The International Council for Science

ISSN 1998-0337

SCAR bulletin

No. 177 June 2011

SCAR Annual Report 2010

Published by the

SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

at the

Scott Polar Research Institute, Cambridge, United Kingdom

SCAR Annual Report 2010

Table of Contents

1. Background

The Scientific Committee on Antarctic Science (SCAR) is a non-governmental, Interdisciplinary Scientific Body of the International Council of Science (ICSU), and Observer to the Antarctic Treaty and the United Nations Framework Convention on Climate Change.

SCAR's mission is to be the leading, independent, non-governmental facilitator, coordinator, and advocate of excellence in Antarctic and Southern Ocean science and research. Secondly, SCAR's mission is to provide independent, sound, scientifically-based advice to the Antarctic Treaty System and other policy makers including the use of science to identify emerging trends and bring these issues to the attention of policy makers.

2. Introduction

SCAR's scientific research adds value to national efforts by enabling national researchers to collaborate on large-scale scientific programmes to accomplish objectives not easily obtainable by any single country. SCAR's members currently include scientific academies of 36 nations and 9 ICSU scientific unions.

SCAR provides independent scientific advice in support of the wise management of the Antarctic environment, in partnership with the Antarctic Treaty Parties and other bodies such as the CEP, CCAMLR, COMNAP, and ACAP.

SCAR's success depends on the quality and timeliness of its scientific outputs, which in most cases are assessed through external peer-review. Descriptions of SCAR's research programmes and scientific outputs are available at www.scar.org and are summarised in this paper.

SCAR produces an electronic quarterly Newsletter highlighting relevant science and other SCAR related issues (http://www.scar.org/news/newsletters/issues2011/SCARnewsletter26_Mar2011.pdf). Please email info@scar.org if you would like to be added to the mailing list.

3. SCAR Past and Future Highlights

SCAR Highlights for 2010:

1. SCAR published its new Strategic Plan 2011-2016, "Antarctic Science and Policy Advice in a Changing World" (http://www.scar.org/strategicplan2011/). SCAR's new Strategic Plan 2011-2016 aims to foster a sense of dedication and commitment in SCAR members and the community it serves to ensure realisation of the organisation's vision, mission and goals. The Strategic Plan guides collective decision-making about priorities and resource allocation.
2. In August 2010 SCAR held its Business meetings, Open Science Conference and Delegates' Meeting in Buenos Aires, Argentina. The Open Science Conference attendance was over 800 and it was particularly gratifying to see a large number of students and early career researchers attending.
3. Several new SCAR research groups were officially approved at the Delegates' Meeting in Buenos Aires, including the Scientific Research Programme Astronomy and Astrophysics from Antarctica (AAA), Action Groups on

Southern Ocean Acidification, Multibeam Data Acquisition, and Antarctic Clouds and Aerosols. New Expert groups on Advancing TecHnological and ENvironmental stewardship for subglacial exploration in Antarctica (ATHENA) and Operational Meteorology in the Antarctic (OPMet) were also established. For further details see Section 4.

4. Planning for next generation of SCAR Scientific Research Programmes moved ahead in earnest with four new planning groups approved (State of the Antarctic Ecosystem (AntEco), Antarctic Ecosystems: Adaptations, Thresholds and Resilience (AntETR), Past and Future Change of the Antarctic Environment (PACE) and Solid Earth Responses and Influences on Cryospheric Evolution (SERCE) – for further details see Section 4.

5. Monaco became the latest country to join the SCAR family, having successfully applied to become an Associate Member of SCAR in 2010.

6. Professor Helen Fricker was awarded the 2010 Martha T Muse Prize for Science and Policy in Antarctica. Professor Fricker is widely recognized for her discovery of active subglacial lakes. She has shown that these lakes form dynamic hydrologic systems where one lake can drain into another in a short period of time. She is also known for her innovative research into Antarctic ice shelf mass budget processes such as iceberg calving and basal melting and freezing.

7. A Southern Ocean Observing System (SOOS) International Project Office was established in Australia, supported by the new Institute for Marine and Antarctic Studies at the University of Tasmania in Hobart (www.imas.utas.edu.au). This is a crucial step in implementing the SOOS.

8. SCAR, with the Association of Polar Early Career Scientists (APECS), and the International Arctic Science Committee (IASC) were awarded funding from the International Council for Science (ICSU) for a project "Education and Outreach Lessons from the International Polar Year".

9. The Ice Sheet Mass Balance and Sea Level: A Science Plan (ISMASS, http://www.scar.org/publications/reports/Report_38.pdf) was finalised. ISMASS is also now co-sponsored by the International Arctic Science Committee (IASC).

10. The Census of Antarctic Marine Life (CAML, www.caml.aq), which has identified more that 1000 new species, officially ended in 2010. The final legacy of CAML is still being explored, with a follow-up workshop in 2011 in Aberdeen, Scotland.

11. SCAR appointed a new SCAR Executive Officer, Dr Renuka Badhe. Renuka is from India, and holds dual Indian (OCI) and British citizenship. She is a marine biologist (PhD from the British Antarctic Survey) but with some policy background (Mphil from Cambridge University in Environmental Policy) and work experience with IUCN.

12. Several important publications of note were completed in 2010, including the International Polar Year Summary Report (http://www.arcticportal.org/ipy-joint-committee); a new book on the 'History of the International Polar Years' (http://www.springer.com/earth+sciences+and+geography/oceanography/book/978-3-642-12401-3) and a book on Science Diplomacy: *Antarctica,*

Science and the Governance of International Spaces (http://www.scholarlypress.si.edu/index.cfm) that was written as an outcome of the Antarctic Treaty Summit (www.atsummit50.aq). Printed copies of the Antarctic Climate Change and the Environment report are available on-line. For further details please email info@scar.org.

SCAR: Future Highlights

SCAR is involved in several major meetings over the next year (http://www.scar.org/events/), including:

- A Workshop on Antarctic Conservation for the 21st Century (31st May to 2nd June 2011), Nelspruit, South Africa – S. Chown will present a "non-paper" to the CEP, updating Parties on the preliminary outcomes of this workshop.
- ISAES XI - 11th International Symposium on Antarctic Earth Sciences 10 - 15 July 2011, Edinburgh, Scotland, UK (http://www.isaes2011.org.uk/)
- SCAR Executive Committee Meeting, 18 - 19 July 2011, Edinburgh, UK
- Symposium on Research Urgencies in the Polar Regions, 23 - 24 September 2011, Siena, Italy (http://www.mna.it/english/News/ICSU_symposium/)

The next SCAR science conference entitled "Antarctic Science and Policy Advice in a Changing World" will be in Portland, USA (July 16-19, 2012). This will follow the International Polar Year (IPY) Conference - "From Knowledge to Action" in Montreal, Canada (http://www.mna.it/english/News/ICSU_symposium/) (http://www.ipy2012montreal.ca/001_welcome_e.shtml).

Several other workshops are in the planning stages, for example on Ice Sheet Mass Balance and the relation to sea level and on Observing Systems in the Antarctic and Southern Ocean region.

4. SCAR Programmes and Groups

During 2010, SCAR's research focused on a wide variety of themes (for a full list see http://www.scar.org/about/introduction/organization/ and Appendix 1). A brief summary of progress with each group is summarised below:

4.1 SCAR Scientific Research Programmes (SRPs)

SCAR's Scientific Research Programmes (SRPs) focus efforts on a limited number of high priority topical areas. These programmes have a finite duration, usually six to eight years, to allow for regular renewal and updating of SCAR's science activities and encouragement of broad participation in SCAR science. For 2010 these were:

4.1.1 Astronomy and Astrophysics from Antarctica (AAA)

As a newly-formed SRP, the main activity of the AAA to date has been the establishment of a set of working groups to manage the operation of the programme. Each of these working groups has been engaged in the formulation of detailed implemntation plans. These working groups are:

- Working Group A: Site testing, validation and data archiving. Chair: Jon Lawrence, Vice-chair: Tony Travouillon

- Working Group B: Arctic site testing. Chair: Michael Andersen, Vice-chair: Eric Steinbring
- Working Group C: Science goals. Chair: Michael Burton, Vice-chair: Hans Zinnecker
- Working Group D: Major new facilities. Chair: John Kovac, Vice-chair: Xuefei Gong

Site testing work in Antarctica at Amundsen Scott (South Pole), Concordia (Dome C) and Kunlun (Dome A), and in the Arctic at SUMMIT (Greenland) and Ellesmere Island (Canada) is proceeding well. The first tranche of data from the Chinese "CSTAR" experiment at Kunlun is now on-line at http://archive.bao.ac.cn/en/cstar/query.html, and real-time status information from the PLATO experiment at Kunlun can be found at http://mcba11.phys.unsw.edu.au/~plato/

Future Plans

AAA will hold its kick-off meeting in Sydney from 29 June – 1 July 2011.

Site testing at the Japanese Dome Fuji station will commence in early 2011, while deployment of a US/Australian automated experiment to Ridge A is planned for the end of the year.

AAA is discussion with SCAR's Scientific Committee on Antarctic Data Management (SCADM) on the most appropriate way to handle the site-testing and astronomical data sets that already exist, plus the much greater volume that will be acquired in the coming years. Kim Finney, Chief Officer of SCADM, has joined the Site testing, Validation and Data Archiving Working Group of AAA, and is helping to draft appropriate protocols.

Publicity of SCAR AAA within both the astronomical and Antarctic research communities is ongoing. For further details see: http://www.astronomy.scar.org/

4.1.2 Antarctic Climate Evolution (ACE)

ACE represents the interests of a large land and marine geoscience research community focusing in deciphering the record of the onset and the response of the Antarctic ice sheets to past climate changes across a range of time scales. ACE coordinates the integration between geophysical and geological records of past ice sheet behaviour and coupled ice sheet models. Understanding the response of large ice masses to climatic forcing is relevant because ice-volume variations impact global sea level and also alter the capacity of ice sheets and sea ice to act as major heat sinks/insulators. For further details see: http://www.ace.scar.org/.

Progress

ACE has made substantial progress in 2010 in programmes that cover some of the original objectives for ACE:

- The Integrated Ocean Drilling Program (IODP) Expedition 318 drilled the Wilkes Land margin (4 January-9 March). The recovered cores represent ~53 m.y. of Antarctic history from an ice-free "greenhouse Antarctica," to the first cooling, to the onset and erosional consequences of the first glaciation and the subsequent dynamics of the waxing and waning ice sheets, all the way to thick, unprecedented "tree-ring style" records with seasonal resolution of the last

deglaciation that began ~10,000 y ago. The Initial Reports Volume will be published in July 2011.

- The Antarctic Geological Drilling programme (ANDRILL) continues to develop results from its SMS and MIS Projects. A science meeting was held in Erice, Italy (April 2010) focusing on results from the SMS Project. The 2010-11 field season saw a major step forward for the Coulman High Project. Oceanographic equipment and a ROV were deployed through 270 m-thick ice and short sediment cores and new seismic data were obtained. These achievements help establish the case for deep drilling.
- The US-UK-AUS ICECAP programme completed its third season of airborne geophysics of the Aurora and Wilkes basins in East Antarctica. The new data shed new insights into former ice sheet dynamics and size. In addition, the UK completed the first airborne survey of the Institute and Moller ice streams in West Antarctica that help us understand modern flow processes and how these have changed in the past.
- The UK-led programme to undertake the direct measurement and sampling of Lake Ellsworth in West Antarctica remains on track for exploration in December 2012. A comprehensive environmental evaluation of the programme has recently been submitted to the Antarctic Treaty Committee on Environmental Protection.
- ACE is active in making the case for a more developed paleoclimate section for the next IPCC report. For this, T. Naish has been invited to contribute to the IPCC report in the section of pre-Quaternary paleoclimate. In addition, ACE continues to provide science-based advice to major scientific programmes (i.e., IODP and ERICON-Aurora Borealis (AB) Science Plans).
- ACE has links to the ice core community via IPICS and the ESF-ERANET Project HOLOCLIP; to the palaeoclimate community via PAGES of the IGBP; to the IASC programme on Arctic Palaeoclimate and its Extremes (APEX); and to drilling programmes such as are ANDRILL, SHALDRIL and the IODP.
- The ACE community is involved in education (i.e., the Urbino Summer School in Paleoclimate) and has been very active in education and outreach programmes within the ANDRILL and the IODP Programmes (e.g., http://www.andrill.org/education; http://www.youtube.com/user/OceanLeadership; http://www.iodp.org and http://www.iodp-usio.org/).

Future Plans

- Special ACE publication by Elsevier Palaeogeography, Palaeoclimatology, Palaeoecology: "Cenozoic Evolution of Antarctic Climates, Oceans and Ice Sheets¨ with selected review papers from the 1st ACE Symposium in 2009: F. Florindo, C. Escutia, R. DeConto, M. Bentley (Editors);
- Publication of the IODP Expedition 318 Wilkes Land Glacial History Initial Reports Vol;
- Research Media Special contribution on ACE;
- Continue providing science-based advise to major scientific programmes and contributing to the IPCC pre-Quaternary paleoclimates;

- Support of ACE activities during the ISAES meeting in Edinburgh, July 2011;
- Guiding the writing of the programme to succeed ACE;
- Coordinating and guiding the writing of a set of drilling proposals to IODP and ICDP;
- Special sessions, Town Meetings, and steering committee meetings at international meetings (e.g., EGU, ISAES, AGU);
- Support for Urbino graduate summer school in paleoclimatology.

4.1.3 Antarctica and the Global Climate System (AGCS)

Antarctica in the Global Climate System (AGCS) focuses on: (i) how does the modern climate system work in Antarctica and the Southern Ocean? (ii) how has it developed over roughly the last 10,000 years?; and (iii) how may it evolve over the next century? The results will be useful to the Intergovernmental Panel on Climate Change (IPCC) and others. For details see: http://www.antarctica.ac.uk/met/SCAR_ssg_ps/AGCS.htm. AGCS incorporates SCAR's International Trans-Antarctic Scientific Expedition (ITASE) and Antarctic Sea Ice Processes and Climate (ASPeCt) projects. AGCS and its sub-programmes are co-sponsored by SCAR and the World Climate Research Programme (WCRP). Members of AGCS have given public lectures, visited schools, prepared popular articles and made broadcasts on radio and television. AGCS has supported the development of the next generation of Antarctic scientists through close links with the Association of Polar Early Career Scientists (APECS).

Progress

AGCS led the preparation of a brief update on the Antarctic Climate Change and the Environment (ACCE) report. This will be a regular feature, with the update being presented to the Antarctic Treaty Consultative meeting. Amongst others, there were the following science highlights:

- The first climatology of the Amundsen Sea Low (ASL) was created from atmospheric reanalysis fields. The ASL is the highly variable climatological low pressure system that has a profound impact on the meteorology between the Antarctic Peninsula and the Ross Sea. In recent years the ASL has deepened as a result of the ozone hole resulting in more sea ice in the Ross Sea and giving a surface warming across the Antarctic Peninsula.
- Analysis of sea ice fields resulted in the discovery of a 'polynya-like' feature just to the west of Faraday / Vernadsky station on the western side of the Antarctic Peninsula. The loss of ice here has been responsible for the large warming that has been observed over recent decades at the station. The polynya has its origins in the loss of summer sea ice over the southern Bellingshausen Sea and the changing nature of the sea ice advance through the autumn and winter. The length of the sea ice season has increased in the area and the ice is now thinner than previously. A more rapid sea ice advance and subtle changes in the meridional component of the wind has resulted in the ice moving away from the coast near to Faraday / Vernadsky, creating the polynya-like feature.
- A surprisingly fast causal link between changes in winds over the Weddell Sea and the warming of the Antarctic Bottom Water filling the Atlantic Ocean abyss

was identified on time scales of months to years through the analysis of repeat oceanographic section and long-term mooring data in the Weddell – Scotia boundary.

AGCS has supported several scientific meetings and workshops targeted at advancing our knowledge of important elements of the Antarctic climate system. A successful workshop was held on Antarctic Clouds at the Byrd Polar Research Center in July 2010. As has been highlighted by the Intergovernmental Panel on Climate Change (IPCC), the forcing by clouds is one of the biggest unknowns in understanding the climate system. This is especially the case in the Antarctic where there are relatively few in situ observations of cloud properties. This workshop brought together modellers and observationalists to assess our current understanding of Antarctic clouds and to plan future research. An AGCS-sponsored workshop was also held in Tromsø in June 2010 to review the achievements of the ASPeCt project. Discussion of future plans highlighted the need to bring observations and modelling of sea ice in alignment, as modelling was not a specific goal of the original ASPeCt project. Future AGCS support of sea ice research will be focussed on that alignment task. A third, highly stimulating AGCS-sponsored workshop took place in Southampton in June 2010, focussed on the role of the Southern Ocean circulation on the changing global carbon cycle.

AGCS was centrally involved in a number of major field programmes. These include the final phase of the Antarctic Deep Waters Rate of Export (ANDREX) project, targeted at measuring for the first time the role of the Weddell gyre in ventilating the abyssal ocean and sequestering anthropogenic carbon. Another fieldwork highlight was the ongoing Roosevelt Island Climate Evolution (RICE) programme, an international, New Zealand-led initiative to recover a 750 m deep ice core, with the ultimate goal of quantifying how stable the West Antarctic Ice Sheet will be in a warming world.

AGCS recovers and archives Antarctic data, and has updated the Met-, Ice- and Southern Ocean- READER databases. Excellent progress has been made on the production of key field data sets which will be presented in the forthcoming months.

Future plans

With the AGCS programme drawing to a close in 2012, future AGCS activities will be focussed on leaving a valuable legacy for the continuation and expansion of SCAR's role in the field of Antarctic climate research. This will be done in parallel to the ongoing support of scientific advances in hot topics such as tropical – polar connections, the role of atmosphere – ice – ocean feedbacks in the ongoing Antarctic climate change, and the future evolution of the Southern Ocean circulation. AGCS will seek to affirm this legacy through (i) its support of the review and reconstitution of a new ASPeCt project focussed on sea ice observation – modelling alignment, and (ii) through the organization of a 3-day workshop in Melbourne in July 2011 to review AGCS' achievements, review recent advances in the field, and identify knowledge gaps and future priorities in Antarctic research.

4.1.4 Evolution and Biodiversity in Antarctica (EBA)

EBA aims to understand the evolution and diversity of life in the Antarctic, to determine how these have influenced the properties and dynamics of present Antarctic and Southern Ocean ecosystems, and to predict how organisms and communities will respond to environmental change. EBA integrates work on marine, terrestrial and lake

ecosystems. By comparing the outcome of parallel evolutionary processes over the range of Antarctic environments, fundamental insights can be obtained into evolution and the ways in which life responds to change, from the molecular to the whole organism to the biome level. A wide range of national and multinational projects contribute to EBA, including CAML (Census of Antarctic Marine Life), MarBIN (Marine Biodiversity Information Network), Aliens, TARANTELLA, MERGE (Microbiological and Ecological Responses to Global Environmental Changes in Polar Regions), the Latitudinal Gradient Project, and ICED (Integrating Climate and Ecosystem Dynamics in the Southern Ocean). CAML, MarBIN and ICED are either SCAR activities or sponsored by SCAR. EBA is organised into five different Work Packages. For further details see: http://www.eba.aq/

Progress

EBA facilitates collaboration through workshops and conferences that maximise international and multidisciplinary involvement. In 2010 the primary effort was towards encouraging and supporting participation at the Buenos Aires Open Science Conference. EBA also put funds towards:

- the Workshop 'Polar Marine and Latchstring Organisms: Gene and Protein Evolution in a Changing Environment' (Naples, Italy);
- IPY 'Aliens' programme data analyses (through NIOO, The Netherlands);
- Jointly with SC-ATS to analyse SCAR terrestrial biodiversity databases and available published data, to assess the utility of the 'Environmental Domains Analysis' in describing biological patterns within Antarctica (through the Centre for Invasion Biology, Stellenbosch University, South Africa);
- EBA members were major participants in the SCAR/PNRA workshop 'Future of SCAR Biology', aimed at developing new programme proposals for consideration by SSG-LS and SCAR Delegates in Buenos Aires;
- Although not specifically funded by EBA, linked IPY projects, programme scientists and contributors were well represented and very visible at the 2010 Oslo IPY meeting.

Two planned workshops for late 2010 were deferred to 2011:

- Genetic monitoring (Cambridge, UK), deferred to April 2011 to allow back to back workshops with IASC, increasing exposure and impact of the planned activity;
- AMBIO terrestrial diversity (Brussels, Belgium), deferred to May 2011 by organizers through venue and participant constraints.

EBA participants have continued to work with SCAR glaciologists and geologists to assess interactions between organisms and their environment through time, in particular through contribution to updates to the ACCE report and membership of the new SCAR Expert Group on this subject. EBA members are also key participants in the SCAR Action Group on Prediction in the Biological and Physical Environment of Antarctica, the SCAR Expert group on Birds and Marine Mammals and SCAR Capacity Building, Education and Training.

Growing interest from the European Science Foundation (ESF) for EBA and EBA-related activities (e.g. CAREX, the EU FP7 Coordination Action on Research in

EXtreme Environments) led to inviting Guido di Prisco to illustrate EBA and CAREX at the ESF Conference 'Biodiversity: Life Responses to Changes', Strasbourg, France, September 27th, 2010.

The jointly funded EBA/SC-ATS terrestrial biodiversity analyses resulted in working papers to the Uruguay ATCM, and further scientific publications are being developed, emphasising the increasing synergy between science and policy input in some areas of EBA-supported research. This is further illustrated in particular by a publication analysing the efficacy of protection measures provided by the current system for Antarctic Specially Protected Areas (Hughes & Convey 2010, *Global Environmental Change* **20**, 96-112), which forms part of an expanding body of literature and activity relating to quantifying, assessing and advising human impacts and interactions of various types with the Antarctic environment.

A compilation of EBA-related publications has not yet been completed for 2010, although the contributing national programmes and individuals have continued publishing at the same rate as in recent years. Various journal special issues have been published in 2010 relevant to or through EBA activities. Primary amongst these is an issue of Polar Science devoted to the outcomes of the Sapporo SCAR Biology Symposium, along with a second special issue of Antarctic Science from the Latitudinal Gradient Project. A special issue of Deep Sea Research II summarizing results from the CAML project was online-available from October 2010 and in print in February 2011. The journal International Innovation will shortly publish an article on EBA based on interviews with G. di Prisco, P. Convey and C. Verde. EBA Newsletters 5 and 6 were distributed in March and November.

In part EBA's success rests on the extent to which biological data can be maintained, archived and exchanged, much of which is done through the Australian Antarctic Data Centre, which hosts and maintains a Biodiversity Database on Antarctic and sub-Antarctic flora and fauna (http://data.aad.gov.au/aadc/biodiversity/). EBA also relies on other databases such as SCAR-MarBIN, MERGE, and the Southern Ocean Continuous Plankton Recorder Programme (SO-CPR). EBA is closely involved in the new ANTABIF database development. EBA has a portal within the Antarctic Master Directory allowing access to metadata that contribute to EBA's aims. To view the portal – go to:
http://gcmd.nasa.gov/KeywordSearch/Home.do?Portal=eba&MetadataType=0.

Census of Antarctic Marine Life (CAML)

The Census of Antarctic Marine Life (CAML www.caml.aq), the regional project of the global Census of Marine Life (CoML), funded by the Sloan Foundation, ended officially in December 2010. In 2010 CAML hosted meetings on marine benthic biodiversity in Bremerhaven, marine biogeography in Villefranche and polychaetes in Woods Hole. The final synthesis meeting of CoML, including CAML, took place at the Royal Society in London in October 2010. Its legacy remains in the strong international network, as evidenced by CAML workshops to be hosted in 2011 on genetic monitoring based on the CAML DNA barcoding datasets and on the genetic divergence of bipolar species, and CAML presentations at the World Conference on Marine Biodiversity (WCMC) 2011 in Aberdeen. Lasting legacies from CAML are the 30-year benthic dataset from Admiralty Bay; > 20,000 barcode sequences for Antarctic marine fauna; initiation of the Southern Ocean Observing System, with both physical and biological components; including biologger data from marine mammals;

writing taxonomic monographs, Antarctic Field Guides and pages for the Encyclopaedia of Life; publication of over 1,000 scientific papers; and providing evidence for CCAMLR's bioregionalisation and declaration of two Vulnerable Marine Ecosystems. The main findings are published in a special volume of *Deep-Sea Research II* (also see above). The CAML achievements provide a robust benchmark against which future change in the Antarctic marine ecosystems may be measured.

Future Plans

- Major review on environmental gradients still in development, arising from 2008 EBA targeted workshop;
- Continue to support the collation of terrestrial biogeographical data, and its analysis in terms of Antarctic regionalisation (joint activity with SC-ATS);
- Describe the aims and legacy of EBA in the ESF 'Brainstorming meeting: towards a wider scenario', Cascais, Portugal, February 10th, 2011;
- Provide advice to CEP on biodiversity and conservation within Antarctica;
- Support studies of the risks of transfer of non-native species into Antarctica;
- Support continuation of SCAR MarBIN database development, and its development into ANTABIF;
- Contribute to the development of two approved proposals for future SCAR biological research programmes;
- Support the achievement of the two targeted workshops deferred from 2010;
- Support a special session at the World Conference on Marine Biodiversity (Aberdeen, September 2011);
- Contribute to and support selected participants at SCAR Antarctic Conservation and Management workshop (South Africa, June 2011);
- EBA has endorsed the III Portuguese Conference on Polar Sciences (Coimbra, Portugal) in April 2011;
- Continue to support the development of outputs from IPY programmes under the EBA umbrella (in particular, Aliens and Tarantella, plus two planned synthesis volumes to be prepared as part of the IPY legacy book series);
- Continue contribution to SCAR Cross Linkages group (Canada, May 2011), and various SCAR Expert Groups.

4.1.5 Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)

Near-Earth space (geospace) is an integral part of the Earth system, providing the material link between the Sun and Earth, primarily through the polar-regions. A primary goal of the ICESTAR Programme is to create an integrated, quantitative description of the upper atmosphere over Antarctica, and its coupling to the geospace environment.

ICESTAR scientists have published more than 200 papers in journals that include Nature, Geophysical Research Letters, and the Journal of Geophysics Research.

Since the start of the programme, ICESTAR further enhanced the SCAR profile by hosting and convening numerous scientific sessions at international conferences (e.g., American and European Geophysical Union Conferences, CEDAR, GEM).

ICESTAR has, or is in the process of, delivering a wide variety of products ranging from a better scientific understanding of the polar atmosphere to a data portal that will enable scientists to create a systems-view of the polar region. Specific current/future plans include the following:

- update and maintain ICESTAR website;
- publish in journals and conference proceedings;
- provide input to databases;
- develop and grow data portals;
- develop and quantify the role of seasonal differences in polar ionospheric conductance and the effects on magnetospheric, ionospheric, and thermospheric dynamics;
- constrain models based on conjugate remote sensing of inner magnetospheric dynamics; and
- characterize the basic state of the polar middle atmosphere.

ICESTAR finished its term as a SCAR SRP in 2010, though will continue as a SCAR Expert Group. For further details see: http://scar-icestar.org.

4.1.6 Subglacial Antarctic Lake Exploration (SALE)

SCAR has a long history of involvement in the study and exploration of subglacial aquatic environments (SAE). The SALE programmme promoted, facilitated and championed international cooperation to better understand subglacial aquatic environments in Antarctica. SALE was highly successful in keeping SAE on the agenda of funding agencies, in the scientific press, and in the lay press. SALE was at the forefront of promulgating guiding principles for environmental stewardship of these unique settings. These efforts culminated in a Code of Conduct for Subglacial Lake Environments. SALE sponsored numerous major international workshops and scientific sessions at meetings. SALE's members are funded by national programmes to conduct SALE science and SCAR funding allowed for yearly meetings.

SCAR SALE met in March 2010 in Baltimore, MD for the sixth time in the margins of an AGU Chapman Conference it co-sponsored. The Chapman conference summarized progress on Antarctic Subglacial Aquatic Environments (SAE) and promoted cooperation and partnerships, particularly among the three major SAE programmes (Russia, UK, and USA). At this meeting SALE members concluded that the groups Terms of Reference had been met and voted to disband SALE. It was also agreed that SCAR should continue to play a leadership role in SAE exploration and research as national programmes entered a phase of lake entry and sampling over the next few years (Subglacial Lake Vostok -Russia, Subglacial Lake Ellsworth - UK, and WISSARD - US). A group of SALE members agreed to form a SCAR Expert Group to assess the state of SAE science, consult with the community, provide a forum for those with SAE interests to interact, and develop plans for the next generation SCAR SAE programmes – the ATHENA Expert Group (see below).

For further details see: http://www.sale.scar.org/

4.2 SCAR Programme Planning Groups (PPGs)

The SCAR Programme Planning Groups (PPGs) develop the plans for future SRPs. The final proposals will likely be submitted for approval to the 2012 Delegates' meeting.

4.2.1 State of the Antarctic Ecosystem (AntEco) and Antarctic Ecosystem: Adaptation, Thresholds and Resilience (AntETR)

At SCAR XXXI two new Programme Planning Groups were established to develop a full programme proposal to be considered in 2012. State of the Antarctic Ecosystem (AntEco) will focus on patterns of Antarctic biodiversity to further the knowledge on past processes that formed the current biodiversity and patterns therein, and use this to develop scenarios of its future state through interdisciplinary approaches. Antarctic Ecosystem: Adaptation, Thresholds and Resilience (AntETR) will determine the resistance, resilience and vulnerability to change of Antarctic biological systems. In particular, it will focus on the likelihood of cataclysmic shifts or "tipping points" in Antarctic ecosystems: How close to the cliff are we? A call for contributions from Antarctic scientists was sent out in the fall of 2010 and membership has been established. Development of the programmes will be overseen by Don Cowan (S. Africa) and Julian Gutt (Germany) respectively. The CO, SSG-LS and co-leaders of EBA will act as overseers. Workshops will occur in September/October 2011.

4.2.2 Past and Future Change of the Antarctic Environment (PACE)

Past and Future Change of the Antarctic Environment (PACE) will be concerned with delivering greater insight into the natural variability of the Antarctic climate system, understanding of the responses of the system to natural and anthropogenic forcing factors and improved regional predictions of key elements of the atmosphere, ocean and cryosphere. Detailed planning of PACE will be carried out at a workshop to be held in Melbourne, Australia in July 2011.

4.2.3 Solid Earth response and Cryosphere Evolution (SERCE)

The goal of the SERCE programme is to improve the understanding of the interaction between the solid earth, cryosphere and climate as a contribution to sea level change.

It will require the study of processes (geodynamics, tectonics, ice mass change) and of geophysical models. There will be a need to identify and develop key disciplinary and interdisciplinary components of a science programme aimed at advancing understanding of the interactions between the solid earth and the cryosphere. This includes glacial isostatic adjustment (GIA) and ice mass change and the influence of solid earth parameters (heat flow, disposition of sediments) on ice sheet dynamics.

Observations will be the input for physical and geophysical modellers who will work on GIA, PGR models in order to furnish an improved sea level change model between the integration of observations in Antarctica and global observation and /or models.

4.3 SCAR Standing Scientific Groups (SSGs)

SCAR plans, conducts and manages its science activities through its Standing Scientific Groups (SSGs for Life Sciences, Physical Sciences and Geosciences). The SSGs interface between the Antarctic scientific community, develop new scientific activities and bring perspectives from the scientific communities.

SSG subsidiary Expert Groups address matters that require an ongoing capability and/or expertise and are expected to continue until that need no longer exists. Action Groups address specific terms of reference that need immediate attention and will normally complete their activities in 2-3 years.

4.3.1 Life Sciences

(i) Expert Group on Birds and Marine mammals (EG-BAMM)

The new SCAR EG-BAMM is tasked with providing expert knowledge and research leadership in all matters related to birds and mammals in the Antarctic, in order to support research that will quantify the role of birds and marine mammals in the Antarctic marine and terrestrial ecosystems. The group works with other components of SCAR towards a multidisciplinary synthesis of biophysical and biochemical coupling mechanisms in the Antarctic and to help collate and provide information on the status and trends of populations of specific species in the SCAR area of interest based on needs identified by SCAR or by the group. EG-BAMM also contributes to the conservation and management of Antarctic and subantarctic birds and mammals through the appropriate utilisation and interpretation of currently available scientific data.

One of the exciting prospects of EG-BAMM is the opportunity to develop new synergies within the wider Southern Ocean science community. This is particularly true in the area of ecosystem structure and dynamics, bearing in mind that these predators can provide an integrated signal of changes in distribution and abundance of prey. Further, the physical and biological coupling mechanisms can be elucidated in these species, due to our ability to track them accurately, measure relevant life history characteristics, and collect pertinent biological data and scales relevant to the organism.

For further details see: http://www.egbamm.scar.org/

(ii) Expert Group on the Continuous Plankton Recorder (EG CPR)

The Southern Ocean CPR Survey completed 44 tows from five vessels during the 2009-10 season. Australia and Japan completed 30 tows south and west of Australia, 11 tows were made south of New Zealand and three tows were conducted across Drake Passage by Brazil. A dedicated CPR session was convened at the SCAR OSC in Buenos Aires, highlighting the achievements of the Survey over the last 20 years. The Survey's 20th anniversary was in January 2011. The EG and NIPR, Tokyo, hosted a highly successful CPR standards workshop in November 2010, to ensure all personnel involved with CPR operations were maintaining the correct methodology and taxonomic accuracy. The CPR data were a central component of the Biogeographic Synthesis workshop convened by SCAR-MarBIN in Villefranche-sur-mer in May 2010. The focus of the analysis was on modelling and predicting distribution patterns of whole zooplankton assemblages around Antarctica. This builds on the recently published CPR zooplankton atlas (McLeod et al., 2010, Polar Science 4, 353-385) and modelling the circum-Antarctic distribution patterns of the copepod Oithona similis (Pinkerton et al., 2010, Deep-Sea Research 57, 469–485). These have shown a number of persistent hot spots of high zooplankton abundance. The EG has been working with the Sir Alister Hardy Foundation for Ocean Science and other CPR surveys to develop a global CPR survey and a global CPR database,

which will place our Antarctic results in a global context. For further details see: http://data.aad.gov.au/aadc/cpr/index.cfm

(iii) Expert Group on Biology and Human Medicine (EG B&HM)

The expert group met in Buenos Aires in Association with SCAR OSC. A joint meeting with the COMNAP MEDINET group was again held, and members participated in the Open Science Forum. It was noted that from a medical viewpoint, the IPY had not been as successful as had initially been hoped largely because of difficulties in securing funding for the umbrella project "Taking the Arctic and Antarctic Polar Pulse". Several national representatives however presented their work.

Long standing discussions with SCAR and COMNAP about the constitution and membership of their respective groups, have this year come to fruition. It has been agreed in principle that the EGHB&M and MEDINET will merge into a single entity encouraging wider participation and reducing duplication of effort. The details of the Terms of Reference of the new group are currently being worked out, maintaining links to both parent organisations. It is felt by EGHB&M members that this will encourage both applied and academic research. For further details see: http://www.scar.org/about/introduction/organization/

(iv) Expert Group on Oceanography (joint with PS)

The major focus of the SCAR/SCOR Oceanography Expert Group has continued to be the Southern Ocean Observing System (SOOS). After a period of community consultation and specifically commissioned reviews, the SOOS plan has been finalised. The final design plan is currently being designed (as of May 2011) and will be made available both online and as hard copies.

In order to aid implementation of the SOOS, an International Project Office (IPO) is being established in Australia, supported by the new Institute for Marine and Antarctic Studies at the University of Tasmania in Hobart. The SOOS IPO will be co-located with Australia's Integrated Marine Observing System (IMOS). An Executive Officer has been appointed and will commence in August 2011.

The SCAR/SCOR Expert Group on Oceanography will act as a Scientific Steering Committee for SOOS. John Gunn (Aus, biology) was appointed as Co-Chair with Mike Meredith (UK. physics). The intention is now to review and revise membership during 2011 to enable the group to fulfil its remit, in particular by promoting the implementation of SOOS in the first instance.

(v) Integrating Climate and Ecosystem Dynamics in the Southern Ocean (ICED)

ICED is an international multidisciplinary programme launched in response to the increasing need to develop integrated circumpolar analyses of Southern Ocean climate and ecosystem dynamics. Southern Ocean Sentinel, which is being developed under ICED will be a pillar of the biological component of the SOOS. For further details see: http://www.iced.ac.uk/

(vi) Advancing TecHnological and ENvironmental stewardship for subglacial exploration in Antarctica (ATHENA) (joint with GS)

This new expert group emerges in the wake of the recently disbanded Scientific Research Programme, SALE. It is not a new version of SALE, but will take

subglacial aquatic research in Antarctica in a new and important direction, by coordinating and facilitating collaboration in Antarctic subglacial aquatic science and specifically technologies and environmental stewardship, both of which are required to underpin current and future subglacial aquatic environment exploration.

ATHENA Terms of reference:

- To establish the critical environmental and technological infrastructure for the future access, sampling and monitoring of Antarctic subglacial aquatic environments (SAE);
- To work with SCAR action groups, expert groups and research programmes to promote inter-disciplinary science on Antarctic SAE, and specifically by developing linkages with research on Antarctic climate (via ACE), Biodiversity (via EBA) and sub-ice geological exploration (via SieGE);
- To provide an independent and international forum for the sharing of information and data during the run up to and execution of funded lake access drilling campaigns (e.g. US-WISSARD, UK-Lake Ellsworth and Russia-Lake Vostok).

(vii) SCAR MarBIN and ANTABIF

2010 saw the integration of SCAR-MarBIN (Scientific Committee on Antarctic Research - Marine Biodiversity Information Network: www.scarmarbin.be), with the biodiversity databases managed by the Australian Antarctic Division, resulting in the Antarctic Biodiversity Information Facility (ANTABIF: www.biodiversity.aq). ANTABIF is a dedicated Antarctic biodiversity data portal giving access to a distributed network of contributing database, according to the principles of the Global Biodiversity Information Facility. ANTABIF will use the best available technology to integrate, share and disseminate all available information on Antarctic Biodiversity. Its implementation by the Belgian Biodiversity Platform ensures that ANTABIF can take advantage of the relevant experience of the Belgian GBIF node. SCAR-MarBIN will continue as its independent website. The taxonomic information in SCAR-MarBIN and Register of Antarctic Marine Species (RAMS) is updated with that of the World Register of Marine Species (WoRMS; www.marinespecies.org). A new feature under construction in SCAR-MarBIN is the Antarctic Field Guide (afg.scarmarbin.be).

(viii) Action Group on Antarctic Fuel Spills (AGAFS)

Reformulation of the SCAR contaminants interests is being discussed and may involve a coalescing of AGAFS and the Expert Group on Environmental Contaminants in Antartica with a broad ToR to cover contaminants from local to global sources and processes. For further details see: http://www.scar.org/researchgroups/lifescience/fuelspills/.

(ix) Seeps and Vents in Antarctic (SAVAnt) (joint with GS)

To assist CCAMLR, the SCAR Geoscience and Life Science SSGs have started an Action Group that aims to identify areas within the CCAMLR region likely to contain Vulnerable Marine Ecosystems around cold seeps and hydrothermal vents.

The SAVANT Project will be handed over to Dr Jodie Smith. The need for field guide to seep communities has been met by the organisation that prepared the original

CCAMLR guide to Vulnerable Marine Ecosystems so SAVANT will concentrate on compiling the location of known seep and vent occurrences. For further details see: http://www.scar.org/researchgroups/savant.html

(x) Prediction of Changes in the Physical and Biological Environment of the Antarctic (PCBEA) (joint with PS)

This SCAR Action Group is concerned with trying to improve our ability to predict how the Antarctic environment will evolve over the next century. It is a cross-disciplinary groups that brings together meteorologists, oceanographers and marine and terrestrial biologists. It was formed at the SCAR Delegates' meeting in Moscow, Russia in July 2008 and will have an initial lifetime of four years.

The group is leading the preparation of the SCAR Data Atlas and a test version is now online (http://www.antarctica.ac.uk/met/SCAR_ssg_ps/Atlas/). The atlas aims to present various key fields concerning the past, present and possible future evolution of the Antarctic environment. It is complementary to the SCAR READER database that contains mean climate data for the Antarctic research stations. For further details see: http://www.scar.org/researchgroups/pcpbea.html

(xi) Ocean Acidification Action Group (joint with PS)

The initial form of the action group will consist of a cross-disciplinary team of ocean acidification experts representing the fields of marine carbonate chemistry, global and regional modelling, marine ecology, marine ecology, ecotoxicology/physiology and paleoceanography. The group is led by Richard Bellerby, Bjerknes Centre for Climate Research, Norway (Richard Bellerby email: Richard.Bellerby@uni.no).

The Action Group will:

- Define our present understanding of the contemporary rates and future scenarios of Southern Ocean acidification;
- Document ecosystem and organism responses from experimental perturbations and geological records;
- Identify present and planned observational and experimental strategies;
- Identify gaps in our understanding of the rates and regionality of ocean acidification;
- Define strategies for future Southern ocean acidification research.

(xii) Coordination of Scientific Activities on King George Island Group (joint with PS and GS)

Progress has not been as fast as had been hoped with this group. It was recognized that one of the problems for this group to accomplish its terms of reference is the fact that individual scientists may not have access to all the required information about programmes and scientific equipment and facilities actually present on the island. Such information is often with national Antarctic programme managers or science programme directors. The leadership of the group and terms of reference (http://www.scar.org/researchgroups/lifescience/) remained unchanged. A discussion on the future of this group will be held at the SCAR Executive Committee Meeting in July 2011.

4.3.2 Physical Sciences

(i) Expert Group on Ice Sheet Mass Balance and Sea Level (ISMASS)

The SCAR Expert Group on Ice Sheet Mass Balance and Sea Level (ISMASS) aims to revitalize the approach towards assessing methods and uncertainties in estimating Antarctic Ice Sheet mass balance. In July 2010, SCAR Report 38 '*Ice Sheet Mass Balance and Sea Level: A Science Plan*' was published (with C.J. van der Veen, ISMASS co-chair, as leading author) and is available on the SCAR website (http://www.scar.org/publications/reports/Report_38.pdf). Its main points were presented by Christina Hulbe (ISMASS co-chair) during the Climate and Cryosphere (CliC) SSG in Valdivia, Chile, February 2010. As a result from discussions during SCAR XXXI (Buenos Aires, July-August 2010), it was agreed to extend the sponsorship of ISMASS to include the International Arctic Science Committee (IASC). This was formally approved by the IASC Cryosphere Working Group during the IASC WG meeting in Potsdam, January 2011, upon a proposal presented by Francisco Navarro (ISMASS co-chair). The plan is to extend further this SCAR-IASC co-sponsorship of ISMASS, to encompass also the International Association of Cryospheric Sciences (IACS).

(ii) Expert Group on Operational Meteorology in the Antarctic (OpMet)

The Expert Group on Operational Meteorology in the Antarctic provides a point of contact between many groups undertaking meteorological work in the Antarctic. The group's web pages provide news and information about Antarctic meteorological activities. Two Google Earth plugins have been created, one to access the archived meteorological data that is held at the British Antarctic Survey (BAS) which includes data from most of the manned stations and from most of the automatic weather stations. The second one gives access to the real-time meteorological data that are received at BAS. The expert group is looking into how precipitation measurements are currently made in Antarctica end evaluating the new optical precipitation measuring devices that are now available. For further details see: http://www.antarctica.ac.uk/met/jds/met/SCAR_oma.htm.

(iii) Expert Group on Oceanography (joint with LS)

See LS report, above.

(iv) International Partnership in Ice Core Sciences

Much of the focus for IPICS in 2010 has been in Greenland with the completion to bedrock of the NEEM ice core drilling. In Antarctica, the US WAIS Divide drilling has also reached its target depth of 3330 m, and should soon be providing exciting new results about West Antarctic climate in the last glacial period (contributing to the IPICS-40k priority project). Considerable progress has been made in setting up a PAGES Antarctic-2K group, led by Tas van Ommen, and dedicated to synthesising the climate of Antarctica over the last 2000 years; this group is based on the IPICS-2k task. This new group will hold a workshop in Bern in July (associated with the INQUA meeting) to start to assemble data towards a product. Planning is now well underway for the IPICS Open Science Conference, which is to be held in Giens, France , October 1-5, 2012, with Jerome Chappellaz as chair of the organising committee. For further details see: http://pages-142.unibe.ch/ipics/.

(v) ICESTAR Expert Group

See Section 4.1.5.

(vi) Action Group on Environmental Contamination in Antarctica

The 3rd ECA meeting was held as planned during the XXXII SCAR conference in Buenos Aires. Additional representatives from the Life Sciences community were also involved.

- The ECA database on Organic Pollutants was integrated in the Antarctic Master Directory by construction of one dedicated portal; the integration of data on contamination from trace elements is in progress.
- One review, focussing on the distribution of Trace elements in fresh and lacustrine waters was prepared and submitted to a journal. One review on trace elements in marine matrices is in preparation.
- The ECA group web page will be ready in few weeks and will contain reports produced by the Group and links to Antarctic Master Directory where data actually available will be presented.
- during the workshop held in Buenos Aires was decided to extend studies to the biological aspects of environmental contamination by involving scientists related to these specific aspects, researchers from the PS and LS should be involved in ECA activities.

The reviews already prepared or in preparation emphasize that the studies carried out in recent years require coordination to obtain a coherent picture of environmental contamination in Antarctica. The majority of available data focus on East Antarctica (McMurdo sound, Newcomb Bay, Larsemann Hills, Terra Nova Bay), the Antarctic peninsula (King George Island, Admiralty Bay) and Prydz Bay in West Antarctica. The latter are potentially at relatively high environmental risk, due to the presence of extensive human activities in these regions.

(vii) Action Group on GPS for Weather and Space Weather Forecasting (joint with GS)

The GPS for Weather and Space Weather Forecast (GWSWF), a joint Geoscience and Physical Sciences Action Group, aims to establish a suitable GNSS receivers network over the Arctic and Antarctica with the scope to develop a 3D image of the upper atmosphere as well as to develop algorithms for water vapour retrieval over Antarctica. Such a network is intended to use the existing GNSS standard receivers managed by the POLENET community, and GNSS receivers appropriately configured to observe the ionosphere under quiet and stormy conditions.

During 2010 several goals have been successfully reached: an enlargement of the GPS bi-polar network for investigating the ionospheric irregularities and scintillations, publications co-authored by different institutions, presentations on multi-instrument inter-hemispheric scintillation studies, on the mitigation of ionospheric effects on GPS positioning over Antarctica and on the water vapour retrieval using GPS over Antarctica. The GWSWF web has been developed and is now accessible at http://www.gwswf.scar.org with the scope of results dissemination, data and software facilities sharing, attraction of new collaborations with other groups and institutions.

(viii) Polar Atmospheric Chemistry at the Tropopause

The initial version of the PACT database has been finalised, and currently includes ozonesonde data obtained by the Australian Antarctic programme. These data will shortly be released through the PACT website (http://data.aad.gov.au/aadc/pact/). A paper is in preparation on initial results, and the early data are being used in chemistry transport validation for the Australian Community Climate and Earth System Simulator (ACCESS). Addition of data from several other Antarctic sites to the PACT database is underway.

(ix) Prediction of Changes in the Physical and Biological Environment of the Antarctic (PCBEA) (joint with LS)

See LS report, above.

(x) Ocean Acidification Action Group (joint with LS)

See LS report, above.

(xi) Antarctic Clouds and Aerosols

This group was recently formed as the result of the International Antarctic Cloud Workshop held in Madison (with some help from SCAR funds) in association with the 5th Antarctic Meteorological Observation, Modelling and Forecasting Workshop. As a result of the workshop David Bromwich is leading the writing of a review paper on Antarctic Clouds that should be published sometime later this year. The long-term object of the group is to plan an International campaign to observe clouds in Antarctic and it is hoped to hold the first meeting during IUGG in Melbourne this summer.

(xii) Coordination of Scientific Activities on King George Island Group (joint with LS and GS)

See LS report, above.

4.3.3 Geo Sciences

(i) Expert Group on Geodetic Infrastructure of Antarctica (GIANT)

The objectives of GIANT are to:

- Provide a common geographic reference system for all Antarctic scientists and operators;
- Contribute to global geodesy for the study of the physical processes of the earth and the maintenance of the precise terrestrial reference frame;
- Provide information for monitoring the horizontal and vertical motion of the Antarctic.

The group is currently being revitalised as it has not been active recently.

(ii) Expert Group on Permafrost and Periglacial Environments (EG PPE)

The main aim of EGPPE is to promote international collaboration towards the development of Antarctic permafrost research. The IPY core project ANTPAS has been the main driver of our activities and allowed for the implementation of several nationally-funded projects, many of them with long-term monitoring and research

goals. Current activities benefit from ANTPAS dynamics are framed within the project objectives. EGPPE's activities in 2010 included:

- Two coordination meetings in Longyearbyen (EUCOPIII) and in Buenos Aires (SCAR OSC) that resulted in a revised Steering Committee, with M. Guglielmin (Italy) and G. Vieira (Portugal) as Co-chairs, M. Balks (New Zealand) as Secretary and J. Putkonen (USA) and C. Schaeffer (Brazil) as Communication Officers. A newsletter in order to facilitate communications will be implemented.
- A session at SCAR OSC in Buenos Aires on Antarctic Permafrost and Periglacial Environments, which will result in a special issue of Geomorphology edited by M. Guglielmin.
- A session was proposed for ISAES 2011.

For further details see: http://erth.waikato.ac.nz/antpas/

(iii) International Bathymetric Chart of the Southern Ocean (IBCSO)

The objective of the IOC regional ocean mapping programme and SCAR Geosciences Expert Group on IBCSO is to gain better knowledge of the sea floor topography in the Southern Ocean. There has been some interruption with progress over the last year due to staff problems, but it is expected that this will be resolved soon. For further details see: http://www.ibcso.org/

(iv) The Antarctic Digital Magnetic Anomaly Project (ADMAP)

ADMAP aims to map Antarctica's magnetic anomaly field to aid in understanding geological processes. It is managed jointly with IAGA (International Association of Geomagnetism and Aeronomy). ADMAP contributes data to the World Magnetic Anomaly Map (for details see: http://www.geology.ohio-state.edu/geophys/admap). During 2008, the release of a CD to the World Data Centres with the latest completed ADMAP compilation was approved. This compilation is ADMAP-1999 to indicate the latest year of survey data that the compilation holds. A successful special session on Antarctic geomagnetism was held during the 2010 SCAR meeting. The papers submitted there are being prepared to be published in a special issue of Tectonophysics. More than 2.5 million line kilometres of new aeromagnetic and ship survey data since 2000 are becoming available for inclusion in the database. In addition, a number of new surveys will be completed. Furthermore, CHAMP satellite magnetic observations, collected at altitudes of about 300-325 km, provide important new constraints on Antarctic crustal anomalies. In view of these data developments, a new-generation ADMAP compilation will be made available soon. The new compilation, tentatively entitled ADMAP-2012, will be a significant ADMAP contribution to the legacy of the IPY. ADMAP is cooperating with Antarctic Geoid Project http://tpg.geo.tudresden.de/antgp/antgp.htm), which aims to support gravity measurements in Antarctica in order to close the gaps in terrestrial gravity data coverage.

(v) Advancing TecHnological and ENvironmental stewardship for subglacial exploration in Antarctica (ATHENA) (joint with LS)

See LS report, above.

(vi) Seeps and Vents in Antarctic (SAVAnt) (joint with LS)

See LS report, above.

(vii) Action Group on GPS for Weather and Space Weather Forecasting (joint with PS)

See PS report, above.

(viii) Coordination of Scientific Activities on King George Island Group (joint with PS and LS)

See LS report, above.

(ix) Action Group on Multibeam Data Acquisition

The SSG on Geosciences recommended the establishment of an Action Group to identify data needs and best practice protocols for mapping of Last Glacial cycle grounding zones using multibeam bathymetry. Mapping the position of past grounding zones of the Antarctic Ice Sheet is important in providing boundary conditions for understanding ice volume history during the last glacial cycle, in understanding regional differences in ice behaviour and in mapping the availability of refugia for marine benthic biota.

The Action Group will:

- Identify the highest priority areas where multibeam bathymetry will provide important insights into the position and retreat history of the Ice sheet grounding zone and where such data do not exist.
- Set out survey design guidelines to maximise the value of multibeam surveys in interpreting grounding zone position, behaviour and history of the Antarctic shelf.

4.3.4 Social Sciences and Humanities

Though Social Sciences and Humanities is not a Standing Scientific Group, SCAR is currently exploring how to integrate this community more fully. In recent years a community has developed with interests in the social sciences and the history of Antarctica. SCAR currently has two groups involved in such activities: An Action Group on Social Sciences and another on History.

(i) The SCAR Social Sciences Action Group (SSAG)

The SSAG was formed in 2010 with the principle goal of advancing our understanding of human values associated with Antarctica. A concurrent goal is to establish a network of Antarctic social scientists and humanities researchers. Since its inception, the group has met eight times via teleconference, and work progresses towards those goals. In 2010, greater geographic representation in the group was achieved, a plenary session on Antarctic values was organised during the IPY Open Science Conference in Oslo, and a report on the breadth of values, across academic disciplines, has begun. For 2011, an interdisciplinary workshop with the title "Exploring linkages between environmental management and value systems – the case of Antarctica" is planned to be held in conjunction with the 25th International Congress for Conservation Biology (ICCB 2011) in Christchurch.

(ii) The SCAR History Action Group

In 2010, the SCAR History Group organized three interesting bipolar sessions on "History of polar exploration, cooperation, research and logistics" during the IPY Oslo Science Conference (10-11 June 2010) with 24 papers representing speakers from 7 countries. On 5 August, 2010, the SCAR History Action Group held a 6th workshop on "History of Antarctica and Scientific Research" during 4th Open Science Conference of SCAR at Buenos Aires (Argentina). In two sessions eight papers were given by speakers from seven nations. An additional poster on music of Antarctic expeditions stimulated a music and cultural arts programme for the next SCAR OSC. Three papers from the 2009 and 2010 workshop are already published and two are in print. Six members of the SCAR History AG contributed various chapters to the book by Susan Ba*rr and Cornelia Lüdecke (eds.) on "*The History of the International Polar Years IPYs" by Springer. The SCAR History AG was invited to hold the next workshop in South Africa in 2011.

5. Data and Information

A major highlight for SCAR was the approval of a SCAR Data Policy, leading from SCAR's Data and Information Strategy. This policy is compatible with the data principles of SCAR's parent body, ICSU and other relevant international agencies (e.g. WMO), and with the goals of Article III 1 c of the Antarctic Treaty (see Appendix 2). For further details of SCAR's work with data and information management see: http://www.scar.org/researchgroups/.

(i) Standing Committee on Antarctic Data Management (SCADM)

In 2010, two of the SCADM highlights were the launch of the Polar Information Commons (PIC) and the XXXI SCAR Business Meetings with the Open Science Conference.

The PIC initiative, sponsored by ICSU, builds on the legacy of scientific activities associated with the International Polar Year and is building a bipolar data access network. It is a key element of the Implementation Plan of the SCAR Data and Information Strategy (DIMS). SCADM is very much involved in the PIC, which was launched by Prof. Steven Chown at the IPY Conference in Oslo in June 2010. Further development of the PIC will be coordinated by SCADM and the newly established ICSU-CODATA Task Group on Governance of Polar Data. It is essential that SCAR members actively participate in and contribute to the development and contents of the PIC, in order for SCAR to get the maximum value out of this initiative and for the global scientific community to get a lasting legacy of readily accessible IPY data.

One of the other highlights was the presentation on data management by Kim Finney (Australia, SCADM Chief Officer) to the joint SCAR and COMNAP Delegates meeting in Buenos Aires. Prior to that highly relevant and well-received presentation, SCADM and the SCAR Standing Committee on Geographic Information (SCAGI) met together for their annual meetings, during which the details of the implementation of the SCAR DIMS were addressed. Another outcome of the SCADM Business meeting was the election of Bruno Danis (Belgium) and Taco de Bruin (Netherlands) as new Deputy Chief Officers, after Helen Campbell (UK) and Shulamit Gordon (New Zealand) had stepped down for various reasons. SCADM also contributed to

several sessions of the SCAR Open Science Conference and the SCADM Chief Officer chaired the session dedicated to data management.

NASA's Global Change Master Directory (GCMD) provided invaluable support to the SCADM-led SCAR Antarctic Data Management System (ADMS).

(ii) Standing Committee on Antarctic Geographic Information (SCAGI)

The SCAR Standing Committee on Antarctic Geographic Information (SC-AGI) met during the XXXI SCAR meeting in Buenos Aires, at the end of July 2010. The SCAR Composite Gazetteer for Antarctica (CGA) is now a well-established piece of geographic information and receives only minor additions and amendments. It is available at the Australian Antarctic Division web site. Italy continues to liaise with SCAR members in compiling the CGA and uploading data to the database in Australia. Compared to the previous layout, the database has been expanded allowing additional information such as photographs and coordinate information for named features to be shown. The ultimate goal is to allow users to determine the accuracy of the coordinates or the confidence level in the location of a name.

SC-AGI now has 19 confirmed national representatives with additional national contacts for Antarctic Names and for Geographic Information Systems (GIS). At present (spring 2011) the chair of the Standing Committee is vacant. One of the main challenges is once more to get SC-AGI members actively involved. A SC-AGI intersessional meeting may be held in Palma da Mallorca, Spain, in September 2011.

6. A Changing Climate

SCAR has several groups with an interest in climate change, either directly (e.g. Antarctic Climate Evolution, Antarctica and the Global Climate System, Ice Sheet Mass Balance and Sea Level, Prediction of Changes in the Physical and Biological Environment of the Antarctic) or indirectly. In order to provide an "umbrella" for all SCAR's climate related activities and lead the ACCE updates to the Treaty an ACCE Expert Group under the leadership of John Turner has been established. The Terms of Reference of this group are to:

- Coordinate research across SCAR on past and potential future climate change over the Antarctic continent and in the Southern Ocean and potential impact on the biota.
- Advise the SCAR Delegates on areas where research is needed.
- Work with SCADM to provide advice to SCAR groups who require access to climate data.
- Lead the preparation of the annual report to the ATCM on recent advances in climate-related research relevant to the Antarctic.
- Prepare updates and supplements to the Antarctic Climate Change and the Environment (2009) report as necessary and consider when and if an ACCE-2 should be prepared.
- Advise on the involvement of SCAR with bodies such as the Intergovernmental Panel on Climate Change on matters relevant to Antarctica and the Southern Ocean.

- Liaise with CCAMLR on matters relevant to climate and the biosphere.

7. Scientific Advice

Through its status as Observer, SCAR continues to be the primary source of independent scientific advice to the Antarctic Treaty Consultative Meeting (ATCM) and the Committee on Environmental Protection (CEP). SCAR's advice is provided through the Standing Committee on the Antarctic Treaty System (SC-ATS). SCAR participated in the XXXIII ATCM and the XIII meeting of the CEP in Punta del Este in May 2010 as well as the Antarctic Treaty Meeting of Experts on Climate Change in Svolvær the previous month.

SCAR's contributions to the XXXIII Antarctic Treaty Consultative Meeting (ATCM) were positively received. The Antarctic Climate Change and the Environment (ACCE) report was seen as critical to the success of the Antarctic Treaty Meeting of Experts (ATME) on Climate Change and annual updates on climate change were welcomed as essential for the ongoing deliberations of the Committee for Environmental Protection (CEP) and the ATCM. Many parties were interested in progress with the Southern Ocean Observing System (which was presented both at CEP and at the ATCM).

The introduction of the non-native species papers were lauded as setting the stage for future directions on this issue by the Parties. There is a plan to develop a guide of best practices and it wall draw extensively on information provided by SCAR and the IPY Aliens project for directions.

The application of biodiversity data to the bioregionalization efforts by New Zealand was seen as a major development in moving toward a more regularized approach to selection of Antarctic Specially Protected Areas (ASPAs) and conservation in general. The 2011 SCAR "a review of conservation practice for Antarctica in the 21st century" workshop was seen as an important next step in conservation efforts and participation by Parties was encouraged.

The Parities welcomed the SCAR contribution on bioprospecting. SCAR's survey and literature review revealed the extent of current bioprospecting and the potential for future biotechnology based on Antarctic organisms.

SCAR is also an Observer to the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR). Mark Hindell (Australia) - represented SCAR at the 29th annual CCAMLR meeting in Hobart (October 2009). SCAR's marine biology programmes provide strong links to CCAMLR's interests, especially the SCAR Continuous Plankton Recorder (CPR) programme, EBA, and SCAR's Marine Biodiversity Information Network (MarBIN). The work of SCAR's Ocean Expert Group, including the Southern Ocean Observing System, is also relevant to CCAMLR, as is that of the Expert Group on Birds and Marine Mammals. SCAR and CCAMLR are forming a joint Action Group to investigate how both organisations can work more strategically together.

When appropriate SCAR also makes use of ICSU's observer status to the IPCC. Bob Bindschadler attended the Kuala Lumpur IPCC workshop on Sea Level Rise and Ice Sheet Instabilities held 21-24 June 2010 in Kuala Lumpur, Malaysia.

8. Capacity Building, Education and Training

SCAR's Capacity Building, Education and Training (CBET) activities are led by a CBET committee, chaired by a SCAR Vice President, Rasik Ravindra, with the support of the SCAR Executive Officer, Renuka Badhe.

SCAR's main contributions to CBET are through its Fellowship Programme and through working closely with the Association of Polar Early Career Scientists (APECS), which SCAR co-sponsors. In 2010 SCAR funded four fellowships. India contributed an additional $10,000 to the Fellowship programme for 2010. Planning began for the 2011 Fellowship programme to be jointly released with COMNAP.

SCAR continues to work closely with APECS (below), acting both in an advisory manner and by co-sponsoring APECS initiatives of relevance to SCAR, such as Virtual Poster sessions for early career scientists and the support of several workshops. APECS had sent an observer to XXXI SCAR, as well as nominated representatives to SCAR science meetings where invited.

SCAR is an Associate Member of the International Antarctic Institute (IAI), and has been working with them regarding Capacity building activities of relevance to both organisations, e.g. the Visiting Professor programme.

An ICSU grant – Education and Outreach lessons from IPY – of 30,000 Euros was obtained in partnership with APECS, IASC and the IPY office.

SCAR was an active contributor at several CBET related activities at IPY Oslo. SCAR, in partnership with Norway, obtained a grant from the Tinker Foundation of $30,000 for travel funds to allow Latin American scientists to travel to the IPY conference in Oslo. SCAR was also an active contributor towards the APECS Pre-IPY Oslo workshop for early career researchers.

SCAR SSGs and SRPs contributed resources to fund travel grants for students and early career scientists to attend the OSC at XXXI SCAR. Around 300 applications for these grants were received, of which 99 were approved for funding.

The MPhil in Conservation Leadership course at the University of Cambridge has now included a module on Antarctic Conservation and a SCAR Lecturer (Prof D Walton).

SCAR successfully ran the second year of the Martha T Muse Prize for Science and Policy in Antarctica, a $100,000 unrestricted yearly prize given to an individual who has demonstrated excellence in Antarctic science or policy.

The CBET web pages (http://www.scar.org/about/capacitybuilding/) now include a large number of Antarctic Education Websites separated into different categories and languages.

The Association of Polar Early Career Scientists

The Association of Polar Early Career Scientists (APECS) has been recognized as one of the major legacies of the International Polar Year 2007-2009. As an international and interdisciplinary organization for early career scientists with interests in Polar Regions and the wider cryosphere, APECS was founded and flourished as part of the IPY. In concluding this unprecedented international collaborative scientific effort, APECS joined SCAR and IASC to share what the three organizations together would do to carry forward the IPY legacy. During the IPY closing ceremony at the IPY Oslo Science Conference in June 2010 — which was moderated by the APECS

president — WMO and ICSU, the main sponsors of IPY, handed over the IPY flag to APECS as a symbol that the next generation of researchers must take responsibility for continuing the momentum of IPY and polar research.

APECS had a very busy 2010, the largest events being held in conjunction with the IPY Oslo Science Conference. Over 550 early career researchers attended the conference and participated in many activities and leadership roles. APECS coordinated the Oslo Stipend programme, which supported accommodation and reduced registration fees for over 400 young researchers. Thanks to many of APECS' partner organizations, including SCAR and IASC, travel support was also available to help assure a large presence of future polar leaders at the conference. In addition, APECS coordinated the early career researcher poster and presentation awards, a two-day career development workshop, launching the Polar Resource Book for education and outreach activities, 26 APECS-related presentations in the conference programme, meetings between APECS members and the Crown Prince Haakon of Norway and Prince Albert of Monaco, and an APECS speed-networking reception which united fun and work as it brought together early-career researchers and senior scientists from many disciplines from around the world.

Aside from the IPY Conference, there were many other opportunities for early career scientists created by APECS. Workshops, mentor panels, and networking events were held at numerous national and international conferences around the world, including the International Symposium on Arctic Research (Tokyo, Japan), European Science Open Forum (Torino, Italy), the Young Researchers Council of VNIIOkeangeologia (Russia), the SCAR Open Science Conference (Buenos Aires, Argentina), the MicroPerm Workshop (Potsdam, Germany), II PAGES International Symposium (Valdivia, Chile), the 7th International Penguin Conference (Boston, USA), and the International Circumpolar Remote Sensing Symposium (Cambridge, UK), just to name a few.

2010 has seen APECS build on its crucial partnership with SCAR and IASC through collaboration at meetings, representation on committees, and work together on the ICSU funded IPY Education and Outreach Assessment, which is lead by APECS. APECS has also signed memoranda of understanding with the University of the Arctic (UArctic), the International Antarctic Institute (IAI), the Arctic Frontiers Conference, the International Arctic Social Sciences Association (IASSA), and the Social Sciences and Humanities Antarctic Research Exchange (SHARE). These new collaborations will help to create many exciting opportunities in the coming years to advance the academic and professional development of early career polar researchers in all aspects of the physical and social sciences.

Within APECS, a contingent of active working groups keeps our exciting projects moving forwards. Our Mentorship Programme has an active and searchable database that brings together mentors and mentees from all disciplines and countries around the world. For those newer to Polar science, our "Who's Who in Polar Science" group is actively putting together a searchable list of organizations, institutions, and research projects whose acronyms might be initially daunting; this database will be complete in early 2011 and includes information about the 'who' that is relevant to young scientists. Other working groups are building education and outreach resources related to climate change in many languages as well as information for new researchers on field sites where members are working in both the Arctic and Antarctic. Two APECS working groups were just recently established – one to build

a database of funding resources available to young polar researchers and another to bring together a network of young researchers interest in the sediments budgets of cold environments; we are looking forward to more activity from these initiatives in 2011.

Increasingly, APECS is harnessing a diversity of web tools to communicate about career opportunities, education and outreach activities, cutting edge research, and polar news and discussions. Http://www.apecs.is has Twitter, Facebook, and RSS feeds that are freely available, and our monthly newsletters are quite popular. The Virtual Poster Session initiative continues to grow and focuses on bringing the concept of the poster presentation beyond the four walls of the conference hall by not only creating an online database of user-submitted polar research poster publications but also hosting monthly online conference calls where APECS members and mentors present and discuss their work. Building upon these activities, newly established email discussion lists are helping APECS members share and discuss the latest news, research and events in topics such as Glaciology, Polar Microbial Ecology, Atmosphere and Climate, Polar Heritage, and Polar Policy, just to name a few.

An exciting new initiative, developed in collaboration with the US NSF Arctic System Science Thermokarst Project and the University of Canterbury, is the APECS webinar series. Aimed at assisting APECS members with their career development goals, online seminars addressing topics such as fieldwork planning/logistics, scientific writing, working with Northern communities, and how to get the most out of a poster session can be joined live or viewed on an online archive. In Fall 2010, more than 1500 people have enjoyed the 10 webinars and subsequent archived videos. This series will continue through at least May 2011.

In addition to already active working groups, discussion lists, webinars, and virtual poster sessions, APECS already has an array of exciting events coming up for the latter part of 2011! APECS panels and workshops will be held at the 7th International Congress of Arctic Social Sciences (June 2011; Akureyri, Iceland), International Union of Geodesy and Geophysics Conference (June 2011; Melbourne, Australia), and the International Symposium on Antarctic Earth Science (July 2011; Edinburgh, UK). In addition, building off both Arctic and Antarctic field schools in 2010, APECS will be collaborating with a Students on Ice Antarctic University Cruise in February as well as an Interdisciplinary Polar Field School at UNIS, Svalbard in June.

APECS continues to look forward to working with SCAR and our many partners as we 'Shape the Future of Polar Research' together. For further details see: www.apecs.is

9. Partnerships

In pursuit of its vision and mission, SCAR often forms partnerships as an efficient means to achieve its goals and objectives. SCAR's partners include other ICSU bodies, entities of the Antarctic Treaty System, organizations with a polar focus, and organizations with a polar interest. The types of partnerships SCAR form vary considerably since each is tailored to best accomplish the shared objectives. In some instances, formal co-sponsorship of an activity is warranted entailing shared responsibility for programme management and resourcing. SCAR is always open to, and looking for ways, to strengthen existing partnerships and establish new ones. For further details see: http://www.scar.org/about/partnerships/

SCAR actively co-sponsors certain activities with partners (for example, the Southern Ocean Observing System with SCOR and others mentioned above). As well as those activities already mentioned SCAR, in partnership with the World Climate Research Programme (WCRP) co-sponsors the Climate and Cryosphere Project, the International Programme for Antarctic Buoys and the Southern Ocean Panel:

(i) The WCRP/SCAR/IASC Climate and Cryosphere (CliC) Project

The "Climate and Cryosphere" project encourages and promotes research into the cryosphere and its interactions as part of the global climate system. It seeks to focus attention on the most important issues, encourage communication between researchers with common interests in cryospheric and climate science, promote international co-operation, and highlight the importance of this field of science to policy makers, funding agencies, and the general public. CliC also publishes significant findings regarding the role of the cryosphere in climate, and recommends directions for future study. See http://www.climate-cryosphere.org/en/ for further details.

(ii) The CLIVAR/CliC/SCAR Southern Ocean Implementation Panel

The 6th Session of the CLIVAR/CliC/SCAR Southern Ocean Region Panel (SOP) was hosted by the National Oceanography Centre (NOC) in Southampton, UK. The science goals of the meeting were to explore the latest ideas for the dynamics of the Upper Cell of the Meridional Overturning Circulation (MOC) in the Southern Ocean (SO), and to discuss missing elements and appropriate future observations needed to fill out our understanding of the Lower Cell of the MOC in the SO. These goals were intended to further the objectives of the Southern Ocean Observing System (SOOS), and to help plan for collaborative studies with carbon and other groups.

The 7th Session of the CLIVAR/CliC/SCAR Southern Ocean Region Panel (SOP) will be held in Boulder, CO, in October this year. The meeting will focus on the following topics: assessment of progress on atmospheric processes linked to carbon cycle processes; upwelling and CO2 fluxes; the Polar Jet trends; and the Southern Ocean freshwater budget with CliC. The meeting will precede the WCRP Open Science Conference in Denver, for which the panel is currently planning its contributions.

In 2010 Dr Nicole Lovenduski was appointed as the newest member of SOP, as approved by the Scientific Steering Group. Nicole represents the interests of the carbon community. Membership of the panel is currently under review, in particular the recruitment of a new co-chair.

CLIVAR/CliC/SCAR SOP worked closely with the SCAR/SCOR Oceanography Expert Group to more the Southern Ocean Observing System (SOOS) Design Plan forward. In addition, a community paper on Southern Ocean Observing System (SOOS), entitled *Rationale and strategy for sustained observations of the Southern Ocean* was updated in terms of the frontier and research directions and is out for broad community input. The Southern Ocean Vision Document has now also been finalised, which was reviewed in the context of the emerging new structure of WCRP and future grand challenges for the Southern Ocean.

Other activities include participation in International Polar Year, through the Climate of Antarctica and the Southern Ocean (CASO) activity and Synoptic Antarctic Shelf-

Slope Interactions Study (SASSI). It is also intended that the panel produce a list of five or six diagnostics for SO to submit to CMIP5.

(iii) WCRP-SCAR International Programme for Antarctic Buoys (IPAB)

The Participants of the WCRP/SCAR International Programme for Antarctic Buoys (IPAB) work together to maintain a network of drifting buoys in the Southern Ocean, in particular over sea ice, to provide meteorological and oceanographic data for real-time operational requirements and research purposes.

The main current plan of IPAB is associated with the cooperation with the International Arctic Buoy Panel, and the idea is to use the experience in the Arctic to implement an array of drifting buoys on the Antarctic sea-ice. Primary collaborators include the US National Ice Center, US Antarctic Meteorological Research Center, British Antarctic Survey, Scottish Association for Marine Science, and some other IPAB Participants. They would like to deploy three types of buoys (Meteorological, Ice Mass Balance, and Polar ADOS buoys (ocean thermistor strings). A part of this plan is apparently already pending but nevertheless, participants are hopeful. For further details see: http://www.ipab.aq/.

10. SCAR Products

For the benefit of the wider community SCAR provides several products underpinning the work SCAR scientists do. These can be useful to other communities too (CCAMLR or COMNAP, for instance). Over the next year SCAR will be conducting a detailed review of its products. For further details, see: http://www.scar.org/researchgroups/productsandservices/.

The list includes:

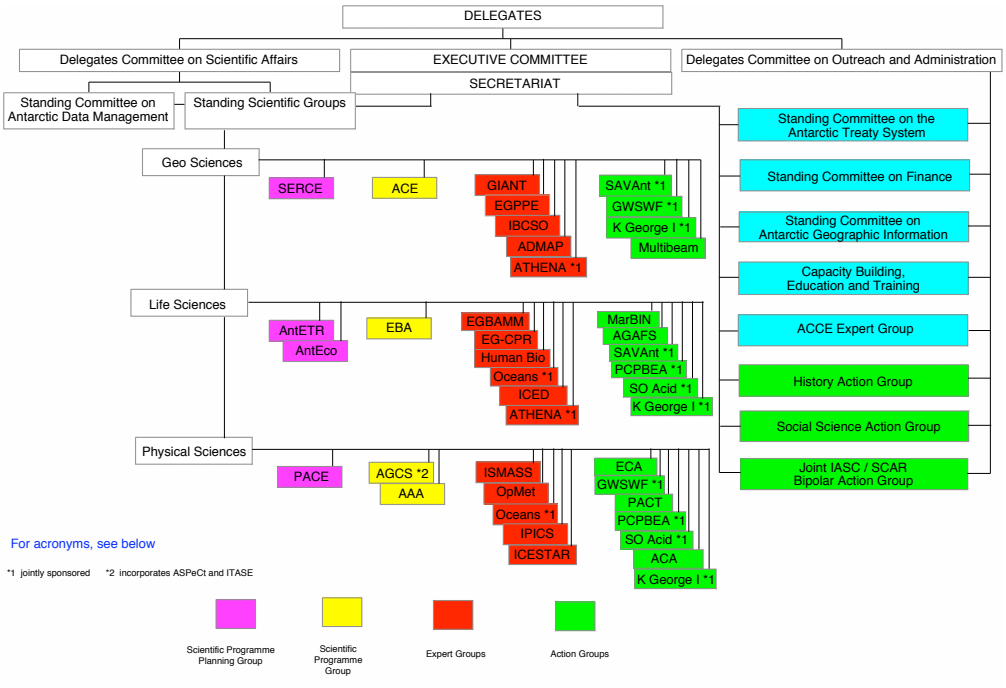
- ADD - Antarctic Digital Database.
  Responsible: Alexander Paul Cooper (aprc@bas.ac.uk);
- ADDS - Antarctic Data Directory System.
  Responsible: Kim Finney (kim.finney@aad.gov.au);
- ADMAP - Antarctic Digital Magnetic Anomaly Project.
  Responsible: Marta Ghidella (mghidella@dna.gov.ar);
- Antarctic Biodiversity Database.
  Responsible: Dave Watts (dave.watts@aad.gov.au);
- Antarctic Map Catalogue.
  Responsible: Henk Brolsma (henk.brolsma@aad.gov.au);
- BEDMAP - Antarctic Bedrock Mapping.
  Responsible: Alexander Paul Cooper (aprc@bas.ac.uk);
- CGA - Composite Gazetteer of Antarctica.
  Responsible: Roberto Cervellati (roberto.cervellati@consorzio.pnra.it);
- CPR – Continuous Plankton Recorder Database.
  Responsible: Graham Hosie (graham.hosie@aad.gov.au);
- IBCSO - International Bathymetric Chart of the Southern Ocean.
  Responsible: Hans Werner Schenke (Hans-Werner.Schenke@awi.de);

- MarBIN - Marine Biodiversity Information Network.
  Responsible: Bruno Danis (bruno.danis@gmail.com);
- READER - REference Antarctic Data for Environmental Research. There are three components of READER:
  - MET-READER providing surface and upper air mean climate data
  - ICE-READER providing links to ice core data
  - OCEAN-READER which holds oceanographic data

  Responsible: John Turner (j.turner@bas.ac.uk);
- SDLS - Seismic Data Library System.
  Responsible: Nigel Wardell (nwardell@ogs.trieste.it).

APPENDIX 1 – SCAR Organisation

The Organisation of the Scientific Committee on Antarctic Research (SCAR) (January 2011)



Acronym Definitions

AAA Astronomy and Astrophysics from Antarctica

ACA Antarctic Clouds and Aerosols

ACCE Antarctic Climate Change and the Environment

ACE Antarctic Climate Evolution

ADMAP Antarctic Digital Magnetic Anomaly Project

AGAFS Action Group on Antarctic Fuel Spills

AGCS Antarctica and the Global Climate System

AntEco State of the Antarctic Ecosystem

AntETR Antarctic Ecosystems: Adaptations, Thresholds and Resilience

ATHENA Advancing TecHnological and ENvironmental stewardship for subglacial exploration in Antarctica

EBA Evolution and Biodiversity in the Antarctic

ECA Environmental Contamination in Antarctica

EGBAMM Expert Group on Birds and Marine Mammals

EG-CPR Expert Group on the Continuous Plankton Recorder

EGPPE Expert Group on Permafrost and Periglacial Environments

GIANT Geodetic Infrastructure of Antarctica

GWSWF GPS for Weather and Space Weather Forecasting

Human Bio Human Biology and Medicine

IBCSO International Bathymetric Chart of the Southern Ocean

ICED Integrating Climate and Ecosystem Dynamics

ICESTAR Inter-hemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research

IPICS International Partnership in Ice Core Sciences
ISMASS Ice Sheet Mass Balance and Sea Level
K George I Coordination of Scientific Activities on King George Island
MarBIN Marine Biodiversity Information Network
Multibeam Multibeam Bathymetric Data Acquisition
Oceans SCAR and Oceanography
Op Met Operational Meteorology in the Antarctic
PACE Past and future Change of the Antarctic Environment
PACT Polar Atmospheric Chemistry at the Tropopause
PCPBEA Prediction of Changes in the Physical and Biological Environment of the Antarctic
SAVAnt Seeps And Vents Antarctica
SERCE Solid Earth Responses and Influences on Cryosphere Evolution
SO Acid Southern Ocean Acidification

APPENDIX 2 – SCAR Data Policy

Summary

SCAR (see www.scar.org) is charged with initiating, developing and coordinating high quality international scientific research in the Antarctic region, and advising on the role of the Antarctic region in the Earth system. The scientific business of SCAR is conducted by its Standing Scientific Groups in the Physical-, Life- and Geo- Sciences which represent the scientific disciplines active in Antarctic research. These groups share information on disciplinary scientific research being conducted by national Antarctic programmes; identify research areas or fields where current research is lacking; coordinate proposals for future research by national Antarctic programmes to achieve maximum scientific and logistical effectiveness; identify research areas or fields that might be best investigated by a major SCAR Scientific Research Programme; and establish Action and Expert Groups to address specific research topics within the discipline.

SCAR related research data is highly multidisciplinary and disparate. This policy aims to provide a framework for these data to be handled in a consistent manner, and to strike a balance between the rights of investigators and the need for widespread access through the free and unrestricted sharing and exchange of both data and metadata. This policy is compatible with the data principles of SCAR's parent body, ICSU and other relevant international agencies (e.g. WMO), and with the goals of Article III 1 c of the Antarctic Treaty.

Since SCAR coordinates a distributed programme of research, generally implemented through a number of nationally self-managed projects, the principles enshrined in this Data Policy should be applied to data in each SCAR-endorsed Project. In order to be considered part of a SCAR Research Programme, each Project should follow the SCAR Data Policy, submit metadata and linked datasets to the Antarctic Master Directory (AMD - gcmd.gsfc.nasa.gov/Data/portals/amd/) in a reasonable timeframe, and should have an appropriately funded data management plan in place before the Project begins.

Nations affiliated with SCAR are urged to establish a National Antarctic Data Centre (NADC) or assign NADC responsibilities to an existing national institution capable of carrying out NADC obligations. NADCs in collaboration with SCAR Research Projects and Programmes will work towards developing a SCAR Antarctic Data and Information System (ADMS).

The SCAR Standing Committee on Antarctic Data Management (SCADM) is responsible for this Data Policy. Questions about the policy and its implementation should be directed to the SCADM Executive (see http://scadm.scar.org).

Data Definition

SCAR data are those data generated under the auspices of a SCAR-sponsored Research Project. This policy applies specifically to those data. It should be recognized, however, that SCAR researchers will use SCAR-relevant data from non- SCAR sources, such as from existing operational data networks and historical national sources. Wherever possible, data used in SCAR Projects that are not SCAR generated, should be treated similarly to SCAR data, where copyright permits and it is practical to treat these data according to SCAR Data Policy norms. A small subset of data both generated and used by SCAR may require special policy and access considerations, because they need to be legitimately restricted in some way. Access to these data may be restricted because they are about human subjects, because there may be intellectual property issues, or because there is a situation where release of the data

may cause harm to the public or environment (e.g., the location of nesting sites for an endangered species).

Figure 1 below conceptually illustrates the different classes of data typically used by SCAR Projects.

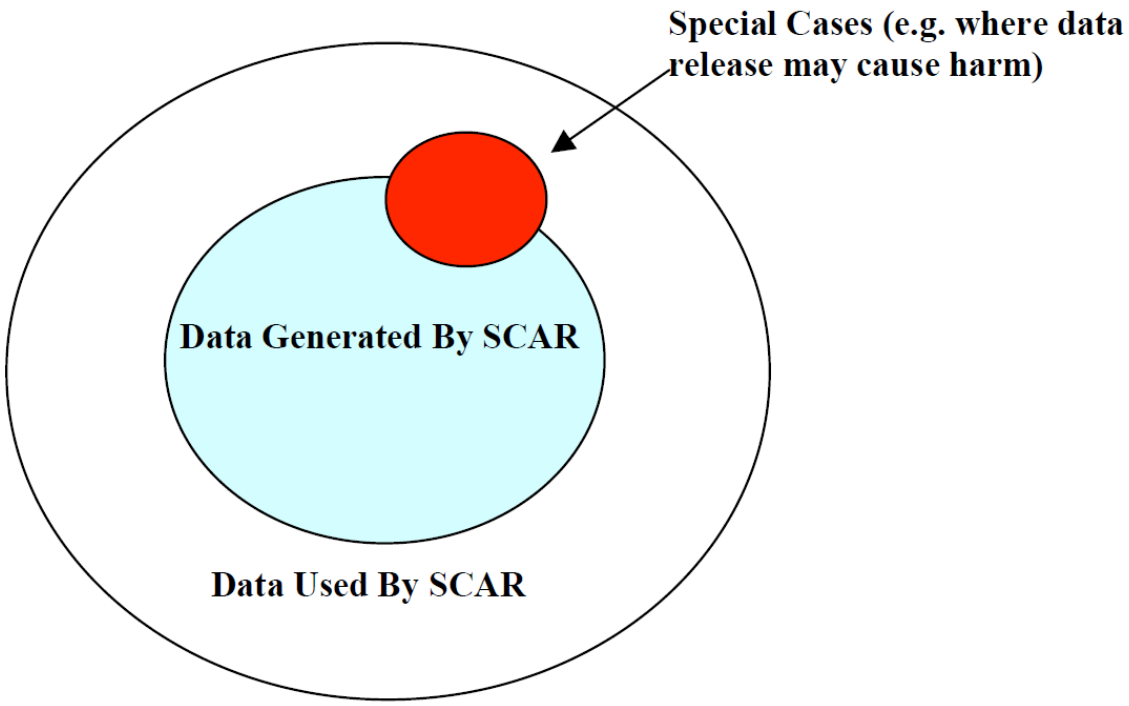


Figure 1. Graphical definition of "SCAR data" (inner blue circle), "SCAR-related data" (outer circle), and Special Cases (red circle).

Data Availability and Exchange

In accordance with

- the Twelfth WMO Congress, Resolution 40 (Cg-XII, 1995)
- the Thirteenth WMO Congress, Resolution 25 (Cg XIII, 1999)
- the ICSU 1996 General Assembly Resolution
- the ICSU Assessment on Scientific Data and Information (ICSU 2004b)
- Article III-1c from the Antarctic Treaty
- the Intergovernmental Oceanographic Commission Data Exchange Policy

and in order to maximize the benefit of data gathered under the auspices of SCAR Projects, the SCAR Executive Committee (EXCOM) requires that SCAR data, including operational data delivered in real time, are made available fully, freely, openly, and on the shortest feasible timescale.

The only exceptions to this policy of full, free, and open access are:

- where human subjects are involved, confidentiality must be protected;
- where data release may cause harm, and where specific aspects of the data may need to be kept protected (for example, locations of nests of endangered birds).

ICSU (2004b) defines "Full and open access" as equitable, non-discriminatory access

to all data preferably free of cost, but some reasonable cost-recovery is acceptable.

WMO Resolution 40 uses the terms "Free and unrestricted" and defines them as non discriminatory and without charge. "Without charge", in the context of this resolution means at no more than the cost of reproduction and delivery without charge for the data and products themselves.

Metadata are essential to the discovery, access, and effective use of data. All SCAR data should be accompanied by a full set of metadata that completely documents and describe the data. In accordance with the ISO standard Reference Model for an Open Archival Information System (OAIS) (CCSDS 2002), complete metadata may be defined as all the information necessary for data to be independently understood by users and to ensure proper stewardship of the data. Regardless of any data access restrictions or delays in delivery of the data itself, all SCAR Projects should promptly provide basic descriptive metadata of collected data to the Antarctic Master Directory (AMD) system.

Data Preservation

Recognizing that the true value of scientific data is often realized long after these data have been collected, and to ensure the lasting legacy of SCAR Projects, it is essential to facilitate long-term preservation and sustained access to SCAR data. All SCAR data should be archived in their simplest, useful form and be accompanied by a complete metadata description. SCADM national contacts (http://scadm.scar.org/index.php?id=368) can help Projects identify appropriate long-term archives and data centers, but it is the responsibility of individual SCAR Projects to make arrangements with long-term archives to ensure the preservation of their data. It must be recognized that data preservation and access should not be an afterthought and needs to be considered when data collection plans are developed. SCADM should work with the relevant national institutions, NADCs, and other organizations to ensure the preservation of SCAR-related data.

Nations affiliated with SCAR are urged to establish a National Antarctic Data Centre (NADC) or assign NADC responsibilities to an existing national institution capable of carrying out NADC obligations. Providing NADC obligations can be met, a SCAR member country could organise for its Antarctic data to be hosted through a virtual facility formed from the collaboration of several national institutes. Under these circumstances a lead institution must be nominated for the purposes of contact and coordination. The responsibilities of an NADC should include:

- assistance to users in using the AMD and preparing metadata,
- collation of all data generated through national Antarctic science projects,
- provision of data archiving services that permit the long-term re-use of data,
- publication of data from national Antarctic science programmes to one or more SCAR-endorsed data access networks, and
- active participation as a node in the ADMS (involving input into the development of network infrastructure standards and conformance with community data standards and protocols)

For an NADC to participate fully as a node in the ADMS it should have, as a minimum a:

- Portal on the AMD, (http://gcmd.nasa.gov/KeywordSearch/amd/nadc_portals.html),
- publicly accessible web site providing access to national Antarctic data,
- published operational plan describing how data is managed and archived to permit re-use,
- publicly accessible national Antarctic data policy complementary to the SCAR Data Policy, and

- commitment and the capability to publish data to SCAR-endorsed data distribution networks.

An operationally active representative from the NADC should be considered for nomination to participate in SCADM.

Development and ongoing enhancement of the SCAR ADMS should be under-pinned by a Data Strategy and an implementation roadmap.

Data Management Planning

All SCAR-endorsed Projects should be required to prepare a Data Management Plan which outlines how any data captured, modelled or acquired will be managed both during the life of the project and beyond. All Data Management Plans should articulate the resources required to implement the plan and outline where data will be hosted for long-term curation. A Data Management Plan template is attached to the SCAR Data and Information Strategy, which demonstrates the types of issues to be considered in such a Plan.

Data Acknowledgment Norms

To recognize the valuable contributions of data providers (generally scientists who collect, synthesise, model or prepare analysed data) and to facilitate repeatability of research results, users of SCAR data should formally acknowledge data authors (contributors) and sources. Where possible, this acknowledgment should take the form of a citation, such as when citing a book or journal article. Some journals already require the formal citation of data used in articles that they publish. However, most current journals do not, but as a professional courtesy all data consumers operating under the auspices of SCAR Projects, should formally acknowledge the datasets that they use in their research.

References

The Antarctic Treaty. 1959. Available at http://www.ats.aq/

CCSDS (Consultative Committee for Space Data Systems). 2002. Reference Model for an Open Archival Information System (OAIS). CCDSD 650.0-B-1. Blue Book. Issue 1. Washington, DC: CCSDS Secretariat. [Equivalent to ISO 14721:2002]. Available at http://public.ccsds.org/publications/archive/650x0b1.pdf

Intergovernmental Oceanographic Commission Oceanographic Data Exchange Policy. 2003.Available at http://www.iode.org/contents.php?id=200

ICSU (International Council for Science). 2004b. ICSU Report of the CSPR Assessment Panel on Scientific Data and Information. Available at: http://www.icsu.org/1_icsuinscience/DATA_Paa_1.html

Resolution of the International Council of Science (ICSU) General Assembly (24-27

September 1996). Available at http://globalchange.gov/policies/icsu-1996.html

World Meteorological Organization Congress, Resolution 40 (Cg-XII, 1995): WMO Policy and Practice for the Exchange of Meteorological and Related Data and Products Including Guidelines on Relationships in Commercial Meteorological Activities Available at http://www.nws.noaa.gov/im/wmocovr.htm

World Meteorological Organization Congress, Resolution 25 (Cg XIII, 1999). Exchange of Hydrological Data and Products. Available at http://www.wmo.ch/web/homs/documents/english/res25eng.html