

Geosciences Standing Scientific Group

Report to XXIX SCAR Delegates Meeting

Hobart – 17-19th July 2006

The Geoscience Standing Scientific Group of SCAR covers activities that range from geological and geophysical scientific research to spatial data standards and data base management.

This document presents a summary of activities carried out by the SCAR Standing Scientific Group on Geoscience (SSG-GS) since SCAR XXVIII in Bremen, July 2004, and a report of the SSG-GS business meeting – Hobart - 8th-11th July 2006.

A summary report will be presented to the meeting of the SCAR Executive Committee (July 14th) and to the SCAR Delegates (July 17th).

Expanded reports on the work of the various sub-groups will be available from the SCAR web site (<http://www.geoscienc.scar.org>). The web site also contains national and other reports on science that comes under the SSG-GS.

Intersessional Activities of the SSG-GS Chief Officer (CO)

Communications with SCAR Executive Committee and other SSGs. The Chief Officer attended the first Chief Officers' meeting, in Sofia, Bulgaria, on July 10th, 2005, and the intersessional Executive Committee meeting on July 11-13, 2005, in Sofia, Bulgaria.

SCAR Fellowships: As a member of the SCAR Fellowships Awards Committee, the Chief Officer read and ranked the very good applications for the SCAR Fellowships in both 2005 and 2006, to help the Executive Committee to make the final decisions.

JCADM Review: SCAR has set in place a new process for reviewing the progress of JCADM annually. The review group includes the SSG_GS CO. The first meeting was held at the Royal Netherlands Institute for Sea Research (NIOZ), Texel, Netherlands, at the end of March 2005. The CO was also involved in the 2006 review of JCADM, which took place by e-mail correspondence. The review reports are available on SCAR web site.

The SCAR Executive Committee is encouraging the development of interdisciplinary **cross-linkages between the SSGs and between the Scientific Research Programmes (SRPs)**. The first **SCAR Cross-Linkages Workshop** was held at the Free University, Amsterdam, The Netherlands, 22 – 24 November, 2005.

A report of the workshop is available on the SCAR web site

SSG-GS Business Meeting Report

The SCAR Geoscience SSG and associated groups met from the 6th to 8th July during SCAR XXIX, in Hobart, Australia, starting with meetings of the Geospatial Expert Group at the

Australian Antarctic Division (AAD) on the 6th and 7th July. In addition to the general group meetings, there were also meetings of the following SSG-GS groups: GIANT (Geodesy in Antarctica), ANTEC (Antarctic Neotectonics), POLENET (the IPY Polar Earth Observing Network), Permafrost- ANTPAS (the IPY Antarctic Permafrost and Soils Project), SDSL (the Seismic Data System Library), and the Plates and Gates IPY proposal team.

The SCAR Open Science Conference succeeded in attracting a large group of interested scientists, many of whom were able to participate in these and in the SSG meetings, which facilitated cross-discipline communication.

There is no complete list of National representatives in the Geoscience SSG. The SSG Officers propose to extract a list from the old Geoscience website <http://www.geoscience.scar.org/scarmemb.htm>, and to integrate this with the list of attendees at the SSG-GS business meeting.

The CO will recommend that SCAR National Delegates be asked to control the actual list, and to help in completing and maintaining it. The CO will also recommend that SCAR Members provide National reports on their Geoscience activities.

The SSG members agreed that it is important to enhance communications within and outside the SSG. The SSG voted to publish the GeoReach electronic newspaper three times per year. In addition, Geoscience publications will be highlighted on the SCAR web site.

Unfortunately Glenn Johnstone, the very effective leader of the Communications Action Group, who had been deeply involved in the GeoReach Newsletter and maintaining the Geoscience web site, is no longer involved in Antarctic activity. The SSG decided to charge the SSG-GS Secretary with the responsibility of publishing the GeoReach Newsletter, maintaining the web site, and upgrading the membership list. It was resolved to assign \$2,000 per year from the SSG budget to hire some help to support the Secretary in these tasks.

Phil O'Brien suggested that the SSG consider an integrated Antarctic drilling initiative to combine plans for the various drilling initiatives within SCAR, e.g., ANDRILL, Shaldrill, Fastdrill, ice core drilling, etc. After some discussion the SSG decided to create a new Action group to take this initiative forward. The new Group will be called Sub-ice Geological Exploration (SIGE).

National Reports were given by Finland, Germany, New Zealand, Poland, Spain, UK, and the USA; written reports were provided by India and Chile.

The meeting made a number of changes in its activities. One new Action Group (AG) was created (SIGE), whereas two of the current AGs had achieved their goals and thus were terminated (Communications, and Marine Surveying). The Marine Acoustics AG remains in being, as it is likely to have to report to a future Antarctic Treaty Consultative Meeting (ATCM). One Expert Group (EG), the EG on Geographical Information (EGGI), was proposed to be moved out of the SSG and repositioned within the SCAR structure as a Standing Committee. All other EGs were approved for continuation for another 2 years; the EG's descriptions and work plans are listed below.

SCAR Executive Director, Colin Summerhayes made a presentation on the developments within SCAR. Other presentations were made by different research projects and research groups:

- (i) David Walton presented an update on the results of the marine acoustics investigation.
- (ii) David Carlson presented an update of IPY.
- (iii) Taco de Bruin presented an update of JCADM.
- (iv) Chuck Kennicutt presented an update on the Subglacial Antarctic Lake Exploration (SALE) Project.
- (v) Jane Francis presented an update on the Antarctic Climate Evolution (ACE project, which included a report on ANDRILL by Ross Powell.
- (vi) SDSL updates were presented by Alan Cooper. .

Terry Wilson reported on the 10th International Symposium on Antarctic Earth Sciences (ISAES), which is to be held in Santa Barbara, California, 26th August - 1st September 2007. The meeting organization committee asked the GSSG for \$15,000 to help to cover primarily travel costs to the meeting for student and scientists from developing countries. Considering the importance and high profile of this Geoscience meeting, the SSG-GS assembly approved the financial support.

Several Geoscience research groups talked about the activities they planned within the IPY. These included: ANDRILL, POLENET, Plates and Gates, and Bipolar Climate Machinery (BIPOMAC). A list of the IPY programmes related to SSG Geoscience activities is given in Information Paper IP 17 on the Members page of the SCAR web site in the list of reports to the Delegates for the XXIX SCAR meeting.

Repositioning of EG Geographic Information

Following the discussion on the repositioning of the EGGI, the text of their proposal was condensed into a special recommendation from the SSG to the SCAR Delegates. The context for the repositioning is along the following lines:-

Geographic context is vital for effective collection and integration of scientific data. Through the work of the EG on Geographic Information the scientific community of SCAR:

- has available an integrated geographic framework
- can rely on current, consistent and comprehensive data
- can access data through an efficient dissemination system

Currently this infrastructure, built on successful work over many years, is under threat due to structural issues as a consequence of the EG being placed within the SSG for Geoscience at the time of SCAR's restructuring (October 2004). This placement has not been successful because:

- The EG on Geographic Information provides infrastructure rather than research;
- The group supports the work of all SCAR SSGs, not just the SSG for Geoscience;
- The group requires critical input from national Geographic Information agencies (e.g. National Mapping Agencies or Place Names Committees) rather than from scientists of geoscience disciplines;

- The activities of the EG on Geographic Information need to closely complement JCADM activities by providing the geographic reference and associated services for data collection and dissemination in an integrated and cross-disciplinary fashion.

The proposal to overcome these issues is:

- That the EG Geographic Information be repositioned within the SCAR structure as the Standing Committee on Antarctic Geographic Information (AGI) under the Outreach and Administration wing of SCAR.
- That SCAR Members' be requested to nominate specific national Geographic Information representatives as members of the new group.
- That the group be able to invite experts in the field of Geographic Information to support the work of the group

The benefits arising from repositioning Geographic Information within SCAR include:

- Greatly improved critical linkages to and involvement from national geographic information agencies, by increased visibility and profile within SCAR and enhancing participation from member nations.
- Better visibility of geographic information activities to all science researchers and operations groups.
- More appropriate and uniform access for all science groups to geo-referenced products.
- Improved separation of support services from sciences groups, producing more efficiency.
- Improved interaction with JCADM, resulting in better integration and more effective use of scientific data

This will position SCAR to successfully meet the ever increasing opportunities of using geographic information in scientific applications.

Office Bearers 2004-2006

Chief Officer: Prof Alessandro Capra - Department DIMeC (Mechanical and Civil Engineering) University of Modena and Reggio Emilia , **ITALY**.

Deputy Chief Officer: Prof. Ross D. Powell - Department of Geology & Environmental Geosciences, Northern Illinois University, **UNITED STATES**

Secretary: Prof. Bryan Storey - Director, Gateway Antarctica, University of Canterbury, Christchurch, **NEW ZEALAND**

Office Bearers 2006-2008:

Chief Officer and Deputy Chief should remain in charge for two more years. The SSG-CO will ask SCAR Executive to extend the period of office of Bryan Storey as Secretary of GSSG for two years.

Chief Officer: Prof Alessandro Capra - Department DIMeC - University of Modena and Reggio Emilia , ITALY.

Deputy Chief Officer: Prof. Ross D. Powell - Department of Geology & Environmental Geosciences, Northern Illinois University, UNITED STATES

Secretary: Prof. Bryan Storey - Director, Gateway Antarctica, University of Canterbury, Christchurch, NEW ZEALAND

GSSG structure 2004-06

Action Group 04-06

COG -	Chair : G.Johnstone (Aus)
MARINE Survey Coordination –	Chair: P.O'Brien (Aus)
Marine Acoustics	(Phil O'Brien)

Expert Group 04-06

GIANT	Chair : R.Dietrich (Ger)
EGGI	Chair: S.Vogts (Ger)
PERMAFROST - EGGPE	Chair: J. Boelhouwers (Swe)
International Bathymetric Chart of the Southern Ocean (IBCSO)	Chair : H.W.Shenke (Ger)
Antarctic Digital Magnetic Anomaly Project (ADMAP)	Chair :M-Ghidela (Arg)
ANTEC: Antarctic Neotectonics	Chair: T.Wilson (USA)

GSSG structure 2006-08

Action Group 06-08

SIGE	Chair: B.Storey (NZ)
Marine Acoustics	(Phil O'Brien)

Expert Group 06-08

GIANT	Chair : R.Dietrich (Ger)
PERMAFROST - EGGPE	Chair: J. Boelhouwers (Swe)
International Bathymetric Chart of the Southern Ocean (IBCSO)	Chair : H.W.Shenke (Ger)
Antarctic Digital Magnetic Anomaly Project (ADMAP)	Chair :M-Ghidela (Arg)
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AG and EG Reports and Implementation Plans

Action Group on Marine Acoustics (the impacts of acoustic technology on the marine environment).

04-06 achievements

The Marine Acoustics Action Group met in Cadiz, Spain, from the 23rd to 26th January 2006 for its third workshop. The Group has provided input to ATCM/CEP discussions at two previous meetings, and provides scientific background information for national regulators responsible for issuing permits for marine geophysical surveys. The report prepared after the first workshop has been used extensively by groups involved in the issues beyond the Antarctic, and the risk analysis developed at the second workshop has also been considered widely (e.g. US Marine Mammal Commission).

The third workshop results were incorporated in to a Working Paper for the Antarctic Treaty Consultative Meeting in May 2006.

All of the SCAR acoustics reports are or will be available on the SSG-GS web page.

The AG will be kept on the back burner, pending a possible call for a fourth report to a future ATCM

Action Group on Communications and Outreach

04-06 achievements

The COG produced GeoReach Newsletters until October 2005 when Glenn Johnston moved into full time work outside the Antarctic.

The SSG-GS web site has been “on hold” with no updates since October 2005, but is still working (maintained on the Geoscience Australia system). In due course the web site will be managed by the SCAR Secretariat.

Action Group SIGE (Sub-Ice Geological Exploration) - Chair Bryan Storey

06-08 Work Plan

This new AG has the following aims:

- To understand the geology and basal ice sheet processes beneath the Antarctic Ice sheets
- To coordinate and develop multinational capabilities in geophysics and drilling to address broad geoscience problems
- To ensure maximum multidisciplinary science benefit comes from drilling and geophysical exploration

Expert Group on Geographic Information (EGGI)

04-06 achievements

Summary of five main achievements (highlights):

- Updated Version of SCAR Composite Gazetteer
- Updated SCAR Map Catalogue
- Updated Version of SCAR Antarctic Digital Database
- Updated Version of SCAR King George Island GIS Database

Further development of AntSDI, the Antarctic Spatial Data Infrastructure.

Detailed project reports including progress against work programme 2004-06, achievements, and budget for the 13 projects are accessible online at <http://www.antsdi.scar.org/eggi/projectreports/>, including IPY contributions.

Expert Group GIANT (Geodetic Infrastructure of Antarctica)

04-06 achievements

The work plan of GIANT for 2004-2006 was realized. The main achievements were:

1. Permanent observatories worked continuously. The GPS stations in Antarctica were included into a reprocessing of the global GPS network for the time span 1994-2006.
2. The GPS Campaigns were continued. So far 30 stations are part of the campaign network.
3. The network solution of the Antarctic GPS stations was submitted to the International Association of Geodesy to become part of the International Terrestrial Reference Frame (ITRF) 2005.
4. The data base for an improved Antarctic geoid, consisting of gravity and bedrock elevation data, was significantly improved. First computations of regional geoids were performed.
5. GPS antenna calibration investigations were carried out.
6. In preparation of the IPY, the project POLENET with a strong SCAR/GIANT component, has been developed. This includes coordination and technical developments for autonomous observatories.
7. Several meetings with relevance for GIANT were organized at EGU 2005, 2006, and at AGU 2005.

06-08 Work Plan

Activities are planned under the following project headlines:

1. Permanent Observatories
2. Epoch Crustal Movement Campaigns
3. Physical Geodesy
4. Geodetic Control Database
5. Tide Gauge Data
6. Atmospheric Impact on Global Navigation Satellite System (GNSS) Observations in Antarctica in relation to Geophysical research
7. Ground Truthing for Altimeter Satellite Missions
8. Geodetic Advice on positioning limits of special areas in Antarctica
9. In situ GNSS Antenna Tests and Validation of Phase Centre Calibration Data
10. High Accuracy Surface Change and Digital Elevation Models' from Satellite and Airborne Imagery
- 11 High Accuracy Kinematic GNSS Positioning and combination with INS

Expert Group on Antarctic Permafrost and Periglacial Environments (PPE)

04-06 achievements

The Antarctic Permafrost and Soils Project (ANTPAS) was awarded programme status by the IPOY Joint Committee. ANTPAS established a website + mail list

(<http://erth.waikato.ac.nz/antpas/>)

There is a new IPA soil carbon initiative (led by Kuhry, Tarnocai, Bockheim)

The permafrost community had a Special Issue of the journal Geoderma

An ANTPAS meeting was held during the SCAR meeting in Hobart, Tasmania in July 2006.

Soil maps are being prepared for Wright and Taylor Valleys and the McMurdo Under the “Dry Valleys” heading (led by Bockheim, McLeod, and Balks), datasets are available for developing maps of the Transantarctic and Ellsworth Mountains.

The Permafrost/CALM/Periglacial process monitoring network has been designed

A draft of the soil attributes manual is on the ANTPAS website (<http://erth.waikato.ac.nz/antpas>)

06-08 Work Plan

1. Obtain standardized permafrost temperature and active layer measurements across all permafrost regions; snapshot and create a retrospective database (TSP, ANTPAS)
2. Revise estimates of carbon pools in permafrost regions (CAPP, ANTPAS)
3. Establish a periglacial monitoring network
4. Improve regional permafrost mapping
5. Develop and promote permafrost information and educational activities
6. Promote the development of a new generation of permafrost researchers (PYRN)

Expert Group on International Bathymetric Chart of the Southern Ocean (IBCSO)

04-06 achievements

The IBCSO project is well established within international organizations like the International Hydrographic Organization (IHO), the International Oceanographic Commission (IOC) and the General Bathymetric Chart of the Oceans (GEBCO). Special attention to IBCSO is being given by the Hydrographic Committee on Antarctica (HCA) of the IHO, where data exchange between the national Hydrographic Offices and scientific institutions is realized.

The IBCSO proposal was presented to the thirty-seventh session of the IOC Executive Council in Paris, 23–29 June 2004 and accepted as an IBC-project.

06-08 Work Plan

The work plan for the proposed IBCSO may be summarized with the following steps:

1. Building and maintaining of a thorough data base, comprising all existing single beam, multibeam and interferometric sidescan sonar depth data, its meta information
existing digital bathymetric charts
existing marine gravity data, and
free-air gravity models from satellite radar altimetry
2. Quality control and assessment, analysis and editing of available bathymetric data

3. Development of a new method for morphological interpolation of bathymetric contours using sonar data and satellite radar altimetry gravity anomalies
4. Determination of Digital Terrain Models around Antarctica. One with a resolution of 2.5 x 2.5 km on a Southern Polar Stereographic projection for minimal distortion due to the southerly latitude and one geographic grid with a resolution of 1'x1' that easily can be merged with other global ocean topography products
5. Creation of a set of 1:1 Million traditional bathymetry sheets to be distributed in digital form
6. In areas of systematic areal multibeam surveys large scale bathymetric charts will be prepared.

A mailing list server was established and is maintained by the NGDC in Boulder, CO, USA. The mailing list can be used to send information to all members and collaborators involved in IBCSO. The address is: Antarctic@mailman.ngdc.noaa.gov

Expert Group on Antarctic Digital Magnetic Anomaly Project (ADMMap)

04-06 achievements

- 1) Development of a DVD of the compilation of data up to year 1999 for release to the World Data Centers.
- 2) Update of the near-surface anomaly predictions from Magsat in the ADMMap database with the significantly more accurate observations from the Ørsted and CHAMP satellite missions.
- 3) Development of improved modeling of the Antarctic core field and its secular variations, and external fields for better definition of the crustal anomalies in magnetic survey data.
- 4) Compilation of rock magnetic and other physical properties into a database to support geological applications of the ADMMap data.
- 5) Development and promotion of regional and continental scale interpretation efforts of the ADMMap data. This provides new insight into global tectonic and geologic processes in the Antarctic context.
- 6) Support to the World Magnetic Anomaly Map initiative of the International Association of Geomagnetism and Aeronomy (IAGA).
- 7) The ADMMap Expert Group has produced 5 Ph.D. dissertations and over 40 in-review, in-press, or published scientific papers. The OSU ADMMap website gives the citations of these scientific works.
- 8) Presented a report on ADMMap's contribution to the World Magnetic Map project at the IAGA'05 assembly in Toulouse, France in July, 2005.

The ADMMap grids were released to the public in November, 2003 and are available on the internet site <http://www.geology.ohio-state.edu/geophys/admap>

06-08 Work Plan

Prepare the digital magnetic anomaly database for release to the World Data Centers and consider the implications of the database for advancing geomagnetic studies of the Antarctic.

Expert Group on ANtarctic NeoTECtonics (ANTEC)

Summary of goals, milestones and deliverables:

Goal 1: Coordinate an implementation plan for deployment of geodetic and seismological stations in Antarctica

Goal 2: Promote research on neotectonics and geodynamics of Antarctica by holding workshops and symposia

GOAL 3: ensure that protocols for data collection, archiving and distribution are meeting the needs of the international research community

04-06 achievements

- Organised a symposium on *Lithospheric Structure and Neotectonics of the Antarctic Plate*, for AGU, December, 2004
- Contributed to the development of the POLENET: Polar Earth Observing Network proposal, approved by International IPY Joint Committee as an IPY core activity
- Organised a symposium on *Short and long-term observations in Polar regions*, for EGU, April, 2006

06-08 Work Plan

Goal 1: Finalize implementation plans for remote observatory deployments during IPY

Goal 2: Develop plan for integrated data analysis and interpretation and modeling for POLENET observations

Goal 3: Promote research on Antarctic neotectonics and international interest in POLENET IPY science goals through symposia at international meetings and journal publications

Proposed Budget requirement for 2007-08

Initiatives	Action and Export Group	05-06 06 expenditure	Budget 07	Budget 08
	SUBICE AG		3.000	3.000
	Geographic Information EG	8.300		
	GIANT Geodetic Infrastructure EG	6.000	3.000	1.500
	New International Bathymetric Chart of the Southern Ocean- IBCSO EG	2.500	1000	1000
	ADMAP EG	3.500		2.500
	ANTEC EG	4000	5.000	5.000
IPY initiatives (meeting)		2000		
ISAES 07			10.000	
Communication and web site		1.700	2.000	2.000
Total			24.000	15.000

Recommendations

Four Internal recommendations

1. Concerning National Representatives:

New Recommendation

Recognising the need to enhance communication within the Geoscience Antarctic Community, SSG-GS recommends (i) that National Delegates control and maintain the list of National Representative(s) in SSG-GS, and (ii) that National Representative(s) to SSG-GS prepare a bi-annual report for each SSG meeting of national research activity related to the activities of the SSG.

2. Concerning Action Group on marine survey planning.

Noting that the Action Group on Marine Survey has identified a method for coordinating marine survey planning and therefore is no longer required.

SSG-GS recommends (i) that a form be set up on the SSG-GS web site for marine survey leaders to complete for posting on the SSG-GS web site; and (ii) That discussions be held with SCAR MARBIN to see if their survey database will be suitable for geosciences as well.

3. Concerning the constitution of a new action group SIGE

Recognising that to understand the geology and basal ice sheet processes beneath the Antarctic Ice sheets, requires coordination and development of multinational capabilities in geophysics and drilling to enable the community to address broad geoscience problems and to ensure that maximum multidisciplinary science benefit comes from drilling and geophysical exploration,

SSG_GS recommends establishing an Action Group on Sub-ice Geological Exploration (SIGE)

4. Concerning EG GI repositioning within SCAR structure

Recognising the uniqueness of the Expert Group on Geographical Information (EGGI),

SSG-GS recommends that the EG Geographic Information be repositioned as Standing Committee on Antarctic Geographic Information (SCAGI) under the Outreach and Administration wing of SCAR, reporting like JCADM directly to the SCAR Executive Committee.

Two New Recommendations

1. Concerning ADMAP (Antarctic Digital Magnetic MAP)

Recognizing the considerable geological utility and growth of magnetic surveying in the Antarctic, and its importance for pan-Antarctic studies, SCAR urges sponsors of magnetic

surveys to archive the survey data in the digital database of the Antarctic Digital magnetic Anomaly Project (ADMAR) for distribution to the World Data Centers and the international geosciences community.

2. Concerning Seismic Data Library System (SDLS)

Recognising the importance of making available for pan-Antarctic studies all multi-channel seismic (MCS) reflection data collected around Antarctica,

SCAR urges delegates to work with their national Antarctic programme managers and MCS data collectors to ensure that all multichannel seismic reflection data collected by their country are submitted to the SDLS according to the timelines outlined in ATCM Recommendation XVI-12, and to ensure that all MCS data collected more than 4 years ago are received at the SDLS before the end of the IPY.

GSSG Members 2006-2008

Country	Member	Address	Email
Argentina	Dr Rudy del Valle	Instituto Antártico Argentino Cerrito 1248 1010 Buenos Aires	delvalle@dna.gov.ar
	Dr Marta Ghidella	Instituto Antártico Argentino Cerrito 1248 1010 Buenos Aires	mghidella@dna.gov.ar
	Ing Federico Mayer	Servicio de Hidrografia Naval Avenida Montes de Oca 2124 1271 Buenos Aires	shn@hidro.gov.ar
Australia	Prof C J L Wilson	University of Melbourne School of Earth Sciences Parkville Victoria 3052	cjlw@unimelb.edu.au
	Dr Philip E O'Brien	Antarctic CRC Project Petroleum and Marine Division, Geoscience Australia, PO Box 378, Canberra, ACT 2600.	phil.o'brien@ga.gov.au
	Mr John Manning	Unit 8, 1 Queen Street Cooks Hill Newcastle NSW2300	j.manning@unsw.edu.au
	Mr Henk Brolsma	Australian Antarctic Division Channel Highway Kingston Tasmania 7051	henk.brolsma@aad.gov.au
Belgium	Dr Tony Van Autenboer	Limburgs Universitair Centrum Toegepaste Geologie Universitaire Campus B-3590 Diepenbeek	slimvzw@freegates.be
	Dr Jozef Hus	Institute Royal Météorologique Centre de Physique du Globe B-5670 Dourbes	jhus@oma.be
	Prof Hugo Decler	Vrije Universiteit Brussel Geografisch Instituut Pleinlaan 2 B-1050 Brussels	hdecler@vub.ac.be
Brazil	Dr Rudolf A J Trouw	Universidade Federal do Rio de Janeiro Rua Sao Manuel 23 apt 801 Botafogo Rio de Janeiro 22290-010	trouw@igeo.ufrj.br

	Dr J M Souza	Petrobras Av. Rep. do Chile 65 S/1001 20035-900 Rio de Janeiro - RJ	
	Dr Tania Brito	Programa Nacional de Areas Protegidas Secretaria de Biodiversidade e Florestas Ministerio de Meio Ambiente - MMA Esplanada dos Ministerios Bloco B Sala 701-A 70068-90 BRASILIA-DF	tania.brito@mma.gov.br
Canada	Prof Wayne Pollard	McGill University Department of Geography 805 Sherbrooke Street Montreal QC H3A 2K6	pollard@geog.mcgill.ca
	Prof Fraser Taylor	Geomatics and Cartographic Research Centre Department of Geography Carleton University 1125 Colonel By Drive Ottawa, Ontario K1S 5B6	fraser_taylor@ccs.carleton.ca
Chile	Prof FA (Pancho) Hervé	Universidad de Chile Departamento de Geología Facultad de Ciencias Físicas y Matemáticas Casilla 13518, Correo 21 Santiago	Fherve@tamarugo.cec.uchile.cl
	Dr E Vera	Universidad de Chile Depto. de Geofísica Fac. Ciencias Físicas y Matemáticas Casilla 2777, Correo Central Santiago	evera@dgf.uchile.cl
	Tnt. Col. Rodrigo Barriga	Jefe Departamento de Investigación y Desarrollo Instituto Geográfico Militar (IGM) Nueva Santa Isabel 1640 Santiago	rbarriga@igm.cl
China	Prof L (Xiaohan) Liu	Chinese Academy of Sciences Institute of Geology and Geophysics PO Box 9825 Beijing 100029	xhliu@public3.bta.net.cn
	Dr Q Yan	Polar Research Inst. of China 451-481 Shang Chuan Road Pudong Shanghai 299129	pricsh@online.sh.cn

	Prof E Dongchen	Chinese Antarctic Centre of Surveying and Mapping Wuhan University 39 Luyu Road Wuhan 430079 Hu Bei	edc1939@public.wh.hb.cn
Ecuador	Capt Ulises Iñiguez Carrión	Armada del Ecuador Instituto Oceanográfico (INOCAR) Avenida 25 de Julio - Base Naval Sur Via Puerto Marítimo PO Box 5940 Guayaquil	inocar@inocar.mil.ec
Finland	Dr Tapio Ruotoistenmäki	Geological Survey of Finland Betonimiehenkuja 4 FIN-02150 Espoo	tapio.ruotoistenmäki@gsf.fi
	Dr Kari O Strand	University of Oulu Thule Institute PO Box 7300 FIN-90401 Oulu	kari.strand@oulu.fi
	Lic Jaakko Mäkinen	Finnish Geodetic Institute Geodeetinrinne 2 PO Box 15 FIN-02431 Masala	Jaakko.Makinen@fgi.fi
France	Dr Jean-Robert Petit	Université Joseph Fourier LGGE 54 rue Molière BP 96 38402 St Martin D-Heres Cedex	petit@glaciog.ujf-grenoble.fr
	Martine Amalvict	EOST 5 rue René Descartes 67084 Strasbourg Cedex	martine.amalvict@eost.u-strasbg.fr
	Jean-Jacques Leveque	EOST 5 rue René Descartes 67084 Strasbourg Cedex	jeanjacques.leveque@eost.u-strasbg.fr
	René-Pierre Menot	Université Jean Monet Département de Géologie- Pétrologie-Géochimie 23 rue du Dr Paul Michelon 42023 Saint-Etienne Cedex2	Rene.Pierre.menot@univ-st-etienne.fr
Germany	Prof Dr Hubert Miller	Institut für Allgemeine und Angewandte Geologie der Universität Luisenstrasse 37/1 D80333 Munchen	hubert.miller@iaag.geo.uni-muenchen.de
	Prof. Dr. Reinhard Dietrich	Technische Universität Dresden Institut für Planetare Geodäsie DE-01062 Dresden	Dietrich@ipg.geo.tu-dresden.de
	Dr Detlef Damaske	Bundesanstalt Für Geowissenschaften und Rohstoffe	d.damaske@dgr.de

		Stilleweg 2 D-3000 Hanover 51	
India	Dr H K Gupta	National Geophysical Research Institute Uppal Road Hyderabad 500007	info@ngri.res.in
	Shri D P Issar	Survey of India Research and Geodetic Branch Karanpur PO Box No. 77 Dehradun 248001 (UP)	gandrb@nde.vsnl.net.in
Italy	Prof Carlo Alberto Ricci	Universita di Siena Dipartimento di Scienze della Terra Via del Laterino 8 53100 Siena	riccica@unisi.it
	Dr Antonio Meloni	Istituto Nazionale di Geofisica Via di Vigna Murata, 605 I-00143 Roma	meloni@ingv.it
	Prof Roberto Cervellati	ENEA -Progetto Antartide Via Anguillarese 301 S. Maria di Galeria Roma 00600	roberto.cervellati@casaccia.enea.it
	Prof Alessandro Capra	University of Bologna Department Distart Viale Risorgimento 2 40136 Bologna	alessandro.capra@mail.ing.unibo.it
Japan	Dr Kazuyuki Shiraishi	National Institute of Polar Research Department of Crustal Studies 9-10 Kaga 1-chome Itabashi-ku Tokyo 173-8515	shiraishi@nipr.ac.jp
	Dr Kazuo Shibuya	National Institute of Polar Research (NIPR) Center for Antarctic Environment Monitoring 9-10, Kaga 1-chome Itabashi-ku Tokyo 173-8515	shibuya@nipr.ac.jp
	Mr Minoru Akiyama	Geographical Survey Institute (GSI) Planning Department Kitasato 1 Tsukuba-shi Ibaraki 305-0811	intex.gsi.go.jp

Korea	Dr Soon-Keun Chang	KORDI - Korean Ocean Research & Development Institute Polar Sciences Laboratory Ansan PO Box 29 Seoul 425-600	skchang@kordi.re.kr
	Dr Yea-Dong Kim	KORDI - Korean Ocean Research & Development Institute Polar Sciences Laboratory Ansan, PO Box 29 Seoul 425-600	ydkim@kordi.re.kr
	Dr Moon Young Choe	KORDI - Korean Ocean Research & Development Institute Polar Sciences Laboratory Ansan, PO Box 29 Seoul 425-600	mychoe@kordi.re.kr
Netherlands			
New Zealand	Prof Peter J Barrett	Victoria University of Wellington School of Earth Sciences PO Box 600 Wellington	peter.barrett@vuw.ac.nz
	Dr Fred J Davey	Institute of Geological and Nuclear Sciences PO Box 30368 Lower Hutt	f.davey@gns.cri.nz
	Mr Tony Bevin	Land Information New Zealand Private Box 5501 Wellington	tbevin@linz.govt.nz
	Prof Bryan Storey	University of Canterbury Gateway Antarctica Private Bag 4800 Christchurch	bryan.storey@canterbury.ac.nz
Norway	Prof Yngve Kristoffersen	University of Bergen Institute of Solid Earth Physics N-5007 Bergen	yngve.kristoffersen@ifjf.uib.no
	Dr Synnøve Elvevold	Norsk Polarinstitutt Polarmiljøseneteret N-9296 Tromsø	elvevold@npolar.no
	Mr Yngve Melvar	Norsk Polarinstitutt (Geodesy and Geographical Information) Polarmiljøseneteret N-9296 Tromsø	yngve.melvaer@npolar.no
Peru			

Poland	Prof Dr Aleksander Guterch	Polish Academy of Sciences Institute of Geophysics ul Ksiecia Janusza 64 P:-01-452 Warszawa	aguterch@igf.edu.pl
	Prof Dr Andrzej Gazdzicki	Polish Academy of Sciences Institute of Palaeobiology Twarda 51/55 00-818 Warszawa	gazdzick@twarda.pan.pl
	Dr Jan Cisak	Instytut Geodezji I Kartografii ul Jasna 2/4 00-950 Warszawa	astro@igik.edu.pl
Russia	Dr Eugene Mikhalsky	VNII Okeangeologia Angliyski Street 1 St Petersburg 90121	mikha@em5609.spb.edu
	Dr German Leitchenkov	VNII Okeangeologia (Antarctic Branch) 1 Angliysky Av. 190121 St Petersburg	ant@g-ocean.spb.ru
	Dr Alexander Yuskevitch	FSUE - Aerogeodeziya 6 Bukharestskaja Street 192102 St Petersburg	aerogeod@agsbp.ru
South Africa	Prof Steve McCourt	University of Durban-Westville Department of Geology Private Bag X54001 Durban 4000	smccourt@pixie.udw.ac.za
	Mr Richard Wonnacott	Department of Land Affairs Directorate of Surveys and Mapping Private Bag X10 Mowbray 7705	rwonnacott@sli.wcape.gov.za
Spain	Dr Miquel Canals Artigas	Dpt.Estratigrafia y Paleontología Facultad de Geología Universidad de Barcelona E-08071 Barcelona	miquel@natura.geo.ub.es
	Dr Jesús Galindo-Zaldivar	Dpto. Geodinámica Facultad de Ciencias Universidad de Granada E-18071 Granada	jgalindo@ugr.es
	Dr Carlos Sanz de Galdeano	Universidad de Granada Instituto Andaluz de Ci ências de la Tierra Facultad de Ciencias 18002 Granada	csanz@goliat.ugr.es
Sweden	Prof Kent Larsson	Lund Universitet Geologiska Institutionen Solvegatan 13 S-223 62 Lund	kent.larsson@geol.lu.se

	Prof Lars Sjöberg	Royal Institute of Technology Department of Geodesy and Photogrammetry SE-10044 Stockholm	sjoberg@geomatics.kth.se
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United Kingdom			
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United States of America	Dr Ross D Powell	Department of Geology & Environmental Geoscience Northern Illinois University 312 Davis Hall, Normal Road DeKalb Illinois 60115	ross@geol.niu.edu
	Dr Robin D Bell	Lamont-Doherty Earth Observatory Columbia University Route 9 West Palisades NY 10964	robinb@ldeo.columbia.edu
	Dr Beata Csatho	Byrd Polar Research Centre Ohio State University 275a Scott Hall 1090 Carmack Road Columbus, OH 43210	csatho.1@osu.edu
	Dr Amy Leventer	Colgate University 13 Oak Drive Hamilton, NY 13346	aleventer@mail.colgate.edu
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Uruguay	Major J Melconian	Instituto Antártico Uruguayo Avenida 8 de Octubre 2958 PO Box 6051 Montevideo CP 11600	antartic@iau.gub.uy
	Major Héctor Rovera	Servicio Geográfico Militar Av. 8 de Octubre 3255 CP 11600 Montevideo	sgm@iau.gub.uy
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