



XXXIII Antarctic Treaty Consultative Meeting
3rd to 14th May, 2010

Punta del Este - Uruguay

Agenda Item: ATCM 4

Presented by: SCAR

Original: English

The Annual Report for 2009 of the Scientific Committee on Antarctic Research (SCAR) of the International Council for Science (ICSU)

The Annual Report for 2009 of the Scientific Committee on Antarctic Research (SCAR) of the International Council for Science (ICSU)

SCAR is the foremost, non-governmental organisation that initiates, develops, and coordinates high quality international scientific research in the Antarctic region including the study of Antarctica's role in the earth system. SCAR's members currently include scientific academies of 35 nations and 9 of ICSU's scientific unions.

SCAR's scientific research adds value to national efforts by enabling national researchers to collaborate on large-scale scientific questions to accomplish objectives not easily obtainable by any single country or programme. SCAR's biennial Open Science Conference provides an important forum for polar scientists; the next one is in Buenos Aires (August 3-6, 2010). SCAR is also cosponsoring the 2nd IPY Open Science Conference, in Oslo (June 8-12, 2010). SCAR supports research Fellows and young scientists (in partnership with the Association for Polar Early Career Scientists – APECS), and provides a number of data and information products (Appendix I).

SCAR provides independent scientific advice in support of the wise management of the Antarctic environment, in partnership with the Antarctic Treaty Parties and CCAMLR, and works closely with COMNAP and ACAP. In 2010 SCAR is providing the ATCM and CEP with 4 Working Papers and 8 Information Papers covering a wide range of important topics. This represents a large effort in manpower and resources for which SCAR is not reimbursed.

SCAR's success depends on the quality and timeliness of its key scientific outputs, which in most cases are assessed through external peer-review. Descriptions of SCAR's research programmes and key scientific outputs are available at www.scar.org. In 2009, an external group reviewed the performance of SCAR, with favourable results. SCAR is now producing its Strategic Plan for 2011-2016.

SCAR Executive Director Colin Summerhayes retired on April 9 after 6 years service and was replaced by the Executive Officer Dr. Michael Sparrow, after an exhaustive international search. He was in turn replaced by Dr Renuka Badhe, a marine biologist and Indian citizen, who was selected from 44 international candidates.

During 2009, SCAR's research continued focusing on five main themes:

- (i) the modern ocean-atmosphere-ice system;
- (ii) the evolution of climate over the past 34 million years since glaciation began;
- (iii) the response of life to change;
- (iv) preparations to study subglacial aquatic environments; and
- (v) the response of the Earth's outer atmosphere to the changing impact of the solar wind at both poles.

Highlights for 2009 include:

1. Publication of a major 560-page interdisciplinary review of "Antarctic Climate Change and the Environment (ACCE)" (<http://www.scar.org/publications/occasionals/acce.html>) showing how the climate has changed in the past and is likely to change in the future, with probable effects on the biota.
2. The discovery that increased growth in Antarctic sea ice during the past three decades results from strengthening of surface winds around Antarctica caused by development of the ozone hole; these winds limit the impact of global warming on Antarctic climate.
3. Published images of the aurora taken simultaneously in the Northern and the Southern hemispheres show that they can be totally asymmetric, contradicting the commonly held assumption that they should be mirror images of one another (Nature 460, 491-493, 2009).

4. A barcoding campaign extended the number of Antarctic DNA barcodes from 3,500 pre-2009 to over 10,000. The data show high numbers of cryptic species in the Antarctic benthos, especially in species previously thought to have circum-Antarctic distributions.
5. Recent research shows that terrestrial, shelf and deeper water biotas all have components that survived repeated glaciations in what appear to be temporary and shifting refugia, which likely also contributed to substantial radiation in the marine biota (reviewed in Quaternary Science Reviews vol. 28, 3035-3048).
6. The SCAR-supported ANDRILL Programme, which contributes to SCAR's Antarctic Climate Evolution (ACE) programme, recovered more than 20 million years of climate and ice sheet history from McMurdo Sound, providing numerical modellers with new constraints on ice sheet behaviour and Ross Sea conditions. The cores reveal periodical collapse of the West Antarctic ice sheet (WAIS) leading to open water in the Ross Sea embayment (Naish et al., Nature 2009).
7. Publication of the first SCAR Data and Information Strategy (DIMS), defining the direction for SCAR data management activities over the next 5 years, emphasises the need to leverage established regional, global and thematic data-centric networks to improve data management capability within the Antarctic science community as a whole.
8. SCAR successfully ran the first year of the Martha T Muse Prize for Science and Policy in Antarctica, a \$100,000 unrestricted yearly prize given to an early to mid-career individual who has demonstrated excellence and the potential or leadership in Antarctic science or policy. Dr Steven Chown was the inaugural recipient. Presentation of the award and a lecture by Dr Chown will take place at the Oslo IPY Conference in June 2010.

Antarctica In The Global Climate System (AGCS)

Activities under this heading are jointly conducted with the World Climate Research Programme (WCRP) and its Climate and Cryosphere programme (CliC). Papers in press in Deep-Sea Research II discuss the development of empirical relationships between ice thickness and satellite-derived snow freeboard, and their application to IceSAT altimetry to determine, for the first time, an adequate baseline for ice thickness distribution for future monitoring of climatic changes in the Antarctic sea ice cover. AGCS has also recovered and archived additional Antarctic data in the Met-, Ice- and Southern Ocean- READER databases.

Antarctic Climate Evolution (ACE)

ACE activities are coordinated with the International Partnership in Ice Core Sciences (IPICS); the palaeoclimate community via the past climate change (PAGES) programme of the International Geosphere Biosphere Programme (IGBP); the IASC programme on Arctic Palaeoclimate and its Extremes (APEX); and drilling programmes such as the Antarctic Geological Drilling programme (ANDRILL) and the Integrated Ocean Drilling Program (IODP).

In 2009, ACE held its first Antarctic Climate Evolution conference in Granada, Spain (7-11 September) (<http://www.acegranada2009.com/>), with nearly 200 attendees. Review papers will be published by Elsevier. Planning is underway for site surveys preparing for the next ANDRILL Project on the Coulman High.

Evolution And Biodiversity In The Antarctic (EBA)

A wide range of national and multinational projects contributes to EBA, including CAML (Census of Antarctic Marine Life), SCAR-MarBIN (the Marine Biodiversity Information Network), 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). Major meetings in 2009 included 10th SCAR Biology Symposium in Sapporo, Japan, 27-31 July 2009, attended by some 300 participants.

In part EBA's success relies on biological data being maintained, archived and exchanged, much of which is done through the Australian Antarctic Division's Biodiversity Database. EBA also relies on other databases

including SCAR-MarBIN (www.scarmarbin.be). The ANTOBIS geodatabase (forming the Antarctic node of the Ocean Biogeographic Information System, OBIS) has now reached over 1 million records from 145 distributed databases. Since it started in 2005, the SCAR-MarBIN website has reached over 700,000 visitors, 5,000,000 hits, and a total of over 32,000,000 downloaded records. SCAR-MarBIN is funded by the Belgian Science Policy office, with assistance from Australia, Germany, The Netherlands, the TOTAL Foundation and the ArcOD consortium.

In the last five years, CAML has coordinated the largest-ever survey of biota in the Southern Ocean, including 18 major voyages to Antarctica. The survey discovered hundreds of new species and published over 1,000 scientific papers. Main findings will be published in a special volume of *Deep-Sea Research II*. These achievements provide a robust benchmark against which future change in the Antarctic marine ecosystems may be measured.

Subglacial Antarctic Lake Environments (SALE)

The SALE programme has succeeded in stimulating funding for 3 major national projects to sample subglacial aquatic environments over the next 5 years, including: Subglacial Lake Ellsworth (direct exploration in 2012/13); Subglacial Lake Whillans and its associated watershed (drill testing in 2011-2012, lake sampling in 2012-2013, and sampling the lake's outflow in 2013-2014); and Subglacial Lake Vostok (plan to enter the lake in 2010-2011). In addition, Japanese scientists confirmed that liquid water was present at the base of the Dome Fuji ice core. Belgian scientists continue to improve numerical models of ice flow over subglacial lakes, and the influence of basal conditions on the dynamic behaviour of Antarctic glaciers and ice streams. A Chapman Conference on subglacial environments was held on 15-17 March 2010 in Baltimore, Maryland, USA, and a monograph is being produced (<http://www.agu.org/meetings/chapman/2010/ccall/index.php>).

Inter-Hemispheric Conjugacy Effects In Solar-Terrestrial And Aeronomy Research (ICESTAR).

ICESTAR is describing the upper atmosphere over Antarctica and its coupling to the global atmosphere and solar-terrestrial links. During periods of enhanced geomagnetic activity the surface temperatures in certain high-latitude regions are on average 4-5°C higher or lower than during quiet conditions. The ICESTAR team continue to develop and refine the Global Auroral Imaging Access (GAIA) data portal; see <http://gaia-yxo.org>, a virtual observatory for dealing with data from geospace optical and riometer systems, containing more than 10,000,000 summary images. At the XXXI SCAR meeting in August, ICESTAR will become an Expert Group and its place as a Scientific Research Programme will be taken by the Astronomy and Astrophysics from Antarctica Programme.

Other SCAR Research Areas are described in Appendix II.

Appendix 1. SCAR'S 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. The list includes:

- Antarctic Data Directory System (ADDS)
- REference Antarctic Data for Environmental Research (Meteo-READER)
- The Ocean READER database
- The Ice READER database
- Antarctic Digital Database (ADD)
- Antarctic Biodiversity Database
- Composite Gazetteer of Antarctica
- Seismic Data Library System (SDLS)
- Geodetic Data including: Master index for Antarctic positional control; Geophysical and geodetic observatories; and Geodetic Control Database
- Antarctic Map Catalogue (
- Antarctic Bedrock Mapping (BEDMAP)
- Tide gauge data
- Antarctic Digital Magnetic Anomaly Project
- The SCAR King George Island Geographical Information System
- The Continuous Plankton Recorder database
- The Feature Catalogue
- Sea Ice Database

Appendix II. Other SCAR Research Areas

SCAR carries out smaller scale investigations on a wide range of topics through the following groups (for more information see www.scar.org):

1. Expert Group on Birds and Marine Mammals;
2. Expert Group on Continuous Plankton Recorder Research
3. Action Group on Prediction of Changes in the Physical and Biological Environments of the Antarctic
4. Integrating Climate and Ecosystem Dynamics in the Southern Ocean
5. Southern Ocean Global Ocean Ecosystems Dynamics
6. Expert Group on Human Biology and Medicine
7. Action Group on Antarctic Fuel Spills
8. Expert Group on Geodetic Infrastructure of Antarctica
9. Solid Earth Response and influences on Cryospheric Evolution Scientific Programme Planning Group:
10. Expert Group on the International Bathymetric Chart of the Southern Ocean
11. Expert Group on Antarctic Permafrost and Periglacial Environments
12. Sub-Ice Geological Exploration Action Group:
13. Seeps and Vents Antarctica Action Group
14. International Partnership in Ice Coring Science Expert Group
15. Astronomy and Astrophysics from Antarctica Scientific Research Programme Planning Group
16. Operational Meteorology Expert Group
17. Environmental Contamination in Antarctica Action Group
18. Polar Atmospheric Chemistry at the Tropopause Action Group
19. Joint SCAR/SCOR Oceanography Expert Group
20. CLIVAR/CliC/SCAR Southern Ocean Implementation Panel (SOIP) and the WCRP/SCAR International Programme for Antarctic Buoys (IPAB)
21. Ice Sheet Mass Balance and Sea Level Expert Group
22. GPS For Weather and Space Weather Forecast Action Group
23. Prediction of Changes in the Physical and Biological Environment of the Antarctic
24. King George Island Cross SSG Action Group:
25. Antarctic Data Management (Standing Committee)
26. Antarctic Geographic Information (Standing Committee)
27. Antarctic Treaty System (Standing Committee)
28. History Action Group
29. Capacity Building, Education and Training Committee