRONMENT

During the first session an overview of the atmospheric elements at the oceans surface south of 40°S, and information on long-term, inter-annual and seasonal variability in the atmospheric circulation, and in the ice cover, mainly in the Atlantic sector were provided. In the field of oceanography a review was given on the spatial and temporal variability within the Southern Ocean, supplemented by presentations of results in

special areas. The importance of wind-induced variations in the Antarctic water ring became apparent. It was discussed that besides macro- and meso-scale investigations more attention should be given in future to micro-scale experiments. The upper layer dynamics should be studied more closely (vertical and horizontal mixing processes). Influences of ENSO events on the Southern Ocean were found likely but not yet well established.

2. MESO/LARGE SCALE VARIABILITY IN THE BIOTA (RELATED TO THE ENVIRONMENT)

11 contributions were concerned with seasonal and inter-annual variabilities in Antarctic primary productivity, phytoplankton, zooplankton, and nutrients. Also presented was a conceptual framework for the breakdown of the Southern Ocean ecosystem in terms of time and space. Patterns of spatial and temporal distribution and their variations in early life stages of Antarctic fish were analysed. An extensive discussion developed on the results of biological studies under and in the pack ice. In this zone recent investigations in winter have shown a rich flora and fauna to exist. The ice cover provides shelter and food and appears to be a most important area in relation to the survival strategies of the organisms, and particularly the krill, in winter.

3. KRILL VARIABILITY IN RELATION TO THE ENVIRONMENT

Large-scale fluctuations in the distribution and abundance of krills and possible causes for this phenomenon were discussed. A concept was presented for the seasonal variation of krill in the Antarctic Peninsula region which - after verification - could be used to establish a baseline for measuring deviations from average conditions. Seasonal variations can be larger than interannual fluctuations. It is difficult to separate changes in krill distribution as a result of variations in the environment from fluctuations in krill abundance due to biological reasons, e.g. recruitment failure. Mechanisms of environmental fluctuations were discussed which could be responsible for rather catastrophic decreases in krill abundance around South Georgia (during certain years 1977/78, 1983/84). Results on relationships between the distribution and structure of water masses, krill concentrations, and fish as their predators illustrated the value of integrated long-term investigations in special selected areas of the Southern Ocean. A need was identified to link biological studies more closely to other investigations of physical oceanography and climatology. The suitability of certain sites for studies of processes and their variability was discussed. Concurrently with the improvement of data sets, modelling approaches should be designed to test hypotheses on biology that are linked to the physics of the Southern Ocean.

4. KRILL VARIABILITY DETECTED FROM PREDATOR STUDIES

The question of the extent to which studies of predators can provide useful information on the variability of physical, biological, temporal and spatial components of ecosystem interactions was a common theme among the four papers presented in this section. Two contributions reported on the interannual variability of seabird and pinniped reproductive performance and foraging behaviour at South Georgia and the South Orkney. A third paper compared yearly changes in bubbler thickness of minke whales in

two IWC areas, the fourth outlined some aspects of trophic interactions between krill, squid and sperm whales. During the discussions it was found unlikely that it will be possible to extrapolate the results of studies in one area to the whole system. Recognizing the ecological diversity between geographic areas, monitoring studies are being planned by CCAMLR in several priority areas and on a variety of important indicator species and parameters.

5. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

It was realized that recommendations from the Seminar, although having no formal status, could nevertheless be brought to the attention of both the IOC Regional Committee for the Southern Ocean and the CCAMLR Working Group on Monitoring Programme Planning, meeting during the coming week, and perhaps thereby influence decisions reached at intergovernmental level. A brief outline of such recommendations follows:

1. Closer collaboration between meteorologists, physical and biological oceanographers should be promoted at all levels.

2. Exchange of information, in particular relevant publications and summary reports with improved lists of activities, cruises, data inventories, etc., should be developed.

3. Studies under the World Climate Research Programme are highly welcomed as relevant to meet many of the needs of the biologists. The second goal of the World Ocean Circulation Experiment Programme, a study of the Southern Ocean Circulation, and the associated UK Fine Resolution Antarctic Model (FRAM) were identified as particularly useful.

4. The usefulness of long time data series was appreciated. Some areas of the Southern Ocean in the Indian and Pacific Ocean sectors are not yet well covered, and proper long-term data collection should be initiated. Ways and means how data were collected should be better specified. It was realized that data from a certain position can often not be extrapolated to wider areas since they were collected on protected places.

5. Although it is appreciated that mean values of environmental parameters are needed to describe average conditions of atmospheric and oceanographic circulations and processes, it should be stressed that data at smaller temporal scale for definite months and years are required to enable their utilization jointly with biological data in the analysis of interactions in ocean and resources variability.

6. Besides of macro- and meso-scale investigations more micro-scale observations are required in the form of interdisciplinary process studies. Particular attention should be paid to the upper mixed layers and to the vertical stability of the water column.

7. Further extensive studies in the pack ice zone, particularly during the winter season, with close integration of work between meteorologists, oceanographers, glaciologists and biologists are encouraged.

8. Ships-of-Opportunity are a suitable means of collecting ground truth data for monitoring positions and variations in the various oceanic fronts (polar front, sub-antarctic front, Weddell/Scotia confluence) and the extent of ice. Improvements are required in the collection and reporting of such data.

9. Considerable further progress can be expected from increasing application of modern methods and techniques, like satellites and other remote sensors (planes, remotely operated underwater vehicles), drifters, drifting-buoys; moored instruments (current meters, sediment traps), and sea-level measurements with tidal gauges.

10. There appears to be a wealth of historical data, e.g. on atmospheric circulation over the Drake Passage, which have not yet been worked up sufficiently to be of immediate use for the analysis of Antarctic ocean and resources variability. The re-activation and evaluation of such data sets is encouraged.

APPENDIX

LIST OF CONTRIBUTIONS

(CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill Paris, 2-6 June 1987)

AINLEY, D.G.; FRASER, W.R.; DALY, K.L.: Effects of pack ice on the composition of micronektonic communities in the Weddell Sea.

BENGSTON, J.L.: Long-term trends in the foraging patterns of female Antarctic fur seals at South Georgia.

BOLTER, M.; v.BODUNGEN, B.; LIEBEZEIT, G.; MEYER, M.: The pelagic ecosystem of the Bransfield Strait, Antarctica: An analysis of microbiological, planktological and chemical characteristics by ordination techniques.

CROXALL, J.P.; McCANN, T.S.; PRINCE, P.A.; ROTHERY, P.: Variation in reproductive performance of sea birds and seals at South Georgia, 1976-1986 and its implication for Southern Ocean monitoring studies.

EL-SAYED, S.Z.: Seasonal and interannual variabilities in Antarctic phytoplankton with reference to krill distribution.

EVERSON, I.: Can we satisfactorily estimate variation in krill abundance?

GORDON, A.L.: Spatial and temporal variability within the Southern Ocean.

HUBOLD, G.; HEMPEL, I.: Zooplankton variability in the Weddell Sea.

KAUFELD, L.: Variability of the atmospheric circulation over the Drake Strait, Scotia Sea and Weddell Sea.

KELLERMAN, A.; KOCK, K.-H.: Patterns of spatial and temporal distribution and their variations in early life stages of Antarctic fish in the Antarctic Peninsula region.

KOTTMEIER, S.T.; SULLIVAN, C.W.: Seasonal, primary, and secondary bacterial productivity in the pack ice as related to krill.

MAKAROV, R.R.; MASLENNYKOV, V.V.; SOLYANKIN, E.V.; SPIRIDONOV, V.A.; YAKOLEV, V.N.: Variability in population density of Antarctic krill in the western Scotia Sea in relation to hydrological conditions.

MARIN, V.: Fine scale variability to two Antarctic copepods north of Elephant Island.

MASLENNYKOV, V.V.; SOLYANKIN, E.V.: Patterns of fluctuation in the hydrological conditions of the Antarctic and their effect on the distribution of Antarctic krill.

MILLER, D.G.M.; MONTEIRO, P.M.: Variability in the physical and biotic environment of the Antarctic krill (Euphasia superba Dana), south of Africa: some results and a conceptual appraisal of important interactions.

MURPHY, E.J.; MORRIS, D.J.; WATKINS, J.L.; PRIDDLE, J.: Scales of interaction between Antarctic krill and the environment.

NAGATA, Y.; MICHIDA, Y.; UMIMURA, Y.: Variation of positions and structures of the oceanic fronts in the Indian sector of the Southern Ocean in the period from 1965 to 1986.

NAST, F.; KOCK, K.-H.; SAHRHAGE, D.; STEIN, M.; TIEDTKE, J.E.: Hydrography, krill and fish and their possible relationships around Elephant Island.

NEMOTO, T.; OKIYAMA, M.; IWASAKI, N.; KIKUCHI, T.: The direct and indirect impacts of variable predation on the krill (Euphasia superba) by squids and on squids by sperm whales in the Antarctic Ocean.

PRABHU MATONDKAR, S.G.; PANT, A.; PARULEKAR, A.H.: Biological productuvity off Queen Maud Land, Antarctica during 1981 to 1986.

PRIDDLE, J.; CROXALL, J.P.; EVERSON, I.; HEYWOOD, R.B.; MURPHY, E.J.; PRINCE, P.A.; SEAR, C.B.: Large-scale fluctuations in distribution and abundance of krill. - A discussion of possible causes.

RAKUSA-SUSZCZEWSKI, S.: Differences in the hydrology, biomass and species distribution of plankton, fishes and birds in the Bransfield Strait and the Drake Passage during FIBEX 1981 and SIBEX 1983/84.

SAHRHAGE, D: Overview on indications for Antarctic ocean and marine resources variability.

SHIMADZU, Y.: An analysis of yearly change in the blubber thickness of minke whales as an indicator of krill availability.

SIEGEL, V.: A concept of seasonal variation of krill (Euphasia superba) distribution and abundance west of the Antarctic Peninsula.

SIEVERS, H.A.; NOWLIN, W.D.: Upper ocean characteristics in the American sector of the Southern Ocean, 39° - 95°W.

SMITH, W.O.; KEENE, N.K.; COMISO, J.C.: Potential interannual variability in primary productivity of the Antarctic marginal ice zone.

STEIN, M.: Variation of geostrophic circulation off the Antarctic Peninsula and in the Scotia Sea, 1975-1985.

VAN LOON, H.; SHEA, D.J.: A survey of the atmospheric elements at the ocean's surface south of 40°S.

VERLENCAR, X.N.; SOMASUNDAR, K.; QASIM, S.Z.: Nutrient anomalies in relation to plankton production in the Indian Sector of the Antarctic Ocean.

WITEK, Z.; KALINOWSKI, J.; GRELOWSKI, A.: Formation of Antarctic krill concentrations in relation to hydrodynamic processes and social behaviour.

WORMUTH, J.H.: Interannual variability in Antarctic zooplankton populations around the tip of the Antarctic Peninsula.

ANNEX IV

THE INTERNATIONAL BIOMASS PROGRAM AND FOLLOW-UP ACTIVITIES

Sayed Z. El-Sayed
Chairman, BIOMASS Executive Committee

Recent activities of the BIOMASS program include meetings and data analysis workshops, full operation of the BIOMASS Data Centre, the organization and meetings of the BIOMASS Data Centre Advisory Group, and a shift in the responsibility for guiding the BIOMASS program from the SCAR Group of Specialists on Southern Ocean Ecosystems and Their Living Resources (also known as SCOR WG 54) to the BIOMASS data analysis and data interpretation. Highlights are detailed here.

OPERATION OF BIOMASS DATA CENTRE

DATA COLLECTION

The BIOMASS Data Centre, located at the British Antarctic Survey (BAS), Cambridge, U.K., is now fully operational. The Data Centre has transferred the complete set of data for the FIBEX cruises from the database in Frankfurt, Federal Republic of Germany, and is in the process of loading and validating SIBEX data. Once all SIBEX 1 and 2 data are loaded, the data base will be available for use by BIOMASS scientists. A recent networking experiment at Bremerhaven, F.R.G. demonstrated that authorized scientists may be able to access the computer system at Cambridge from anywhere.

Two publications to facilitate use of the Data Centre, an introductory brochure and a users manual, are being prepared.

FUTURE WORKSHOPS

The BIOMASS program was the first major international collaborative effort to study the Antarctic marine ecosystem and to provide the necessary information for the wise management of the marine living resources. With the successful completion of FIBEX and SIBEX, and the establishment of the BIOMASS Data Centre, the program has now entered a new phase of data analysis and data interpretation. To ensure that full advantage is taken of the enormous amount of data collected, further evaluation of the existing data is necessary. To this end, a series of workshops to process information and report on findings is being held. These workshops are both disciplinary (e.g., krill, fish, birds, etc.) and interdisciplinary (e.g., ecosystem modelling) in nature. A final meeting to evaluate the decade of BIOMASS (1976-1986) is planned for 1989. Workshops include:

Krill Physiology and Biochemistry

Objectives are to focus on future areas for research through an exchange of information about current projects. Topics include: reproduction, feeding, moulting, oxygen consumption, seasonal biochemistry, energetics of larval development, and lipofuscins and their value in age determination. After an initial planning meeting, a workshop to discuss current research and decide upon topics most in need of attention was held 15-17 September 1986 at the Laboratoire Oceanologique de Rimouski, Quebec, Canada. Fifteen scientists representing seven countries participated in exchanges which centered on aspects of the energy budget of krill that have received attention since the previous meetings in Wilmington (1982) and Bremerhaven (1983). Much discussion focussed on the reproductive biology of krill. A second workshop, to review results, will be held in 1989. Venue of the first workshop is the Institut national de la recherche scientifique-Oceanology, Quebec, Canada.

Fish Ecology

Objectives are to validate SIBEX data oriented to ichthyoplankton, including mesopelagic fish and formulate objectives for a final evaluation workshop. The first workshop, dedicated to the validation of the fish data transferred to the BIOMASS Data Centre, took place 6-17 October 1986 at the Data Centre. Scientists from six countries met to assess species identification, then compare the digitized information to actual specimens to arrive at a standard scheme for describing some of the more difficult specimens. Another accomplishment was standardizing the descriptions of nets used, to improve accuracy between them. Despite the volume of work, the original aim of establishing a stable base was accomplished. A second workshop, devoted to the validation of SIBEX fish results, will follow in October 1987, also at the Data Centre.

Catch per Unit of Effort (CPUE) as an Estimator of Krill Abundance

The goals of this workshop are to determine the extent to which CPUE (catch per unit of effort) of individual vessels and fleets can be used as an estimator of abundance over large-scale areas of the Southern Ocean. A planning meeting, venue undetermined, will be held in late 1987. The workshop will be held at the BIOMASS Data Centre.

Phytoplankton/Zooplankton Relationship

This workshop will focus on species as indicators of water masses; patchy and vertical distribution in relation to bottom topography; interaction between species; seasonal succession and annual variation of species composition and biomass; relation between phytoplankton and zooplankton. Two workshops will be held back-to-back: the first one, on South Atlantic data, will be held in Rio de Janeiro, Brazil, 5-7 October 1987; the second will follow immediately (14-16 October) in College Station, Texas, U.S.A., with a participant from the Rio meeting attending to report on it.

Physical and Chemical Oceanography

Objectives of this workshop were to analyze SIBEX data and prepare the results in a form which may be used during the interpretation of SIBEX biological data. A data preparation session was followed by a data evaluation session, both held in March 1987 at the BIOMASS Data Centre. The data sets analyzed reflected seasonal changes from early spring through early autumn 1984/85 (SIBEX I), during FIBEX, and in other years. Preparation of data for evaluation involved charting the temporal changes in the distribution of the different water masses, geostrophic current flow, frontal zones, and the relation of chlorophyll a concentration to these features as well as the stability of the upper 200 m of water and nutrient concentrations.

Krill Acoustic Workshop

The purpose of this workshop will be to analyze SIBEX krill abundance data once they are added to the data base and validated. Venue and dates not yet determined.

BIOMASS PUBLICATIONS

Throughout the BIOMASS program, findings have been reported through numerous publications in the BIOMASS Scientific Series, BIOMASS Report Series, BIOMASS Handbook Series, and the BIOMASS Newsletter. The printing of the BIOMASS Handbook Series has been completed, while meetings and workshops continue to be detailed in the BIOMASS Report Series. The BIOMASS Newsletter, featuring news of interest to the BIOMASS community, is published each July and December.

TOWARD A "MORE-FOCUSSED" POST-BIOMASS PROGRAM

A review of recent FIBEX and SIBEX results has shown that despite the large quanitities of data collected, much remains to be achieved. At present, some of the deficiencies are being addressed by ongoing or proposed programs. These include:

INTERNATIONAL TARGET STRENGTH STUDY

Definitive target strength experiments of Euphasia superba are recognized as being of utmost importance for making better use of both present and future acoustic data.

INTERNATIONAL KRILL PHYSIOLOGY PROJECT

Physiological studies of krill growth, energy requirements, and metabolic rates are extremely important for understanding the ecological relationships in the Southern Ocean.

INTERNATIONAL WEDDELL SEA WINTER STUDIES

The objective of these ongoing studies is to provide relevant information on the physical/chemical components of the marine ecosystem of the area, in particular:

(i) to describe the physical/chemical factors governing the distribution, abundance, productivity, and behaviour of marine organisms, especially phytoplankton, zooplankton (including krill), and fishes;

(ii) to describe the short- and long-term environmental fluctuations governing the biology of the organisms under the ice cover; and

(iii) to describe the behaviour of the penguins and seals in the pack-ice.

Both the Federal Republic of Germany and the U.S.A. (the latter, through its Antarctic Marine Ecosystem in the Ice Edge Zone [AMERIEZ] program) are presently involved in these winter studies.

OTHER "SPIN-OFF" RESEARCH PROGRAMS FROM THE BIOMASS PROGRAM

These might include the following:

Krill biology and its relation to the environment

Krill biology is still a research field of high priority. Key topics that need to be addressed include:

(i) growth and mortality in different areas;

(ii) spawning success and recruitment mechanisms;

(iii) stock separation and migration patterns;

(iv) krill survival underneath the ice in winter.

All of these topics should be viewed in relation to the biotic and abiotic environment of the krill.

Methodology for abundance estimates of krill

Solving the great uncertainties regarding target strength and net avoidance calls for concerted internation action in areas of hydroacoustics and net sampling.

Research on other dominant components of the ecosystem

These components include fish, squid, and key predators, which have to some extent subordinated to krill research.

COMPLEMENTARY RESEARCH PROGRAMS WITH CCAMLR

The Scientific Committee of the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has the responsibility of providing information and management advice about the Southern Ocean ecosystem and its living resources. The necessary research cannot be handled by CCAMLR alone. There is need for co-operation between SCAR and

its subsidiary bodies and CCAMLR on several key research activities. For instance, the proposed collaborative International Studies of Krill Physiology and Biochemistry currently being formulated (under SCAR/BIOMASS auspices) are an example of how SCAR/BIOMASS's expertise can be drawn upon to provide essential background information for the management-oriented activities of CCAMLR.

Those who are involved in BIOMASS view the role of BIOMASS, or any SCAR-co-ordinated successor to the program, as providing assistance to and co-operating with CCAMLR. It is assumed that this policy of co-operation and assistance is a mutual one, with BIOMASS and CCAMLR each having unique strengths and resources. The BIOMASS community has developed a level of competence and expertise capable of advancing basic scientific understanding of the Antarctic marine ecosystem and can thus make a valuable contribution to CCAMLR in its mandate to conserve the living resources of the Antarctic within the context of the ecosystem.

As an example of this assistance and co-operation, CCAMLR will be able to draw upon the competence and expertise of the BIOMASS community in planning and carrying out its long-term ecosystem monitoring program designed to assess seasonal and interannual variability of the biological, chemical, and physical oceanographic parameters and processes at selected sites. Such a research effort would be of great interest to SCAR/SCOR, as well as CCAMLR.

The essential components of an ecosystem monitoring program are outlined in the report of the CCAMLR ad hoc Working Group on Ecosystem Monitoring. The working group has identified the species targeted for research; the broad categories of parameters to be monitored for predator species (i.e., reproduction, growth, and feeding behaviour, abundance, and distribution); potential areas and sites for ecosystem monitoring (with special emphasis on Prydz Bay, Bransfield Straight, and South Georgia regions); and the hydrographic features to be investigated in relation to temporal and spatial scale effects on the availability of prey to regional predator populations.

Future collaborative research between SCAR and CCAMLR should be planned so the activities complement rather than compete with each other. Necessarily, CCAMLR must concentrate its efforts on directed research, while SCAR (and SCOR) must concentrate on basic research. To co-ordinate and maximize collaborative efforts, formal links between CCAMLR and SCAR would be desirable.

CO-OPERATIVE RESEARCH WITH OTHER INTERNATIONAL PROGRAMS

Antarctic Sea Ice Studies

The seasonal advance and decay of sea ice around the Antarctic continent, a unique physical feature of the region, plays a dominant role in determining the overall structure of this ecosystem. It is likely that interannual variability in this process has a significant impact on the recruitment success of Antarctic krill and perhaps other species.

The proposed ten-year program for an international collaborative study of the Antarctic Sea Ice Zone includes a biological component. The expertise and competence developed by scientists from the Federal Republic of Germany, U.S.A., and other countries while pursuing their Weddell Sea winter studies should ensure that the new program will significantly contribute to a better understanding of the pack-ice ecosystem.

WORLD OCEAN CIRCULATION EXPERIMENT (WOCE)

WOCE is an international program being co-ordinated under the SCOR/IOC Committee on Climatic Changes and the Ocean as a major marine science contribution to WMO/ICSU, World Climate Research Programme. The primary scientific objective of WOCE is "... to understand the general circulation of the global ocean well enough to be able to model its present state and predict its evolution in relation to long-term changes in the atmosphere".

Starting in 1987, WOCE will begin working on the first comprehensive global survey of physical properties of the oceans which it is expected to provide by 1995. The resulting data will be used to establish the first "global baseline" for long-term behaviour of the ocean and to test computer models of the ocean circulation, which are vitally needed to understand climate and to predict climate change.

The Southern Ocean has been identified for one of the three Core Projects that will have top priority in WOCE Goal 1 (i.e., developing models useful for predicting climate change and to collect the data necessary to test them). It behooves Antarctic marine biologists to take advantage of this unique opportunity by joining forces with the physical and metorological oceanographers in a collaborative effort to study the influence of the abiotic factors on the temporal and spatial variabilities of the major components of the Southern Ocean ecosystem.

SCAR GROUP OF SPECIALISTS ON SOUTHERN OCEAN ECOLOGY

In expressing its concern about the disbanding of the SCAR Group of Specialists on Southern Ocean Ecosystems and their Living Resources and noting the possible vacuum created by the demise of this group, the SCAR Biology Working Group recommended to SCAR (at its XIX meeting in June 1986) the establishment of a new Group of Specialists on Southern Ocean Ecology. The new group will identify important fields of research on Antarctic marine ecology and will propose co-operative studies, including multiship experiments. It will encourage and facilitate interdisciplinary studies in Antarctic marine ecosystems. It will develop Southern Ocean ecosystems studies through workshops and other activities. It will respond through SCAR to requests for scientific advice from the Antarctic Treaty as well as the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) and other international organizations with interest in science, resources, and conservation in the Southern Ocean. Such advice will include possible impacts on marine ecosystems from fishing and potential mineral exploitation.

ANNEX V

OCEAN OBSERVING SYSTEMS IN THE SOUTHERN OCEANS

1. Proposed GLOSS sea-level stations (Appendix 1)

2. BATHY observations in the Southern Ocean for 1986 (Appendix 2)

3. Drifting buoys in the Southern Ocean in July 1986 and February 1987 (Appendix 3)

APPENDIX 1

PROPOSED GLOSS SEA-LEVEL STATIONS

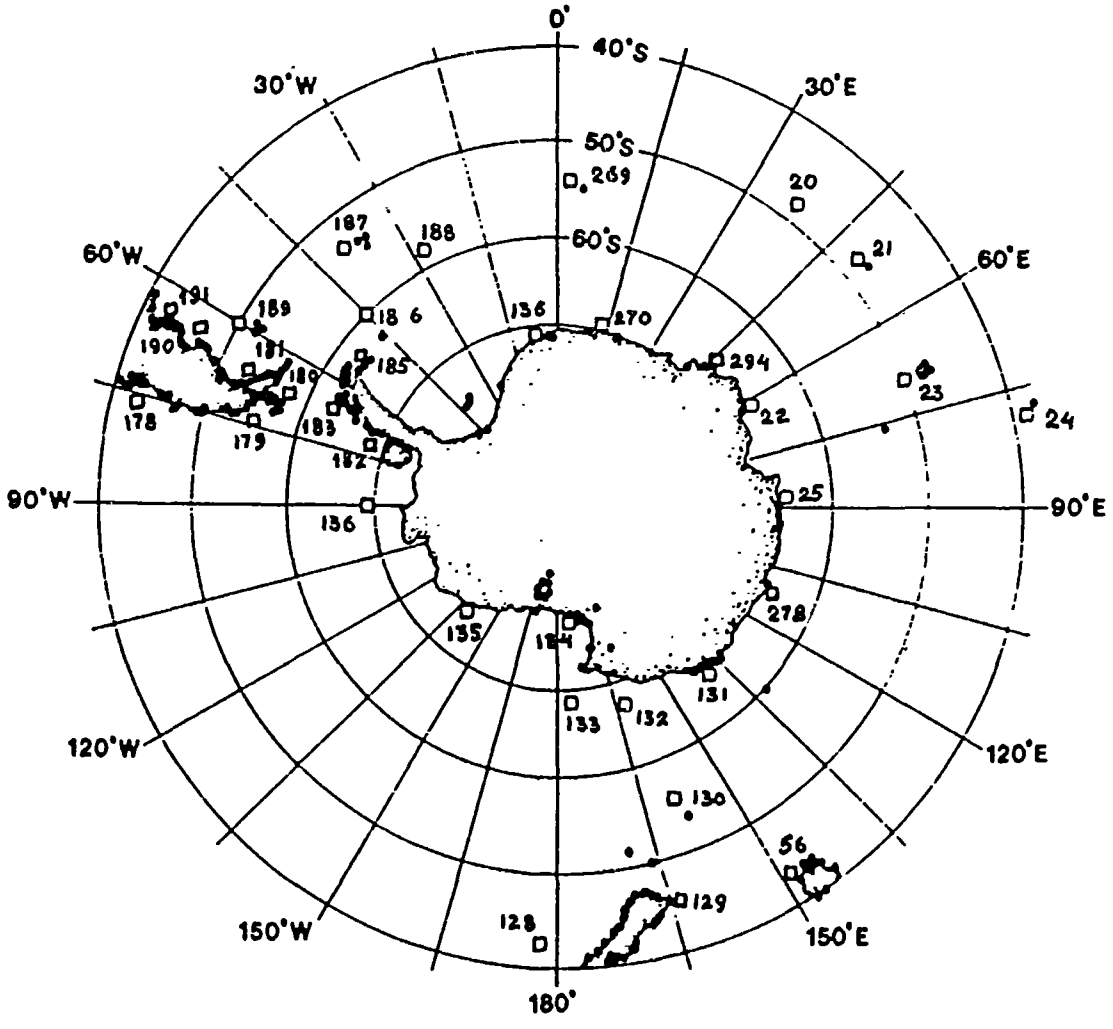


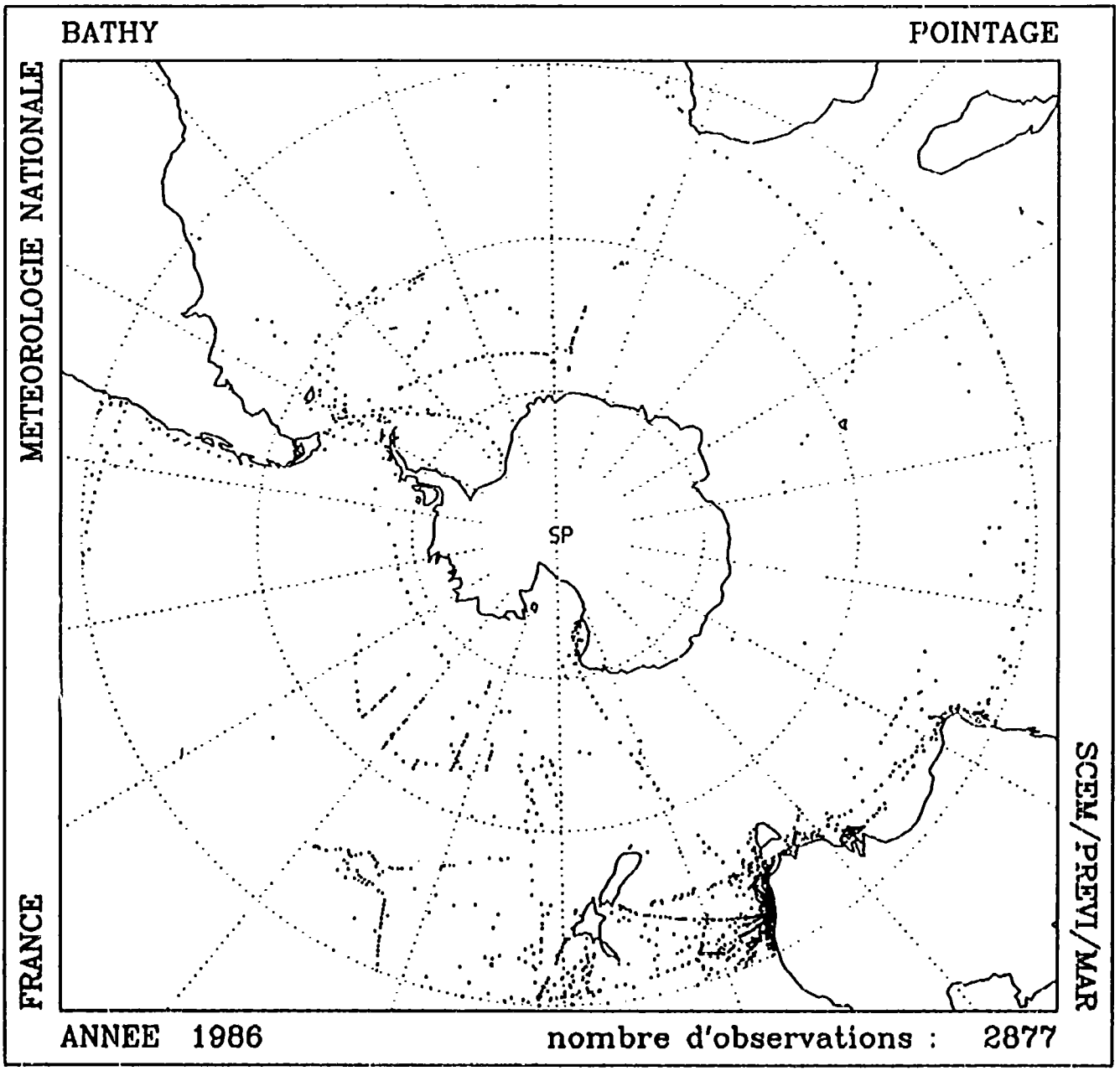
Fig. 1 Sea-level records exist from position indicated by solid circles (Lutjeharms, 1980). Proposed sea-level stations according to GLOSS Implementation Plan (IOC/INF-663 rev.) are indicated by open squares.

I O C S O C

NN	STATION	COUNTRY	CO-ORDINATES	TYPE OF TIDE-GAUGE	O	PERIOD OF OBSERVATION FROM - TO	EXISTING STATION ***	Q **	C *	PARTICIPATION IN OTHER INTERNATIONAL ACTIVITIES (PSMSL.TOGA, ISLPP, ITSU)
186	Bahia Scotia	Argentina	60-44S 044-39W		S		0	Q	C	
185	Esperanza	Argentina	63-18S 56-55W	ST (K)	S	1959-1978	0	Q	C	
184	Base TTe Jubany	Argentina	62-14S 058-40W		S		0	Q	C	
190	Puerto Deseado	Argentina	47-45S 065-55W	ST (B)	A	1970	+	Q	C	
191	Puerto Madryn	Argentina	42-46S 065-02W	ST (K)	A	1945	+	Q	C	
181	Ushuaia	Argentina	54-49S 068-13W	ST (B)	A	1953	+	Q	C	
278	Casey	Australia	66-17S 110-32E		S		0	Q	C	
56	Hobart	Australia	42-53S 147-20E	K (F)	S	1960	+	Q	C	
130	Macquarie Is.	Australia	54-30S 158-58E		S		0	Q	C	
22	Mawson	Australia	67-36S 62-52E		S		0	Q	C	
178	Puerto Montt	Chile	41-29S 072-58W	BGTG	P	1945	+	Q	C	
180	Puerto Williams	Chile	54-56S 067-37W	SFG	P	1964	+	Q	C	
179	Punta Arenas	Chile	53-10S 070-54W	BGTG	P	1944	+	Q	C	
21	Crozet Is.	France	46-25S 051-52E		I		0			
131	Dumont d'Urville	France	66-40S 139-50E		S		0			
23	Kerguelen Is.	France	49-21S 070-12E		I		0			
24	St. Paul	France	38-43S 077-35E		I		0			
132	Balleny Is.	New Zealand	66-35S 162-50E		S		0			
129	Bluff Harbour	New Zealand	46-36S 168-21E	FG	P	1920	+	Q	C	
128	Chatham Is.	New Zealand	43-50S 176-30W		P		0			
133	Scott Is.	New Zealand	67-00S 175-00E		S		0			
269	Bouveteya (Bouvet Is.)	Norway	54-22S 03-22E		A					
136	Peter Is.	Norway	68-47S 090-35W		S		0			
20	Marion Prince Edward Is.	PSMSL	46-35S 37-56E		I		0			
187	South Georgia	U.K.	54-15S 036-45W		A	1957-1959	0			
296	South Orkney	U.K.	60-35S 045-30W		A	-				
188	South Sandwich Is.	U.K.	57-45S 026-30W		A	-				
182	Rothera	U.K.			A					
189	Stanley, Malvinas Falkland Is.		51-42S 057-52W		A	1964-1974	0			
134	Mc Murdo	U.S.A.	77-30S 168-00E		S					
183	Palmer	U.S.A.			S					
270	Novolazarevskaya	U.S.S.R.	70-46S 011-50E		S					
25	Mirny	U.S.S.R.	66-40S 093-00E		S					
294	Molodezhnaya	U.S.S.R.	67-45S 046-00E		S					
135	Russkaya	U.S.S.R.	74-45S 136-30W		S					

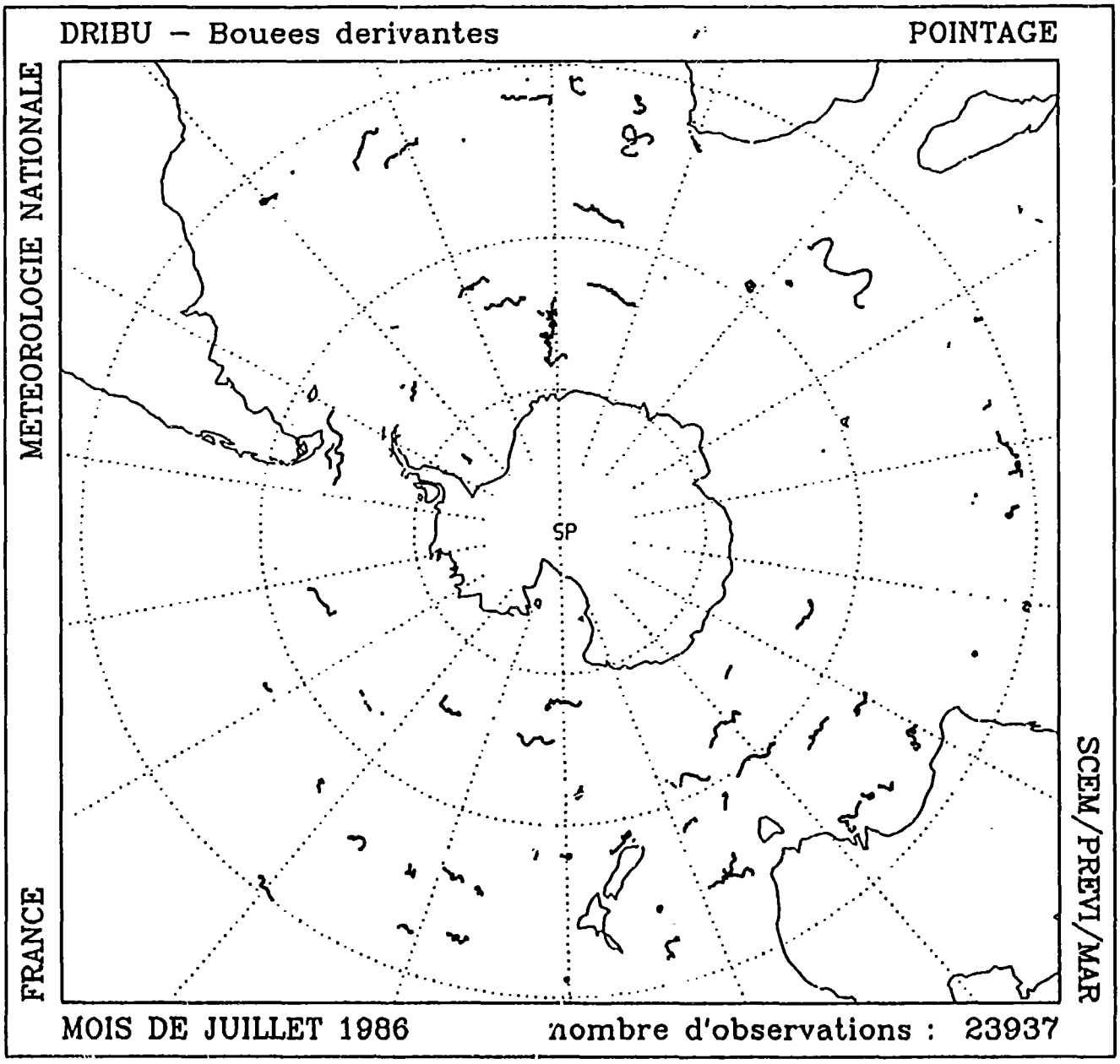
Ocean: P - Pacific; I - Indian; A - Atlantic; S - Southern; Ar - Arctic; M - Mediterranean Sea
* C - the station committed to GLOSS
** Q - questionnaire has been received
*** + station exist; 0 station does not exist

APPENDIX 2

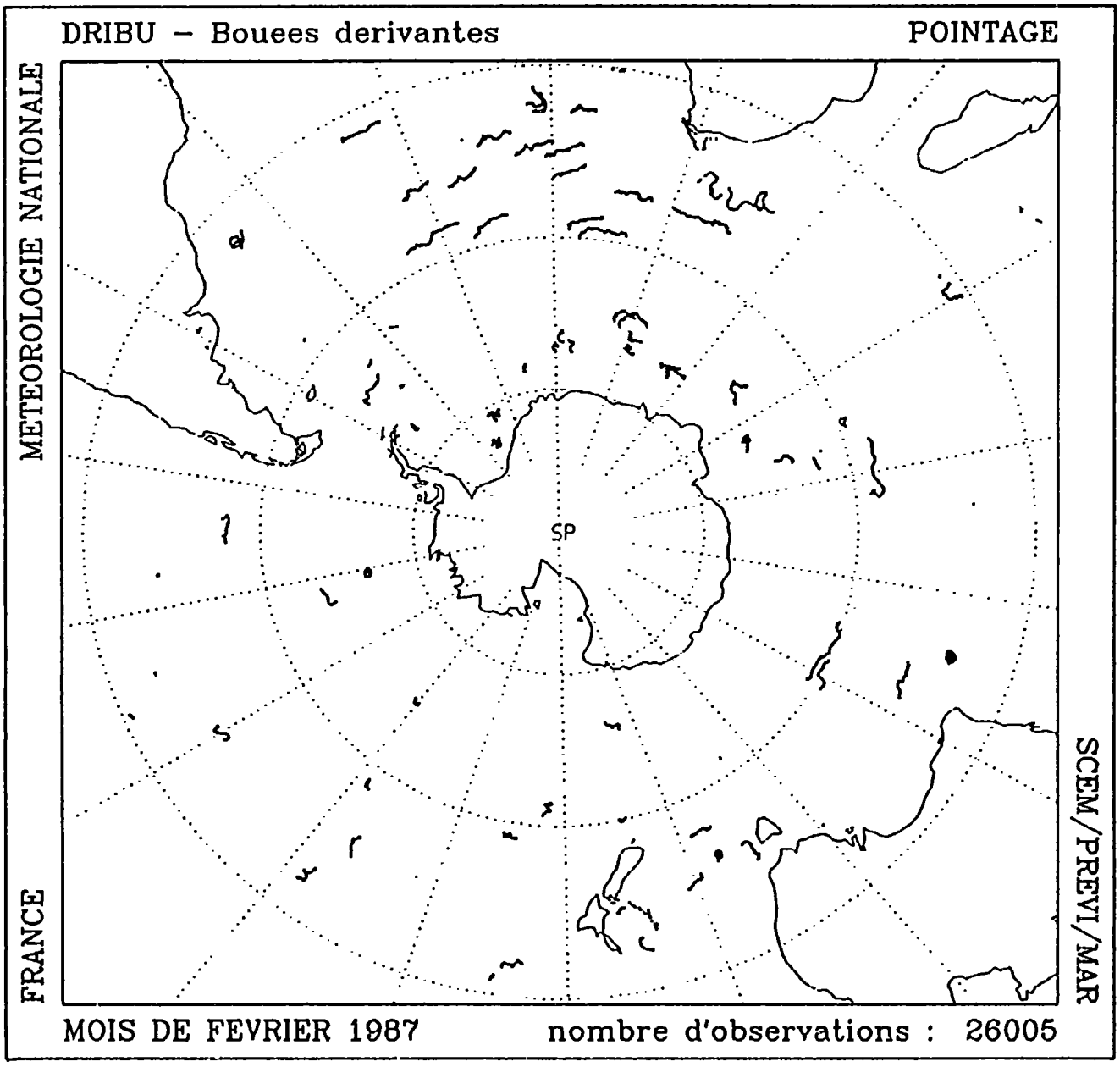


BATHY observations in the Southern Ocean for 1986
(presented by Meteorologie Nationale, France)

APPENDIX 3



Drifting buoys in the Southern Ocean
(July 1986)



Drifting buoys in the Southern Ocean
(February 1987)

ANNEX VI

LIST OF DOCUMENTS

Document Code	Title
WORKING DOCUMENTS	
IOC/SOC-V/1 prov	Provisional Agenda
IOC/SOC-V/2	Annotated Provisional Agenda
IOC/SOC-V/3	Summary Report
IOC/SOC-V/4	List of Documents
IOC/SOC-V/5	List of Participants
IOC/SOC-V/6	Report on Intersessional Activities
IOC/SOC-V/7	Reports of Member States and International Organizations
IOC/SOC-V/8	Action Paper
IOC/SOC-V/8 Annex 1	SOC Regional Component of GLOSS
IOC/SOC-V/8 Annex 2	Regional Component of IGOSS XBT Ship-of-Opportunity Programme
IOC/SOC-V/8 Annex 3	Oceanographic Data Management in support of SOC
IOC/SOC-V/8 Annex 4	Drifting Buoy Activities in the Southern Ocean
IOC/SOC-V/9	Executive Summary and Recommendations of the CCAMLR-IOC Scientific Seminar on Antarctic Ocean Variability and its Influence on Marine Living Resources, particularly Krill
IOC/SOC-V/10	Report on BIOMASS and Follow-up Activities

N.B. THIS LIST IS FOR REFERENCE ONLY. NO STOCKS OF THESE DOCUMENTS ARE MAINTAINED.

ANNEX VII

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