



**WP 07**

Agenda Item: 2.2.3

Person Responsible: Dr. W Berry  
Lyons

**EXCOM 2013**

**Barcelona, Spain 22/23<sup>rd</sup> July 2013**

# **STANDING SCIENTIFIC GROUP ON GEOSCIENCES (SSG-GS)**



## Executive Summary (1 page)

**Title:** Standing Scientific Group on Geosciences Report to the Delegates, EXCOM, July 2013

**Authors:** W. Berry Lyons, Jesús Galindo-Zaldivar, Naresh C. Pant

**Introduction/ Background:** (Summary of SSG) Progress of work, future plans and highlights of work was presented by Prof. A. Capra after introduction by Y-D. Kim to the delegates during July 2012 XXXII Delegates meeting at Portland, USA. . Necessity of stronger linkages between PS, GS and LS groups was brought out. Efforts to have inclusion of more palaeontologists in the programmes is to be made and more sessions in the next ISEAS to be invited from them.

PAIS (*Past Antarctic Ice Sheet dynamics*) following the legacy of ACE (*Antarctic Climate Evolution*) aims to progress from paleoclimate reconstruction focus to a comprehensive understanding of the ice-sheet geometry in various domains in Antarctica from deep interior to far field records. *Solid Earth Response and influence on Cryospheric Evolution* (SERCE) approaches modeling of glacial isostatic adjustments (GIA) through geological, geophysical and geodetic measurements. New Action and Expert Groups on Geological Heritage and Conservation (new proposal submitted) and Connecting geophysics with geology: key areas for understanding the building stones of Antarctica aim to broaden the scope of SCAR activities.

**Important Issues or Factors:** (what do the SCAR Delegates need to be aware of) There is a need of increased international participation of young researchers from SCAR member countries especially where the national Antarctic programs are relatively less developed.

**Recommendations/Actions and Justification:** (what actions are you requesting of EXCOM and why they should agree) A quota of one or two seats for participants from SCAR community in National Antarctic programs

**Expected Benefits/Outcomes:** (if the actions are taken what outcomes are expected) Two main benefits expected. First, quality and quantity of field data will improve and errors can be better constrained. Second, increased human resource on account of training from collaborative participation.

**Partners:** (will this involve others both within and outside of SCAR?) Initially from within SCAR

**Budget Implications:** (What funds are requested or other commitments by SCAR?) SCAR can facilitate the collaborative participation through an expert committee. Possibly no additional financial implication other than hosting of this committee.

## Standing Scientific Group on Geosciences

(Should be no longer than 8 pages, excluding appendices)

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### 2. Major Future Initiatives and Actions

Members of the Geosciences-SSG have been instrumental in developing two new flagship SCAR programmes, the abstracts from which are given below. These “Scientific Research Programmes (SRPs) are transformative scientific initiatives that address compelling issues and emerging frontiers in Antarctic or Southern Ocean science of regional and global importance. SRPs are SCAR’s highest level of investment in science. SRPs advance scientific questions that are expected to require sustained efforts by international teams of scientists and researchers for six to eight years.”

#### **2.1. Past Antarctic Ice Sheet dynamics (PAIS)**

Lead proponents: C. Escutia (Spain), R. DeConto (Canada), K. Gohl (Germany), R. Larter (UK), R. Powell (USA), L. De Santis (Italy), M. Bentley (UK)

The proposed SCAR Scientific Research Programme PAIS (*Past Antarctic Ice Sheet dynamics*) aims to improve understanding of the sensitivity of East, West, and Antarctic Peninsula Ice Sheets to a broad range of climatic and oceanic conditions. PAIS builds on the success of SCAR-ACE (*Antarctic Climate Evolution*),

but with a new focus on the ice sheet rather than palaeoclimate reconstructions. Study intervals span a range of timescales, including past “greenhouse” climates warmer than today, and times of more recent warming and ice sheet retreat during glacial terminations. The PAIS research philosophy is based on data-data and data-model integration and intercomparison, and the development of “ice-to-abyss” data transects, extending from the ice sheet interior to the deep sea. The data- transect concept will link ice core, ice sheet-proximal, offshore, and far-field records of past ice sheet behaviour and sea level, yielding an unprecedented view of past changes in ice sheet geometry, volume, and ice sheet-ocean interactions. These integrated data sets will enable robust testing of a new generation of coupled Glacial Isostatic Adjustment-Ice Sheet-Atmosphere-Ocean models that include new reconstructions of past and present ice bed topography and bathymetry. PAIS will accomplish its objectives by: 1) facilitating the planning of new data-acquisition missions using emerging technologies; 2) encouraging data sharing and integration of spatially targeted transect data with modelling studies; and 3) initiating/expanding cross linkages among Antarctic research communities. The overarching goal of PAIS is to improve confidence in predictions of ice sheet and sea level response to future climate change and ocean warming. The full programme and contact details may be found at [www.scar.org/researchgroups/progplanning/PAIS\\_Proposal\\_Apr2012.pdf](http://www.scar.org/researchgroups/progplanning/PAIS_Proposal_Apr2012.pdf).

## 2.2. Solid Earth Response and influence on Cryosphere Evolution (SERCE)

Lead proponent: Terry J. Wilson (USA)

The *Solid Earth Response and influence on Cryospheric Evolution* (SERCE) scientific research programme aims to advance understanding of the interactions between the solid earth and the cryosphere to better constrain ice mass balance, ice dynamics and sea level change in a warming world. This objective will be accomplished through integrated analysis and incorporation of geological, geodetic and geophysical measurements into models of glacial isostatic adjustment (GIA) and ice sheet dynamics. The programme is designed to synthesize and integrate the extensive new geological and geophysical data sets obtained during and subsequent to the International Polar Year with modeling studies, in a timeframe to contribute to IPCC AR6. SERCE will provide the international collaborative framework and scientific leadership to investigate systems-scale solid earth – ice sheet interactions across Antarctica and relate these results to global earth system and geodynamic processes. A series of expert workshops will produce synthetic science products based on extensive new geophysical data sets for Antarctica as well as improved data-modeling integration. Thematic science symposia and workshops, and ensuing published thematic journal issues, will propel the science of solid earth – cryosphere interactions beyond the current state of knowledge and contribute a body of new knowledge to the IPCC AR6 assessment. The SERCE programme will conduct major efforts in capacity building, training and public outreach using complementary strategies to achieve technical capacity via information exchange, analytical capacity via training schools, engagement of new polar researchers via thematic science sessions, and public outreach via the world wide web. The full programme and contact details may be found at: [www.scar.org/researchgroups/progplanning/SERCE\\_Proposal\\_Apr2012.pdf](http://www.scar.org/researchgroups/progplanning/SERCE_Proposal_Apr2012.pdf).

## 2.3 Progress on XII International Symposium on Antarctic Earth Science (ISEAS), India:

National Centre for Antarctic and Ocean Research (NCAOR) located at Goa is the lead agency organizing ISEAS XII in 2015. The symposium will be organized at Goa. A national advisory committee and a Steering Committee are initially planned to be established for which approval from the concerned ministry is being sought. The first meeting of the steering committee is expected to be held during September 2013

Following the precedence of ISEAS XI, contact has been made with the Geological Society of London (Ms. Angharad Hills) for publication of the articles as *Special Publication Series*.

## 3. Major Activities and Significant Progress

**Bedmap2:** improved ice bed, surface and thickness datasets for Antarctica, *The Cryosphere*, 7, 375–393, doi:10.5194/tc-7-375-2013 by P. Fretwell et al. 2013 is a SCAR Product.

**Tectonic Map of Antarctica** by Garrick Grikurov and German Leychenkov (Russia) June 2012;

### **Assessment and recommendation of multibeam data acquisition for characterizing Ice Sheet retreat (AG) (Phil Bart and O. Nitsche)**

Draft report prepared.

### **Antarctic Digital Magnetic Anomaly Project (ADMAP) Expert Group (EG) (Marta Ghidella)**

The ADMAP project has been a very successful project with acquisition and compilation of a huge amount of data. The work is being continued through an ADMAP-2 steering committee.

The ADMAP 2 steering committee is called for an inter-sessional meeting in Korea in the end of July / beginning of August 2013. The overarching aim is to establish a road map towards ADMAP 2, the new digital magnetic anomaly compilation for Antarctica. A significant number of surveys covering extensive areas in the interior of Antarctica and in geologically and geophysically key areas have been performed in the past decade (since ADMAP 1). There is a pressing need to compile these new data and make them available for the wider scientific community. Furthermore, there is a need to produce navigational line data sets or at least survey details not only to avoid duplication but also to foster new international cooperative studies in logistically difficult areas.

This first steering committee meeting will be in Korea: it will take place at KOPRI (City of In-Cheon) from 30 July to 1 August. It is expected that the committee members arrive on 29 July (Monday) to ensure that all 3 meeting days can be fully utilized.

Budgetary consideration: \$ 2000 advanced from the next year's budget of SSG-GS for this meeting.

### **Antarctic Permafrost, Soils and Periglacial Environments (ANTPAS) (EG) (Guglielmin and G. Viera)**

Bockheim et al (2013) report for the first time warming in permafrost in the Western Antarctic Peninsula from new research between the Palmer archipelago and the South Shetlands. Permafrost is discontinuous in most low altitude sites and with temperatures close to thawing where it occurs. This is especially significant for infrastructure planning, maintenance and hazard/risk evaluation and should be accounted for by managers of Antarctic Programmes.

Guglielmin and Cannone (2012) report warming permafrost for the last 10 years in Northern Victoria Land even in a scenario of stable air temperatures and attributed this to changes in solar radiation.

O'Neill et al (2013) evaluate the impacts of vehicle and foot traffic in the Ross Sea region and present important recommendations for managers of Antarctic Programmes and to the ATCM. For many sites, allowing widespread trampling will give lower medium-term visible impact than concentrating traffic flow by track formation. For steep slopes and sites where repeated visits occur, use of a single track is recommended. Some 1950s vehicle tracks remain visible in the Antarctic landscape, but where visually obvious impacts were remediated, evidence of former occupation was almost undetectable.

Bockheim J, Vieira G, Ramos M, Lopez-Martinez J, Serrano E, Guglielmin M, Wilhelm K, Nieuwendam A. 2013. Climate Warming and Permafrost Dynamics in the Antarctic Peninsula Region . *Global and Planetary Change*, 100: 215-223.

Guglielmin M, Cannone N 2012. A permafrost warming in a cooling Antarctica? *Climatic Change* 111: 177–195.

TANYA A. O'NEILL, MEGAN R. BALKS and JERONIMO LOPEZ-MARTINEZ 2013: Visual recovery of desert pavement surfaces following impacts from vehicle and foot traffic in the Ross Sea region of Antarctica *Antarctic Science* page 1 of 17 & Antarctic Science Ltd 2013 doi:10.1017/S0954102012001125

### **International Bathymetric Chart of the Southern Ocean- IBCSO (EG) (Hans Warner Shenke)**

The International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0 is a new digital bathymetric model (DBM) portraying the seafloor of the circum-Antarctic waters south of 60° S. IBCSO is a regional mapping project of the General Bathymetric Chart of the Oceans (GEBCO). IBCSO Version 1.0 DBM has been compiled from all available bathymetric data collectively gathered by more than 30 institutions from 15 countries. These data include multibeam and single beam echo soundings, digitized depths from nautical charts, regional bathymetric gridded compilations, and predicted bathymetry. Specific gridding techniques were applied to compile the DBM from the bathymetric data of different origin, spatial distribution, resolution, and quality. The IBCSO Version 1.0 DBM has a resolution of 500 x 500 m, based on a polar stereographic projection, and is publicly available together with a digital chart for printing from the project website ([www.ibcso.org](http://www.ibcso.org)) and at <http://dx.doi.org/10.1594/PANGAEA.805736>. (The International Bathymetric Chart of the Southern Ocean (IBCSO) Version 1.0 – A new bathymetric compilation covering circum-Antarctic waters (Journal of Geophysical Research, 2013)

## **Advancing Technologies and Environmental stewardship for subglacial exploration in Antarctica-ATHENA (Joint EG- PS and GS) (J L Wadham)**

**Authors:** J.L. Wadham and P.T. Doran

### **Introduction/ Background:**

The goal of the 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)

*The founding of the ATHENA group in 2010 brought together a diverse range of scientists and technologists who are active in the exploration of Antarctic SAEs. Over this time period, several members of the group have initiated collaborations or acquired funding for projects focussed upon technology development for SAEs (the UK NERC-funded “DELVE: Development and Validation of Chemical Sensors for Icy Ecosystems” programme (Wadham, Mowlem, UK), the NASA JPL Micro-Submersible Lake Exploration Device (Behar, US) and the elemental speciation programme (Barbante, Italy). The ATHENA group convened a very successful session at the SCAR Open Science Conference in Portland in July 2012, where the Vostok drilling programme field report was presented for the first time. The ATHENA Co-chairs (Peter Doran and Jemma Wadham) are now assembling a special issue for Annals of Glaciology focussed up on the development of clean technologies for SAE exploration. This will include the publication of drilling methodologies for international drilling campaigns such as WISSARD.*

- b. To work with SCAR action groups, expert groups and research programmes to promote interdisciplinary science on Antarctic SAE.

*Several of the ATHENA group members also serve on the Code of Conduct Action Group for the Exploration and Research of Subglacial Aquatic Environments (AG-CCER-SAE) (Alekhina, Doran, Vincent, Wadham), and have proposed to SCAR that the ATHENA group be awarded a zero cost extension in order that this Code of Conduct might be revised following the findings of the Vostok and WISSARD drilling campaigns, which have now been executed.*

- 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).

*The group has successfully provided an independent forum for the sharing of information and data during the run up to the recent implementation of funded lake access drilling campaigns. It has hosted 5 steering committee meetings and has included a website which has served as a central portal for the dissemination of documentation regarding the clean technologies and environmental stewardship of SAEs.*

**Important Issues or Factors:** The funding of this group terminated in 2012. However, a number of activities have extended beyond the time frame of the group and are documented in this report.

**Recommendations/Actions and Justification:** No actions requested from EXCOM.

**Expected Benefits/Outcomes:** n/a

**Partners:** n/a

**Budget Implications:** none

#### **Seeps and Vents in Antarctica (SAVANT) Action Group (AG) (Phil O'Brien and Jodie Smith)**

The SAVANT Project has made little progress in 2013 with both Jodie Smith and Phil O'Brien having to respond to other work priorities. They recommend that someone actively engaged in seeps and vent research in the Antarctic should take over the group or it be wound up. [The SSG-GS, therefore, recommends winding up of SAVANT.](#)

#### **GNSS research and application for polar environment and weather and space weather forecast (Joint EG- PS and GS) (GRAPE? WSWF) (Giorgiana De Franceschi)**

*To be presented by PS*

#### **Impacts of marine acoustic technology on the Antarctic environment (Joint EG- LS/PS/GS) (Phil O'Brien)**

*To be presented by LS*

Papers presented in XI ISEAS (Edinburgh, 2011)- Papers in the Geological Society of London Special Publications (SP381 [and](#) SP383) Antarctic Palaeoenvironments and Earth-Surface Processes [and Antarctica and supercontinent evolution](#) are currently online.

#### **Geology of Antarctica Online**

As part of SCAR's strategy to improve public outreach, the previous Geoscience officers believed that we should develop a website that summarises and explains in simple language the geology of Antarctica. To start this process, Mike Hambrey has developed appropriate text and a database of some 200 geological photographs. Comments on, and corrections to, the text are welcome! Diagrams and maps suitable for the accompanying pdf file would also be welcome. We invite Antarctic geoscientists to submit their best high-resolution photographs, along with captions. These will be processed annually and added to the collection. Copyright will be retained by the photographer, whose contact details will be indicated. It is doubtful that we can place online all submitted photographs, but we appreciate a selection from which to choose. Landscape format is preferred. For technical reasons, the site will not be hosted by the SCAR website, but by the Educational site *Swiss-Educ*, managed by Dr Jürg Alean in Switzerland. This site already has a large selection of glacier photographs from around the world, including many from Antarctica ([www.glaciers-online.net](http://www.glaciers-online.net)), and is widely used by the educational community. Please send images to: [mjh@aber.ac.uk](mailto:mjh@aber.ac.uk). Slides should be scanned to at least 2000 dpi resolution to allow for processing. Digital images should be of at least 2 Mb size.

Please see: [www.swisseduc.ch/glaciers/antarctic/geology/index-en.html](http://www.swisseduc.ch/glaciers/antarctic/geology/index-en.html).

#### **Glaciology of Antarctica online**

For the same reasons as Geology, a new website has been developed by SCAR Fellow, Bethan Davies (UK) to explain the glaciology and glacial geology of Antarctica. The site includes the following components:

background to Antarctica, glaciers and climate, modern glaciers and glacial geology (with an account of the Sirius debate concerning the Cenozoic glacial record). Sections aimed at advanced secondary/high school and university students are provided, and there is also a blog of fieldwork undertaken by Aberystwyth scientists in the Antarctic Peninsula.

Contributions from other groups are welcome and Dr Bethan Davies ([bdd@aber.ac.uk](mailto:bdd@aber.ac.uk)) may be contacted. See: [www.antarcticglaciers.org](http://www.antarcticglaciers.org).

ii) Subsidiary Bodies (Action, Expert groups etc.)

#### ***4. Budgetary Implications***

An additional budget of US\$ 20000 is requested for the year 2015 for travel assistance (speakers for plenary sessions/young researchers) to the ISEAS 2015.

#### ***Appendices***

##### ***Report:***

##### **Symposium on ‘The Scotia Arc’ (May 14-16, 2013, IACT, Granada, Spain)**

A symposium on the geodynamic evolution of the Scotia Arc and its implications for global evolution, including paleoceanography, climate, ice-sheets and biota was held during May 2013. It was attended by 58 participants of 14 countries with relevant contributions of SRP PAIS. This symposium was dedicated to Peter Barker.