



WP 7

Agenda Item: 4.2.1

Person Responsible: David
Bromwich

XXXIII SCAR Delegates Meeting

Auckland, New Zealand, 1-3rd September 2014

SCAR Standing Scientific Group on Physical Sciences (SSG-PS)

Report to the Delegates

Executive Summary

Title: SCAR Standing Scientific Group on Physical Sciences

Authors: David Bromwich (CO), Maurizio Candidi (Deputy CO), and Steven Colwell (Secretary)

Introduction/ Background: Clouds and Aerosols AG is rallying the community to conduct cloud measurement campaigns. Environmental Contamination (ECA) AG hopes to change direction to establish an Antarctic Monitoring and Assessment Program. Ocean, but needs to deliver the Trace Metals report first. Acidification AG is finalizing its report and presenting the results in many international forums. Remote Sensing AG is exploring the best ways to collect penguin (and other seabirds and seals) abundance data using remote sensing methods. The ATHENA EG is winding up its activities. GRAPE EG is initiating DemoGRAPE project to provide an empirical assessment of the delay and of the corruption induced by the ionosphere on satellite signals in the Polar Regions. ICED EG has been very active in promoting research on Southern Ocean ecosystems. The ICESTAR EG has been mostly inactive. IPICS EG is promoting ice coring campaigns. ISMASS EG is facilitating research on ice sheet mass balance. Operational Meteorology EG works to improve weather forecasts for Antarctica. ASPeCT devotes its energies to elucidating the role of sea ice in the climate system. ITASE provides an umbrella for traverse and shallow ice coring activities conducted by many countries and is planning follow-on activities.

Important Issues or Factors: A new observing system is being proposed “Antarctic Near-Shore and Terrestrial Observing System (ANTOS)”. This is a cross-disciplinary project is proposed as an AG under SSG-LS but involving SSG-PS and SSG-GS. ATHENA EG is nearing the end of its activities so should be disbanded. ICESTAR EG should be disbanded because the group has been inactive for several years. ASPeCT should become an EG because it does not have a definite home within the SCAR structure at the moment. It has an expected long lifetime that fits with an EG designation. ICED EG (joint with Life Sciences) should become a co-sponsored activity of SCAR. This fits better with its change of direction. Two new AGs are proposed under SSG-PS: SERAnt (Sun Earth Relationships and Antarctica) to replace ICESTAR, and SnowAnt (Snow in Antarctica). Proposals for these two new AGs are included in Appendix 2. SSG-PS is examining ways to start to realize the Horizon Scan research priorities.

Recommendations/Actions and Justification: **Number 1.** SCAR requests that national programs which operate shipping in the sea ice zone participate, where possible, in the underway sea ice data collection according to the ASPeCT protocols. **Number 2.** SCAR encourages national programs to continue to make their meteorological data available in near real time to global weather forecast centres and to make observations from ships and aircraft where possible. **Number 3.** SSG-PS recommends that AAA SRP be continued for a further 4 years at the present funding level. **Number 4.** SCAR endorses the freely available, but non-commercial, GIS package “Quantarctica” and allows re-distribution SCAR datasets as part of Quantarctica. SCAR recommends multiple theme editors from each standing group. These editors select peer-reviewed publicly available datasets that will be included in Quantarctica.

Expected Benefits/Outcomes: Recommendations 1 and 2 encourage important data collection while number 4 facilitates data usage. Recommendation 4 recognizes the success of AAA SRP, and encourages its continuation.

Partners: ANTOS will involve all SSGs, and work with the new SRPs, plus SOOS, CEP, CCAMLR and national Antarctic programs.

Budget Implications: \$27,000 is requested for each of 2015 and 2016 to support SSG-PS activities.

Action Group on Clouds and Aerosols

1. Chief Officer: Tom Lachlan-Cope, UK

2. Major Future Initiatives and Actions

It is hoped to arrange a further workshop for later this year in the UK using funds supplied by the SSG to bring as many members of the action group as possible together.

3. Major Activities and Significant Progress

Over the last 12 months there has been much activity and interest in clouds and aerosols at high southern latitudes. The period started with an IUGG/IAMAS meeting in Davos last summer that had a session on polar clouds that was attended by many members of the group. It was obvious at that meeting that there were serious gaps in our understanding of the processes driving clouds and aerosols over the Southern Oceans and further south over the Antarctic Continent itself. The interest in the Southern Oceans led to an US led workshop (SOCRATES) on clouds and aerosols over the Southern Ocean in Seattle early in 2014. It was hoped this workshop will lead to proposals led by the US but also by the Australia and the UK.

4. Budgetary Implications: None.

Action Group on Environmental Contamination in Antarctica (ECA) (joint with Life Sciences)

1. Chief Officers: Paolo Cescon, Italy and Gabriele Capodaglio, Italy.

2. Major Future Initiatives and Actions

Available data on Environmental contamination are fragmented and focussed on specific hot point, therefore emphasized the necessity to coordinate monitoring programs and research project to obtain a coherent panorama of the environmental contamination in Antarctica that should be discussed during the next meeting that will be held in Auckland August 29th. Therefore the group plans to:

- develop an AnMAP synthesis (Antarctic Monitoring and Assessment Program, similar to AMAP) to coordinate national monitoring and research programs and by producing Reports on specific aspects of the environmental quality in Antarctica. For this activity, the national agencies responsible for the application of the Madrid Protocol should be involved.
- The Contaminants portal already integrated on the Antarctic Master Directory must be updated with recent available data. A continuously updated database is a useful tool for assessing the quality of the environment.
- produce a Risk assessment guideline.
- One Workshop and/or meetings to coordinate future activities in order to implement the AnMAP program.

The group recommended:

- Extension of interest from environmental chemical contamination studies to the assessment of their effects on the Antarctic ecosystem.
- Therefore the group recommended that studies should be carried out to clarify this potential environmental problem deriving from remobilization of contaminants buried or immobilized in soils by the permafrost producing a potential effect on the biota.

3. Major Activities and Significant Progress

The dataset of organic and inorganic pollutants, collected and integrated on the Antarctic Master Directory, was updated until 2012 with available literature information.

Two reports are in advanced state of preparation entitled:

- Trace elements in coastal marine water and sediments by M. Radaelli, C. Turetta and G. Capodaglio.
- Element Distribution and Behaviour in Lake Waters by O. Abollino, J. Webster-Brown, W.B. Lyons, G. Capodaglio.

The ECA group and the AGAFS are merged on a new group: “Chemical contamination in the Antarctic environment: monitoring and mitigation” the acronym will be defined in occasion the meeting in Auckland.

The new group’s aim is to assess the Antarctic environment quality by studying biogeochemical cycles of pollutants and their effects on the biota considering also the climatic changes. The proposed new group is of interest and involve researchers of both SSG-PS and SSG-LS standing groups.

4. Budgetary Implications

A budget of USD5000 is requested to maintain and update the group’s data base and to organize a workshop (travel expenses of 3 participants) to coordinate and plan the activities to implement the AnMAP program. SSG-PS considers this budget request premature because the promised Trace Metals report has not been delivered.

Action Group on Ocean Acidification (OA, joint with Life Sciences)

1. Chief Officer: Richard Bellerby, Norway

See SSG-Life Sciences for the report.

4. Budgetary Implications

Funding during 2015 is requested for promotion of the OA report at an international meeting to the amount of USD1000 for travel and subsidence.

Action Group on Polar Atmospheric Chemistry at the Tropopause (PACT)

1. Chief Officers: Andrew Klekociuk, Australia and Gennadi Milinevsky, Ukraine

2. Major Future Initiatives and Actions

The current intention is to complete and submit the main publication and secondary publications by mid-2015, and have the database material fully publically available once the main publication is accepted. There are no likely specific impediments to completion of the project within the next year, except possibly for the required availability of time for the small project team to complete the necessary work.

3. Major Activities and Significant Progress

Work for PACT continued towards finalizing a database on tropopause region parameters that is being derived using ozonesonde measurements poleward of 50° latitude. Only limited work was possible in the reporting period as co-chair Klekociuk was seconded to other duties for a significant period.

During the reporting period, we added ozonesonde data from the Antarctic station Belgrano-II courtesy of Instituto Nacional de Técnica Aeroespacial, Spain. On analyzing for trends and variability in tropopause region parameters, we derived selection criteria to remove outliers, and we have settled on using data from 13 Southern Hemisphere (SH) sites (including the lower latitude sites of Melbourne (Australia) and Lauder (New Zealand) for comparison), and 17 Northern Hemisphere sites. We have derived climatological means of tropopause height and sharpness, and placed limits on inter-annual and long-term variability in these parameters and ozone mixing ratios in the vicinity of the tropopause.

For the SH sites, we have specifically examined influences from observed long-term changes in stationary waves in the lower stratosphere and inter-annual variability associated with the Southern Annular Mode. The recent behavior of the quasi-stationary wave in the distribution at southern extratropical latitudes, which shows backward movement (reversal from eastward to westward shift) of the South Atlantic ozone minimum, has been investigated by co-chair Milinevsky. The results were presented at EGU-2014 and are being prepared for publication in ACPD. These results will be analyzed together with data of tropopause

height and sharpness from the PACT database. Co-chair Klekociuk discussed potential further use of the analysis with collaborators performing model evaluations for the 1st Chemistry-Climate Model Initiative (CCMI-1) at the 2014 CCMI Workshop (Lancaster, UK).

4. **Budgetary Implications:** None

Action Group on Remote Sensing (Joint with Life Sciences)

1. **Chief Officer:** Hans-Ulrich Peter, Germany.

See SSG-Life Sciences for this report.

Budgetary Implications.

1000 USD during both 2015 and 2016 for participation of young scientists in conferences.

Expert Group on Advancing TecHnological and ENvironmental stewardship for subglacial exploration in Antarctica (ATHENA, joint with Life Sciences)

1. **Chief Officers:** Jemma Wadham, UK and Peter Doran, USA.

2. **Major Future Initiatives and Actions**

ATHENA is winding down and should be disbanded.

3. **Major Activities and Significant Progress**

- publication of a special issue of the Annals of Glaciology on technologies for icy environments. It should come out later this year and has been led by the ATHENA group.

- a session on subglacial aquatic environments and technologies at the SCAR Open Science Conference in August 2014.

- Jemma Wadham has a keynote at the SCAR OSC also on ATHENA related activities.

4. **Budgetary Implications:** None

Expert Group on GNSS Research and Application for Polar Environment (GRAPE, joint with Geosciences).

1. **Chief Officer:** Giordiana De Franceschi, Italy.

See SSG-Geosciences for this report.

4. Budgetary Implications

SCAR SSG PS and GS financial support is requested to improve and maintain the existing website (www.GRAPE.SCAR.org), for meetings organization, publications, participation in international conferences, etc.: USD1500 in 2015 and USD3000 in 2016.

Expert Group on Integrating Climate and Ecosystem Dynamics (ICED) in the Southern Ocean (joint with Life Sciences)

1. **Chief Officer:** Eugene Murphy, UK.

2. **Major Future Initiatives and Actions** – see Appendix 1

3. **Major Activities and Significant Progress** – see Appendix 1

4. Budgetary Implications: This EG should become a co-sponsored activity of SCAR.

Expert Group on Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research (ICESTAR)

1. Chief Officer: Allan Weatherwax, USA.

2. Major Future Initiatives and Actions

SuperDARN (Super Dual Auroral Radar Network) consists of two chains of coherent HF radars, in the northern and southern hemispheres and it is devoted to the study of high-latitude ionospheric convection, from subauroral regions to the geomagnetic poles. PNRA for the Italian side, and INSU and IPEV, for the French side, funded, with equal financial commitments, the construction of two radars at Dome Concordia on the Antarctic plateau, Dome C East (DCE) and Dome C North (DCN), with fields of view extending from the southward geomagnetic pole towards two uncovered auroral regions. The DCE radar has been successfully installed during the 2012-2013 Antarctic campaign in the framework of a cooperation between INAF-IAPS, Rome, and LPC2E-CNRS, Orléans and it is now operating under the responsibility of IAPS. The installation has been challenging because the new generation antennas were deployed over a vast area away from the base, with a considerable use of machinery and the handling of large quantities of material in extreme environmental conditions. Since the installation DCE has been operating well and scientific data are continuously produced and provided to the scientific community through the SuperDARN web site at Virginia Tech.

3. Major Activities and Significant Progress

This group has been mostly inactive and should be disbanded. A follow-on AG SERAnt has been proposed and the proposal is given in Appendix 2.

4. Budgetary Implications. None for ICESTAR.

Expert Group on International Partnerships in Ice Core Sciences (IPICS, joint with Life Sciences and Geosciences)

1. Co-chairs: Eric Wolff, UK and Ed Brook, USA.

Background

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 23 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. Major Future Initiatives and Actions

*Antarctic 2k plans new efforts on reconstruction of temperature, accumulation and perhaps sea ice extent in the next year or so.

* 40k work will be discussed extensively at the WAIS Divide meeting in La Jolla in September 2014, to which several people representing other 40k projects have been invited. SCAR funds may be used to support these external invitees if necessary.

*geophysical work for the oldest ice project is in planning for the next two field seasons in several targeted regions of Antarctica.

*Planning is starting for the 2016 OSC.

3. Major Activities and Significant Progress

After the Open Science Conference (OSC) held in Giens (France) in late 2012 (and supported by SCAR), a journal special issue, jointly published by *Climate of the Past* and *The Cryosphere*, has been under production. This is now complete with 32 papers (http://www.clim-past.net/special_issue55.html). IPICS had three excellent bids to hold the next OSC in 2016, and this has now been awarded to Hobart, Australia.

IPICS has 4 priority science projects (with a fifth in preparation) and a technical group. Progress on the 4 priorities is summarised as follows:

*Oldest ice (Antarctica) project: the main need now is to establish where the best locations in Antarctica for drilling a core extending towards 1.5 million years would be. A radar tracing workshop was held in Copenhagen in 2013, and meetings to discuss geophysical needs have been held in both the US and Europe in early 2014. The European meeting was supported with SCAR funds (allowing US, Japanese and Australian scientists to take part). These workshops have defined the regions in which further geophysical work and pilot drillings are required in the next couple of years, with drilling expected later in the decade.

*Last interglacial: with completion of the NEEM project in Greenland, focus is turning to comparisons between Greenland and Antarctica for the last interglacial. New Antarctic records are becoming available, and modelling studies are starting to unravel the interplay between the hemispheres across this event.

*IPICS-40k: the WAIS Divide project have published several important papers highlighting similarities and differences between climate history in East and West Antarctica. At least two further cores covering this period are being analysed.

*IPICS2k: After the PAGES 2k synthesis, which included Antarctic2k work, there is a need for a more detailed paper about the Antarctic studies. Barbara Stenni has taken over leadership of this PAGES-IPICS activity from Tas van Ommen..

New ice cores to study ice dynamics are being planned, and a white paper to turn this into an IPICS priority project is being written. The new group "Ice Core Young Scientists" now has a web presence and arranged activities at both AGU and EGU. They are in contact with APECS.

4. Budgetary Issues

Co-sponsorship of the IPICS Open Science Conference in Hobart during 2016 is sought, USD5000 in each of 2015 and 2016.

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

1. Chief Officer: Frank Pattyn, Belgium.

Background:

The new Steering Committee of ISMASS met in Sheffield, UK, on 7 Oct 2013. New terms of reference were defined. ISMASS is now a joint SCAR-IASC-CliC Expert Group. Catherine Ritz (LGGG-Grenoble, France) was appointed as new chair of ISMASS. Reps. from member organizations: Frank Pattyn (SCAR), Francisco Navarro (IASC), Edward Hanna (CliC).

2. Major Future Initiatives and Actions:

A workshop on ice-sheet future projections will be held on Tuesday 26 August 2014, Auckland, New Zealand, linked with the SCAR Open Science Conference. The objective is to stimulate the ice-sheet

community to improve methods and agree on common framework when producing ice-sheet mass balance model projections for the next 100 years. This meeting will include a report by Ryan Walker on the outputs of the "Ice sheet MIP for CMIP6" workshop that was held in July 2014 at Washington DC.

An IMBIE follow-up will be organized in September 2014 by Andy Shepherd (forthcoming AGU Chapman Conference).

A major model intercomparison initiative on West Antarctic Glacier-Ocean Models will have its Kick-Off Meeting on 27-29 October 2014 at the New York University Campus in Abu Dhabi, United Arab Emirates (organized by David Holland). This is a CliC and ISMASS endorsed initiative.

Organization of a workshop by Edward Hanna on "Constraining uncertainty in Greenland Ice Sheet surface mass balance model output and in situ validation", University of Sheffield, April-May 2015

An ice-sheet model inter-comparison splinter group meeting was held at EGU in April 2014 and at the IGS conference on Ice sheets and Sea Level rise at Chamonix, May 2014, both organized by Frank Pattyn. It was agreed to proceed with a new MISMIP (Marine Ice Sheet Model Intercomparison Project) to test ice sheet models on how to cope with grounding line retreat due to basal melting under the shelf and loss of buttressing. A preliminary website was set up: [http://homepages.ulb.ac.be/~fpattyn/mismip+/,](http://homepages.ulb.ac.be/~fpattyn/mismip+/) where details on the procedure can be found.

3. Major Activities and Significant Progress

- A review paper was published in 2013 in Nature. This was an outcome of the ISMASS Workshop held within SCAR-Portland 2012:

E. Hanna, F.J. Navarro, F. Pattyn, C.M. Domingues, X. Fettweis, E.R. Ivins, R.J. Nicholls, C. Ritz, B. Smith, S. Tulaczyk, P.L. Whitehouse, H.J. Zwally (2013). Ice-sheet mass balance and climate change. *Nature*, **498**, 51-59, doi:10.1038/nature12238.

- The new Steering Committee had its first meeting in Sheffield, UK, on 7 October 2013.
 - Composition of the Committee & Expertise: Catherine Ritz (LGGE-Grenoble, France ; Ice-sheet modelling), Andrew Shepherd (Univ. Leeds, UK; Remote sensing), Pippa Whitehouse (Durham University, UK; Glacial Isostatic Adjustment), Dan Dixon (Univ. Maine, USA; In-situ observations), Xavier Fettweis (Univ. Liège, Belgium; Interactions with atmosphere), David M. Holland (New York Univ., USA; Interactions with oceans), Frank Pattyn (Univ. Libre Bruxelles, Belgium; SCAR rep.), Francisco J. Navarro (Univ. Politécnica Madrid, Spain; IASC rep.), Edward Hanna (Univ. Sheffield, UK; CliC rep.).
 - An APECS rep. to be appointed.
 - Catherine Ritz appointed as chair of ISMASS.
 - New terms of reference were defined.
 - Several ongoing and near-future initiatives were discussed
 - Several workshops were proposed (see below one already held and another to be held during SCAR-Auckland 2014.
 - It was decided that ISMASS website would be hosted by CliC.
- A future of ice-sheet model inter-comparison splinter group meeting was held at EGU in Spring 2014, organized by Frank Pattyn.
- A workshop on "Modelling strategy for ice sheet mass balance projections" will be held on 26 August 2014 within the SCAR New Zealand Meeting and Open Science Conference. It will include a report by Ryan Walker on the outputs of the "Ice sheet MIP for CMIP6" to be held on 16-18 July 2014.

4. Budgetary Implications

Supporting funds of USD3500 in 2015 and USD2500 in 2016 are requested.

Expert Group on Operational Meteorology in the Antarctic (OpMet)

1. Chief Officer: Steven Colwell, UK.

2. Major Future Initiatives and Actions:

The Chief Officer in discussion with the International Association of Antarctic Tour Operators (IAATO) to try and encourage their members to make meteorological observations from their ships to increase weather coverage in the southern oceans.

3. Major Activities and Significant Progress

Over the past couple of year the group has concentrated on establishing links between other groups working in the same area of operational meteorology in Antarctica. The main links are to the Antarctic Meteorological Observation, Modeling, and Forecasting Workshop group which holds annual meeting in June or July and SCAR provides some funds to pay for accommodation for representatives from some countries to attend. Also a link between SCAR and the WMO EC-PORS (Panel of Experts on Polar Observations, Research and Services) where it is possible to carry out monitoring of the meteorological observations that come from Antarctica via AnTON (Antarctic Observing Network) which helps to identify problems with the data that is currently coming out from Antarctica, for more information see:

http://www.wmo.int/pages/prog/www/Antarctica/Antarctic%20Task%20Team/Doc_4_4_1_Resolution_AnTON.doc

Establishing these links means that the groups are now working together better and we have seen an improvement in the quality and quantity of observations coming from Antarctica.

The group maintains a webpage at http://www.antarctica.ac.uk/met/jds/met/SCAR_oma.htm which has links to online resources where national operators can check the quality and quantity of the data that they are sending out from Antarctica.

4. Budgetary Implications: USD2000 in both 2015 and 2016 for travel related to the annual Antarctic Meteorological Observation, Modeling and Forecasting Workshop (AMOMFW).

Other Groups affiliated with SSG-PS

Antarctic Sea Processes and Climate (ASPeCt)

1. Chief Officers: Steven Ackley, USA and Marilyn Raphael, USA.

2. Major Future Initiatives and Actions

1). Finalizing the sea ice core database and coordinating user interfaces for data access through the Australian Antarctic Division data centre.

2). Additions to the ship observations database (ASPeCt observations) are being made on a continuing basis, and sea ice thickness and sea ice core properties databases are being developed.

3). Developing the ASPeCt ship-based observation system and database for sea ice measurements taken by remote vessels (airborne and under ice), ship-based instruments and surface-based instruments and sampling.

3. Major Activities and Significant Progress

Meetings:

1. Workshop at the Gordon Research Conference (GRC), Ventura, California March 2013

2. Workshop at the International Glaciological Society (IGS) meeting, Hobart, Tasmania, March 2014 – joint with the Arctic Sea Ice Working group in the morning and ASPeCt alone in the afternoon

3. ASPeCt also participated in the planning and execution of the Sea ice Workshop in, Tromso, Norway in June, 2013 and the WCRP Grand Challenge Cryosphere Workshop also in Tromso, Norway in October, 2013.

Workshop outcomes:

Science Plan:

At both the GRC and IGS workshops we worked to update the Aspect Science Plan for the next ten years. Major emphases in the Science Plan are:

- Snow and Sea Ice Climatology (Ship Observations)
- Snow and Ice Properties (Cores, Thickness, Sampling)
- Time Series of Sea Ice Processes (Drifting Stations and Ice Mass Balance Buoys)
- Coastal Polynya Process Experiments
- Ice Edge Process Experiments
- Validation of Remote Sensing of Sea Ice
- Modeling

We worked to make these emphases compatible with SCAR Horizon Scan concerns. The Plan also recognizes ASPeCt as the "operating arm" for SOOS on the Future of Antarctic Sea ice, one of the six SOOS themes. Steve Ackley is the SOOS SSG member responsible for this. He has worked to develop the definition of the Essential Climate Variables (ECVs) for sea ice. A major part of this is circumpolar sea ice thickness and snow depths, something the ASPeCt observations have and will be contributing to. There is also an emphasis (for ASPeCt) in establishing calibration/validation (Cal/Val) through surface measurements of ice thickness (or e.g. airborne and ship-based EMI) for airborne lidar and satellite altimetry (IceSat and CryoSAT) algorithm development and use.

Outcome of the June 2013 Workshop

Formation of a joint subgroup of ASPeCt and the Arctic Sea Ice Working Group (Technical Committee on Integrating In-Situ Sea Ice Observations to work on updating sea ice observation technology from vessels and apply these technologies to vessels working in both the Arctic and Antarctic. This group provided an update on their activities at the IGS Sea Ice Conference in Hobart in March, 2014.

The goals are to facilitate:

- 1) standardization of observational methods;
- 2) archival of data collected;
- 3) near-real time transference of data to users; and
- 4) rescue and integration of historical data collections.

These goals may be accomplished through the following objectives:

- a) development of a comprehensive Arctic/Antarctic observation system that can be adjusted to the local conditions;
- b) design of robust equipment and software to facilitate standardized and autonomous observations;
- c) development of novel observation methods, providing data follow WMO or accepted standards.
- d) exchange technical information on hardware and software between institutes and nations to best leverage limited funding availability; and
- e) provide expert development of technical and training material to broaden participation in sea ice watches with sufficient standardization and quality control.

Initial Membership: Jenny Hutchings (OSU), Petra Heil (AAD), Blake Weissling (UTSA), Alice Orlich (UAF), Marcel Nicolaus(AWI) and Stephen Ackley (UTSA). Other members are welcome to join, or may

be asked to join, based on their interest and expertise in contributing to the objectives of the Technical Committee.

Outcome of the March 2014 Workshop in Hobart

Note: a workshop report can be found at the ASPeCt website <http://aspect.antarctica.gov.au/>.

ASPeCt Projects:

Two projects were funded in 2013:

(a) to look at Terra Nova Bay and the Ross Ice Shelf Polynyas using NB Palmer funded by NSF. **An initial cruise is scheduled for April 2017. PIs are Ackley, Stammerjohn, Maksym, Cassano, Guest and Bell**

(b) to work on IceBridge airborne lidar analyses for sea ice thickness from China funded by NSF-China. **(X. Wang PI(China), S.F.Ackley Co-I(USA) and H.Xie Co-I(USA))**

Review Paper

Draft text was discussed and edited based on comments from the GRC and IGS workshops.

4. **Budget Implications:** USD4000 in 2015 and 2016 to support activities. ASPeCt should become an EG under SSG-PS.

International Transantarctic Scientific Expedition (ITASE)

1. Chief Officer

Paul Mayewski, USA. (ITASE Coordinator)

2. Major Future Initiatives and Actions

ITASE continues to provide an umbrella for the traverse and shallow coring activities conducted by several countries (eg., Brazil, Chile, China, New Zealand, USA all have current or planned activities).

ITASE has extension activities that seek to understand Antarctic-South American and Polar to Tropical connections utilizing ice core and other current and paleo records:

CASA (Climate of Antarctica and South America) – <http://www.polar tropical.org/casa/>

PTC (Polar to Tropical Connections) - <http://www.polar tropical.org/>

3. Major Activities and Significant Progress

Data and information services: ITASE hosts under the auspices of SCAR an ice core data base - <http://www.icereader.org/icereader/>

Workshops: ITASE hosted a workshop in Castine, Maine Fall (2013) – results are expected to be forthcoming in a paper being prepared for publication

Some recent notable publications:

Dixon, D.A., Mayewski, P.A., Korotkikh, E., Sneed, S.B., Handley, M.J., Introne, D.S. and Scambos, T.A., 2011, A spatial framework for assessing modern and monitoring future change in the chemistry of the atmosphere over Antarctica, *The Cryosphere Discussions* 5, 1-66.

Goodwin, I.D., et al., 2013, A reconstruction of the Indo-Pacific extratropical atmospheric longwave patten during the medieval Climate Anomaly, *Climate Dynamics*, DOI 10.1007/s00382-013-1899-1.

Korotkikh, E. V., Mayewski, P.A., Dixon, D., Potocki, Handley, M., Introne, D. and Kurbatov, A.V., 2014, Recent increase in Ba and As concentrations as recorded in a South Pole ice core, *Atmospheric Environment* 89, 683-687.

Mayewski, P.A., et al., 2013, West Antarctica's sensitivity to natural and human-forced climate change over the Holocene, *Journal of Quaternary Science* 1 (28), DOI: 10.1002/jqs.2593.

SCAR ACCE Advisory Group., in press, Antarctic climate change and the environment – 2014 update, Antarctic treaty Meeting Report 2014.

Stager, J.C., et al., 2012, Precipitation variability in the winter rainfall zone of South Africa during the last 1400 years linked to the austral westerlies, *Climate of the Past* 8, 877-1125.

Steig, E.J., et al. 2013, An assessment of recent climate and glaciological changes in West Antarctica, *Nature Geosciences*, doi: 10.1038/NGEO1778.

4. Budgetary Implications

No requests at this time.

SCAR SSG-PS Budget Request for 2015 and 2016

<u>Group</u>	<u>2015</u>	<u>2016</u>	<u>Comments</u>
ASPECT	4000	4000	Science Tasks
OpMet EG	2000	2000	AMOMFW Mtgs.
PACT AG	0	0	Winding up
GRAPE EG (GS)	1500	3000	Mtgs,-website
ECA AG (LS)	0	0	Trace Metals Rep. Pending.
ISMASS EG	3500	2500	Mtgs.
IPCS EG (LS/GS)	5000	5000	2016 Hobart OSC
OA AG (LS)	1000	0	Wrap up work
Remote S. AG (LS)	1000	1000	Mtgs.
SERAnt AG (New)	1500	1500	Planning for EG
ANTOS (LS/GS New)	0	1000	Planning mtg.
SnowAnt AG (New)	2500	2000	Mtgs., Database
SSG-PS	5000	5000	Travel Young Sci, Contingency.
Total:	\$27K	\$27K	

Assumptions: ICESTAR EG disbanded; ICED EG becomes a co-sponsored activity of SCAR; and SERAnt, SnowAnt, and ANTOS AGs are approved.

Appendix 1: Report from Expert Group on Integrating Climate and Ecosystem Dynamics (ICED) in the Southern Ocean (joint with Life Sciences)

2. Major Future Initiatives and Actions

- Two ICED sessions at the IMBER OSC (Bergen, Jun 2014), with a panel discussion on ‘Challenges for evidence-based management of Southern Ocean ecosystems’.
- An ICED stakeholder event (jointly with WWF), June 2014, UK, bringing together key sectors with an interest in Antarctic krill: the fishing industry, scientists, and conservation organisations.
- A joint AnT-ERA / AntClim21 / ICED session ‘Impact of climate change on Antarctic biota’ at the SCAR Open Science Conference 25-28 Aug 2014, Auckland, New Zealand.
- To publish the ICED community paper on scenarios; strengthen our science areas as outlined in the White Paper; and establish a clear and strong role for ICED within CCAMLR, SCAR and Future Earth.

ICED and SCAR:

We aim to further strengthen our links with SCAR and its relevant programmes, particularly in 2 areas; fieldwork map development and improved data access (as discussed with Mike Sparrow at the ICED SSC meeting in November 2013). We also aim to maintain our links with AntEco, AnT-ERA and SOOS to promote collaboration and avoid duplication of effort in the areas of data rescue and analyses, modelling and fieldwork. We would like to work with SCAR in strengthening our links with CCAMLR. We feel that these activities will be extremely beneficial to ICED, SCAR, and the polar ecosystem research community.

3. Major Activities and Significant Progress

International events April 2013-May 2014

- **Thematic workshop: Polar Marine Ecosystems Research: Strategic directions for the EU Research Area, Brussels, Belgium, May 2013:** In this workshop we presented a joint ICED and EUR-OCEANS Consortium Flagship Project (Polar Ecosystem Change and Synthesis, PECS) strategy document for Polar Marine ecosystem research to senior European Commission members. We highlighted why such research should form an essential component of the EU Research Area funded by the European Commission’s Horizon 2020 funding programme. This is already promoting European and international collaborative research and some of the aims of the strategy have appeared in recent calls of Horizon 2020, thereby fulfilling the workshop’s objective.
- **ICED Scientific Steering Committee Meeting (SSC), Nov 2013:** This meeting was significant for the ICED SSC – 5 yrs on from the adoption of our Science Plan and Implementation Strategy (ICED SPIS) by IMBER. Mike Sparrow attended on behalf of SCAR. We reviewed our progress since publication of the ICED SPIS; highlighted contributions to Southern Ocean scientific research community; reconsidered the key issues and agreed on directions and priorities for the next 5 yrs. We are now preparing this information in manuscript format for publication in an internationally peer reviewed journal.
- **ICED Workshop on Southern Ocean Food webs and Scenarios of Change, Nov 2013:** As part of a grant awarded to Cavanagh, Murphy, Johnston and others (to coordinate ICED activities and conduct specific ICED science*), this workshop focused on exploring plausible quantitative scenarios of how the Southern Ocean may change in the future based on the latest available climate models, ecological data and models, and information on fisheries. Ecologists had the opportunity to ask leading climate scientists questions, and in turn, the climate scientists gained an insight into what ecologists require. Critical challenges were discussed, and these are explored in our community paper (currently in prep).

- **Workshop on Ecosystem Essential Ocean Variables (eEOVs) for the Southern Ocean, March 2014:** Convened by ICED SSC scientists Andrew Constable, Dan Costa, et al. This workshop made significant progress in clarifying the context and procedures for Southern Ocean eEOVs.
- **SCAR Horizon Scan.** ICED scientists have been involved throughout this process.

Science Highlights: Southern Ocean food web structure, comparisons and change scenarios

- Several scientific papers published (see Appendix) covering Southern Ocean change, ecosystem structure and function, links between ecology and biogeochemistry and management of the Southern Ocean.
- The EUR-OCEANS Consortium Flagship for Polar Ecosystem Change and Synthesis (PECS) came to an end in Oct 2013. European ICED scientists had lead roles in this and manuscripts are in preparation.
- *The UK Natural Environment Research Council funded grant: ‘Coordinating International Research on Southern Ocean Ecosystems: Implementation of the ICED Programme’ 2012-14 entered its second (final) year. This grant has enabled us to employ an ICED postdoc (Dr Cheryl Knowland) for this year to work on scenarios and projections.

Informing Policy and society:

- Contributed ICED science highlights to SCAR for input into the Antarctic Treaty Consultative Meeting XXXVII in May 2014.
- Submitted a series of documents to the CCAMLR Working Group on Ecological Monitoring and Management highlighting relevant ICED science and ways of interfacing with policy.
- Continuing to work with CCAMLR to ensure that ICED scientific results are translated appropriately into messages that resonate with policy makers.
- Contributed to the forthcoming IPCC AR5 Report (*Climate Change 2014: Impacts, Adaptation, and Vulnerability* Working Group II), led by A Constable.

Selected Publications 2013-14:

Philipp Assmy, Victor Smetacek, Marina Montresor, Christine Klaas, Joachim Henjes, Volker H. Strass, Jesús M. Arrieta, Ulrich Bathmann, Gry M. Berg, Eike Breitbarth, Boris Cisewski, Lars Friedrichs, Nike Fuchs, Gerhard J. Herndl, Sandra Jansen, Sören Krägfesky, Mikel Latasa, Ilka Peeken, Rüdiger Röttgers, Renate Scharek, Susanne E. Schüller, Sebastian Steigenberger, Adrian Webb and Dieter Wolf-Gladrow (2013) Thick-shelled, grazer-protected diatoms decouple ocean carbon and silicon cycles in the iron-limited Antarctic Circumpolar Current. *PNAS* 2013 110 (51) 20633-20638; doi:10.1073/pnas.1309345110

Rachel Cavanagh, Nadine Johnston, Eugene Murphy, Cynan Ellis-Evans, Stig Falk-Petersen, Paul Tréguer and Dieter Wolf-Gladrow (2013). Summary and Conclusions Brussels Thematic Workshop on Polar Marine Ecosystems Research: Strategic directions for the European Research Area. Summary document prepared for the EU by, on behalf of the EUR-OCEANS Consortium Flagship for Polar Ecosystem Change and Syntheses (PECS). See <http://www.iced.ac.uk>

Cavanagh R.D. on behalf of the international ICED Scientific Steering Committee (2013). ICED workshop and conference session on Southern Ocean food webs and scenarios of change, WG-EMM-13/13.

Andrew J. Constable, Jessica Melbourne-Thomas, Stuart P. Corney, Kevin R. Arrigo, Christophe Barbraud, David K.A. Barnes, Nathaniel L. Bindoff, Philip W. Boyd, Angelika Brandt, Daniel P. Costa, Andrew T. Davidson, Hugh W. Ducklow Louise Emmerson, Mitsuo Fukuchi, Julian Gutt, Mark A. Hindell, Eileen E. Hofmann, Graham W. Hosie, Takahiro Iida, Sarah Jacob, Nadine M. Johnston, So Kawaguchi, Philippe Koubbi, Mary-Anne Lea, Azwianewi Makhado, Rob A. Massom, Klaus Meiners, Michael P. Meredith, Eugene J. Murphy, Stephen Nicol, Kate Richerson, Martin J. Riddle, Stephen R. Rintoul, Walker O. Smith Jr, Colin Southwell, Jonathon S. Stark, Michael Sumner, Kerrie M. Swadling, Kunio T. Takahashi, Phil N. Trathan, Dirk C. Welsford, Henri Weimerskirch, Karen J. Westwood, Barbara C. Wienecke, Dieter Wolf-

Gladrow, Simon W. Wright, Jose C. Xavier, Philippe Ziegler (Accepted) Change in Southern Ocean ecosystems I: How changes in physical habitats directly affect marine biota, *Global change biology*

Constable, A, Costa, D, Schofield, O, Newman, L, Urban, E, Ballerini T, et al. 2014. Outcomes and context for future work from the workshop on Ecosystem Essential Ocean Variables (eEOVs) for the Southern Ocean. Rutgers University, USA, 18-21 March 2014.

Grant, S.M., Hill, S.L., Trathan, P.N. & Murphy, E.J. (2013). Ecosystem services of the Southern Ocean: trade-offs in decision-making. *Antarctic Science*. 25: 603-617

Hauck, J., Völker, C., Wang, T., Hoppema, M., Losch, M., & Wolf-Gladrow, D. A. (2013). Seasonally different carbon flux changes in the Southern Ocean in response to the Southern Annular Mode. *Global Biogeochemical Cycles*, 27(4), 1236-1245.

Hill, S.L. (2013) From strategic ambiguity to technical reference points in the Antarctic krill fishery: the worst journey in the world? *Environmental Conservation*. doi: 10.1017/S0376892913000088

Hill, S.L., Phillips, T. & Atkinson, A. (2013) Potential Climate Change Effects on the Habitat of Antarctic Krill in the Weddell Quadrant of the Southern Ocean. *PLoS ONE* 8(8): e72246.
doi:10.1371/journal.pone.0072246

Johnston N.M., E.J. Murphy, J.R.D. Silk, C.M. Waluda, S.L. Hill and R.D. Cavanagh (United Kingdom) on behalf of the ICED Scientific Steering Committee (2013). Historical data synthesis in the Southern Ocean: Priority data sets. WG-EMM-13/19

Melbourne-Thomas, J., A. Constable, S. Wotherspoon, and B. Raymond, 2013: Testing Paradigms of Ecosystem Change under Climate Warming in Antarctica, *PLoS ONE*, 8:e55093.

Murphy EJ, Hofmann EE, Watkins JL, Johnston NM, Piñones A, Ballerini T, Hill, Trathan PN, Tarling GA, Cavanagh RD, Young EF, Thorpe SE, Fretwell P, (2013) Comparison of the structure and function of Southern Ocean regional ecosystems: The Antarctic Peninsula and South Georgia. *J Mar. Sys.* 109-110:22-42

Murphy, EM., R.D. Cavanagh (United Kingdom), A. Constable (Australia), E.H. Hofmann (USA), S.L. Hill, N.M. Johnston, P.N. Trathan and J.L. Watkins (United Kingdom) (2013). Developing research on Antarctic krill to facilitate the development and updating of feedback management procedures. WG-EMM-13/12.

Tancell C, Phillips RA, Xavier JC, Tarling GA, Sutherland WJ (2013) Comparison of methods for determining key marine areas from tracking data. *Mar. Biol.* 160:15-26

Tavares, S., Xavier, J.C., Philips, R.A., Pereira, M.E., and Pardal, M.A. (2013) Influence of age, sex, and breeding status on mercury accumulation patterns in the wandering albatross *Diomedea exulans*. *Environmental Pollution*. 181:315-320.

Walker O. Smith Jr., Michael S. Dinniman, Eileen E. Hofmann and John M. Klinck (2014) The effects of changing winds and temperatures on the oceanography of the Ross Sea in the 21st century. *Geophysical Research Letters*. Accepted manuscript online: 6 FEB 2014 09:26AM EST | DOI: 10.1002/2014GL059311

Ward P, Tarling GA, Thorpe SE (2014) Mesozooplankton in the Southern Ocean: spatial and temporal patterns from Discovery Investigations Prog. *Oceangr.* 120:305-319

Xavier, J.C., Louzao, M., Thorpe, S.E., Ward, P., Hill, C., Roberts, D., Croxall, J.P., and Philips, R.A. (2013) Seasonal changes in the diet and feeding behaviour of a top predator indicate a flexible response to deteriorating oceanographic conditions. *Mar. Biol.* 160:1597-1606. DOI 10.1007/s00227-013-2212-x

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Other:

Shea, L., Xavier, J. C. and Lipinski, M. (3013). The role of cephalopods in the world's oceans: a symposium in honour of Malcolm Clarke. In World Congress of Malacology, 21-27 July (plus J Xavier was coordinator of two discussion panels)

Appendix 2 Proposals for new Action Groups

Proposal for new Action Group on Sun Earth Relationships and Antarctica (SERAnt)

We propose to establish a new Action Group within SSG/PS to determine the Terms of Reference for an Expert Group on solar terrestrial physics, with the following objectives:

- * Identify the science to be addressed, and the groups worldwide that are already active in research in the field.
- * Formulate a proposal for its structure and composition
- * Analyse the interaction with GRAPE EG and avoid duplication, while promoting synergy
- * Bridge over gap between ICESTAR EG, closed at Auckland, and future EG to be formed in Kuala Lumpur

Proposed members:

Dr. Maurizio Candidi, Chair

Dr. Allan Weatherwax, Chair of past ICESTAR EG

Dr Annika Seppala, SCAR representative in SCOSTEP Bureau

Dr. Giorgiana DeFranceschi, Chair of GRAPE EG

Requested budget for 2015 and 2016:

US\$ 1500 per year to support limited travel, and participation in SCAR XXXIV

Proposal for new Action Group on Snow in Antarctica (SnowAnt)

We propose to establish a new Action Group within SSG/PS with the following key goals: protect:

- Protect: What is disturbed today will be in the ice cores for the next ~ 1 My – preserve pristine snow areas
- Implement: SnowREADER to document disturbed areas. historic snow profiles, accumulation data from AWS, stake farms, surface radar profiles, shallow firn – snow cores
- Map: develop a snow classification for Antarctica
- Educate and Coordinate: quantitative snow stratigraphy methods developed by IACS working group MicroSnow should be implemented by snow schools to recognize the importance of snow for SCAR

Proposed members:

Martin Schneebeli, Switzerland

Katie Leonard, Switzerland /US

Nancy Bertler, New Zealand

Johannes Freitag, Germany

Laurent Arnaud, France

Willem Jan van de Berg, Netherlands

Requested budget for 2015 and 2016:

Meetings: \$2000; database setup: \$3000; support of snow school: \$1000; totaling \$6000 over 2 years.
