



**XXXII SCAR Delegates' Meeting**

**Portland, USA, 23-25 July 2012**

Agenda Item: 5.2.1

Person Responsible: Maurizio  
Candidi

# **SCAR Standing Scientific Group on Physical Sciences (SSG/PS)**

## **Report to the Delegates**



## Executive Summary

**Title:** SCAR Standing Scientific Group on Physical Sciences (SSG/PS), Report to the Delegates, SCAR XXXII July, 2010

**Authors:** M. Candidi, T. Yamanouchi, T. van Ommen

**Relevant URLs or references to other reports:**

<http://www.scar.org/publications/bulletins/Bulletin180.pdf>

**Introduction/ Background:**

Highlights, Progress and Plans of SSG/PS, were outlined at the SCAR Executive Committee (EXCOM) Meeting, Edinburgh, UK, 18-19th July 2011, by Dr. T. Yamanouchi, Chief Officer for SSG/PS.

ICESTAR became a new Expert Group and AAA was approved as an SRP. AGCS will end in 2012 and be replaced by “Antarctic Climate 21” or “AntClim21” (formerly PACE (Past and Future Changes of the Antarctic Environment) PPG) subject to Delegate approval. The Antarctic Clouds and Aerosols (ACA) group and the Southern Ocean Acidification Action Group have been established. The GPS for Weather and Space Weather Forecasting (GWSWF) Action Group has discussed its Terms of Reference and will be jointly sponsored as an Expert Group by PS and GS; the name of the group will be changed to GRAPE (GNSS Research and Application for Polar Environment).

There was a discussion on interactions with programs outside of SCAR (e.g. IPICS). Agreements with groups external to SCAR can take several forms (e.g. as a SCAR Expert Group or through a letter of agreement). These agreements are to be regularly reviewed to ensure partnerships are functioning and beneficial. These partnerships are important and leverage SCAR resources.

The Ice Sheet Mass Balance and Sea Level (ISMASS) Expert Group held a workshop in association with the SCAR meetings in Portland on July 14. The meeting was highly successful and marks the beginning of a new era in coordination of this key research area.

AAA: a very well attended session of the Antarctic astronomical community at the SCAR OSC in Portland, devoted to astronomy and astrophysics, testifies of its growth within SCAR. New exciting results are emerging due to the specific qualities of the Antarctic sites (both atmosphere and ice quality).

**Budget Implications:** Estimated SCAR funding needed by SSG/PS for the next 2 years (in USD) : \$ 33.5k in 2013 and \$ 19.5k in 2014. (Pending approval of the finance committee)

## Summary of main achievements within SSG/PS.

- 1) Revitalisation of the Ice Sheet Mass Balance and Sea Level Expert Group is a significant highlight. A workshop, sponsored by SCAR, the International Arctic Science Committee and World Climate Research Program, was held in Portland on July 14, 2012 in association with the SCAR meetings. This meeting reviewed the current status of knowledge and approaches to addressing knowledge gaps, and worked toward setting directions for future research.
- 2) In the framework of the Astronomy and Astrophysics from Antarctica SRP, data from the first wide-field optical telescope at Kunlun Station have been released by the Chinese Academy of Sciences, and are publicly available at <http://archive.bao.ac.cn/en/cstar>.
- 3) Under the leadership of the ASPeCt group, an analysis was conducted of IceSAT data taken from the Bellingshausen-Amundsen pack ice from 2003-2009, based on the relationships developed from field campaigns, that related sea ice thickness to satellite-derived snow freeboard. This analysis (Xie et al 2012 submitted to “The Cryosphere”), provides the first regional-scale and interannual comparisons of sea ice thickness for Antarctic sea ice. It therefore fulfils a gap noted in the last IPCC assessment, that the variability of Antarctic sea ice thickness has been unavailable.
- 4) A major focus of the PCPBEA EG this year has been utilizing the climate model data that are becoming available for the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), which is due to report in 2014. The world’s leading climate prediction centres are running coupled atmosphere-ocean general circulation models (GCMs) as part of the Coupled Model Intercomparison Project 5 (CMIP5). The models are being run for periods of several hundred years with pre-industrial forcing, through the historical period since 1860 with observed forcing and out to 2100 driven by various greenhouse gas emission scenarios and predicted recovery of the ozone hole. A new method has been developed (Bracegirdle and Stephenson, 2012) to combine the predictions of the various models taking into account their biases in simulating the present climate. This has the potential to give more precise surface temperature projections for the coming century. This work was presented at the WCRP workshop on CMIP5 model analysis held in Hawaii over 5-9 March 2012.
- 5) The major effort of the SOOS group consisted in starting the development of a Southern Ocean Observing System, following the initial requirements of ATCM Resolution 3 (2007), which welcomed and supported “the proposal by SCAR to establish a multi-disciplinary pan-Antarctic observing system, which will, in collaboration with others, coordinate long-term monitoring and sustained observation in the Antarctic”. This is one of the key recommendations from the ACCE Report. The SOOS is also a significant legacy of the recent International Polar Year.

## SSG/PS Scientific Research Programs

New scientific research programs have been presented in Portland. AntClim21, SERCE and PAIS are of direct relevance to SSG/PS, also as an effect of the cross-linkages activity. The proposals have been scrutinised by anonymous referees and their reports are positive. Some comments have been raised with respect to each, and it appears to SSG/PS that some of these may be an improvement over the proposed programmes. SSG/PS notes potential gaps in PAIS and SERCE proposals in regard to their use of ice core and radar data from the Japanese Dome F community and also in regard to the extent of use of available marine geology data. For example, there is glacial morphological data available from the continental shelf from several places.

SSG/PS recommends that PAIS and SERCE include engagement with providers of glacial morphological data available from the continental shelf from several places.

SSG/PS recommends engagement between PAIS and ISMASS be developed.

SSG/PS recommends that AntClim21 include expertise in upper atmospheric physics to the program.

SSG/PS recommends that the programs AntClim21, SERCE, and PAIS, which address research fields of relevance to physical sciences, be approved; it is recommended that the programs address referee comments and, where appropriate, incorporate these in their implementation.

***Astronomy and Astrophysics from Antarctica (AAA).*** Leader J. Storey, Australia.

A complete report on AAA can be found as WP 18 in the papers for the Portland delegates' meeting.

**Authors:** John Storey (Chief Officer) and the AAA Steering Committee

### **Introduction/Background:**

Broadly stated, the objectives of Astronomy & Astrophysics from Antarctica are to coordinate astronomical activities in Antarctica in a way that ensures the best possible outcomes from international investment in Antarctic astronomy, and maximizes the opportunities for productive interaction with other disciplines. The SCAR AAA SRP Planning Group was proposed at the Hobart XXIX SCAR in 2006. Creation of the AAA SRP was approved at the Moscow XXX SCAR Delegates meeting in 2008. AAA held its first formal meeting as a Scientific Research Program in August 2010 in Buenos Aires, followed by a kick-off meeting in Sydney in June 2011.

### **Important Issues or Factors:**

At this stage, AAA is functioning well and is putting in place the structures and processes outlined in the implementation plan. There have been no significant problems.

**Recommendations/Actions and Justification:** No action required.

### **Benefits/Outcomes:**

- 1) **The First release of the CSTAR Point Source Catalog from Dome A, Antarctica.** *Publ. Astron. Soc. Pacific*, **122**, (2010), 347 – 353.
- 2) **Future plans for astronomy at Dome Fuji.** *Highlights of Astronomy*, **15** (2010), 632 – 633
- 3) **The First Public Release of South Pole Telescope Data: Maps of a 95 deg<sup>2</sup> Field from 2008 Observations,** *The Astrophysical Journal*, **743**, (2011). id. 90

**Partners:** No formal partners, although the International Astronomical Union (IAU) is a Union Member of SCAR.

***Antarctica in the Global Climate System (AGCS).*** Leader A. Naveira-Garabato, UK.

**Authors:** AGCS Steering Committee

**Introduction/ Background:** AGCS is a cross-disciplinary science programme that focuses on the atmospheric, oceanic and cryospheric linkages between the Antarctic and the rest of the Earth system. See WP16 for a complete report.

**Important Issues or Factors:** AGCS has produced several important scientific highlights in the last two years, ranging from major advances in the understanding of Antarctic clouds to significant new insights into how turbulent flows shape the climatically key Southern Ocean overturning circulation.

**Recommendations/Actions and Justification:** AGCS is coming to an end in 2012. We ask the Delegates to consider supporting the AGCS-sparked proposal of a new climate-related SRP (AntClim21) focused on the understanding and prediction of how the Antarctic environment will change over the 21st century.

**Expected Benefits/Outcomes:** AntClim21 will lead to improved projections and mechanistic understanding of the magnitude and patterns of change to Antarctica's physical environment and of the likely consequences for biological ecosystems over the next century.

**Partners:** In its final year, AGCS will continue to work (often in a leading role) with the SSGs and several other SRPs, the Southern Ocean Observing System Steering Committee, and the CLIVAR / CliC / SCAR Southern Ocean Implementation Panel, amongst others, to ensure that AGCS-sponsored research and associated activities are carried out to a successful conclusion. AGCS will continue to support the development of the next generation of Antarctic scientists via its close association with APECS.

## ***1. Rationale for the Programme***

AGCS consisted of four science themes concerned with:

1. Decadal-scale variability in the Antarctic climate system
2. Global and regional climate signals in ice cores
3. Natural and anthropogenic forcing on the Antarctic climate system
4. The export of Antarctic climate signals.

This document reports on progress with the implementation of the programme since our report to the SCAR Delegates in July 2010. It provides details of progress with the science and lists outputs.

## ***2. Important Issues or Factors***

### *Five Scientific Highlights*

The first climatology of the Amundsen Sea Low (ASL) as produced. (Turner et al., 2012).

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. (Jullion et al., 2010; Meredith et al., 2011).

The present state of knowledge of tropospheric clouds over Antarctica and the Southern Ocean, a key factor in the radiation budget and surface mass balance of the regional cryosphere, was reviewed and critiqued in a recent review paper (Bromwich et al., 2012).

A new theory for the rate at which mesoscale eddies stir and transport water masses across the Antarctic Circumpolar Current (ACC) was developed and tested against observations (Naveira Garabato et al., 2011).

A collection of articles in Deep-Sea Research II (volume 58, issues 9-10) discusses Antarctic sea-ice zone research during the International Polar Year (see Worby et al., 2011).

### *Progress against Prior Work:*

Selected achievements are listed below, avoiding duplication of the work described in the above highlights.

AGCS has produced brief annual updates on the ACCE report via the newly created SCAR Expert Group on Antarctic Climate Change and the Environment.

Themes 1 and 3. 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 (Turner et al., 2012).

Themes 1 and 3. Different climate models give different answers under greenhouse gas increases. This presents a major challenge when faced with combining data from a collection (ensemble) of models.

Themes 1, 2 and 3. The AGCS-sponsored ITASE Synthesis Workshop in Castine in September 2008 requested a synthesis of the ice core reconstruction tools used to develop sea ice extent proxies. This has now been published (Sneed et al., 2011).

Themes 1, 2, 3 and 4. Polar-Tropical Connections and CASA, both stemming from ITASE, are focusing on emerging results from an ice core recovered from Detroit Plateau through a joint Brazil-Chile-US effort (several papers near review).

Theme 4. The US-UK Diapycnal and Isopycnal Experiment of the Southern Ocean (DIMES) has concluded much of its fieldwork phase, consisting of 8 research expeditions.

AGCS has supported several scientific meetings and workshops targeted at advancing our knowledge of important elements of the Antarctic climate system.

Members of AGCS have been involved in many education and outreach activities through public lectures, schools visits, the preparation of popular articles and broadcasts on radio and television. We are also actively seeking to engage scientists from the new Antarctic nations in AGCS activities and broaden the membership of the AGCS Steering Committee. AGCS supports early career researchers through its partnership with the Association of Polar Early Career Scientists (APECS).

## Reports on the SSG/PS Action and Expert Groups

*Ice Sheet Mass Balance and Sea Level (ISMASS)*, Edward Hanna (UK), Francisco Navarro (Spain) and Frank Pattyn (Belgium)

See IP 08 for a complete report

### *1. Rationale for the Group*

In 1993 the Global Change in Antarctica (GLOCHANT) Group of Specialists established ISMASS “Antarctic ice sheet mass balance and sea-level”, to address the role of the Antarctic ice sheet in sea-level change. With the re-organisation of SCAR, ISMASS became an Expert Group of the SCAR Physical Sciences Standing Scientific Group. During the SCAR/IASC Open Science Conference in St. Petersburg, Russia, July 2008, an ISMASS workshop was held, in which it became evident that a bi-polar perspective was desirable for ISMASS.

### *2. Report on Progress*

During the Buenos Aires Meeting, the SC completed the new Terms of Reference for ISMASS (Appendix 2, IP 08). The main progress since the Buenos Aires meeting can be summarized as follows:

The new Terms of Reference for ISMASS, as joint SCAR-IASC Expert Group, were presented on 13-01-2012 to the new Cryosphere Working Group (CWG) of IASC during its meeting in Potsdam, Germany, approved by the CWG and later endorsed by the IASC Council. At the IASC-CWG meeting it was suggested that ISMASS could be also co-sponsored by the International Association of Cryospheric Sciences (IACS); the IACS Bureau, during its business meetings held within IUGG General Assembly in Melbourne, 2011, declined co-sponsorship of ISMASS, though expressed its willingness to support particular activities upon request.

During the SERCE/POLNET meeting held at ISAES Edinburgh, July 2011, subjects of common interest to both ISMASS and SERCE/POLNET and ISMASS were discussed. Contacts with AntClim21 PPG members have also been maintained, regarding subjects of common interest to both AntClim21 and ISMASS.

On 6-7 October 2011 the first IASC-CWG meeting, in which ISMASS acted as a joint group SCAR-IASC, was held in Utrecht, The Netherlands.

During the Fall of 2011, the membership of the Interim Steering Committee of ISMASS was modified, to reflect the current co-sponsorship by SCAR-IASC, and the support by the World Climate Research Programme.

The main focus of ISMASS since then was the organization and announcement of a kickoff workshop of the renewed ISMASS, to be held on 14 July 2012 in Portland, Oregon. An ICSU grant (amounting 30,000 \$) was received from ICSU, as well as funding from the International Glaciological Society (IGS) and the IACS, and secretariat support from WCRP-CliC. The workshop was held as planned, with the participation of 60 delegates. It included invited lectures by 8 invited speakers, three round tables and an ISMASS organization session. Further information at <http://www.climate-cryosphere.org/en/events/2012/ISMASS/Home.html>

### **3. Future Plans**

Elect a new Steering Committee of 6 members representing the main focus themes of ISMASS, plus a chairman. The new SC will define the roadmap of activities for the forthcoming 2 years, which will include strong interaction with the new programmes SERCE, AntClim21 and PAIS.

## **ATHENA: Advancing Technologies and Environmental stewardship for subglacial exploration in Antarctica, Dr. JL Wadham, UK.**

### **1. Rationale for the Group**

Antarctic subglacial aquatic environments (SAE) have been documented for some time using remote sensing geophysical techniques, but only very recently have plans been devised and implemented to sample and study these environments directly. The long lead in times for the sampling of these lakes is largely related to the technological difficulty of penetrating the overlying ice sheet, but also reflects the cautious approach warranted by the pristine nature of the environments, and their almost completely unknown capacity to sustain viable ecosystems. SCAR (e.g. via SALE) has played a fundamental role in shaping the science priorities and international partnerships in the nascent field of subglacial aquatic research, but now there is an important need for a new path forward that focuses international exchange on the appropriate technology and methodologies required to carry out the science in an environmentally responsible way. The goal of ATHENA Expert Group is to lay the foundations for future SAE exploration via the development of rate limiting Technological and Environmental infrastructure. The aims of this Expert Group are as follows

- a. To establish the critical environmental and technological infrastructure for the future access, sampling and monitoring of Antarctic subglacial aquatic environments (SAE)
- b. To work with SCAR action groups, expert groups and research programmes to promote inter-disciplinary science on Antarctic SAE.
- c. 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).

### **2. Report on Progress**

Objective 1: the environmental and technological infrastructure has begun to be established for future SAE exploration, coordinated by this Expert Group which has maintained a presence in national campaigns via the actions of its members (e.g. Wadham on Steering Committee of the Lake Ellsworth Programme, Doran on the advisory body for the WISSARD project and Alekhina in the Vostok programme). Clean probes and lake entry technologies are being developed and there is good communication between leading groups.

Objective 3: The presence of the ATHENA Expert Group has undoubtedly enabled a dialogue between national groups to be continued following SALE, and has helped to maintain the exchange of ideas and information on clean technologies (e.g. during the entry into Lake Vostok, which led to a number of “reactive” type media activities by ATHENA and former SALE members).

This coordination of environmental and technological infrastructure via ATHENA has been aided by the following activities:

- 1. Project website:** A website for the ATHENA Expert Group was established (see <http://www.athena-scar.co.uk/>). This describes the full remit of the group, whilst also providing a central portal for Guidance/Code of Conduct/IEE/CEE documents related to the future sampling of sub-Antarctic aquatic ecosystems.
- 2. Meetings:** A summary of ATHENA meetings conducted to date can be found on the website, together with minutes of these meetings. In short, we have hosted 4 steering committee meetings.
- 3. Conference session/workshop:** the group submitted a session proposal to the SCAR-Open Science Conference in Portland, which was accepted. This session (Advancing clean technologies for exploration of glacial aquatic ecosystems, convenors: Wadham, Doran, Vincent) took place in July 2012. It is being closely coordinated with an aligned session, with members of the ATHENA Steering Committee as convenors ("Subglacial Aquatic Environments": Vincent, Alekhina, Bell). Both sessions have generated considerable interest in the form of abstract submissions, including representatives from major active subglacial lake drilling campaigns (WISSARD, Lake Ellsworth and Lake Vostok).

We aim to connect more fully with other SCAR groups in the near future (Objective 2), but are already doing so with the AG-CCR-SAE (Code of Conduct for the Exploration and Research of Subglacial Aquatic Environments). Once the three funded lake access campaigns have been successfully delivered there will an opportunity to revise the Code of Conduct and ATHENA members will play a central role in this.

### **3. Future Plans**

Two conferences sessions at the SCAR Open Science Conference in summer 2012

Steering Committee Meeting in July 2012 (this falls close to the end of the funding period).

We would like to publish a collection of papers from our session at the SCAR Open Science Conference. We are currently canvassing authors of abstracts to gauge interest in this effort.

## ***ASPeCt, Antarctic Sea Ice Processes and Climate***, Marilyn Raphael (USA) and Steve Ackley (USA)

### **1. Rationale for the Group**

The major focus of the ASPeCt programme is physical sea ice processes and ocean-atmosphere interaction in the sea-ice zone. As a SCAR programme, ASPeCt is focused on the role of the unique regional environment of the Antarctic sea ice zone, but it is essential that this is closely linked to international Global Change research. Hence, the inter-disciplinary components of ASPeCt are designed to contribute to, and to extend, other international climate, ocean and biology programmes.

### **2. Report on Progress**

Along with multiple other journal publications, a special issue of *Deep Sea Research II* in 2011 contained 21 papers giving the main results from the two International Polar Year expeditions into the Antarctic sea ice zone. (Worby, A.P., K.M. Meiners, S.F. Ackley, 2011. Antarctic sea-ice zone research during the International Polar Year, 2007-2009. *Deep-Sea Research II*, doi:10.1016/j.dsr2.2011.01.001). Databases include additions to the ship observations data base (ASPeCt observations) on a continuing basis and development of sea ice thickness and sea ice core properties databases. A workshop on Ice Boundary Layers was co-sponsored (with IASC) in June 2012 in Boulder CO, USA. S.F. Ackley (CoChair ASPeCt) was appointed to the Science Steering Committee of the Southern Ocean Observing System as the sea ice representative.

### **3. Future Plans**

1. During 2012-2013 develop and write the new 10 year ASPeCt Science and Implementation Plan.
2. Conduct the sea ice experiment SIPEX II (Australia with International participation) in Sept 2012 in the east Antarctic sea ice zone.
3. Finalize sea ice core database and coordinate user interfaces for data access through AAD data center.
4. Implement ASPeCt's role as the operating arm for the Southern Ocean Observing System on the SOOS theme, The Future of Antarctic Sea Ice.

## ***Prediction of Changes in the Physical and Biological Environment of Antarctica.*** Leader: J. Turner, UK.

### ***1. Rationale for the Group***

The cross-SSG Action Group on Prediction of Changes in the Physical and Biological Environments of the Antarctic was established at the SCAR Delegates' meeting in Moscow during July 2008. Its brief is to improve our ability to predict how the Antarctic environment will evolve over the next century. It is a cross-disciplinary group that brings together meteorologists, oceanographers and marine and terrestrial biologists. It has an initial 4 year lifetime.

### ***2. Report on Progress***

A major focus of the group this year has been utilizing the climate model data that are becoming available for the Fifth Assessment Report (AR5) of the Intergovernmental Panel on Climate Change (IPCC), which is due to report in 2014. A new method has been developed (Bracegirdle and Stephenson, 2012) to combine the predictions of the various models taking into account their biases in simulating the present climate.

Members of the AG have contributed to the writing and reviewing of several chapters of the next IPCC Assessment Report.

Work has continued on the development of high horizontal resolution atmosphere-only climate models that can be run over parts of the Antarctic continent and Southern Ocean.

Members of the AG have developed a cross-disciplinary concept outlining how to improve habitat suitability (environmental envelop) models and apply them to Antarctic marine and terrestrial ecosystems (Gutt et al. in press).

Cross-disciplinary analyses linking climate change scenarios to potential ecological impacts are emerging from the wider Antarctic science community. For example, the IPY project team, Aliens in Antarctica, has recently published a continent-wide risk assessment for the establishment of non-indigenous species in Antarctica including an evaluation of the situation in 2100 based on IPCC Scenario A1B (Chown et al. 2012). The ready availability of model-derived data and the continued up-dating of the ACCE synthesis are essential for supporting the wider up-take of this approach. An example of such cross-disciplinary analysis in a marine ecosystem is the use of CMIP5 sea surface temperature projections for 2070-2100, together with an empirical model of Antarctic krill habitat suitability, to investigate the potential impact of 21<sup>st</sup> Century climate change on krill distribution and assess the implications for land-based predator species on South Georgia.

Data - The group is developing a web-based collection of basic fields describing the physical environment of the Antarctic and the Southern Ocean that will be of use to many scientists who have an interest in the climate of high southern latitudes [http://www.antarctica.ac.uk/met/SCAR\\_ssg\\_ps/Atlas/index.html](http://www.antarctica.ac.uk/met/SCAR_ssg_ps/Atlas/index.html).

Outreach - Members of the AG gave many talks over the year on Antarctic prediction to groups ranging from schools to professional bodies. The group maintains a web site at [http://www.antarctica.ac.uk/met/SCAR\\_ssg\\_ps/Prediction/](http://www.antarctica.ac.uk/met/SCAR_ssg_ps/Prediction/). This provides details of our activities, group membership and formal minutes of our meetings.

The ACCE report - Several members of the AG are involved in updating the 80 'key points' from the original ACCE report published in 2009. This is dealt with in more detail in the report of the EG on ACCE.

### ***3. Future Plans***

We propose that the AG merges with the EG on Antarctic Climate Change and the Environment (ACCE) to form a single group that is responsible for advising on Antarctic climate matters and possible impact on the environment.

## ***Antarctic Climate Change and the Environment (ACCE),*** Leader J. Turner, UK.

### ***1. Rationale for the Group***

The Expert Group on ACCE is a new group created in late 2010 to provide coordination amongst all those within SCAR who have an interest in climate change at high southern latitudes and the possible impact on the environment. The terms of reference were agreed by email and are:

- 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, including scientific advice relevant to the recommendations arising from the Antarctic Treaty Meeting of Experts on Climate Change and Implications for Antarctic Management and Governance;
- Prepare updates and supplements to the Antarctic Climate Change and the Environment (2009) report as necessary;
- 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.

## ***2. Report on Progress***

The members of the EG have been heavily involved in the updating of the 80 ‘key points’ that were included as a summary within the full 2009 ACCE report. The new key points document will be presented to the 2012 ATCM meeting in Hobart.

A number of members of the EG have contributed to the writing of the Fifth Assessment Report (AR5) of the IPCC. Papers have also been submitted on past and possible future Antarctic climate change based on the Coupled Model Intercomparison Project 5 (CMIP5) data, that will form the basis of the AR5 report.

## ***3. Future Plans***

The group met in Portland just before the SCAR OSC, to consider how the ACCE volume could develop, a possible online version of the ACCE report and the annual paper that we present to the ATCM. Consideration was also given to how we can promulgate the results of the IPCC AR5/CMIP5 exercise to the SCAR community.

It is proposed that the AG on Prediction of Changes in the Physical and Biological Environments of the Antarctic (PCPBEA) merges with the new EG to form a single group that is responsible for advising on Antarctic climate matters and possible impact on the environment.

## ***Oceanography Expert Group: Leader Mike Meredith (UK)***

See WP 19 for a complete report.

The major effort of this group consisted in starting the development of a Southern Ocean Observing System (SOOS), following the initial requirements of ATCM Resolution 3 (2007), which welcomed and supported “the proposal by SCAR to establish a multi-disciplinary pan-Antarctic observing system, which will, in collaboration with others, coordinate long-term monitoring and sustained observation in the Antarctic”. This is one of the key recommendations from the ACCE Report. The SOOS is also a significant legacy of the recent International Polar Year.

The design of a SOOS was led by a partnership of organisations: SCAR, the Scientific Committee on Oceanic Research (SCOR), The Census of Antarctic Marine Life (CAML), the Global Ocean Observing System (GOOS), the World Climate Research Programme (WCRP) and the Partnership for Observations of the Global Ocean (POGO). Other groups such as IAATO and COMNAP have provided significant feedback. The US NOAA programme also provided funds for holding SOOS workshops to further the SOOS design plan. Views have been solicited from as wide a range of interested parties as possible in order to finalise the plan.

Despite the fact that the southern ocean plays unique and critical roles for both the physical Earth system and its overall ecology, the Southern Ocean is poorly monitored, not least because of its harsh conditions and geographical remoteness. Southern Ocean continuous observations are needed to understand and predict global climate change accurately. Antarctic resupply vessels can make many observations routinely. A key problem concerns measurement of ocean properties year-round beneath the sea ice. Moorings, gliders, instrumented marine mammals and modified Argo floats provide various means of escaping from this constraint. Commitments are needed to sustain the necessary in-situ observations in this remote area. The scientific achievements of the IPY demonstrate the power and value of integrated, multi-disciplinary observations. The challenge in the years ahead is to build on these IPY achievements to ensure a sustained commitment is made to observations of the Southern Ocean.

## ***Ocean acidification AG***, Leader R. Bellerby, Norway.

### ***1. Rationale for the Group***

The oceans provide an important service in absorbing anthropogenic CO<sub>2</sub> perturbations of the natural carbon cycle and therefore lowering the warming effect of a larger atmospheric CO<sub>2</sub> reservoir. To date the oceans have absorbed around 50% of anthropogenic CO<sub>2</sub> (defined as the excess CO<sub>2</sub> in the system over the natural cycle) and at present are taking up about 25% annually. There is a cost to this natural carbon mitigation. As carbon dioxide dissolves in seawater the speciation of dissolved inorganic carbon is altered - a process termed ocean acidification. There are measurable changes in marine carbonate chemistry that change physiological and biogeochemical systems. Despite developments towards a greater understanding of global acidification and development of observational and experimental strategies, the Southern Ocean is poorly represented. To date there has not been a group to focus specifically on coordination of Southern Ocean acidification research, hence SCAR approved the formation of the new group.

### ***2. Report on Progress***

There has been significant consultation with existing global ocean acidification efforts (e.g SOLAS/IMBER Sub Group 3, US Ocean Carbon Biogeochemistry and the SCAR ICED and the SCAR Oceanography Expert Group.)

Members of the SCAR OA Action group with expertise on ocean chemistry and plankton interactions met in Tromsø, Sept 27-29 in conjunction with the "Acidification in aquatic environments" workshop.

Plans are being made for the first group meeting for the lead authors where the first draft will be devised and other authors identified and invited to the writing team. Other international experts will be invited to this meeting. The project funds will be used to support this meeting.

### ***3. Future Plans***

Ocean Acidification OSC session and Town hall meeting in Portland July 2012

## ***Operational Meteorology Expert Group***: Leader Steve Colwell (UK)

The webpage for the expert group is regularly updated with news from the operational meteorology world, there are also many links from this webpage to other operational meteorology sites and online weather forecast pages, the web page can be found at [http://www.antarctica.ac.uk/met/jds/met/SCAR\\_oma.htm](http://www.antarctica.ac.uk/met/jds/met/SCAR_oma.htm)

Since September 2009 there have been two radio-sonde launches per week from Marambio station at the top of the Antarctic Peninsula and we are now seeing almost all of the CLIMAT messages on the GTS (Global Telecommunication System).

The International Antarctic Weather Forecast Handbook is now available online; it is searchable and some updates have been added to the handbook and any new updates can now easily be added.

Two Google Earth plugins have been created, one to access the archived meteorological data that is held at 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 via the GTS.

The expert group is looking into how precipitation measurements are currently made in Antarctica and evaluating the new optical precipitation measure devices that are now available.

***Environmental Contamination in Antarctica Expert Group:*** Leader G. Capodaglio, Italy.

During the 3rd ECA meeting held at the XXXII SCAR conference in Buenos Aires, it was decided to extend the collaboration with other groups in order to plan common actions. Closer contact with scientists related to the biological aspects of Environmental contamination was established to better integrate competence from SSG-PS and from SSG-LS and, more recently, a connection was established with the Action Group on Antarctic Fuel Spills (AGAFS) to coordinate common scientific activities to study the fate and effect of organic pollutants in polar environments.

Two reviews presenting the state of the art on chemical contamination and distribution of inorganic components in marine systems and lake waters are ready to be published on scientific journals. Collected data were integrated on the ECA dedicated portal of the Antarctic Master Directory.

**Results**

The ECA data base was integrated in the Antarctic Master Directory; the integration of data on Organic and trace elements was completed.

Two reviews, focussing on the distribution of Trace elements in fresh and lacustrine waters were prepared and are ready to be submitted to scientific journals.

One session of the XXXII SCAR and Open Science Conference in Portland were be dedicated to ECA.

Future activities will be planned considering the biological implications of environmental contamination, as well as aspects of common interest with the AGAFS Action Group.

***IPICS - International Partnership on Ice Coring Science Expert Group:*** Leaders E. Wolff (UK) and Ed Brook.

***1. Rationale for the Group***

Ice cores provide information about past climate and environmental conditions on timescales from decades to hundreds of millennia, and direct records of the composition of the atmosphere. As such, they are cornerstones of global change research. With the completion of major projects in Greenland and Antarctica over the last 15 years, the international ice coring community is planning for the next several decades. The costs and scope of future work create the need for coordinated international collaboration. Developing this international collaboration is the charge of IPICS, the International Partnerships in Ice Core Sciences, a planning group currently composed of ice core scientists, engineers, and drillers from 22 nations. IPICS is supported by PAGES (Past Global Changes), SCAR (Scientific Committee on Antarctic Research) and IACS (International Association of Cryospheric Sciences), although it is not a formal project under any of these organizations.

***2. Report on Progress***

- IPICS has 4 priority science projects (which remain valid) and a technical group. Progress on the 4 priorities is summarised as follows:
- Oldest ice (Antarctica) project: much enthusiasm for the concept has been generated, but the actual locations and modes of operation have not yet been agreed. To enable this, we are arranging an oldest ice workshop attached to the IPICS OSC in October 2012, at which scientists and logistics people will discuss together.
- Last interglacial (NEEM): the NEEM drilling has been completed, and first papers are underway. It is planned to incorporate new Antarctic interglacial information into this project.
- IPICS-40k: 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. Other activity has seen a couple of syntheses that use the data from several Antarctic cores to draw conclusions about the climate of this period.

- IPICS2k: 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 held a workshop in Bern in July (associated with the INQUA meeting) to start to assemble data towards a product that will be used by IPCC.
- Technical group: an ice core drilling meeting is being planned for 2013.

### **3. Future Plans**

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. Up to 300 attendees are expected. A workshop to pursue steps towards implementation of the IPICS oldest ice project will be held immediately afterwards.

### ***Polar Atmospheric Chemistry at the Tropopause (PACT)***, Leaders: G. Milinewsky, Ukraine and A. Klekociuk, Australia.

The analysis methods and database content for the initial release of the PACT database have been developed and refined using 5 years of ozonesonde measurements from Davis (Antarctica) and Macquarie Island (sub-Antarctic). Documentation and initial data are available since 2010 from the web site at the Australian Antarctic Data Centre (<http://data.aad.gov.au/aadc/pact/>). The initial data release includes:

1. Profiles of ozone mixing ratio and partial pressure in the vicinity of the tropopause, at 100 meter vertical resolution with vertical coordinates of geopotential height, pressure, potential temperature, and potential vorticity.
2. The height of the chemical, thermal and dynamical tropopause.
3. Ten day forward and backward trajectory information at selected potential temperature surfaces intersected by the ozonesonde profiles. The trajectories are obtained from the Goddard Automailer for NCEP and GEOS meteorological assimilations.
4. Diagnostic flags and metadata.

The PACT team has developed a robust definition of the chemical tropopause as the height at which the vertical gradient in the ozone mixing ratio is 75 ppbv km<sup>-1</sup> in a measurement profile which has been binned to 500-metre vertical resolution, to obtain information on the its location based solely on high resolution radiosonde measurements. Using this definition, comparisons with the thermal and dynamical tropopause have been made, and a diagnostic for stratosphere-troposphere exchange has been developed for inclusion in the database.

The aims and initial analysis for PACT was presented at a half-day workshop during the 36th Annual European Meeting on Atmospheric Studies by Optical Methods (Kyiv, Ukraine, August 2009). Presentation from this workshop and other relevant material can be downloaded from <http://data.aad.gov.au/aadc/pact/>.

SSG-PS noted a comment that not all data of relevance will necessarily be in the WOUDC (World Ozone and Ultraviolet radiation Data Center) and PACT members are encouraged to extend their database, for example to include NDACC (Network for the Detection of Atmospheric Composition Change).

The PACT Action Group are asked to formulate a response to the suggestion that they move to an Expert Group at the next SCAR meeting.

### ***GRAPE, GNSS Research and Application for Polar Environment***, Leader Giorgiana De Franceschi, Italy.

#### ***1. Rationale for the Group***

Higher exposure of GNSS based technological systems to solar perturbations, particularly in the polar regions, will require more extended investigations, both in variety of approaches and spatial coverage. Increased coverage in the Arctic and Antarctic will provide remote sensing tools to map the ionospheric total electron content (TEC) and precipitable water vapour (PWV); this will allow assessing the impact of solar disturbances on precision positioning during the next solar maximum, expected in 2013, and in the declining phase of the solar cycle. It may also help improve short term weather forecasts and remote sensing for climate change studies.

The International Polar Year (IPY) and International Heliophysical Year (IHY) initiatives left an important heritage in terms of data sharing, expertise exchange and increasing awareness of the current scientific capabilities. In particular, the GWSWF (GPS for Weather and Space Weather Forecast, [www.gwswf.scar.org](http://www.gwswf.scar.org)), a joint SSG GS and PS Action Group, took advantage of the Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR) and the Polar Earth Observing Network (POLENET) experiences that led to creation of working groups on specific themes such as the use of geodetic data to study space weather events.

Built on the AG GWSWF, the Expert Group GRAPE intends to continue along this line, intensifying the efforts to build and coordinate a robust network of collaborations in order to answer a variety of space weather related needs through ad hoc data sharing and model development.

***GRAPE is based on the use of the classical GPS POLENET array and the growing coverage of modern GNSS systems, on the availability of advanced modelling and on the opportunity offered by the advancing solar cycle. The main objectives are:***

- Create and maintain distributed networks of specialized GPS/GNSS Ionospheric Scintillation and TEC Monitors particularly at high latitudes.
- Identify and quantify mechanisms that cause scintillation and control interhemispheric differences, asymmetries and commonalities in scintillation occurrence and intensity as a result of the geospace environment conditions.
- Develop ionospheric scintillation climatology, tracking and mitigation models to improve prediction capabilities of space weather.
- Retrieve tropospheric PWV for input to weather forecast models and to develop regional PWV climatology for atmospheric sensing in remote areas.

## ***2. Report on Progress***

The II GWSWF meeting was held in Modena, Italy, in April 2011, to discuss the objectives in the perspective of the next SCAR OSC and Business Meetings in Portland (USA), 2012. The meeting was attended by representatives from Brazil, Canada, UK, USA, Slovenia and Italy. The main goal, based on the initial success of the AG GWSWF, was the agreement to update the AG in the more ambitious Expert Group GRAPE. The meeting also underlined the need to enhance collaboration to work in synergy with other SCAR EGs or SRPs on the assessment of the ionosphere over the poles. The task is very challenging especially because different scientific contexts mean different data formats, different data processing and different data interpretation. On the other hand, the group considers such heterogeneity as a strong point to stimulate advancement of our understanding of space weather effects in polar regions. Several presentations highlighted the bi-polar GNSS network maintenance and enlargement, the data availability through ad hoc data bases ([www.eswua.ingv.it](http://www.eswua.ingv.it)) and investigations carried out with the contribution of different Countries/Institutions. Several expressions of interest have been received on the GWSWF web portal, underlining its role to coordinate efforts, disseminate results and attract new collaborations.

## ***3. Future Plans***

Maintain and update the current GWSWF web portal into a new version that will highlight the subgroups activities of GRAPE. In particular a data portal development is planned to facilitate sharing and utilization of the GNSS/GPS and geophysical databases. The data portal will be linked to other useful databases for easy access, and encourage the collaboration, data sharing and help in interpretation of the results.

A special issue of Annals of Geophysics is in preparation aiming to collect the GRAPE papers presented during the SCAR OSC in Portland.

A GRAPE meeting-workshop will be organized in 2013-2014 to provide forum for discussions and to focus the community efforts towards the GWSWF project goals.

### ***ICESTAR: Interhemispheric Conjugacy Effects in Solar Terrestrial and Aeronomy Research.*** Leader Allan Weatherwax, USA.

#### Rationale

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 (expert group) is to create an integrated, quantitative description of the upper atmosphere over Antarctica, and its coupling to the geospace environment. The aim is to deliver 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.

#### ***Achievements***

ICESTAR scientists have published more than 250 papers in journals that include Nature, Geophysical Research Letters, and the Journal of Geophysics Research. Since the start of the program, 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).

#### ***Future Developments***

The ICESTAR expert group 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.

### ***Antarctic Clouds and Aerosols:*** Leader T. Lachlan-Cope, UK.

Since the 2010 meeting of the group in Ohio a review article on Tropospheric Clouds in Antarctica has been published (Bromwich et al, 2012, REVIEWS OF GEOPHYSICS, VOL. 50, RG1004, 40 PP., 2012doi:10.1029/2011RG000363). No further formal meetings of the group have taken place although a meeting on Atmospheric Model Parameterisation in Polar Regions sponsored by ICPM to take place just before the SCAR open science conference will be attended by many members of the Action Group and consider clouds as part of it remit.

The group's long term goal is to organise an international large scale campaign to investigate clouds and aerosols in Antarctica although the present funding problems have not made this easy. However we would like to arrange a meeting during 2013 to start the planning of such a campaign; support through SCAR funding will be requested to enable the widest possible attendance at such a meeting.

## SSG/PS and other ICSU bodies:

### ***SCOSTEP***

SCOSTEP (Scientific Committee for Solar-Terrestrial Physics, <http://www.yorku.ca/scostep/>) organizes and conducts international solar-terrestrial programs (STP) programs of finite duration in cooperation with other ICSU bodies (IAU, IAGA, IAMAS, IUPAP, COSPAR, URSI, SCAR, IUGG has a liaison).

The current scientific program is the Climate and Weather of the Sun-Earth System (CAWSES - Phase II), with the goal of understanding the space environment and its impacts on life and society. Functions: help coordinate international activities in observations, modeling, and applications crucial to achieving this understanding, to involve scientists in both developed and developing countries, and to provide educational opportunities for students of all levels.

CAWSES organizes meetings to bring the various scientists in mutual contact; the next meeting is planned in Japan, 2013 (CAWSESII-2013). It will cover one week in June or Sept-November, 2013.

### ***Climate and Cryosphere (CliC) - World Climate Research Programme (WCRP)***

SCAR has an agreement with WCRP to cosponsor the Climate and Cryosphere project since 2008. Through this we have worked on many projects including the Southern Ocean Panel and others. Most recently CliC has agreed to cosponsor the SOOS project and is also working with us to provide coordination support for the ISMASS workshop.

The CliC office appointed a new Director, Jenny Baeseman, who recently attended the BiPAG II meeting in Potsdam to help strengthen the collaborations with SCAR and IASC.

### ***International Programme for Antarctic Buoy (IPAB).*** Leader Dr. Christian Haas, Germany.

The WCRP/SCAR International Programme for Antarctic Buoy (IPAB) maintains a network of drifting buoys in the Southern Ocean to provide meteorological and oceanographic data for real-time operational requirements and research purposes. The operational area of IPAB is south of 55°S and that region of the Southern Ocean and Antarctic marginal seas within the maximum seasonal sea-ice extent. Variables monitored may include atmospheric, oceanographic and cryospheric parameters.

IPAB activities have significantly increased recently, with the deployment of 16 buoys in the Bellingshausen and Amundsen Seas, including mostly new technology developed for acquisition of additional atmospheric, ice, and ocean data. In addition, the Polar Science Center of the University of Washington, and National Ice Center have received seed funding for the deployment of 20 and more buoys each year from 2012 to 2013 primarily in the Ross and Amundsen Seas. The Meteorological Services of South Africa, Australia, and New Zealand continue to operationally deploy numerous SVP's in the Southern Ocean, primarily north of the sea ice edge.

### ***Priorities***

Testing and supporting development of new buoys like AXIB –AirdroppableXpendableIceBeacon;

data transmission of observations in real-time to the GTS; funding for acquisition and deployment of buoys; development of accessible data archive; closer collaboration with WCRP/SCAR Antarctic Sea Ice Processes & Climate (ASPeCT) and Southern Ocean Observing System (SOOS).

## **ICED: Integrating Climate & Ecosystem Dynamics in the Southern Ocean Programme**

### **Recent and forthcoming events and activities**

- A meeting was held in Nov 2011 between ICED and representatives of proposed SCAR AnT-ERA and Ant-ECO SRPs, to ensure coordination across the range of activities.
- ICED scientists at BAS in partnership with external ICED members awarded NERC International Opportunities Fund for ‘Coordinating ICED: Implementation of the ICED Programme’, July 2012-2015.
- BAS and AWI ICED scientists awarded a EUR-OCEANS Consortium Flagship Project (‘Flagship for Polar Ecosystem Change and Synthesis’, PolEcoSyn), Nov 2011-13.
- An interactive fieldwork mapping tool is being developed on the ICED website to provide information on planned and proposed S. Ocean fieldwork and for coordination.
- IPY Science into Policy Conference, Apr 2012: ICED Session Convened by Jose Xavier, Eileen Hofmann and others. The ICED Session was a success, the 2nd most subscribed session. Andrew Constable gave a presentation on Sentinel and progress of ICED
- ICED supported Sentinel Workshop: ‘State of knowledge of SO food webs’ run by Andrew Constable, Australia, May 7-11 2012.
- SCAR XXXII connected activities at Portland, July 2012: ICED session during OSC; SSC meeting.
- PolEcoSyn Workshop at AWI (Autumn 2012) to unite network of EU Polar Scientists.
- ICED IOF workshop: Predicting change in Southern Ocean Ecosystems, Spring 2013.

### **Food web Modelling**

- The range of activities includes: a circumpolar food web review (under the PolEcoSyn project), food web quantification and comparison, circumpolar food web analyses => development of generic model structure. There is an agreed need to focus on coupling and scenario analysis, and an ICED integrated modelling strategy/expert action group needs establishing.

### **Data syntheses and mining – building circumpolar maps of distribution**

- A Data Mining Action Group needs establishing. ICED scientists at BAS are seeking funds to develop an ICED data portal & mine Discovery Investigations data further.

### **Fieldwork coordination**

- BAS is soon to redevelop and launch fieldwork map tool/links with SOOS and Sentinel Wiki. There is potential for a workshop for planning of the fieldwork phase of ICED. There is a forthcoming NSF funded project to undertake foodweb analysis in the Ross Sea.

### **Informing policy**

- Scenario testing => inform IPCC
- Monitoring/Marine Protected Areas/Modelling => inform CCAMLR
- ICED session at IPY Science into Policy Conference
- Ecosystem services and valuation
- Strategy for European polar ocean ecosystem research (PolEcoSyn)

### **Education and outreach**

ICED website has an area where people wanting to become involved in the ICED community can upload their details. The ICED website E&O area will be updated every 6 months. The ICED SSC has links with Association of Polar Early Career Scientists (APECS) to facilitate E&O through and with this active community.

**2013-2014 SSG/PS proposed budget (k\$)**

	2013	2014
ATHENA	1	ZERO
Ocean Acidification	10	ZERO
PCBEA	WILL BE MERGED	WITH ACCE
ECA	1	1
ICESTAR	ZERO	ZERO
Clouds & Aerosols	3	ZERO
OpMet	2	2
GRAPE	6	6
Oceans	ZERO	ZERO
ISMASS	2.5	2.5
PACT	1	1
ACCE	ZERO	ZERO
IPICS	3	3
ASPeCt	4	4
TOTAL	33.5	19.5

**Officers** of the Physical Sciences SSG up to SCAR XXXII

Dr Maurizio Candidi (Italy) ([Maurizio.candidi@ifsi-roma.inaf.it](mailto:Maurizio.candidi@ifsi-roma.inaf.it)) Acting Chief Officer

Dr. Takahashi Yamanouchi (Japan) ([yamanou@nipr.ac.jp](mailto:yamanou@nipr.ac.jp)) **Resigned** Chief Officer

Dr. Tas van Ommen (Australia) ([tas.van.ommen@aad.gov.au](mailto:tas.van.ommen@aad.gov.au)) Secretary

**Elections.** Elections have been held in Portland for the positions of Chief Officer and Secretary. The new officers of SSG/PS are as follows:

Chair: Dr. David Bromwich

Alternate Chief Officer: Dr. Maurizio Candidi

Secretary: Dr. Steve Colwell

## Appendix – Other items pertaining to business meeting

### *List of attendees to SSG/PS business meeting:*

Francisco J. Navarro (Spain),  
 Per Holmlund (Sweden),  
 Dave Bromwich (USA),  
 Al Weatherwax (USA),  
 Joe McConnell (USA),  
 Terry Deshler (USA),  
 Marilyn Raphael (USA),  
 Alberto Foppiano (Chile),  
 Alexander Klepikov (Russia),  
 Jiuxin Shi (China),  
 Jefferson Simoes (Brazil),  
 Pedro Skvarca (Argentina),  
 Alfredo J Costa (Argentina),  
 Thomas James (Canada),  
 Pierre Cilliers (S Africa),  
 Andriy Zlizovski (Ukraine),  
 Rolf Nahnauer (Germany),  
 Hans Oerter (Germany),  
 Giorgiana De Franceschi (Italy),  
 Nancy Bertler (New Zealand),  
 Kate Sinclair (New Zealand),  
 Matti Lepparanta (Finland),  
 Matthias Braun (Germany),  
 Seong-Joong Kim (Korea),  
 Steve Colwell (UK),  
 Tom Lachlan-Cope (UK),  
 Mitsumu K. Ejiri (Japan),  
 Hideaki Motoyama (Japan),  
 John Storey (Australia),  
 Günther Heinemann (Germany),  
 Simon Ommanney (Canada),  
 Emmanuelle Sultan (France)  
 Muricio Mata (Brazil),  
 Emilia Correia (Brazil),  
 Heitor Evangelista (Brazil),  
 Tas van Ommen (Australia),  
 Maurizio Candidi (Italy)

### **New recommendations (internal to SCAR)**

SSG-PS notes potential gaps in PAIS and SERCE proposals in regard to their use of ice core and radar data from the Japanese Dome F community and also in regard to the extent of use of available marine geology data. For example, there is glacial morphological data available from the continental shelf from several places. SSG-PS recommends that PAIS and SERCE include engagement with providers in these areas.

SSG-PS recommends engagement between PAIS and ISMASS be developed.

SSG/PS recommends that the programs AntClim21, SERCE, and PAIS, which address research fields of relevance to physical sciences, be approved; it is recommended that the programs address referee comments and, where appropriate, incorporate these in their implementation.

### **Future meetings of relevance to the SSG-PS**

August 2012, IAU General Assembly, Beijing

22-26 Oct 2012, SOOS workshop, Hobart, Australia

November 5 - 12, 2012: International symposium on STP: ISWI-CAWSES Joint meeting, Pune, India

July 2013, AAA, Italy

November 18 - 22, 2013: International CAWSES symposium, Nagoya, Japan

Late 2013 GRAPE, S. Africa

August 25-28, 2014: STP13 Xian, China