





SDM 15 rev. 1  
Agenda Item: 4.3.1  
Person Responsible: J Galindo-Zaldívar et al.

## XXXV SCAR Delegates Meeting Davos, Switzerland, 25-26 June 2018

### Progress and Plans

#### Major Outcomes/Activities

Preparation of the XIII International Symposium on Antarctic Earth Science (ISAES), July 29- August 2, 2019, Incheon, South Korea. It will be hosted by KOPRI and the venue will be Songdo Convensia convention center. It is a SCAR Geosciences initiative aimed at showcasing Antarctic Geoscience research, taking stock of the accomplishments of the International fraternity and providing guidance for future studies. It is expected to be attended by 500 participants.

Scientific meetings including sessions in general symposia, workshops and conferences (e.g. OSC, AGU, URSI, GASS, IAGA, indicated in the detailed reports of the AG/EG) and specific meetings (e.g. 1<sup>st</sup> International Antpas Workshop, Varese; Antvolc, Barcelona; Airborne Geodesy and Geophysics with Focus on Polar Applications, Dresden, Germany, 2017; 2nd SCAR Summer School on Polar Geodesy, Ladozhskoe Ozero, Russia, 10–19 May 2018).

Production of maps. Bathymetry (IBCSO V2.0 and Drake Passage). Magnetic anomalies, completion of the ADMAP2 grid and databases. Compilation of geological maps (GeoMAP) in digital form.

Observations related to long-term dataset including GNSS measurements, geophysical measurements (gravity, magnetic, heat flow and seismic data) and geological observations. Identification of ANTOS sites and database management plan.

Scientific publications in high impact journals and preparation of information papers. A selection of the high impact publications is included in this report. The Geological Heritage and Geoconservation AG will work with SCATS to produce the Working Paper for the Committee for Environmental Protection (CEP) in July 2019 (editorial meeting proposed for March 2019).

#### Sub-group Outcomes

Sub-group	Activity/Outcome/Benefit/Achievement
ADMAP	Preparation of the second edition of the Antarctic Digital Magnetic Anomaly Map (ADMAP2). Outgoing chair Damaske presented ADMAP2 to AGU2017 international conference.
ANTOS	International survey /completed /will provide essential information for placement of ANTOS nodes. Database design /completed/functional web-based interface/essential to allow all ANTOS node data to be compiled and made accessible from a common site. 2 workshops /planned /prior to SCAR-OSC, Genoa for committee only and a community workshop to present all of



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	the current ANTOS information/ The benefit is that this will connect the Expert Group with the rest of the community and enable the programme to proceed.
<b>ANTPAS</b>	Meetings held in 2016 at Potsdam (Germany) during the International Permafrost Conference (IPA) and the OSC in Kuala Lumpur. The first international workshop that was held at Varese 4-5 October 2017 concluding to promote a SRP. White paper in preparation on the role of Antarctic Permafrost in the changing scenario. Paper on Polar Geography by Hrbacek et al 2018 on Active layer monitoring.
<b>ANTVOLC</b>	Antarctic tephra database ( <a href="http://www.tephrochronology.org/AntT/about.html">http://www.tephrochronology.org/AntT/about.html</a> ) Organisation of the 2nd AntVolc Workshop, 22-24/11/2017, Barcelona, Spain. Creation of the Expert Group Website( <a href="https://antvolcscar.wordpress.com/">https://antvolcscar.wordpress.com/</a> )
<b>CGG</b>	Field activities: Aerogeophysical surveys and Geological investigations. Meetings: EGU 2017, IGCP 628, REGGAE workshop. Contributions to: IGCP 628 and IGCP 648
<b>GEOLOGICAL HERITAGE AND GEOCONSERVATION</b>	Code of conduct that would include advice relevant to geology, palaeontology, geomorphology and meteorite studies, particularly sampling protocols. Compilation of a list of national repositories (museums, universities, institutes, etc.) housing Antarctic geological and palaeontological specimens. Identify Geosites important for Antarctic Geological Heritage.
<b>GEOMAP</b>	Modern geological dataset that classifies and describes the bedrock and surficial geology of Antarctica's rock exposures. 8 datasets variably complete. Scheme developed for harmonised legend. Attributes translated into GeoSciML.
<b>GIANT</b>	International Workshop "Airborne Geodesy and Geophysics with Focus on Polar Applications" Dresden, Germany, 19-21 April 2017. "2nd SCAR Summer School on Polar Geodesy", Ladozhskoe Ozero, Russia, 10–19 May 2018. GIANT-REGAIN (Geodynamics In ANTarctica based on REprocessing GNSS dAta Initiative) – ongoing major effort to realize a reprocessing of all available Antarctic GNSS data to provide best estimates of station coordinates and velocities to infer plate motion and vertical uplift (due to glacial-isostatic adjustment).



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<b>GRAPE</b>	<p>Infrastructures (observing systems and ICT) / new tools in progress to contribute to Weather and Space Weather / better coverage of Antarctica/ satisfactory.</p> <p>Preparation of a new SRP proposal/ submitted/involvement of a larger community on Radio Science at polar regions/in progress.</p> <p>School organization/appreciated by international bodies (e.g. EGU)/training of students on polar atmosphere and preparation of proposals/hopefully very good.</p>
<b>IBCSO</b>	<p>IBCSO coordination/IBCSO V2.0/ IBCSO V2.0 initiation up to 50°S.</p> <p>Identification of data sets and data gaps/improved data collection/up-to-date data coverages available.</p> <p>Support of mapping projects/regional mapping projects/BATDRAKE project was supported by providing data and knowhow.</p>

**Sub-group Cash Flow**

Sub-group	Allocation	Amount spent		
		2016	2017	2018
<b>ADMAPP</b>	7946		3056	887
<b>ANTOS</b>	2648		0	
<b>ANTPAS</b>	11472		5903	
<b>ANTVOLC</b>	5298		2374	
<b>CGG</b>	3972		2373	
<b>GEOLOGICAL HERITAGE AND GEOCONSERVATION</b>	3972		0	
<b>GEOMAP</b>	7946		1990	
<b>GIANT</b>	3972		0	
<b>GRAPE</b>	3972		0	
<b>IBCSO</b>	5298		0	

All the groups express the intention to spend the available funds during 2018.

**Sub-groups recommended for closure**

None

**New sub-groups being proposed**

Sub-group	Leaders	Cross-reference SCAR Delegates WP
<b>AntArchitecture</b>	Robert Bingham	Oral presentation.

**Notable Papers**

1. Scheinert, M., Ferraccioli, F. & Schwabe, J., et al., 2016. New Antarctic gravity anomaly grid for enhanced geodetic and geophysical studies in Antarctica. *Geophysical research letters* **43**, 600-610. *This paper presents a major data product, namely a gridded dataset of terrestrial gravity anomalies in Antarctica,*



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for further application in geodesy (global Earth gravity models and regional geoid of Antarctica) and geophysics (investigation of Earth structure and tectonic processes). EG GIANT was key for international cooperation to acquire and compile ground-based and airborne gravimetry data. The dataset is also included in the new release 3 of the SCAR product Quantarctica.

2. Golynsky, A. V., Ferraccioli F. & Hong J. K., et al. 2018. New Magnetic Anomaly Map of the Antarctic. *Geophysical Research Letters*, **published online**. This work introduces the ADMAP2 compilation, and its 3 million line-kilometres of new data, to the geophysics community. ADMAP2 will form the basis of the next decade of magnetic-based research in Antarctica.
3. Ruppel, A., et al., 2018, New geophysical data from a key region in East Antarctica: Estimates for the spatial extent of the Tonian Oceanic Arc Super Terrane (TOAST), *Gondwana Research*, **59**, 97-107. This work introduces one of the first large post-ADMAP2 data sets, that will contribute to future ADMAP compilations, and which is one of the first whose interpretation is made with the benefit of the context ADMAP2 provides. An important example of the use of magnetic data for extending and improving interpretations of outcrop geology for Antarctic geological history.
4. Riley, T.R., Flowerdew, M.J. & Pankhurst, R.J., et al. 2017. A revised geochronology of Thurston Island, West Antarctica, and correlations along the proto-Pacific margin of Gondwana. *Antarctic Science*, **29**, 47-60. In the frame of ANTVOLC, this research presents new age data that improve the knowledge of the geological evolution of Gondwana.
5. Correia, E., Spogli, L. & Alfonsi, L., et al. 2017. Ionospheric F-region response to the 26 September 2011 geomagnetic storm in the Antarctica American and Australian sectors. *Annales Geophysicae* **35**, 1113-1129. This work provides a detailed investigation on the ionized atmosphere reaction to a geomagnetic storm in different longitudinal sectors over Antarctica and comes from a strong collaboration among scientists of different Countries supporting GRAPE.
6. Bohoyo, F., Larter, R.D. & Galindo-Zaldívar, J., et al. 2016. Bathymetry and Geological Setting of the Drake Passage (1:1 500 000). BAS GEOMAP 2 Series, Sheet 7, British Antarctic Survey, Cambridge, UK. This work provides a detailed new compilation of bathymetric data of the Drake Passage that constitutes a key region to understand the recent tectonic, paleoceanographic and climatic evolution of the Antarctica. This map is part of the IBCSO activities and constitute the base of future detailed researches.
7. Jacobs, J., Opås, B., Elburg, M. A., Läufer, A., Estrada, S., Ksienzyk, A. K., Damaske, D., and Hofmann, M., 2017, Cryptic sub-ice geology revealed by a U-Pb zircon study of glacial till in Dronning Maud Land, East Antarctica: *Precambrian Research*, **294**, 1-14. This work indicates that the newly discovered Tonian Oceanic Arc Super Terrane (TOAST) continues farther inland and probably covers a significant area to the south of the main Dronning Maud Land mountains.
8. Hughes, K. A., López-Martínez, J., Francis, J. E., Crame, J. A., Carcavilla, L., Shiraishi, K., Hokada, T., and Yamaguchi, A. (2016). Antarctic geoconservation: a review of current systems and practices. *Environmental Conservation* **43**, 97-



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108. <http://dx.doi.org/10.1017/S0376892915000387>. *This work provides a comprehensive overview of current Antarctic geoconservation and served as a basis for the further work of the Action Group. The paper was used by SCAR through SCATS to present an Information Paper to the 2016 CEP and ATCM meetings (IP31).*
9. King, M.A., P.L. Whitehouse and W. van der Wal (2016): Incomplete separability of Antarctic plate rotation from glacial isostatic adjustment deformation within geodetic observations. *Geophysical Journal International*, **204**(1), 324-330, doi:10.1093/gji/ggv461. *Geodetic GNSS measurements allow to infer the deformation of the solid Earth which includes plate rotation and glacial-isostatic adjustment. This paper investigated to which degree these signals can be separated within horizontal GNSS velocities. The authors showed that “in the absence of reliable forward models of plate rotation or GIA then Antarctic geodetic velocities cannot totally and unambiguously constrain either process, especially GIA”, which emphasizes the urgent need of both acquiring further precise GNSS data at bedrock sites in Antarctica and taking efforts to better understanding and modelling especially GIA.*
10. Alfonsi, L., Cilliers, P. J., Romano, V., Hunstad, I., Correia, E., Linty, N., ... & Riley, P. (2016). First observations of GNSS ionospheric scintillations from DemoGRAPE project. *Space Weather*, **14**(10), 704-709, doi:10.1002/2016SW001488. *This work provides the outcomes of the DemoGRAPE project concerning new solutions on Software-Hardware infrastructures tested in different Antarctic Stations in the frame of GRAPE*

#### Forthcoming Activities

All the AG/EG report relevant forthcoming activities:

- a. **ADMAP** - The Geophysical Research Letter release paper will be followed up by a more detailed methods paper for a top journal, possibly G-Cubed. The methods paper will form the basis on which ADMAP will develop workflows for contributors to prepare candidate surveys for inclusion into and alongside the continental compilation of ADMAP2, and for the working group to accept them. Acceptances will see ADMAP2 compilation expand on a piecemeal basis via a series of ADMAP2.X releases.
- b. **ANTARCHITECTURE**- Growth of international membership and interaction with stakeholders. Development of standards for processing data, joining datasets and lodging open-access products. Development of products suitable for use in numerical modelling (input and/or calibration).
- c. **ANTPAS**- Barcelona Meeting 2018 (October) to finalize the white paper. ISAES 2019 South Korea Meeting and Session. South IPA COP 2019 New Zealand Meeting and three scientific sessions. Hobart SCAR OSC 2020 Presentation of the research Program proposal, Meeting and Scientific sessions.
- d. **ANTOS**- Genoa Workshop (Committee only) – 2018. Davos Workshop (Open) – 2018. Database working group meeting – 2018. Technical working group meeting – 2019. ANTOS Workshop (open) – Hobart – 2020



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- e. **ANTVOLC-** SCAR White Paper on the state of Antarctic volcanic research and future directions. White Paper will commence in late 2018, probably with a planning workshop near that time. It will build on the results of the new science review volume. The White Paper is an important document and must have input from as many members of AntVolc as possible so that all views on future directions are included. Establish a link between the new Antarctic tephra database and the IAVCEI commission on tephra (INTAV – i.e. International Focus Group on Tephrochronology and Volcanism). Proposal of an IAVCEI Commission for Polar Volcanism. It would enhance international visibility and possibly attract some funding. IAVCEI is linked to IUGG, which is linked to SCAR. Proposal of a special issue of a specialist journal, e.g. JVGR, focussed on Antarctic volcanism, e.g. tephrochronology, especially in ice cores, perhaps linked to a dedicated AntVolc workshop.
- f. **CGG-** AWI-BGR-NIPR survey: GEA VI: Aerogeophysical exploration over Enderby Land from Syowa Station. Importance: Extension of existing surveys in central and eastern Dronning Maud Land to the E and S, 2019/20. High resolution survey over Mariner Glacier North Victoria Land in combination with geological fieldwork, 2018/19. **BELLRIFT-** Proposed AWI-BAS aerogeophysical exploration to investigate both the extent and influence of the West Antarctic Rift System in the Bellingshousen Sea Embayment region. Development of new crustal architecture models & supercontinent plate reconstructions aided by ADMAP 2.0 magnetic data (within ESA's 3D Earth project, 2018-2020). **FMA-geology:** Key area: geological investigation in the transition zone from Kalahari into the Toninan Oceanic Super Terrane (TOAST).
- g. **GEOLOGICAL HERITAGE AND GEOCONSERVATION** - Meeting to identify criteria for selection of Geological Frameworks (October 2018). Development of Working Paper providing guidance to CEP and ATCM on conservation of Antarctic geoheritage (meeting March 2019). Further consultation on the draft SCAR Code of Conduct on Geological Field Research in Antarctica (SG-Geosciences, SCATS, COMNAP, CEP, ATCM). Consultation with the SCAR Geosciences community about the establishment of procedures to identify geological and geomorphological features to be protected. Initiate discussion with the SG Geosciences about the continuity of Geoheritage and Geoconservation work, possibly as a subgroup within SG-Geosciences.
- h. **GeoMAP** Complete capture of Peninsula geology. Finalise north Victoria Land glacial geology. Improve definition of Ferrar-Beacon rocks in cTAM. Hold workshop GeoMAP (probably prior to AGU conference). Finalise legends and data into GeoSciML. Organise online peer review system. Review workshop at XIII ISAES in South Korea 2020-GeoMAP coming to a close (or at least Phase 1).
- i. **GIANT-** Continuity of the project GIANT-REGAIN (Geodynamics In ANTArctica based on RE-processing GNSS dATA Initiative). Improve the visibility of GIANT to other SCAR entities and both geoscientific and non-geoscientific disciplines. Involve early career scientists to take over responsibilities, and to supporting them in realizing (short) research stays and taking part in conferences with GIANT-related sessions.



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- j. **GRAPE**- Efforts will be addressed to the improvement/refinement of the SRP proposal RESOURCE, built upon the important GRAPE legacy, firstly by enhancing interactions between the scientists who measure and utilise the entire radio spectrum, either as an auxiliary or principal observation, to study the atmosphere.
- k. **IBCSO**- A side meeting is organised prior to Polar 2018. At the side meeting, the IBCSO community will be informed about the latest IBCSO and Seabed 2030 developments. An additional focus of the side meeting is the identification of data sets, the exchange of metadata, and the planning of future expeditions for bathymetric data collection. From 8.-10. October 2018, IBCSO representatives will participate in the Seabed 2030 Arctic – Antarctic – North Pacific Mapping Meeting 2018, Stockholm Sweden, October 8-10, 2018. Such meetings are planned each successive year to continue data integration to IBCSO. The status of IBCSO will be reported yearly to the GEBCO Guiding Committee and to the ISAES community at the meeting South Korea in 2019.

**Scientific Research Program Planning Groups**

*RESOURCE* - Lead Proponents: Giordiana De Franceschi (Italy)

**Budget**

**Planned use of funds for 2018 to 2020**

All the groups aim to expend the available funds during Polar 2018 meetings and other proposed activities before the end of 2018. The budget requested for each group during 2019-20, and proposed activities are indicated in the sub-group reports.

Although the total budget requested is **\$ 64500** (32250 \$/year) for Geosciences group, the proposed request has been reduced after discussion to the total amount indicated by the SCAR EXCOM (24500 \$/year). Anyway, if additional funds are available, it is supported by Geosciences Group to be reallocated to the Geosciences subgroups.

ISAES XIII will be held on 2019 in South Korea. An additional request of up to \$10.000 for early career scientists to attend this meeting is also supported by Geosciences group.

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019-20	<b>ADMAP</b>	6500	Graeme Eagles	graeme.eagles@awi.de
2019-20	<b>ANTARCHITECTURE</b>	2000	Robert Bingham	r.bingham@ed.ac.uk
2019-20	<b>ANTOS</b>	2000	Craig Cary	caryc@waikato.ac.nz
2019-20	<b>ANTPAS</b>	5000	Mauro Guglielmin	mauro.guglielmin@uninsubria.it
2019-20	<b>ANTVOLC</b>	5000	John Smellie	jls55@le.ac.uk



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2019-20	<b>CGG</b>	5000	Joachim Jacobs	joachim.jacobs@uib.no
2019-20	<b>GEOLOGICAL HERITAGE AND GEOCONSERVATION</b>	4000	Kevin A. Hughes	kehu@bas.ac.uk
2019-20	<b>GEOMAP</b>	4500	Simon Cox	s.cox@gns.cri.nz
2019-20	<b>GIANT</b>	6000	Mirko Scheinert	mirko.scheinert@tu-dresden.de
2019-20	<b>GRAPE</b>	4000	Giorgiana De Franceschi	giorgiana.defranceschi@ingv.it
2019-20	<b>IBCSO</b>	5000	Boris Dorschel	boris.dorschel@awi.de
<b>TOTAL</b>		<b>49000</b>		

**Briefly describe funds usage and desired results**

Detailed descriptions are included in the individual subgroup reports.

2018: Attend the Davos meetings and other activities indicated in the individual reports

Group	2019-20
<b>ADMAP</b>	Continue to support development of early career researchers in ADMAP by supporting their attendance at major international conferences that also host ADMAP2 sessions, splinter groups, or major ADMAP2 presentations.
<b>ANTARCHITECTURE</b>	Initiate the activities proposed for this action group. Growth of international membership and Interaction with stakeholders. Development of standards for processing data, joining datasets and lodging open-access products. Development of products suitable for use in numerical modelling (input and/or calibration).
<b>ANTOS</b>	Support for meetings: Technical manual and to oversee the deployment of the first Tier 3 nodes. Major ANTOS workshop in 2020.
<b>ANTPAS</b>	Meeting support, Barcelona, South Korea and Hobart. 1 grant for each meeting for young-early career scientists.
<b>ANTVOLC</b>	Meeting organization. Organization of a web repository. Travel support to early career scientist.
<b>CGG</b>	Young scientist participation at ISAES 2019, EGU Chair meeting
<b>GEOLOGICAL HERITAGE AND GEOCONSERVATION</b>	Meetings for criteria for Geosite selection, Working Paper to CEP, Early Career Researcher attendance at ISAES Korea
<b>GEOMAP</b>	Travel expenses for workshops. Student travel & support.
<b>GIANT</b>	Financial support for scientific student assistant: Development of web and GIS-related services and applications for SCAR GNSS Database. Travel Support for early career scientists.



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GRAPE	Travel expenses for workshops.
IBCSO	Travel expenses for workshops and meetings.

#### Percentage of the budget to be used for support of early career researchers

2018:  
2019: 45%  
2020: 45%

#### Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes

2018:  
2019: 20%  
2020: 20%

## Linkages

### Direct support from outside organisations

- **ADMAP** - Until 2017: USD100,000 from Kopri
- **ANTOS** - Substantial in kind support comes from all of the ANTOS committee home institutions that must amount to well over \$20,000USD/year; NIWA and University of Waikato - \$7000 USD – *in-kind*
- **ANTVOLC** - International Association of Volcanology and Chemistry of the Earth's Interior. <http://www.iavcei.org/>
- **ANTPAS** - PNRA Italian national Program (1200 Euro for the organization of the 1st Antpas Workshop Varese)
- **CGG** - Norwegian Polar Institute, Norway; Federal Institute for Geosciences and Natural Resources, Germany; Alfred Wegener Institute, Germany; Italian National Antarctic Program; University of Bergen, Norway; ESA 3D Earth (ADMAP 2.0+), PolarGAP and GOCE+Antarctica projects
- **GEOMAP** - GeoMAP relies almost entirely on co-funding and voluntary efforts. We estimate the co-funding to total ~US\$150,000 per annum: New Zealand's contribution led by GNS Science is based on US\$70k from Direct Core Funding, US \$20k from a Ross Sea Region (RSR) Terrestrial Data Analysis project (Landcare MBIE CO9X1413) and US\$7k NZ Antarctic Research Institute grant. Marie Byrd Land work completed by Colorado College was supported by a Witter Internship (~US\$10k). At the time of writing we do not have detailed information on the funding utilized by Gianni Capponi (Italy), John Goodge and David Elliot (USA), Alex Burton-Johnston (UK), or Brett Kitchner and Matthew Cracknell (Australia). Paul Morin and the Polar Geospatial Centre are doing all sorts of other work in support of GeoMAP, providing datasets that we utilize.
- **GIANT** - German Research Foundation (DFG) supported the "International Workshop on Airborne Geodesy and Geophysics with Focus on Polar Applications", Dresden, Germany, 19-21 April 2017, by granting funds of 5,000 €; German Society of Polar Research (DGP) supported "2<sup>nd</sup> SCAR Summer School on Polar



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Geodesy”, Ladozhskoe Ozero, Russia, 10–19 May 2018, by granting funds of 2,000 €

- **GRAPE** - Most of the groups participating in GRAPE are supported by their own Countries through specific projects for Antarctic sciences.
- **IBCSO** - IBCSO activities are supported by the Nippon foundation – GEBCO Seabed 2030 Project.

#### Major collaborations

##### Within SCAR

- *ADMAP*: CGG
- *ANTPAS*: Ant-era and Ant-Eco.
- *CGG*: ADMAP, GEOMAP, SERCE, PAIS
- *GEOLOGICAL HERITAGE AND GEOCONSERVATION*: SCATS
- *GIANT*: SERCE, PAIS, ADMAP, GRAPE, QUANTARCTICA, SGAI, SCADM
- *GRAPE* : SCAR PS, SERCE

##### Outside SCAR

- *ADMAP*: World Digital Magnetic Anomaly Mapping project
- *ANTPAS*: IPA, International Permafrost Association.
- *CGG*: – IUGG ; IGCP 628: Gondwana map ; IGCP 648: Supercontinent cycles & global geodynamics
- *GEOLOGICAL HERITAGE AND GEOCONSERVATION*:- Presentation of Information Paper 31 Antarctic Geoconservation: a review of current systems and practices to CEP XIX.
- *GEOMAP*: New Zealand Antarctic Research Institute, Polar Geospatial Centre (PGC), University of Minnesota
- *GIANT*:-International Association of Geodesy (IAG) Subcommission 1.3f: Regional reference frame in Antarctica; IAG Subcommission 2.4: Gravity and Geoid in Antarctica
- *GRAPE*: EU PROJECTS and initiatives focusing on GNSS services and Space Weather, URSI COMMISSIONS G and F, IAGA.
- *IBCSO*: The IBCSO has strong collaboration to the General Bathymetric Chart of the Oceans (GEBCO), which operates under the joint auspices of the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC) (of UNESCO)

#### Outreach and Capacity Building

- **ANTOS** - Several activities, and it is remarkable the support for early career.
- **GEOLOGICAL HERITAGE AND GEOCONSERVATION**- Engagement of early career scientists (S. McLennan and T. Manograsso Czalbowski) in development of the Code of Conduct. Support of session at Polar 2018 on Geoconservation and Geoheritage. Development of the Action Group page on the SCAR website.
- **GEOMAP** - GeoMAP was profiled in the SCAR March 2017 Newsletter and our pages on the SCAR website a reasonably up to date. A series of presentations and posters were delivered at the SCAR 2016 conference, 2016 AGU Fall meeting and the 2017 NZ Antarctic Conference. The same banner and logo have been used for all posters and presentations, deliberately placing them together.



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- **GIANT** - Communication is being maintained through the SCAR GIANT website as well as through a GIANT mailing list that is open to all interested scientists. There is a strong component for capacity building in supporting (master and PhD) students as well as PostDocs to participate in dedicated conferences as well as in exchange at expert institutions (activities 1 and 3, see above). Also, we support capacity building when acting as a host for SCAR / COMNAP Fellowships
- **GRAPE**- GRAPE participants support locally outreach, communication activities and events (e.g. Festival of Sciences) addressed to the general public as well to pupils and students from intermediate to high schools. Special lectures are also organized for Masters, e.g.: Spogli Luca, "Space climate and space weather from the Pole" lecture within the "Master in sustainable development, geopolitics of resources and arctic studies" organized by the Società Italiana per l'Organizzazione Internazionale (The Italian Society for International Organization), 2016 and 2017.
- **IBCSO** - As a regional mapping program of GEBCO, IBCSO is able to benefit from the large GEBCO network of ocean mappers and the growing number of GEBCO/Nippon Foundation scholars. The work of the IBCSO EG is regularly presented on conferences.

#### SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Lucilla	Alfonsi	lucilla.alfonsi@ingv.it	IONOSPHERE
Jan Erik	Arndt	Jan.Erik.Arndt@awi.de	bathymetry
Nicolas	Bergeot	nicolas.bergeot@oma.be	GEOPHYSICS
Craig	Cary	Caryc@waikato.ac.nz	Terrestrial ecology/ microbiology
Emilia	Correia	ecorreia@craam.mackenzie.br	Multi-instrument upper atmosphere monitoring
Simon	Cox	s.cox@gns.cri.nz	Geology; Transantarctic Mountains; Geomorphology; GIS
Vonda	Cummings	vonda.Cummings@niwa.co.nz	Marine ecology
Boris	Dorschel	Boris.Dorschel@awi.de	bathymetry
Graeme	Eagles	geagles@awi.de	Plate tectonics of southern hemisphere
Fausto	Ferraccioli	ffe@bas.ac.uk	Antarctic airborne geophysics; Antarctic tectonics
René	Forsberg	rf@space.dtu.dk	Geodesy, gravity field



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<b>Mauro</b>	Guglielmin	Mauro.guglielmin@uninsubria.it	Physical geography climate change
<b>Joachim</b>	Jacobs	Joachim.jacobs@uib.no	geology
<b>Matt</b>	King	Matt.King@utas.edu.au	Geodesy, GNSS, GIA
<b>Andreas</b>	Laeufer	Andreas.laeufer@bgr.de	geology
<b>Jeronimo</b>	Lopez-Martinez	jeronimo.lopez@uam.es	Geological Heritage
<b>Monia</b>	Negusini	negusini@ira.inaf.it	WATER VAPOR
<b>Marc</b>	Oliva	Oliva_marc@yahoo.com	Quaternary Geology, Geomorphology
<b>Mirko</b>	Scheinert	Mirko.Scheinert@tu-dresden.de	Geodesy, GNSS

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chief officer	Jesús	Galindo-Zaldívar	Universidad de Granada	Spain	jgalindo@ugr.es	sept, 2016	aug, 2020
Deputy chief officer	Naresh	Pant	University of Delhi	India	pantnc@gmail.com	sept, 2016	aug, 2020
Secretary	Marcelo	Leppe	Instituto Antártico Chileno	Chile	mleppe@inach.cl	sept, 2016	aug, 2020

### Other members

First Name	Last Name	Affiliation	County	Email
Fernando	Bohoyo	Instituto Geológico y Minero	Spain	<a href="mailto:f.bohoyo@igme.es">f.bohoyo@igme.es</a>
Nicolas	Bergeot	Royal Observatory of Belgium	Belgium	<a href="mailto:Nicolas.bergeot@oma.be">Nicolas.bergeot@oma.be</a>
Francisco	Fernandoy	Universidad Nacional Andrés Bello	Chile	<a href="mailto:Francisco.fernandoy@unab.cl">Francisco.fernandoy@unab.cl</a>
Fausto	Ferraccioli	BAS	UK	<a href="mailto:ffe@bas.ac.uk">ffe@bas.ac.uk</a>
Jane	Francis	BAS	UK	<a href="mailto:j.francis@bas.ac.uk">j.francis@bas.ac.uk</a>
Karsten	Gohl	Alfred Wegener Institut	Germany	<a href="mailto:Karsten.gohl@awi.de">Karsten.gohl@awi.de</a>
Mauro	Guglielmin	Università degli studi dell'Insubria	Italy	<a href="mailto:Mauro.guglielmin@uninsubria.it">Mauro.guglielmin@uninsubria.it</a>
Samantha	Hansen	University of Alabama	USA	<a href="mailto:shansen@geo.ua.edu">shansen@geo.ua.edu</a>



### XXXV SCAR Delegates Meeting Davos, Switzerland, 25-26 June 2018

Kate	Hendry	U Bristol	UK	<a href="mailto:k.hendry@bristol.ac.uk">k.hendry@bristol.ac.uk</a>
Joachim	Jacobs	University of Bergen	Norway	<a href="mailto:Joachim.jacobs@uib.no">Joachim.jacobs@uib.no</a>
Andreas	Laufer	BGR	Germany	<a href="mailto:andreas.laeufer@brg.de">andreas.laeufer@brg.de</a>
German	Leitchenkov	All-Russia Scientific Research Institute for Geology and Mineral Resources of the Ocean	Russia	<a href="mailto:German_l@mail.ru">German_l@mail.ru</a>
Marek	Lewandowski	IGF PAN	Poland	<a href="mailto:Lewan@igf.edu.pl">Lewan@igf.edu.pl</a>
Xiaohan	Liu	Academy of Science	China	<a href="mailto:Xhliu@mail.iggcas.ac.cn">Xhliu@mail.iggcas.ac.cn</a>
Berry	Lyons	Ohio State University	USA	<a href="mailto:Lyons.142@osu.edu">Lyons.142@osu.edu</a>
Jaakko	Makinen	National Land Survey	Finland	<a href="mailto:Jaakko.makinen@nls.fi">Jaakko.makinen@nls.fi</a>
Ian	Meiklejohn	Rhodes University	South Africa	<a href="mailto:i.meiklejohn@ru.ac.za">i.meiklejohn@ru.ac.za</a>
Martin	Melles	Universität zu Köln	Germany	<a href="mailto:mmelles@uni.koeln.de">mmelles@uni.koeln.de</a>
Thomas	Mörs	Naturhistoriska riksmuseet	Sweden	<a href="mailto:Thomas.mors@nrm.se">Thomas.mors@nrm.se</a>
Yoshifumi	Nogi	NIPR	Japan	<a href="mailto:nogi@nipr.ac.jp">nogi@nipr.ac.jp</a>
*Lara	Perez	GEUS	Spain	<a href="mailto:larafperez@gmail.com">larafperez@gmail.com</a>
Massimo	Pompilio	Istituto Nazionale di Geofisica	Italy	<a href="mailto:Massimo.pompilio@ingv.it">Massimo.pompilio@ingv.it</a>
Alix	Post	Geoscience Australia	Australia	<a href="mailto:Alix.post@ga.gov.au">Alix.post@ga.gov.au</a>
Markku	Poutanen	National Land Survey	Finland	<a href="mailto:Markku.poutanen@nls.fi">Markku.poutanen@nls.fi</a>
Mirko	Scheinert	TU Dresden	Germany	<a href="mailto:mirko.scheinert@tu-dresden.de">mirko.scheinert@tu-dresden.de</a>
Kari	Strand	Oulu Mining School	Finland	<a href="mailto:Kari.strand@oulu.fi">Kari.strand@oulu.fi</a>
Gonzalo	Vieira	U Lisbon	Portugal	<a href="mailto:vieira@campus.ul.pt">vieira@campus.ul.pt</a>
Gary	Wilson	Otago University	New Zealand	<a href="mailto:Gary.wilson@otago.ac.nz">Gary.wilson@otago.ac.nz</a>
Yue	Zhao	Academy of Science	China	<a href="mailto:Yue_zhao@cags.ac.cn">Yue_zhao@cags.ac.cn</a>

*\*Early Career Scientists*

### Requests to the Secretariat

GeoMAP need to decide how to deliver their final datasets and set a system for review. It is not clear to the group whether these can sit on the SCAR website, and if they will be SCAR products. It would be highly desirable to develop some form of online comment/peer review system that would be hosted on the GeoMAP page on the website. Some assistance with web development may be needed. It would also be good to update our webpages with posters and presentations from conferences.



SDM 15 rev. 1  
Agenda Item: 4.3.1  
Person Responsible: J Galindo-Zaldívar et al.

**XXXV SCAR Delegates Meeting  
Davos, Switzerland, 25-26 June 2018**

## **Attachment 1. Subsidiary/Joint Groups**

**ADMAP (Antarctic Digital Magnetic Anomaly Project) EG**

**ANTOS (Antarctic near-shore and terrestrial observing system) EG**

**ANTPAS (Antarctic Permafrost, Soils and Periglacial Environments) EG**

**ANTVOLC (Antarctic Volcanism) EG**

**CGG (Connecting Geophysics with Geology) AG**

**GEOLOGICAL HERITAGE AND GEOCONSERVATION AG**

**GEOMAP (Geological Mapping Update of Antarctica) AG**

**GIANT (Geodetic infrastructure of Antarctica) EG**

**GRAPE (GNSS research and application for polar environment) EG**

**IBCSO (international bathymetric chart of the southern ocean) EG**

**Proposal of ANTARCHITECTURE AG**



SCAR Sub-Group

SG

Person  
Responsible:

ADMAP

GS

Graeme  
Eagles

## SCAR Delegates Meeting 2018

Davos, Switzerland, June 2018

# ADMAP 2016-2018 Report

**Report Author(s) Graeme Eagles (Germany), Fausto Ferraccioli (UK)**

### **Summary of activities from 2016-18 and any other important issues or factors**

- SCAR 2016 Kuala Lumpur - ADMAP business meeting and contribution to session on Antarctic Geology and Geophysics
- EGU 2017 - ADMAP splinter meeting. Several ADMAP-related papers were also contributed to a session on Antarctic geodynamics
- AGU 2017 – First presentation of complete ADMAP2 compilation
- EGU 2018 – presentation of complete ADMAP2 compilation & session on Antarctic geology and geophysics
- Online and print availability of ADMAP2 compilation map:  
DOI: 10.22663/ADMAP.V2
- 2017-18: Drafting, submission, acceptance and online publication of ADMAP2 release paper in *Geophysical Research Letters*

### **Recommendations that EXCOM and Scientific Group Chief Officers should consider**

none

### **Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	3943	3973	4000	4000

## Progress and Plans

### Sub-group Major Outcomes/Activities

The main development in the reporting period has been the completion of the ADMAP2 grid and databases compilation, its presentation at major international conferences (SCAR2016, EGU2017, AGU2017, EGU2018), its availability as a published map (DOI: 10.22663/ADMAP.V2), and introduction via a high-impact release paper in Geophysical Research Letters.

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
ADMAP	AGU2017: Outgoing chair Damaske presented ADMAP2 to international conference

### Sub-group Cash Flow

*(From previous Delegates meeting to date)*

Sub-group	Allocation	Amount spent		
		2016	2017	2018
ADMAP	3973	0	3943	0

### Notable Papers

*(Three most notable papers, if applicable)*

Golynsky, A., et al., 2018, New magnetic anomaly map of the Antarctic, Geophysical Research Letters, **published online**

This work introduces the ADMAP2 compilation, and its 3 million line-kilometres of new data, to the geophysics community. ADMAP2 will form the basis of the next decade of magnetic-based research in Antarctica.

Ruppel, A., et al., 2018, New geophysical data from a key region in East Antarctica: Estimates for the spatial extent of the Tonian Oceanic Arc Super Terrane (TOAST), Gondwana Research, 59, 97-107

This work introduces one of the first large post-ADMAP2 data sets, that will contribute to future ADMAP compilations, and which is one of the first whose interpretation is made with the benefit of the context ADMAP2 provides. An important example of the use of magnetic data for extending and improving interpretations of outcrop geology for Antarctic geological history.

Martos, Y., et al., 2017, Heat Flux Distribution of Antarctica Unveiled, Geophysical Research Letters, 44.

This work uses a close relative of one of the ADMAP2 regional sub-compilations together with data from the previous ADMAP compilation to arrive at Antarctic-wide estimates of subglacial heatflow.

**Forthcoming Activities**

The GRL release paper will be followed up by a more detailed methods paper for a top journal, possibly G-Cubed.

The methods paper will form the basis on which ADMAP will develop workflows for contributors to prepare candidate surveys for inclusion into and alongside the continental compilation of ADMAP2, and for the working group to accept them.

Acceptances will see ADMAP2 compilation expand on a piecemeal basis via a series of ADMAP2.X releases.

**Budget**

**Planned use of funds for 2018 to 2020**

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	ECR D. Golynsky to attend Polar2018	1500	Graeme Eagles	geagles@awi.de
2019	ECR to attend major international conference	2000		
2020	ECR to attend major international conference	2000		
<b>Total</b>		<b>5500</b>		

**Briefly describe what the funds will be used for and what the desired results are**

We would like to use the funds to continue to support development of early career researchers in ADMAP by supporting their attendance at major international conferences that also host ADMAP2 sessions, splinter groups, or major ADMAP2 presentations.

**Percentage of the budget to be used for support of early career researchers**

2018: up to 100

2019: up to 100

2020: up to 100

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: 0  
2019: 0  
2020: 0

## Linkages

**Direct support from outside organisations received for your activities**

Until 2017: USD100,000 from Kopri.

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

**Within SCAR**

1. CGG

**Outside SCAR**

1. World Digital Magnetic Anomaly Mapping project

## Outreach and Capacity Building

**Outreach, communication and capacity building activities**

Our efforts have been concentrated on the compilation, which has been a huge undertaking. With the compilation now available, we can leverage on it in order to devise and begin meaningful activities in this category.

**SCAR Fellowship Reviewers**

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
<b>Graeme</b>	Eagles	geagles@awi.de	Plate tectonics of southern hemisphere
<b>Fausto</b>	Ferraccioli	ffe@bas.ac.uk	Antarctic airborne geophysics; Antarctic tectonics

## Membership

**Leadership**

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
<b>Chair</b>	Graeme	Eagles	AWI	Germany	geagles@awi.de	Aug. 2016	unknown
<b>Chair</b>	Fausto	Ferraccioli	BAS	UK	ffe@bas.ac.uk	Sep. 2014	unknown
<b>Data manager</b>	Alexander	Golynsky	VNIIO	Russia	sasha@vniio.nw.ru		

Please identify Early Career Scientists with \* in first column

#### Other members

First Name	Last Name	Affiliation	Country	Email
<b>Dmitry*</b>	Golynsky		Russia	dmitry.a.golynsky@gmail.com
Antonia*	Ruppel	BGR	Germany	Antonia.Ruppel@bgr.de
Duncan	Young	UTIG	USA	duncan@ig.utexas.edu
<b>Hyung Rae</b>	Kim	Konju Uni	Korea	kimhr@kongju.ac.kr
<b>Marta</b>	Ghidella		Argentina	mghidella@gmail.com
<b>Ralph</b>	Von Frese	OSU	USA	von-frese.3@osu.edu
<b>Damasko</b>	Detlef		Germany	damaske [d.damaske@t-online.de]

Please identify Early Career Scientists with \* in first column

#### Requests to the Secretariat

(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)



**SCAR Sub-Group**

SG

Person  
Responsible:

**ANTOS**

PS/LS/GS

Craig Cary  
and Vonda  
Cummings

## **SCAR Delegates Meeting 2018**

**Davos, Switzerland, June 2018**

# **ANTOS** **2017-2018 Report**

### **Report Author(s)**

Craig Cary and Vonda Cummings (NZ), co-chairs of ANTOS Expert Group

### **Summary of activities from 2017-18 and any other important issues or factors**

We have continued to develop the ANTOS database and the technical manual, as per plans originally implemented at the 2016 Kuala Lumpur SCAR-OSC ANTOS workshop. A committee meeting at the 2017 SCAR Biology Symposium (Leuven, Belgium) reviewed progress on the technical manual and database, and refined and finalised a web-based survey (to poll the international research community about existing long-term ecological and environmental data, and other areas where such data is needed).

Achievements to date, and the impending survey, were publicised at the open ANTOS meeting held at the Biology Symposium, and through SCAR distribution lists and executive newsletters. The survey was active for three months (July-September 2017).

Technical attributes for the terrestrial three-Tier systems have been configured and off the shelf designs are being developed and considered. Work is underway on development of the marine three-Tier systems. Plans were made for a closed workshop to develop a full implementation plan and to summarise the survey results (Genoa, June 11-13<sup>th</sup>), and for the ANTOS community workshop to be held prior to the Polar 2018 SCAR-OSC (June 15<sup>th</sup>). Several poster and oral presentations highlighting the aims of and plans for ANTOS have also been given by committee members in the past year.

### **Recommendations that EXCOM and Scientific Group Chief Officers should consider**

None

### **Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
LS	0	7000	7000	7000
GS	0	1324	2000	2000
PS	0	2000	2000	2000

## Progress and Plans

### Sub-group Major Outcomes/Activities

- 1) We have conducted a survey to identify potential high priority ANTOS sites. The survey was designed by the Expert group and implemented following the SCAR Biology meeting (Leuven, Belgium). The survey is now closed and the data are being analyzed for presentation at the Genoa workshop. These results will be critical to identify and justify the placement of critical ANTOS nodes around the continent.
- 2) We were asked repeatedly at the KL SCAR-OSC to provide accurate descriptions and costing of each of the Tier level installations for ANTOS so that researchers have the information to include in proposals being submitted to their national programmes. The Technical details for the most part have now been decided and are being packaged into a "How To" manual that will be reviewed at the Polar 2018 SCAR OSC (Davos) workshop
- 3) A comprehensive database management plan that includes development of web-based user interface to access database and for outreach has been developed by Soon Gyu Hong and KOPRI and will be presented for discussion at the Davos workshop. This database and the agreement to host it by KOPRI is critical for the success of ANTOS

### Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
ANTOS	International survey/completed/ will provide essential information for placement of ANTOS nodes
ANTOS	Database design completed/functional web-based interface/essential to allow all ANTOS node data to be compiled and made accessible from a common site
ANTOS	2 workshops planned prior to SCAR-OSC, Genoa for committee only and a community workshop to present all of the current ANTOS information/ The benefit is that this will connect the Expert Group with the rest of the community and enable the programme to proceed.

### Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
ANTOS	10324	0	0	10324

### Notable Papers

- Cary, C. Cummings, V. (2017). ANTOS - Antarctic Near-shore and Terrestrial Observation System. Poster presentation at the International workshop on Antarctic permafrost, periglacial processes and soils (ANTPAS), Varese, Italy 4-5<sup>th</sup> October.
- Bergstrom, D. 2017. "ANTOS". Oral presentation to the Australian Antarctic Division. September.

## [ANTOS]: 2016-2018 Annual Report, cont.

- Convey, P., Cary, C., Cummings, V. 2017. Antarctic Near-shore and Terrestrial Observation System (ANTOS). Poster presented at the Past Antarctic Ice Sheet Dynamics (PAIS) meeting, Trieste Italy, 10-15<sup>th</sup> September.
- Cummings, V.J. (2017). ANTOS (Antarctic Near-shore and Terrestrial Observing System). **Oral presentation** at the Southern Ocean Observing System Ross Sea Regional Workshop. Shanghai, China. 10-13<sup>th</sup> September.
- Cummings, V.J. (2017). ANTOS - Antarctic Near-shore and Terrestrial Observation System. Poster presentation at the Southern Ocean Observing system Ross Sea workshop. Shanghai, China. 10-13<sup>th</sup> September.
- Cummings, V.J. (on behalf of ANTOS committee). (2017). Antarctic Near-shore and Terrestrial Observation System (ANTOS). Poster presented at the XIIth SCAR Biology Symposium, Leuven, Belgium. 10-14<sup>th</sup> July.
- Cummings, V.J., Cary, S.C. (2017). Antarctic Near-shore and Terrestrial Observation System (ANTOS). Poster presented at the NZ Antarctic conference, Dunedin, 26-28<sup>th</sup> June.

### Forthcoming Activities

- Genoa Workshop (Committee only) - 2018  
 Davos Workshop (Open) - 2018  
 Database working group meeting – 2018  
 Technical working group meeting – 2019  
 ANTOS Workshop (open) – Hobart - 2020

### Budget

#### Planned use of funds for 2018 to 2020

Please note that these are estimates and will be discussed and refined in consultation with the wider ANTOS committee at an upcoming workshop in Genoa (June 2018).

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	Workshop – Hobart SCAR-OSC	\$11,000	Craig Cary, Vonda Cummings	<a href="mailto:craig.cary@waikato.ac.nz">craig.cary@waikato.ac.nz</a> <a href="mailto:Vonda.Cummings@niwa.co.nz">Vonda.Cummings@niwa.co.nz</a>
2019	Technical Task Group meeting	\$11,000	Charles Lee	<a href="mailto:c.lee@waikato.ac.nz">c.lee@waikato.ac.nz</a>
2018 - late	Database task group meeting	\$4324	Soon Gyu Hong	<a href="mailto:polypore@gmail.com">polypore@gmail.com</a>
2018 - Davos	Workshop (open)	\$3500	Craig Cary, Vonda Cummings	<a href="mailto:craig.cary@waikato.ac.nz">craig.cary@waikato.ac.nz</a> <a href="mailto:Vonda.Cummings@niwa.co.nz">Vonda.Cummings@niwa.co.nz</a>
2018 - Genoa	Workshop (Committee)	\$3500	Craig Cary, Vonda Cummings	<a href="mailto:craig.cary@waikato.ac.nz">craig.cary@waikato.ac.nz</a> <a href="mailto:Vonda.Cummings@niwa.co.nz">Vonda.Cummings@niwa.co.nz</a>
<b>Total</b>		<b>33,324</b>		

**Briefly describe what the funds will be used for and what the desired results are:**

2020 – Major ANTOS workshop presenting continental wide success of node installation and data management. This, we hope, will be the final meeting as an Expert Group having achieved the desired result. The rest is in the research.

2019 – Support is requested for 2-3 individuals from the technical team to meet and compile the final version of the technical manual and to oversee the deployment of the first Tier 3 nodes.

2018 – The database team will meet in Korea to finalize the database implementation and to oversee the first live streaming of data from a Tier 1 terrestrial installation.

2018 – Matching support being provided for 3-4 early career researchers to attend the ANTOS meeting at the Davos SCAR-OSC.

2018 – Funds will be used towards support for multiple committee members to travel to the ANTOS workshop in Genoa (e.g. Bergstrom, Sultan). We will also use some funds to support room and board for the 6 committee members attending this workshop.

**Percentage of the budget to be used for support of early career researchers**

2018:30%  
2019:20%  
2020:40%

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018:30%  
2019:10%  
2020:20%

**Linkages**

**Direct support from outside organisations received for your activities**

PS-SSG -\$2000 USD  
GS-SSG - \$1324 USD

Substantial in kind support comes from all of the ANTOS committee home institutions that must amount to well over \$20,000USD/year

- NIWA and University of Waikato - \$7000 USD – *in-kind*

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

**Within SCAR**

**PS- SSG – committee member**  
**GS-SSG – Committee member**  
**AntEco– Committee member**  
**Ant ERA– Committee member**  
**ANTPAS**  
**PAIS**

**Outside SCAR**

New Zealand Antarctic Research Institute

**Outreach and Capacity Building**

**Outreach, communication and capacity building activities**

- 2 of the ANTOS committee members are considered early career
- Charles Lee, Univ. of Waikato, Early Career brought on the lead technical effort within ANTOS
- NZ Antarctic conference poster on ANTOS – June 2017
- NZ CEP representatives have been briefed at regular intervals on ANTOS development.
- Co-chairs were invited to attend the SOOS Ross Sea Working Group Workshop in China in Sept 2017.
- ANTOS meeting is scheduled for the SCAR OSC meeting in Davos on June 15, 2018. This will consist of an open meeting in the afternoon for the entire community in the afternoon. Several committee members unable to attend the meeting will connect through video conferencing.

**SCAR Fellowship Reviewers**

As part of SCAR’s Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a ‘review panel’ so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
<b>Craig</b>	Cary	Caryc@waikato.ac.nz	Terrestrial ecology/ microbiology
<b>Vonda</b>	Cummings	vonda.Cummings@niwa.co.nz	Marine ecology

**Membership**

**Leadership**

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
<b>Co-Chair</b>	Craig	Cary	U. of Waikato	NZ	Caryc@waikat o.ac.nz	8/2014	8/2020

[ANTOS]: 2016-2018 Annual Report, cont.

<b>Co Chair</b>	Vonda	Cummings	NIWA	NZ	Vonda.Cummings@niwa.co.nz	8/2014	8/2020
<b>Sec</b>	*Megumu	Tsujimoto	MPR	Japan	megumutsujimoto@gmail.com	8/2014	8/2020

**Other members**

First Name	Last Name	Affiliation	County	Email
Byron	Adams	BYU	USA	<a href="mailto:byron_adams@byu.edu">byron_adams@byu.edu</a>
*Charles	Lee	Waikato University	NZ	<a href="mailto:cklee@waikato.ac.nz">cklee@waikato.ac.nz</a>
Dana	Bergstrom	Australian Antarctic Division	Australia	<a href="mailto:dana.bergstrom@aad.gov.au">dana.bergstrom@aad.gov.au</a>
Dolores	Deregibus		Argentina	<a href="mailto:dolidd@yahoo.com">dolidd@yahoo.com</a>
Eli	Verleyen		Belgium	<a href="mailto:Elie.Verleyen@UGent.be">Elie.Verleyen@UGent.be</a>
Emmanuelle	Sultan	Museum National d'Historie Meleuelle	France	<a href="mailto:esulod@locean-ipsl.upmc.fr">esulod@locean-ipsl.upmc.fr</a>
Marcela	Libertelli	Instituto Antártico Argentino	Argentina	<a href="mailto:mibertelli5@yahoo.com.ar">mibertelli5@yahoo.com.ar</a>
Mauro	Guglielmin	ANTPAS rep	Italy	<a href="mailto:mauro.guglielmin@uninsubria.it">mauro.guglielmin@uninsubria.it</a>
Peter	Convey	BAS	UK	<a href="mailto:pcon@bas.ac.uk">pcon@bas.ac.uk</a>
Sharon	Robinson	Woolingong University	Australia	<a href="mailto:sharonr@uow.edu.au">sharonr@uow.edu.au</a>
Soon Gyu	Hong	KOPRI	Korea	<a href="mailto:polypore@gmail.com">polypore@gmail.com</a>
Stefano	Schiaparelli	Unige of MNA	Italy	<a href="mailto:stefano.schiaparelli@unige.it">stefano.schiaparelli@unige.it</a>
Steve	Colwell	PSG rep	UK	<a href="mailto:src@bas.ac.uk">src@bas.ac.uk</a>

**Requests to the Secretariat**

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



**SCAR Sub-Group**

**ANTPAS**

SG

GS

Person  
Responsible:

Mauro  
Guglielmin



## **SCAR Delegates Meeting 2018**

**Davos, Switzerland, June 2018**

# **ANTPAS** **2016-2018 Report**

### **Report Author(s)**

Mauro Guglielmin (Italy)

### **Summary of activities from 2016-18 and any other important issues or factors**

Antpas is going on with the permafrost and active layer monitoring around all the continent contributing to international network as GTN-P. Antpas had a scientific session in Kuala Lumpur SCAR-OSC (16 orals) and its meeting (22 participants). Thanks the support of SCAR SSG-GS the first international workshop was held at Varese (4-5 October 2017; 33 abstracts, 19 orals; 31 participants of 9 countries). Finally a white paper is in preparation according the results of the workshop and it will be the base for the Research Program proposal that will be presented officially for the next SCAR OSC. During the workshop Goncalo Vieira stepped down as Co-Chair, with a new Co-Chair to be elected within the next few months. In December 2017 the Antpas community voted (59 voting persons) for the new Co-Chair and Prof. Marc Oliva of University of Barcellona has been elected.

Antpas promoted three different sessions on POLAR 2018. Nicoletta Cannone leaded one of the larger session "Life distribution and responses to environmental changes in Polar ecosystems".

Finally in the meeting held on 17<sup>th</sup> June 2018 at Davos was decided to promote scientific sessions and ANTPAS meeting at the next ISAES and 1<sup>st</sup> SouthCop at Queenstown (December 2019).

### **Recommendations that EXCOM and Scientific Group Chief Officers should consider**

#### **Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	5903	5569	2500	2500

## Progress and Plans

### Sub-group Major Outcomes/Activities

*(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)*

The first international workshop that was held at Varese (4-5 October 2017; 33 abstracts, 19 orals; 31 participants of 9 countries) represented an important step towards a better integration of the research results and projects. The white paper in preparation according the results of the workshop it will be the base for the Research Program proposal that will be presented officially for the next SCAR OSC and that will be used by all the researchers as guideline for future research.

In terms of contribution to the bipolar knowledge of the permafrost status and its relationships with the climate change the paper now in revision on Nature Communications entitled “Permafrost is warming at a global scale” by Biskaborn et al.(2018) represents an important results as well as the paper entitled “Active layer monitoring in Antarctica: an overview of results from 2006 to 2015” by Hrbacek et al (2018) published on Polar Geography give a snapshot on the active layer monitoring around all Antarctica.

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
ANTPAS	1 <sup>st</sup> International Workshop, Varese October 2017
ANTPAS	White paper in preparation on the role of Antarctic Permafrost in the changing scenario
ANTPAS	Paper on Polar Geography by Hrbacek et al 2018 on Active layer monitoring

### Sub-group Cash Flow

*(From previous Delegates meeting to date)*

Sub-group	Allocation	Amount spent		
		2016	2017	2018
ANTPAS	11472		5903	

### Notable Papers

*(Three most notable papers, if applicable)*

1. Moore, K.A., Smythe, P.H. & Hui, C.W., et al. 2017. Remote sensing using remotely piloted aircraft systems in Antarctica. *Frontiers in Remote Sensing* **62**, 102-136.

This work provides a comprehensive overview of developments in remote sensing based on RPAS in the Antarctic region. It was the outcome of the AG-Remote Sensing's meeting in Kuala Lumpur, October 2016.

### Forthcoming Activities

*(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)*

Barcelona Meeting 2018 (October) to finalize the white paper.  
 ISAES 2019 South Korea Meeting and Session.  
 South IPA COP 2019 New Zealand Meeting and three scientific sessions.  
 Hobart SCAR OSC 2020 Presentation of the research Program proposal, Meeting and Scientific sessions.

## Budget

### Planned use of funds for 2018 to 2020

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019	Travel to Meeting New Zealand and South Korea	2500	Mauro Guglielmin	Mauro.guglielmin@uninsubria.it
2020	Travelling to Meeting Hobart	2500	Mauro Guglielmin	Mauro.guglielmin@uninsubria.it
2018	Barcellona meeting	5569	Mauro Guglielmin	Mauro.guglielmin@uninsubria.it
<b>Total</b>		<b>10569</b>		

### Briefly describe what the funds will be used for and what the desired results are

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

The funds not used up to now will be used to support the people that will attend to the meeting that will be held in Barcellona to finalize the white paper that will be the base for the Research Program proposal.

The other funds will be used to cover partially the costs of the chair of the group to attend the meeting in South Korea and in Hobart and probably we

can reserve some money to make 1 grant for each meeting for young-early career scientists.

**Percentage of the budget to be used for support of early career researchers**

2018:30%

2019:30%

2020:30%

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018:0%

2019:30%

2020:30%

## Linkages

**Direct support from outside organisations received for your activities**  
*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

**PNRA give 1200 Euro for 1<sup>st</sup> International ANTPAS Workshop. (2017)**

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**  
*(Numbered list of substantive collaborations)*

**Within SCAR**

1. Ant-era and Ant-Eco

**Outside SCAR**

1. IPA

## Outreach and Capacity Building

**Outreach, communication and capacity building activities**  
*(Provide a numbered list of no more than half a page)*

**SCAR Fellowship Reviewers**

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who

would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
<b>Mauro</b>	Guglielmin	Mauro.guglielmin@uninsubria.it	Physical geography climate change
<b>Marc</b>	Oliva	Oliva_marc@yahoo.com	Quaternary Geology, Geomorphology
<b>Goncalo</b>	Vieira	Vieira@campus.ul.pt	Permafrost, Physical Geography

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
<b>Chair</b>	Mauro	Guglielmin	Insubria Univ	Italy	Mauro.guglielmin@uninsubria.it		SCar HObart
<b>Chair</b>	Marc	Oliva	Barcellona Univ	Spain	Oliva_marc@yahoo.com		Scar Hobart

*Please identify Early Career Scientists with \* in first column*

### Other members

First Name	Last Name	Affiliation	County	Email
<b>Same memberships of the last report</b>				

*Please identify Early Career Scientists with \* in first column*

### Requests to the Secretariat

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



**SCAR Sub-Group**

**ANTVOLC**

SG

GS

Person  
Responsible:

Massimo  
Pompilio

## **SCAR Delegates Meeting 2018**

**Davos, Switzerland, June 2018**

# **ANTVOLC** **2016-2018 Report**

**Report Author(s) Massimo Pompilio (ITALY) on behalf of John Smellie (UK)**

### **Summary of activities from 2016-18 and any other important issues or factors**

AntVolc now has > 100 members, from 11 countries (Spain, Italy, New Zealand, USA, UK, Argentina, Germany, South Korea, Japan, Australia, Poland). Main activities comprised:

- Change in the Steering Committee
- Creation of the Expert Group Website(<https://antvolcscar.wordpress.com/>)
- Organisation of 2 scientific sessions
  - Egu – 2018 General Assmby
  - SCAR-OSC, 'POLAR2018 – Session
- 2nd AntVolc Workshop, 22-24/11/2017, Barcelona, Spain

The second AntVolc Workshop was hosted by the Institute of Earth Sciences Jaume Almera..It attracted >30 participants, from Spain, Italy, Portugal, New Zealand, Poland & UK. Much of the meeting revolved around 2 days of scheduled talks, of which there were 20 orals (incl. three invited talks) plus several posters. The contributions described the results of a wide range of current volcanic-related investigations, both published and unpublished. All the talks were well presented and generated lively discussions but a particularly noteworthy presentation was that discussing atmospheric modelling of the most recent eruption of Deception Island. It showed that, because of its peripheral geographical position relative to continental Antarctica, tephra from the volcano can escape the polar vortex and influence the southern continents as well as aircraft directly overflying Antarctica. The results of the study should help to convince sceptical funding organisations that Antarctica's volcanoes have an important role that is immediately relevant to the present. In addition, three of the talks were about related research on adjacent continents, which is a new and very welcome extension of AntVolc's interests. Ample time was allowed for discussions at the end of each day.

John Smellie (AntVolc Chair) also presented an overview of Antarctic volcanism and the present and future state of AntVolc.

His review also included a progress report on the three major AntVolc deliverables.

### **Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)			3000	3000

## Progress and Plans

### Sub-group Major Outcomes/Activities

*(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)*

- new Antarctic tephra database: The new online database of tephra analyses, by Nelia Dunbar and Andrei Kurbatov and others, is now accessible (<http://www.tephrochronology.org/AntT/about.html>) and additional funding (from NSF) is being sought to complete it.
- new volume on Antarctic volcanism (Smellie/Panter/Geyer et al.): The comprehensive scientific review volume and database on '200 million years of Antarctic volcanism' is underway (since May 2017); it has three editors (John Smellie, Kurt Panter, Adelina Geyer) and 17 lead authors of 29 chapters, and it will be published as a Geological Society of London Memoir, probably in early-middle 2019.

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
ANTVOLC	Antarctic tephra database ( <a href="http://www.tephrochronology.org/AntT/about.html">http://www.tephrochronology.org/AntT/about.html</a> )
ANTVOLC	Volume on Antarctic volcanism
ANTVOLC	Creation of the Expert Group Website( <a href="https://antvolcscar.wordpress.com/">https://antvolcscar.wordpress.com/</a> )
ANTVOLC	Organisation of the 2nd AntVolc Workshop, 22-24/11/2017, Barcelona, Spain
ANTVOLC	Organisation of 2 scientific sessions (EGU2018-POLAR2018)

### Sub-group Cash Flow

*(From previous Delegates meeting to date)*

Sub-group	Allocation	Amount spent		
		2016	2017	2018
	5298		2374	

### Notable Papers

*(Three most notable papers, if applicable)*

## ANTVOLC: 2016-2018 Annual Report, cont.

1. Martin, A.P., Smellie, J.L., Cooper, A.F. and Townsend, D.B., 2017. Formation of a spatter-rich pyroclastic density current deposit in a Neogene sequence of trachytic- mafic igneous rocks at Mason Spur, Erebus volcanic province, Antarctica. *Bulletin of Volcanology*, 80(1): 13. doi: 10.1007/s00445-017-1188-7
2. Geyer, A., A. Marti, S. Giralt, and A. Folch (2017), Potential ash impact from Antarctic volcanoes: Insights from Deception Island's most recent eruption, *Scientific Reports*, 7(1), 16534, doi: 10.1038/s41598-017-16630-9.
3. Van Wyk de Vries, M., Bingham, R.G. & Andrew S. Hein, A.S. 2017. A new volcanic province: an inventory of subglacial volcanoes in West Antarctica. In: *Exploration of Subsurface Antarctica: Uncovering Past Changes and Modern Processes*. Geological Society, London, Special Publications, 461. DOI: 10.1144/SP461.7

### Forthcoming Activities

*(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)*

- SCAR White Paper on the state of Antarctic volcanic research and future directions. White Paper will commence in late 2018, probably with a planning workshop near that time. It will build on the results of the new science review volume. The White Paper is an important document and must have input from as many members of AntVolc as possible so that all views on future directions are included.
- Establish a link between the new Antarctic tephra database and the IAVCEI commission on tephra (INTAV – i.e. International Focus Group on Tephrochronology and Volcanism?)
- Proposal of an IAVCEI Commission for Polar Volcanism? It would enhance international visibility and possibly attract some funding. IAVCEI is linked to IUGG, which is linked to SCAR.
- Proposal of a special issue of a specialist journal, e.g. *JVGR*, focussed on Antarctic volcanism, e.g. tephrochronology, especially in ice cores, perhaps linked to a dedicated AntVolc workshop.
- Increase Antvolc presence on social media, e.g. Twitter, Facebook et?

## Budget

### Planned use of funds for 2018 to 2020

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019	Meeting organization, Organization of a web repository,	3000	John Smellie	jls55@le.ac.uk

	Travel support to early career scientist.			
2019	Meeting organization, Organization of a web repository, Travel support to early career scientist.	3000	John Smellie	jls55@le.ac.uk
<b>Total</b>		<b>6000</b>		

**Briefly describe what the funds will be used for and what the desired results are**

50 % of budget will support early career scientists and scientists during group meeting and scientific sessions from countries with small Antarctic programmes.

**Percentage of the budget to be used for support of early career researchers**

2018: 30  
2019: 30  
2020: 30

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: 20  
2019: 20  
2020: 20

## Linkages

**Direct support from outside organisations received for your activities**

*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

**IESJA- CSIC – in kind support**

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

*(Numbered list of substantive collaborations)*

**Within SCAR**

1. X

**Outside SCAR**

## 1. X - IAVCEI

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
<b>Chair</b>	John	Smellie	Leicester Univ.	UK		2017	2018
<b>Deputy Chair</b>	Adelina	Geyer	CSIC	Spain		2017	2018
<b>Former Chair</b>	Massimo	Pompilio	INGV	Italy		2017	2018
<b>Steering Committee</b>	<b>Nelia</b>	Dunbar	Mexico Tech	USA		2017	2018
<b>Steering Committee</b>	<b>Adam</b>	Martin	GSI	NZ		2017	2018
<b>Steering Committee</b>	<b>Kurt</b>	Panter	Bowling Univ.	USA		2017	2018
<b>Steering Committee</b>	<b>Don</b>	Blankeship				2017	2018
<b>Steering Committee</b>	<b>Jenn</b>	Cooper				2017	2018

*Please identify Early Career Scientists with \* in first column*

### Other members

First Name	Last Name	Affiliation	Country	Email
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*Please identify Early Career Scientists with \* in first column*

Present AntVolc membership is about 109. Includes representatives of 14

countries: Argentina, Australia, Germany, Greece, Iceland, Italy, Japan, New

Zealand, Poland, Romania, South Korea, Spain, UK, USA

### Requests to the Secretariat

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



SCAR Sub-Group

CGG

SG

GS

Person  
Responsible:

J. Jacobs

## SCAR Delegates Meeting 2018

Davos, Switzerland, June 2018

# Connecting geology and geophysics (CGG) 2016-2018 Report

### Report Author(s):

**Joachim Jacobs, Norway; Fausto Ferraccioli, UK; Andreas Läufer, Germany**

**Summary of activities from 2016-18 and any other important issues or factors**

### Field activities:

- Aerogeophysical survey in key area across the Forster Anomaly (central Dronning Maud Land) was completed in season 16/17
- Geological investigation close to key area in vicinity of Troll Station, DML
- Geological investigation in key in North Victoria Land, conducted in field season 16/17 (REGGAE project)
- Amundsen Sea Embayment investigation, Polarstern PS 104

### Meetings:

- CGG action group meeting during EGU 2017
- Contribution IGCP 628, New Gondwana Map, Gondwana 16, Bangkok 17
- REGGAE workshop at BGR, 5/18
- Keynote presentations at. Inter. Polar Conference Rostock, 3/18; Japan Geoscience Union Meeting, Tokyo, 6/17, AGU 2017
- Presentations of group members at: AGU 2017, EGU 2017 & 2018, Int. Polar Conf., German Geol. Soc., IAGA 2017 (IUGG), ESA 2017/18.

### Contribution to:

- IGCP 628: Gondwana map project, by involving specialists to review various key areas
- IGCP 648: Supercontinent cycles & global geodynamics

### Other:

Andreas Läufer (BGR) replaces Detlef Damaske (retired) as co-chair of CGG  
**Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	2000	2500	2500	2500

## Progress and Plans

### Sub-group Major Outcomes/Activities

(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)

not applicable

### Sub-group Outcomes Summary

(Summarize the above and in each case provide your sub-group name in left hand column)

Sub-group	Activity/Outcome/Benefit/Achievement

### Sub-group Cash Flow

(From previous Delegates meeting to date)

Sub-group	Allocation	Amount spent		
		2016	2017	2018
	3972		2373	

### Notable Papers

(Three most notable papers, if applicable)

- Jacobs, J., Opås, B., Elburg, M. A., Läufer, A., Estrada, S., Ksienzyk, A. K., Damaske, D., and Hofmann, M., 2017, Cryptic sub-ice geology revealed by a U-Pb zircon study of glacial till in Dronning Maud Land, East Antarctica: *Precambrian Research*, v. 294, p. 1-14.

This work indicates that the newly discovered Tonian Oceanic Arc Super Terrane (TOAST) continues farther inland and probably covers a significant area to the south of the main Dronning Maud Land mountains.
- Ruppel, A., Jacobs, J., Eagles, G., Läufer, A., and Jokat, W., 2018, New geophysical data from a key region in East Antarctica: Estimates for the spatial extent of the Tonian Oceanic Arc Super Terrane (TOAST): *Gondwana Research*, v. 59, p. 97-107.

Mapping of the eastern extent of TOAST shows that TOAST has an estimated extent of 500000 km<sup>2</sup>, close to the size of the Antarctic Peninsula.
- Jordan, T. A., Ferraccioli, and P. T. Leat 2017, New geophysical compilations link crustal block motion to Jurassic extension and strike-slip faulting in the Weddell Sea Rift System of West Antarctica, *Gondwana Res.*, 42, 29–48.

This paper presents new geophysical views of crustal extension and crustal motion within the Weddell Sea Rift. These favour a more proximal pre-rift position for the enigmatic Ellsworth-Whitmore-Haag Block with significant implications for Gondwana reconstructions.

### Forthcoming Activities

*(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)*

- AWI-BGR-NIPR survey: GEA VI: Aerogeophysical exploration over Enderby Land from Syowa Station. Importance: Extension of existing surveys in central and eastern Dronning Maud Land to the E and S, 2019/20.
- High resolution survey over Mariner Glacier North Victoria Land in combination with geological fieldwork, 2018/19.
- BELLRIFT- Proposed AWI-BAS aerogeophysical exploration to investigate both the extent and influence of the West Antarctic Rift System in the Bellingshousen Sea Embayment region.
- Development of new crustal architecture models & supercontinent plate reconstructions aided by ADMAP 2.0 magnetic data (within ESA's 3D Earth project, 2018-2020).
- FMA-geology: Key area: geological investigation in the transition zone from Kalahari into the Toninan Oceanic Super Terrane (TOAST)

### Budget

#### Planned use of funds for 2018 to 2020

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2019	ISAES 2019	2500		
2020	EGU 2020	2500		
<b>Total</b>		<b>5000</b>		

#### Briefly describe what the funds will be used for and what the desired results are

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

Young scientist participation at ISAES 2019, EGU Chair meeting

#### Percentage of the budget to be used for support of early career researchers

2018:  
2019: 80%  
2020: 80%

#### Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes

2018:

2019:  
2020:

## Linkages

**Direct support from outside organisations received for your activities**  
(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)

Norwegian Polar Institute, Norway  
Federal Institute for Geosciences and Natural Resources, Germany  
Alfred Wegener Institute, Germany  
Italian National Antarctic Program  
University of Bergen, Norway  
ESA 3D Earth (ADMAP 2.0+), PolarGAP and GOCE+Antarctica projects

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**  
(Numbered list of substantive collaborations)

### Within SCAR

1. ADMAP
2. GEOMAP
3. SERCE
4. PAIS

### Outside SCAR

1. IUGG
2. IGCP 628: Gondwana map
3. IGCP 648: Supercontinent cycles & global geodynamics

## Outreach and Capacity Building

**Outreach, communication and capacity building activities**  
(Provide a numbered list of no more than half a page)

Press releases  
Blogs  
Teaching and training  
Schools and kindergarden

### SCAR Fellowship Reviewers

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who

would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
<b>Fausto</b>	Ferraccioli	ffe@bas.ac.uk	geophysics
<b>Andreas</b>	Laeufer	Andreas.laeufer@bgr.de	geology
<b>Joachim</b>	Jacobs	Joachim.jacobs@uib.no	geology

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
	Joachim	Jacobs	Univ. Bergen	Norway		2012	
	Fausto	Ferraccioli	BAS	UK		2013	
	Andreas	Läuffer	BGR	Germany		2018	

*Please identify Early Career Scientists with \* in first column*

### Other members

First Name	Last Name	Affiliation	County	Email
<b>Alex *</b>	Burton-Johnson	BAS	UK	alerto@bas.ac.uk
<b>Antonia *</b>	Ruppel	BGR	Germany	Antonia.ruppel@bgr.de
<b>Rafael *</b>	Fragoso	Univ. Rio de Janeiro	Brasil	rafael.araujo.fragoso@gmail.com
<b>Laura</b>	Crispini	Univ. Genoa	Italy	Laura.crispini@unige.it
<b>Christine</b>	Siddoway	Colorado C	USA	csiddoway@coloradocollege.edu
<b>Jaquiline *</b>	Halpin	Univ. Tasmania	Australia	jacqueline.halpin@utas.edu.au
<b>John</b>	Goodge	Univ. of Minnesota	USA	jgoodge@d.umn.au
<b>Karsten</b>	Gohl	AWI	Germany	karsten.gohl@awi.de
<b>German</b>	Leitchenkova	VNIIO	Russia	german_I@mail.ru

*Please identify Early Career Scientists with \* in first column*

## Requests to the Secretariat

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*

Help with web page



**SCAR Sub-Group**      **Action Group on Geological Heritage and Geoconservation**  
 SG      GS

Person Responsible: Kevin Hughes

**SCAR Delegates Meeting 2018**

Davos, Switzerland, June 2018

**Action Group on Geological Heritage and Geoconservation**  
**2016-2018 Report**

**Report Author(s)**

Kevin A. Hughes (Secretary; UK) and Marcelo Reguero (Co-Chair; Argentina)

**Summary of activities from 2016-18 and any other important issues or factors**

1. Development of a draft SCAR Code of Conduct for Geological Field Research in Antarctica
2. Compilation of a list of national repositories (museums, universities, institutes, etc.) housing Antarctic geological and palaeontological specimens.
3. Investigation of methodologies used elsewhere to identify sites important for geological heritage. The Action Group has agreed to develop a version of the methodology used by IUGS & ProGeo adapted to Antarctica.
4. Resignation of Action Group Chair Chris Carson – potential replacement candidate identified
5. It is anticipated that the Action Group will provide a Working Paper on conservation of Antarctic geological heritage for submission to the Committee for Environmental Protection XXII (July 2019).

**Recommendations that EXCOM and Scientific Group Chief Officers should consider**

The Action Group will need to work with SCATS to produce the Working Paper for the Committee for Environmental Protection (CEP) in July 2019 (editorial meeting proposed for March 2019).

**Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	0	2000 (spent by Oct 2018)	2000	2000

## Progress and Plans

### Sub-group Major Outcomes/Activities

*(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)*

1. SCAR Code of Conduct (CoC) for Geological Field Research in Antarctica
  - The Action Group has been focussed on the development of a draft SCAR Code of Conduct (CoC) for Geological Field Research.
  - Antarctica contains many unique geological (i.e. petrological, stratigraphical, geochronological, geomorphological, palaeontological and meteoritic) features some of which may be vulnerable to disturbance and easily and irreversibly damaged.
  - The CoC provides recommendations on how scientists and associated personnel can undertake geological field activities while protecting Antarctic geological heritage for future generations
  - The work has involved consultation and contributions of expertise from many members from Argentina, Australia, Germany, New Zealand, Spain, UK and the US.
  - The draft CoC building on the SCAR Geological Sampling Code of Conduct (GeoReach Newsletter, SCAR GSSG Vol. 7 May, 2008).
  - The draft CoC compliments other SCAR CoCs including the Code of Conduct for Activity within Terrestrial Geothermal Environments in Antarctica (2016) and the SCAR Environmental Code of Conduct for Terrestrial Scientific Research in Antarctica (2018)
  - It is envisioned that once agreed within SCAR, the CoC would be passed to COMNAP for comments, before submission to the Committee for Environmental Protection for endorsement and then approval through Resolution by the ATCM.
2. The Action Group has also compiled a list of national repositories (museums, universities, institutes, etc.) housing Antarctic geological and palaeontological specimens. This may facilitate reuse of existing material and reduce over sampling of geological material at vulnerable sites
3. To identify Geosites important for Antarctic Geological Heritage, the Action Group has investigate existing methodologies used elsewhere. The Action Group has agreed to use a version of the methodology used by IUGS & ProGeo adapted to Antarctica.

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
-----------	--------------------------------------

**Sub-group Cash Flow**

(From previous Delegates meeting to date)

Sub-group	Allocation	Amount spent		
		2016	2017	2018
<b>Action Group on Geological Heritage and Geoconservation</b>	2000	-	0	0 (spent by Oct 2018)

**Notable Papers**

(Three most notable papers, if applicable)

1. Hughes, K. A., López-Martínez, J., Francis, J. E., Crame, J. A., Carcavilla, L., Shiraishi, K., Hokada, T., and Yamaguchi, A. (2016). Antarctic geoconservation: a review of current systems and practices. *Environmental Conservation* 43: 97-108.  
<http://dx.doi.org/10.1017/S0376892915000387>

This work provides a comprehensive overview of current Antarctic geoconservation and served as a basis for the further work of the Action Group. The paper was used by SCAR through SCATS to present an Information Paper to the 2016 CEP and ATCM meetings (IP31).

2. Carson, C.J., Atkins, C.V., Hughes, K.A., Reguero, M.A. 2018. Guest Editorial: Protecting Antarctica’s geological heritage. *Antarctic Science* 30(1):1, doi: 10.1017/S0954102017000517

**Forthcoming Activities**

(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)

- Meeting to identify criteria for selection of Geological Frameworks (October 2018).
- Development of Working Paper providing guidance to CEP and ATCM on conservation of Antarctic geoh heritage (meeting March 2019)
- Further consultation on the draft SCAR Code of Conduct on Geological Field Research in Antarctica (SG-Geosciences, SCATS, COMNAP, CEP, ATCM).
- Consultation with the SCAR Geosciences community about the establishment of procedures to identify geological and geomorphological features to be protected.

**[Geological Heritage and Geoconservation ]: 2016-2018 Annual Report, cont.**

- Initiate discussion with the SG Geosciences about the continuity of Geoheritage and Geoconservation work, possibly as a subgroup within SG-Geosciences.

## Budget

### Planned use of funds for 2018 to 2020

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	Meeting (criteria for Geosite selection)	2000	Kevin Hughes	kehu@bas.ac.uk
2019	Editorial Meeting for Working Paper to CEP	1000	Kevin Hughes	kehu@bas.ac.uk
	Early Career Researcher attendance at ISAES Korea	1000	Kevin Hughes	kehu@bas.ac.uk
2018	Meeting (criteria for Geological Framework selection)	2000 (allocated)	Kevin Hughes	kehu@bas.ac.uk
<b>Total</b>				

### Briefly describe what the funds will be used for and what the desired results are

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

With the SCAR Code of Conduct at the stage of a late draft (and largely put together by the community via e-mail) we would now like to turn our attention to the further development of the geoheritage guidelines for the CEP paper. To facilitate this, we would like to hold a meeting in October 2018 and a further smaller editorial meeting in early 2019 to finalise the guidelines for selection of Geological Frameworks and prepare the Working Paper to CEP, respectively.

### Percentage of the budget to be used for support of early career researchers

2018: 20%  
2019: 50%

2020: 50%

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: 33%

2019: 33%

2020: 33%

## Linkages

**Direct support from outside organisations received for your activities**

*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

None

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

**Within SCAR:** We have close connections with SCATS (Marcelo Reguero is SCATS Geoscience member, Kevin Hughes recently completed his second term as Deputy Chief Officer of SCATS) including through the presentation of the IP to CEP XIX.

**Outside SCAR:** Presentation of Information Paper 31 Antarctic Geoconservation: a review of current systems and practices to CEP XIX.

## Outreach and Capacity Building

**Outreach, communication and capacity building activities**

- Engagement of early career scientists (S. McLennan and T. Manograsso Czalbowski) in development of the Code of Conduct.
- Support of session at Polar 2018 on Geoconservation and Geoheritage
- Development of the Action Group page on the SCAR website.

**SCAR Fellowship Reviewers**

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

[Geological Heritage and Geoconservation ]: 2016-2018 Annual Report, cont.

First Name	Last Name	E-mail	Principal Expertise
Jeronimo	Lopez-Martinez	jeronimo.lopez@uam.es	Geological Heritage

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
<b>Chair</b>	Vacant	-	-	-	-	-	-
<b>Co-Chair</b>	Marcelo	Reguero	Instituto Antártico Argentino	Arg	regui@fcnym.unlp.edu.ar	August 2016	August 2018
<b>Secretary</b>	Kevin	Hughes	BAS	UK	kehu@bas.ac.uk	August 2016	August 2018

### Other members

First Name	Last Name	Affiliation	County	Email
<b>Tamara*</b>	Czalbowski	Instituto Antártico Argentino	Arg	tamamc2903@gmail.com
<b>Enrique*</b>	Diaz	Geological Survey of Spain	Spain	e.diaz@igme.es
<b>Stephanie*</b>	McLennan	Geoscience Australia	Aus	Stephanie.McLennan@ga.gov.au
<b>Anne</b>	Grunow	Polar Rock Repository	US	grunow.1@osu.edu
<b>Berry</b>	Lyons	Ohio State University	US	lyons.142@osu.edu
<b>Carlo</b>	Baroni	Università di Pisa	Italy	carlo.baroni@unipi.it
<b>Cliff</b>	Atkins	University of Wellington	NZ	cliff.atkins@vuw.ac.nz
<b>Jerónimo</b>	López-Martínez	Universidad Autónoma de Madrid	Spain	jeronimo.lopez@uam.es
<b>John</b>	Smellie	University of Leicester	UK	jls55@le.ac.uk
<b>Andreas</b>	Laufer	German Federal Institute for Geosciences and Natural Resources	Ger	Andreas.Laeufer@bgr.de
<b>Luis</b>	Carcavilla	Geological Survey of Spain	Spain	l.carcavilla@igme.es
<b>Marco</b>	Taviani	Italian National Research Council	Italy	marco.taviana@bo.ismar.cnr.it

[Geological Heritage and Geoconservation ]: 2016-2018 Annual Report,  
cont.

Phil	O'Brien	Macquarie University	Aust	phil.obrien.ant@gmail.com
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*Please identify Early Career Scientists with \* in first column*

### Requests to the Secretariat

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



**SCAR Sub-Group**

**GeoMAP**

SG

GS

Person  
Responsible:

Simon Cox

## **SCAR Delegates Meeting 2018**

**Davos, Switzerland, June 2018**

# **GeoMap** **2016-2018 Report**

**Report Author(s):** Dr Simon Cox, GNS Science, New Zealand

### **Summary of activities from 2016-18 and any other important issues or factors**

GeoMAP action group is collaboratively building a modern geological dataset to classify and describe the bedrock and surficial geology of Antarctica. It will depict 'known geology' of rock exposures rather than 'interpreted' sub-ice features, and is aimed towards continent-wide perspectives and cross-discipline interrogation. There has been substantial progress during 2016-2018 such that digital capture of Antarctica is 80%. At present data is held in 8 separate datasets: Transantarctic Mountains, Marie Byrd Land, Peninsula, Ellsworth, Pensacola, Dronning Maud Land, Prince MacRobertson Land, and Wilkes Land. SCAR funding has enabled use of students, resulting in our major steps forward, in turn providing training for early career scientists. About 85% of all the Antarctic rock outcrops now have some form of geological representation assigned to them suitable for use at 1:250,000 (or more-regional) scale (cf. 40% reported in 2016). Our second meeting was held at the SCAR 2016 conference and informal meetings completed by skype. We aim to have the first version of datasets ready for in early 2019, but acknowledge this is still a very ambitious target.

### **Recommendations that EXCOM and Scientific Group Chief Officers should consider**

Please note significant progress towards a wonderful new dataset. No major approvals needed (apart from confirmation of ongoing budget). We seek input and guidance on how to release the data: should it be a SCAR product, can it be from the SCAR website, do special procedures need to be followed and approvals necessary.

### **Summary Budget 2017 to 2020**

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	\$1990	\$4000	\$5500	

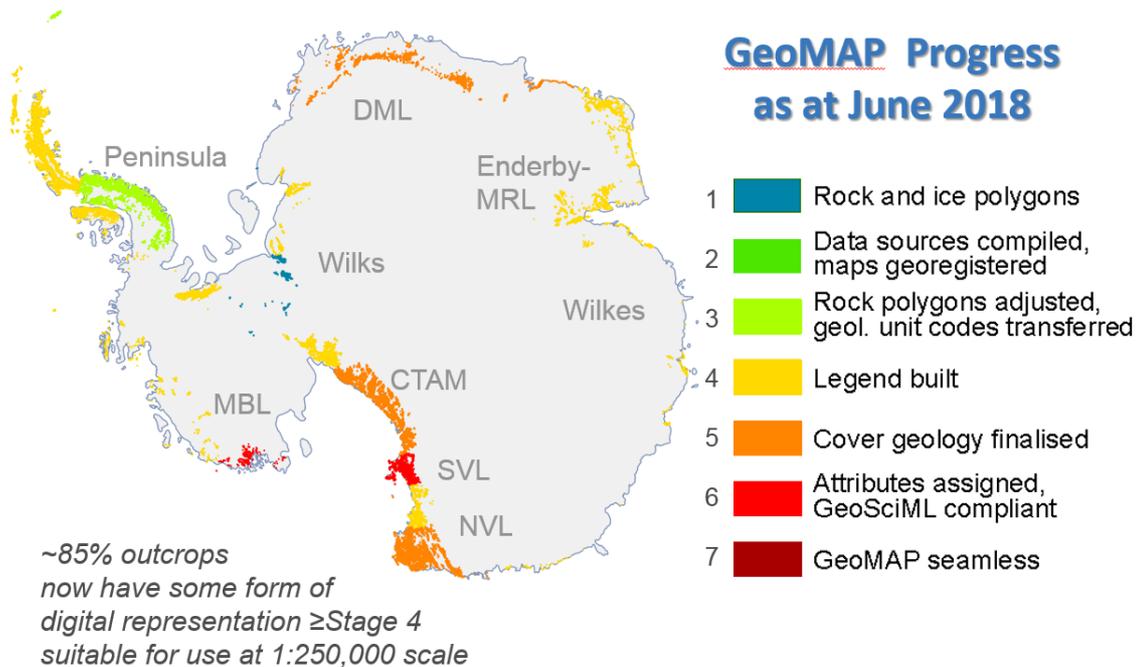
## Progress and Plans

### Sub-group Major Outcomes/Activities

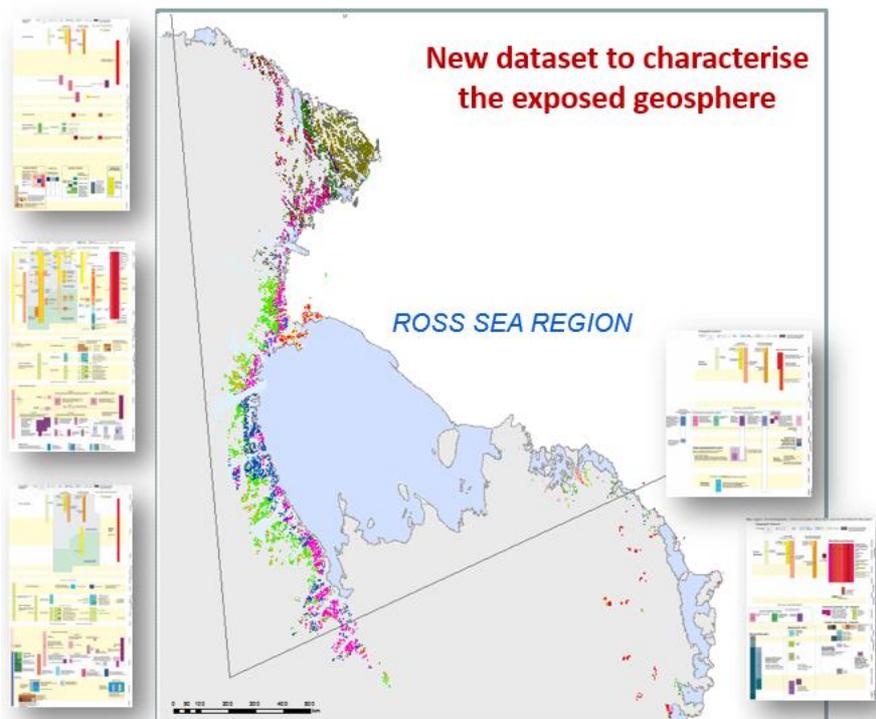
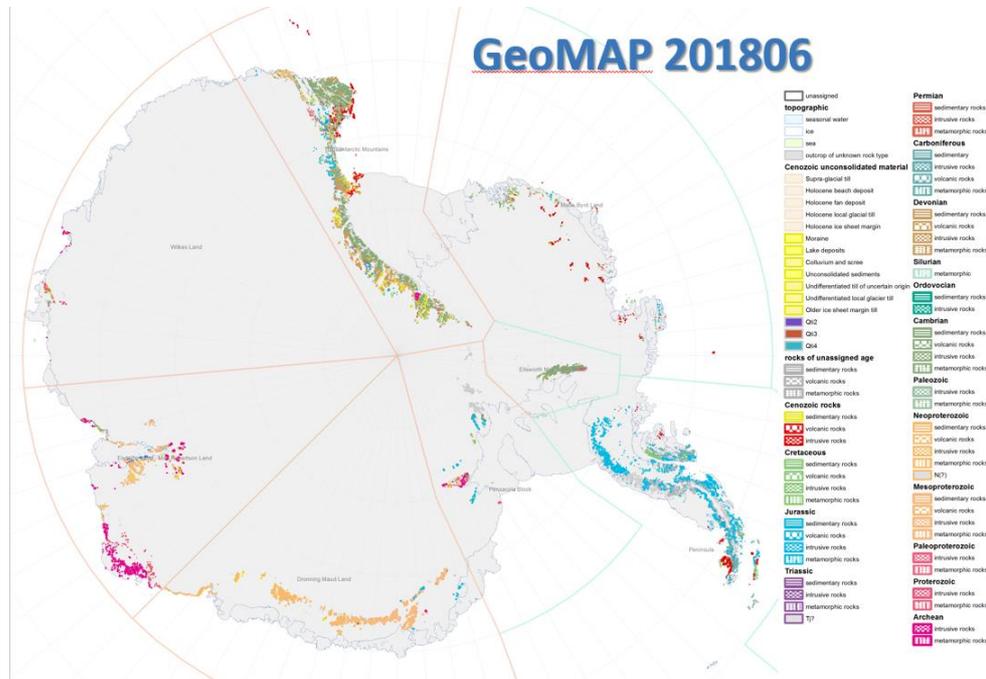
*(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)*

GeoMAP's challenge is to collaboratively build a modern geological dataset that classifies and describes the bedrock and surficial geology of Antarctica's rock exposures – in practice this means classifying and describing around 80,000 distinct polygons that cover 51,000 km<sup>2</sup>. We aim to use the international GeoSciML data format standard to turn available hard-copy maps into an easily accessible dataset that describes the exposed geosphere. **63,300 polygons have now been classified.**

Significant work has been done to build a harmonised legend, and trialling ways to develop it in ArcGIS so that it can be queried in the same way as the GIS map. A map showing our progress is provided below, colour-coded according to a 7 stage approach adopted:



The new dataset is still a little premature to become a public product, requiring some harmonization between the different areas and their legends, but is already being sought and used for field planning and environmental domains analysis. An overview of some of the mapping is provided below.



### Sub-group Outcomes Summary

(Summarize the above and in each case provide your sub-group name in left hand column)

Sub-group	Activity/Outcome/Benefit/Achievement
GeoMAP	8 datasets variably complete wrt a 7 stage process
GeoMAP	Scheme developed for harmonised legend
GeoMAP	Attributes translated into GeoSciML

### Sub-group Cash Flow

(From previous Delegates meeting to date)

Sub-group	Allocation	Amount spent		
		2016	2017	2018
GeoMAP	\$8000		\$1,990	

### Notable Papers

(Three most notable papers, if applicable)

GeoMAP is focussed on producing a dataset, rather than papers, at this stage.

### Forthcoming Activities

(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)

July-Sep 2018	Complete capture of Peninsula geology. Finalise north Victoria Land glacial geology. Improve definition of Ferrar-Beacon rocks in cTAM.
Sep-Dec 2018	Hold workshop GeoMAP (probably prior to AGU conference).
Jan-Mar 2019	Possible first version release of the beta-version of datasets for peer review and discussion.
Mar-Jun 2019	Finalise legends and data into GeoSciML. Organise online peer review system. Call for reviews.
2019	Review workshop at XIII ISAES in South Korea
2020	GeoMAP coming to a close (or at least Phase 1)

## Budget

### Planned use of funds for 2018 to 2020

GeoMAP Action Group: 2016-2018 Annual Report, cont.

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
<b>2020</b>	GeoMAP windup			
<b>2019</b>	Workshop of Action Group to review and harmonise data	\$500	Simon Cox	s.cox@gns.cri.nz
<b>2019</b>	Travel to workshop	\$3000	Simon Cox	s.cox@gns.cri.nz
<b>2019</b>	Student travel & support	\$2000	Laura Crispini	crispini@dipteris.unige.it
<b>2018</b>	Workshop to finalise datasets	\$3000	B. Smith-Lytle	b.smith.lytle@gns.cri.nz
<b>2018</b>	Student travel & support	\$2000	Simon Cox	s.cox@gns.cri.nz
<b>Total</b>		<b>\$10,500</b>		

**Briefly describe what the funds will be used for and what the desired results are**

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

No costs will be claimed for travel to Davos. Instead we plan other activities, all of which aid in development of the GeoMAP digital data.

**Student travel & support:** GeoMAP relies mostly on the enthusiasm of members and co-funding, rather than direct funding from SCAR. We were extremely grateful access to leftover funding at the end 2016, which enabled us to fund student travel and employ some labour, and resulted in a large step forward in data captured. We wish to use a similar work strategy during the austral summer 2018-19 to focus on data capture from Antarctic Peninsula, most probably with student(s) from New Zealand, UK or Italy. \$2000 allocated for 2018 will be spent directly for capability development and training of students in GeoSciML, using their labour to help collate datasets for the project. GNS Science have recently been granted 4-star accreditation for their digital geological map web services (on OneGeology), and provide supervision, host visit and/or work virtually on datasets.

**Workshops:** In 2018 we aim to hold a workshop to harmonize geological legends and a seamless continent-wide dataset. This will be held prior to AGU to save on travel costs. This requires individual experts with experience, so only ~40% of requested 2018 budget would be allocated to early career scientists. A similar workshop will be held in 2019, prior to the ISAES conference in Korea.

**Percentage of the budget to be used for support of early career researchers**

2018: 40%

2019: 36%

2020: 0%

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: 0%?

2019: 0%?

2020: 0%?

At this stage there is no specific plan for involvement of countries with small or developing Antarctic programmes, but GeoMAP welcomes anyone who would like to contribute voluntary labour!

## Linkages

**Direct support from outside organisations received for your activities**

*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

1. GeoMAP relies almost entirely on co-funding and voluntary efforts. We estimate the co-funding to total ~US\$150,000 per annum:
2. GeoMAP is largely led by GNS Science. New Zealand's contribution is based on US\$70k from Direct Core Funding, US \$20k from a Ross Sea Region (RSR) Terrestrial Data Analysis project (Landcare MBIE CO9X1413) and about US\$10k from NZ Antarctic Research Institute grants. Marie Byrd Land work completed by Colorado College was supported by two Witter Internships (~US\$10k).
3. At the time of writing we do not have detailed information on the funding utilized by Gianni Capponi (Italy), John Goodge and David Elliot (USA), Alex Burton-Johnston (UK), or Jacqueline Halpin (Australia). Paul Morin and the Polar Geospatial Centre are doing all sorts of other work in support of GeoMAP, providing datasets that we utilize.

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

*(Numbered list of substantive collaborations)*

**Within SCAR**

1. CGG
2. GeoHeritage – we hope to support

### Outside SCAR

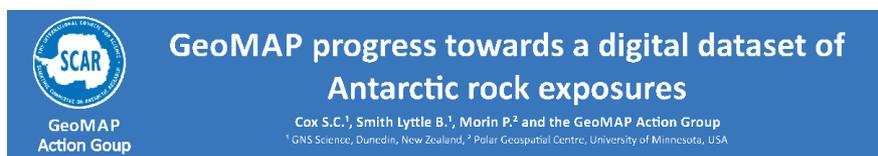
1. New Zealand Significant Database Core Funding (GNS Science)

## Outreach and Capacity Building

### Outreach, communication and capacity building activities

*(Provide a numbered list of no more than half a page)*

1. Communication has generally been by way of group email (~half-yearly) and small skype meetings. **Our mailing list has over 60 recipients representing 15 different nations.** We have held meetings once a year at conferences. GeoMAP was profiled in the SCAR March 2017 Newsletter and our pages on the SCAR website a reasonably up to date.
2. A series of presentations and posters were delivered at the SCAR 2016 conference, 2016 AGU Fall meeting, the 2017 GSA and NZ Antarctic conferences, and 2018 TACTical conference. We have been using the same banner and logo for all posters and presentations, deliberately placing them together.



3. Eight students from USA, NZ, Australia and UK have now worked on the GeoMAP project and been trained in GIS and GeoSciML. They have presented their mapping at conferences and published abstracts and posters.

### SCAR Fellowship Reviewers

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

GeoMAP Action Group: 2016-2018 Annual Report, cont.

First Name	Last Name	E-mail	Principal Expertise
Simon	Cox	s.cox@gns.cri.nz	Geology; Transantarctic Mountains; Geomorphology; GIS

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chair	Simon	Cox	GNS Science	NZ	s.cox@gns.cri.nz	2015	2020
Chair	Paul	Morin	PGC	USA	lpaul@umn.edu	2015	2018
Deputy Chair	Christine	Siddoway	Colorado College	USA	CSiddoway@ColoradoCollege.edu	2018	2020

Please identify Early Career Scientists with \* in first column

### Other members

First Name	Last Name	Affiliation	Country	Email
Laura	Crispini	University of Genova	Italy	crispini@dipteris.unige.it
Gianni	Capponi	University of Genova	Italy	capponi@dipteris.unige.it
*Burton-Johnson	Alex	British Antarctic Survey	UK	alerto@bas.ac.uk
Elliot	David	Ohio State University	USA	elliot.1@osu.edu
Synnøve	Elvevold	Norwegian Polar Institute	Norway	elvevold@npolar.no
*Tamer	Abu-Alam	Norwegian Polar Institute	Norway	Tamer.Abu-Alam@npolar.no
*Adam	Martin	GNS Science	NZ	a.martin@gns.cri.nz
Jacqueline	Halpin	University Tasmania	Australia	jahalpin@utas.edu.au

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*Please identify Early Career Scientists with \* in first column*

\*Note that since GeoMAP held its first formal meeting at the ISAES XII conference Goa there have been many people involved. The mailing list has ~60 people, representing 15 different nations. The people listed above are a selection of those who have been more extensively involved in the first phases of work.

### **Requests to the Secretariat**

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*

GeoMAP need to decide how to deliver their final datasets and set a system for review. It is not clear to the group whether these can sit on the SCAR website, and if they will be SCAR products. It would be highly desirable to develop some form of online comment/peer review system that would be hosted on the GeoMAP page on the website. Some assistance with web development may be needed. It would also be good to update our webpages with posters and presentations from conferences.



SCAR Sub-Group

EG GIANT

SG

GS

Person Responsible:

Mirko Scheinert

## SCAR Delegates Meeting 2018

Davos, Switzerland, June 2018

# SCAR Expert Group “Geodetic Infrastructure in Antarctica” (GIANT) 2016-2018 Report

### Report Author(s)

Mirko Scheinert, Germany ([mirko.scheinert@tu-dresden.de](mailto:mirko.scheinert@tu-dresden.de))

### Summary of activities from 2016-18 and any other important issues

Geodetic GNSS measurements on bedrock are indispensable to determine vertical and horizontal deformations of the Earth's crust in order to provide in-situ information for the study of glacial-isostatic adjustment (GIA) and plate tectonics. During last Antarctic seasons GNSS measurements were continued. New data – especially episodic GNSS data – are incorporated into the “SCAR GNSS Database” maintained at TU Dresden.

The new “Geodynamics In ANTarctica based on REprocessing GNSS dAta Initiative” (GIANT-REGAIN) launched in 2016 is in progress to realize a major reprocessing of Antarctic GNSS data to infer a consistent set of coordinates and coordinate changes for further investigation (especially GIA).

The “International Workshop Airborne Geodesy and Geophysics with Focus on Polar Applications“ was held in Dresden, Germany, 19–21 April 2017, supported by SCAR. The “2<sup>nd</sup> SCAR Summer School on Polar Geodesy” was carried out in Ladozhskoe Ozero, Russia, 10–19 May 2018.

### Recommendations that EXCOM and Scientific Group Chief Officers should consider

Considering that the “SCAR’s Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica” was approved at the 41<sup>st</sup> ATCM / 21<sup>st</sup> CEP Meeting in Buenos Aires, 13–18 May 2018, with the modification to the recommendation long-term installations be retained if “**identified as useful for longer-term monitoring and/or research**”, it is recommended that the SCAR Delegates Meeting endorses a resolution that

- a) all national programs retain their geodetic monuments\*, and
- b) provide data on these monuments to the SCAR Expert Group “Geodetic Infrastructure in Antarctica” for archiving in a long-term database.

*\*A geodetic monument is a marker permanently fixed to bedrock which allows exact placement of geodetic GNSS antennas and other geodetic sensors to repeat precise measurements.*

***We seek approval of the SCAR Delegates Meeting.***

### Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	0	3,972	4,000	4,000

## Progress and Plans

### Sub-group Major Outcomes/Activities

The “**International Workshop Airborne Geodesy and Geophysics with Focus on Polar Applications**“ was held in Dresden, Germany, 19-21 April 2017. This workshop was the third in a series of thematic workshops on airborne techniques in polar geosciences, and was supported by SCAR, the German Research Foundation (DFG), the International Association of Geodesy (IAG), and German Society of Polar Research (DGP). 40 participants from six countries (Germany, United Kingdom, USA, China, Norway, Denmark) took part in six oral sessions and one poster session as well as a concluding panel discussion. Additionally, a technology display was organized. Airborne platforms offer the most amenable and powerful means of surveying the polar areas. They are adaptable to meet a diversity of scientific demands, bridging the gaps between a wide range of sparse ground-based point observations and satellite measurements. The huge variety of airborne platforms available today also offers the prospect to conduct surveys with a variety of survey resolutions and extents. Thus, the workshop was quite timely in order to focus on recent developments both in enhancing our knowledge on a variety of geoscientific phenomena in Antarctica as well as in technology. A brief workshop report was published by Scheinert, M., G. Eagles, and K. Tinto (2017): Airborne platforms help answer questions in polar geosciences, EOS, 98, doi: 10.1029/2017EO082521, 29 Sept. 2017.

The “**2<sup>nd</sup> SCAR Summer School on Polar Geodesy**” was held in Ladozhskoe Ozero, Russia, 10–19 May 2018, to teach the young generation and provide expertise on a variety of geoscientific subjects in the polar regions. It was supported by SCAR SRP SERCE and EG GIANT, the German Society of Polar Research (DGP), the Arctic and Antarctic Research Institute (AARI) and AO Aerogeodesya, both St. Petersburg, Russia. 12 students from 7 countries attended the summer school (Argentina, Denmark, Germany, India, Italy, Poland, Russia). We had 7 lecturers from Germany, Russia & USA (M. Horwath, M. Scheinert (TU Dresden), A. Ekaykin (AARI, St. Petersburg), E. Ivins (JPL/Caltech, Pasadena), E. Brovko (Aerogeodesya, St. Petersburg), Martin Melles (University of Cologne), Sergey Popov (PMGE/ St. Petersburg State University)). The school comprised about 65 hours of lectures, practical exercises and students work as well as one full-day scientific excursion to Pulkovo Observatory and Kronstadt (reference tide gauge). The topics covered a variety of geoscientific questions related to polar research, among others on the application of geodetic GNSS methods, satellite altimetry and gravimetry, glacial-isostatic adjustment, and glacial, climate and sea-level history. Within an exercise “Designing a new research project” the students were trained to identify topical questions and develop a research project in a highly multidisciplinary way.

Major efforts were dedicated to the project **GIANT-REGAIN (Geodynamics In ANTarctica based on REprocessing GNSS dAta Initiative)** which was initiated at the SCAR Meeting in Kuala Lumpur in 2016. The aim is to realize a reprocessing of all GNSS data available in Antarctica to come up with best estimates

of station coordinates and velocities to infer plate motion, vertical uplift (dedicated to glacial-isostatic adjustment) and further geodynamic parameters. By now, a lot of work was fulfilled with regard to the retrieval and compilation of data and metadata. By mid-2018 the list of stations (about 260) will be finalized. The re-processing of the entire dataset will be performed at three processing centres (TU Dresden, Germany; University of Tasmania, Hobart, Australia; and Ohio State University, Columbus, USA).

### Sub-group Outcomes Summary

Sub-group	Activity/Outcome/Benefit/Achievement
EG GIANT	International Workshop „Airborne Geodesy and Geophysics with Focus on Polar Applications“ Dresden, Germany, 19-21 April 2017
EG GIANT	“2 <sup>nd</sup> SCAR Summer School on Polar Geodesy”, Ladozhskoe Ozero, Russia, 10–19 May 2018
EG GIANT	<b>GIANT-REGAIN (Geodynamics In ANTarctica based on RE-processing GNSS dAta Initiative)</b> – ongoing major effort to realize a reprocessing of all available Antarctic GNSS data to provide best estimates of station coordinates and velocities to infer plate motion and vertical uplift (due to glacial-isostatic adjustment)

### Sub-group Cash Flow

Sub-group	Allocation	Amount spent		
		2016	2017	2018
EG-GIANT	3,972		0	3,972

### Notable Papers

1. Scheinert, M., Ferraccioli, F., Schwabe, J., Bell, R., Studinger, M., Damaske, D., Jokat, W., Aleshkova, N., Jordan, T., Leitchenkov, G., Blankenship, D. D., Damiani, T. M., Young, D., Cochran, J. R., Richter, T. D. (2016): New Antarctic Gravity Anomaly Grid for Enhanced Geodetic and Geophysical Studies in Antarctica. *Geophysical Research Letters*, 1944-8007, doi: 10.1002/2015GL067439  
Datasets are published at <https://doi.org/10.1594/PANGAEA.848168>.

This paper presents a major data product, namely a gridded dataset of terrestrial gravity anomalies in Antarctica, for further application in geodesy (global Earth gravity models and regional geoid of Antarctica) and geophysics (investigation of Earth structure and tectonic processes). EG GIANT was key for international cooperation to acquire and compile ground-based and airborne gravimetry data. The dataset is also included in the new release 3 of the SCAR product Quantarctica.

2. King, M.A., P.L. Whitehouse and W. van der Wal (2016): Incomplete separability of Antarctic plate rotation from glacial isostatic adjustment deformation within geodetic observations. *Geophysical Journal International*, 204(1): 324-330, doi:10.1093/gji/ggv461.

Geodetic GNSS measurements allow to infer the deformation of the solid Earth which includes plate rotation and glacial-isostatic adjustment. This paper investigated to which degree these signals can be separated within horizontal GNSS velocities. The authors showed that “in the absence of reliable forward models of plate rotation or GIA then Antarctic geodetic velocities cannot totally and unambiguously constrain either process, especially GIA”, which emphasizes the urgent need of both acquiring further precise GNSS data at bedrock sites in Antarctica and taking efforts to better understanding and modelling especially GIA.

3. Schröder, L., A. Richter, D. V. Fedorov, L. Eberlein, E. V. Brovko, S. V. Popov, C. Knöfel, M. Horwath, R. Dietrich, A. Y. Matveev, M. Scheinert, and V. V. Lukin (2017): Validation of satellite altimetry by kinematic GNSS in central East Antarctica, *The Cryosphere*, 11, 1111-1130, doi: 10.5194/tc-11-1111-2017

The authors used kinematic GNSS measurements along traverse routes from the Russian Vostok Station to the East Antarctic coast. They showed that these measurements acquired between 2001 and 2015 allow to infer the ice-surface height with an accuracy between 4 and 9 cm and, thus, provide valuable in-situ data for a validation of datasets of ice-surface heights inferred from different satellite altimetry missions as well as given by various digital elevation models. Especially the joint cross-over adjustment of the kinematic GNSS with ICESat data gave independent evidence for the stability of the ice surface above Lake Vostok and, thus, proves the importance of Lake Vostok as a validation region especially for satellite laser altimetry.

### Forthcoming Activities

1. The project GIANT-REGAIN (**G**eodynamics **I**n **ANT**arctica based on **RE**processing **GNSS d**ata **I**nitiative) enters the next phase when finalizing the set of Antarctic GNSS bedrock sites by mid-2018. The re-processing of the entire dataset will be performed at three processing centres (TU Dresden, University of Tasmania, and Ohio State University). The aim is to provide a best estimated, consistent set of station coordinates and velocities at these bedrock sites for further investigation of Antarctic geodynamics and neotectonics. There is an urgent need both to enhance the provision of in-situ data as well as to improve the consistency of geodetic data products. Station velocities are to be used as constraints for the investigation of glacial-isostatic adjustment which is a key to understand interactions between ice sheet, solid earth and sea level. Thus, it is also indispensable to continue and even densify measurements at geodetic GNSS sites in Antarctica.
2. We aim to improve the visibility of GIANT to other SCAR entities and both geoscientific and non-geoscientific disciplines. It is timely to disseminate information on the importance and value of geodetic measurements. Geodesy

provides key data to maintain the terrestrial reference frame in Antarctica and to determine the regional gravity field at high resolution. Especially GNSS observation at bedrock sites provide in-situ data for further investigations in geodynamics but also reference to link local or regional surveys to a proper reference frame solution. Thus, EG GIANT through its observational projects is a key Antarctic geosciences are based on. Therefore, we will further develop web services and long-term archiving facilities. This includes to compile metadata and assist to fulfil requirements evolving from recommendations (e.g. on geodetic monuments, see above) and from the SCAR scientific research program SERCE. We will further improve linkages with GIS developments and information platforms like Quantarctica and SOOS.

3. We aim to involving early career scientists to take over responsibilities, and to supporting them in realizing (short) research stays and taking part in conferences with GIANT-related sessions. The latter is an ongoing major goal to foster scientific exchange and discussion. For this, in close coordination with SRP SERCE, we will organize special session(s) at upcoming conferences. Focus shall be given on the scientific applications of geodetic measurements in geodesy, geodynamics and glaciology. In that respect, a dedicated conference is the International Symposium on Antarctic Earth Sciences ISAES XIII to be held in South Korea in 2019. EGU (2019 or 2020) and AGU 2019 provide further venues of broad multidisciplinary scientific exchange.

Due to the described major activities (cf. especially 1 and 2) and Terms of Reference it is needed to continue geodetic observations for all kind of applications (maintenance of reference frame; investigation of changing dynamics of the Antarctic ice sheet, especially the study of glacial-isostatic adjustment; in-situ data for validation of satellite missions and products especially w.r.t. CryoSat-2, ICESat-2 and GRACE-FO). In terms of the changing ice sheet and linked sea-level change there is also a strong monitoring aspect.

**Therefore, the Expert Group GIANT is to be continued.**

## Budget

### Planned use of funds for 2018 to 2020

Year	Purpose/Activity	Amount (USD)	Contact Name	Contact Email
2020	Financial support for scientific student assistant: Development of web and GIS-related services and applications for SCAR GNSS Database	2,000	Mirko Scheinert	Mirko.Scheinert@tu-dresden.de
2020	Travel Support for early career scientists to realize	2,000	Alessandro Capra, Mirko Scheinert, Matt King	Alessandro.Capra@unimore.it

	research stay and/or attend GIANT-related conferences			
<b>2019</b>	Financial support for scientific student assistant: Development of web and GIS-related services and applications for SCAR GNSS Database	2,000	Mirko Scheinert	Mirko.Scheinert@tu-dresden.de
<b>2019</b>	Travel Support for early career scientists to realize research stay and/or attend GIANT-related conferences	2,000	Alessandro Capra, Mirko Scheinert, Matt King	Alessandro.Capra@unimore.it
<b>2018</b>	Financial support for scientific student assistant: Development of web and GIS-related services and applications for SCAR GNSS Database	2,000	Mirko Scheinert	Mirko.Scheinert@tu-dresden.de
	Travel support for early career scientist for Polar2018	1,972	Mirko Scheinert	Mirko.Scheinert@tu-dresden.de
<b>Total</b>		<b>11,972</b>		

**Briefly describe what the funds will be used for and what the desired results are**

*Financial support for scientific student assistant: Development of web and GIS-related services and applications for SCAR GNSS Database*

These funds are related to activities 1 and 2 (see above). Scientific student assistant (bachelor degree) shall work on the development of web services and incorporation of GIS functionalities utilizing latest software technologies. The goal is to come up with a user-friendly, interactive web-based interface to the SCAR GNSS Database and archives. This funding shall be committed to the period 2018 to 2020.

*Travel Support for early career scientists to realize research stay and/or attend GIANT-related conferences*

These funds are related to activities 1 and 3 (see above). We aim to especially supporting early career scientists to take part in conferences to contribute to special sessions initiated by GIANT and SERCE and/or to realize a research stay at one of the processing centers of GIANT-REGAIN to further develop their expertise in geodetic data processing and analyses. In 2018 we will support the attendance of early career scientist at Polar2018 SCAR Meeting and OSC.

**Percentage of the budget to be used for support of early career researchers**

2018: 50%  
 2019: 50%  
 2020: 50%

## **Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: ??  
2019: 50%  
2020: 50%

## **Linkages**

### **Direct support from outside organisations received for your activities**

1. German Research Foundation (DFG) supported the “International Workshop on Airborne Geodesy and Geophysics with Focus on Polar Applications“, Dresden, Germany, 19-21 April 2017, by granting funds of 5,000 €
2. German Society of Polar Research (DGP) supported “2<sup>nd</sup> SCAR Summer School on Polar Geodesy“, Ladozhskoe Ozero, Russia, 10–19 May 2018, by granting funds of 2,000 €

### **Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

#### **Within SCAR**

1. Scientific Research Program SERCE
2. Scientific Research Program PAIS
3. Expert Group ADMAP
4. Expert Group GRAPE
5. SCAR Product Quantarctica
6. Standing Committee on Antarctic Geographic Information (SCAGI)
7. Standing Committee on Antarctic Data Management (SCADM)

#### **Outside SCAR**

1. International Association of Geodesy (IAG) Subcommission 1.3f: Regional reference frame in Antarctica
2. IAG Subcommission 2.4: Gravity and Geoid in Antarctica

## **Outreach and Capacity Building**

### **Outreach, communication and capacity building activities**

1. Communication is being maintained through the SCAR GIANT website as well as through a GIANT mailing list that is open to all interested scientists.
2. There is a strong component for capacity building in supporting (master and PhD) students as well as PostDocs to participate in dedicated conferences as well as in exchange at expert institutions (activities 1 and 3, see above).

- Also, we support capacity building when acting as a host for SCAR / COM-NAP Fellowships.

### SCAR Fellowship Reviewers

First Name	Last Name	E-mail	Principal Expertise
Matt	King	Matt.King@utas.edu.au	Geodesy, GNSS, GIA
Mirko	Scheinert	Mirko.Scheinert@tu-dresden.de	Geodesy, GNSS
René	Forsberg	rf@space.dtu.dk	Geodesy, gravity field

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chair	Alessandro	Capra	Università di Modena e Reggio Emilia	Italy	Alessandro.Capra@unimore.it	2014	
Co-Chair	Mirko	Scheinert	TU Dresden	Germany	Mirko.Scheinert@tu-dresden.de	2014	

### Other members

Please identify Early Career Scientists with \* in first column

First name	Last name	Affiliation	Country	Email
<b>Manuel</b>	Berrocso	Universidad de Cadiz	Spain	manuel.berrocso@uca.es
<b>Graeme</b>	Blick	LINZ	New Zealand	gblick@linz.govt.nz
<b>Jan</b>	Cisak	IGIK	Poland	jcisak@igik.edu.pl
<b>Beata</b>	Csatho	University of Buffalo	USA	bcsatho@buffalo.edu
<b>John</b>	Dawson	Geoscience Australia	Australia	john.dawson@ga.gov.au
<b>Koishiro</b>	Doi	National Institute of Polar Research	Japan	doi@nipr.ac.jp
<b>Rene</b>	Forsberg	DTU Space	Denmark	rf@space.dtu.dk
<b>Brendan</b>	Hodge	UNAVCO	USA	hodge@unavco.org
<b>Larry</b>	Hothem	USGS	USA	ldhothem@gmail.com

<b>Asparuh</b>	Kamburov	University of Mining and Geology Sofia	Bulgaria	asparuh.kamburov@mgu.bg
<b>Matt</b>	King	University of Tasmania	Australia	Matt.King@utas.edu.au
<b>*Christoph</b>	Knöfel	TU Dresden	Germany	Christoph.Knoefel@tu-dresden.de
<b>Jeronimo</b>	Lopez	Universidad Autonoma de Madrid	Spain	jeronimo.lopez@uam.es
<b>Jaakko</b>	Mäkinen	Finnish Geodetic Institute	Finland	jaakko.makinen@fgi.fi
<b>Alexey</b>	Matveev	Aerogeodeziya	Russia	matveev@agspb.ru
<b>Gennadi</b>	Milinevsky	University of Kyiv	Ukraine	gennadim@gmail.com
<b>Markku</b>	Poutanen	Finnish Geodetic Institute	Finland	Markku.Poutanen@fgi.fi
<b>Goncalo</b>	Prates	Univ. Algarve	Portugal	gprates@ualg.pt
<b>Yves</b>	Rogister	Univ. Strasbourg	France	Yves.Rogister@unistra.fr
<b>Lars</b>	Sjöberg	KTH Royal Institute of Technology	Sweden	lars.sjoberg@abe.kth.se
<b>Norbertino</b>	Suarez	Servicio Geografico Militar	Uruguay	norbertinosuarez@gmail.com
<b>Andrés</b>	Zakrajsek	Instituto Antartico Argentina	Argentina	afz@dna.gov.ar

### Requests to the Secretariat

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



SCAR Sub-Group

xxx

SG

PS/LS/GS

Person

xxx

Responsible:



## SCAR Delegates Meeting 2018

Davos, Switzerland, June 2018

# SCAR EG "GRAPE" GNSS RESEARCH AND APPLICATION TO POLAR ENVIRONMENT 2016-2018 Report

### Report Author(s):

Giorgiana De Franceschi (Italy), Nicolas Bergeot (Belgium)

### Summary of activities from 2016-18 and any other important issues or factors

**GRAPE** is a **joint Physical Sciences and Geosciences Group** aiming to intensify the international efforts to build and coordinate a robust network of collaborations in order to answer a variety of weather and space weather related needs at high latitudes and polar regions (Arctic and Antarctica), through ad hoc data sharing and models development. The main outcome from the activities carried out relies on the increasing interest and participation of the international community and early career scientists to the scientific and business sessions focused on GRAPE topics organized within: 1) the International **Beacon Satellite Symposium 2016** (26 June-1 July, Trieste, IT), 2) the **SCAR OSC 2016** (22-26 August, Kuala Lumpur), 3) the **URSI GASS 2017** (19-26 August, Montreal, CA), 4) the **IAGA 2017** (27 August- 1 September, Cape Town, SA) GRAPE mini symposium, 5) the **GRAPE workshop at ROB** (4 December 2017, Brussels, BE) and finally the forthcoming **POLAR2018** (15-23 June 2018, Davos, Switzerland).

### Recommendations that EXCOM and Scientific Group Chief Officers should consider

*(Please indicate if approval is necessary or if they are just asked to note information).*

**Please note** GRAPE is coordinating/leading efforts addressed to the new SRP proposal RESOURCE (Radio Sciences Research on AntarctiC AtmospherE), that is hopefully expected to be approved and to start in 2020. In case of RESOURCE success, GRAPE will be then disbanded in 2020 because will be included in this more ambitious SRP.

### Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	1986	2162	2000	2000

## Progress and Plans

- **The observing infrastructures** (mainly based on GNSS receivers able to monitor ionospheric TEC and scintillations), managed and upgraded by National Projects, is growing above all over Antarctica however not yet filling the existing gap between the Northern and Southern Hemispheres. **New solutions for data exchange and management** addressed to Weather and Space Weather products development assisting communications, navigation and positioning have been tested with success.
- A new SRP proposal “**RESOURCE**” (Radio Sciences Research on AntarctiC AtmospherE) has been submitted to SCAR in May 2017 aiming to improve the current monitoring and knowledge of the Antarctic atmosphere in relation to the Arctic environment in a bipolar framework, achieved using radio sensors and supported by complementary instrumentation. In this frame, the establishment of a closer link between neutral/ionized atmosphere and **Synthetic Aperture Radar** communities in respect to the past is also in progress.
- The 2018 school "**Polar Upper Atmosphere: from Science to Operational Issues**", will be held at the International School of Space Science in L'Aquila, Italy on 17-21 September 2018 ([http://www.cifs-iss.org/application\\_september.asp](http://www.cifs-iss.org/application_september.asp)). The event is kindly highlighted on SCAR web

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
<b>GRAPE</b>	Infrastructures (observing systems and ICT) / new tools in progress to contribute to Weather and Space Weather / better coverage of Antarctica/ satisfactory.
<b>GRAPE</b>	Preparation of a new SRP proposal/ submitted/involvement of a larger community on Radio Science at polar regions/in progress
<b>GRAPE</b>	School organization/appreciated by international bodies (e.g. EGU)/training of students on polar atmosphere and preparation of proposals/hopefully very good

### Sub-group Cash Flow

(From previous Delegates meeting to date)

Sub-group	Allocation	Amount spent		
		2016	2017	2018
GRAPE	4148 (2017-2018)		1986	2162

### Notable Papers

(Three most notable papers, if applicable)

- Alfonsi, L., Cilliers, P. J., Romano, V., Hunstad, I., Correia, E., Linty, N., ... & Riley, P. (2016). First observations of GNSS ionospheric scintillations from DemoGRAPE project. *Space Weather*, 14(10), 704-709, doi:10.1002/2016SW001488

This work provides the outcomes of the DemoGRAPE project concerning new solutions on Software-Hardware infrastructures tested in different Antarctic Stations in the frame of GRAPE.

- M. Negusini, B. H. Petkov, P. Sarti and C. Tomasi, (May 2016) "Ground-Based Water Vapor Retrieval in Antarctica: An Assessment," in IEEE Transactions on Geoscience and Remote Sensing, vol. 54, no. 5, pp. 2935-2948,. doi: 10.1109/TGRS.2015.2509059.

This work provides a contribution to GRAPE neutral atmosphere topic and the advancement on the capability to retrieve Water Vapor.

- Correia, E., Spogli, L., Alfonsi, L., Cesaroni, C., Gulisano, A. M., Thomas, E. G., ... & Rodel, A. A. (2017, October). Ionospheric F-region response to the 26 September 2011 geomagnetic storm in the Antarctica American and Australian sectors. In *Annales Geophysicae* (Vol. 35, pp. 1113-1129), doi: 10.5194/angeo-35-1113-2017

This work provides a detailed investigation on the ionized atmosphere reaction to a geomagnetic storm in different longitudinal sectors over Antarctica and comes from a strong collaboration among scientists of different Countries supporting GRAPE.

### **Forthcoming Activities**

*(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)*

Efforts will be addressed to the improvement/refinement of the SRP proposal RESOURCE, built upon the important GRAPE legacy, firstly by enhancing interactions between the scientists who measure and utilise the entire radio spectrum, either as an auxiliary or principal observation, to study the atmosphere. This will be reached through ad hoc meetings/workshops/scientific sessions focused on these aspects. Another important goal of the GRAPE-RESOURCE community will be to strength collaborations with the SAR community to develop atmospheric (troposphere and ionosphere) mitigation tools to be used as correction of the SAR images. Efforts of GRAPE participants will focus also on the development/improvement of data archive and database in order to make experimental observations and tools available to the international community. Finally, GRAPE will continuously update the web site to share information/activities/proposals as much as possible. Just as an example, in January 2018 GRAPE has been contacted via the web site by Korean groups dealing with upper atmosphere that from now will actively participate to the GRAPE\_RESOURCE initiatives.

In case RESOURCE will be approved from 2020, GRAPE will be disbanded and included in RESOURCE.

## **Budget**

### **Planned use of funds for 2018 to 2020**

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

<b>Year (YYYY)</b>	<b>Purpose/Activity</b>	<b>Amount (in USD)</b>	<b>Contact Name</b>	<b>Contact Email</b>
<b>2020</b>	SCAR2020	2000	Giorgiana De Franceschi	Giorgiana.defranceschi@ingv.it
<b>2019</b>	WORKSHOP GRAPE_RESOURCE_URSI, SERCE_WEB	2000	Nicolas Bergeot	nicolas.bergeot@oma.be
<b>2018</b>	POLAR2018 3 Early Bird registrations, 1 registration for a PhD student	2100	Giorgiana De Franceschi	Giorgiana.defranceschi@ingv.it
<b>Total</b>		<b>6100</b>		

**Briefly describe what the funds will be used for and what the desired results are**

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

- 2020 SCAR2020- Funds will support registration fees and early career scientists expected to present a paper
- 2019 WORKSHOP GRAPE\_RESOURCE\_URSI, WEB- funds will support the organization of dedicated meetings/scientific sessions to enlarge the GRAPE RESOURCE community. Funds will also support the web maintenance and updating
- 2018 POLAR2018- Funds will support the registration fees for Nicolas Bergeot (ROB, BE), Emilia Correia (INPE, BR) Giorgiana De Franceschi (INGV, IT) (co-conveners of the special session AC4, side GRAPE meeting organization) and of Giulia D'Angelo (UNIROMATRE, IT), a PhD student presenting a paper to the session above. Through the dedicated side meeting and scientific session, the challenge is the involvement of other groups in the discussion of the SRP proposal RESOURCE.

**Percentage of the budget to be used for support of early career researchers**

2018:~16%

2019:~30%

2020:~30%

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

We cannot provide an estimation; it will depend on the adhesion to GRAPE of scientists from countries with developing Antarctic programs, which are more than welcome. Of course, they will be facilitated as much as possible.

2018:

2019:

2020:

## Linkages

**Direct support from outside organisations received for your activities**

*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

Most of the groups participating in GRAPE are supported by their own Countries through specific projects for Antarctic sciences. GRAPE is not directly supported by any of these projects but of course takes advantage of the existing infrastructures at Polar Regions to monitor neutral and upper atmosphere.

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

*(Numbered list of substantive collaborations)*

**Within SCAR**

1. SCAR PS
2. SERCE SRP

**Outside SCAR**

1. EC and ESA initiatives focusing on GNSS services and Space Weather
2. URSI COMMISSIONS G and F
3. IAGA

## Outreach and Capacity Building

**Outreach, communication and capacity building activities**

*(Provide a numbered list of no more than half a page)*

GRAPE participants support locally outreach, communication activities and events (e.g. Festival of Sciences) addressed to the general public as well to pupils and students from intermediate to high schools. Special lectures are also organized for Masters, e.g.: Spogli Luca, "Space climate and space weather from the Pole" lecture within the "Master in sustainable development, geopolitics of resources and arctic studies" organized by the Società Italiana per l'Organizzazione Internazionale (The Italian Society for International Organization), 2016 and 2017.

**SCAR Fellowship Reviewers**

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
Nicolas	Bergeot	<a href="mailto:nicolas.bergeot@oma.be">nicolas.bergeot@oma.be</a>	GEOPHYSICS

Lucilla	Alfonsi	<a href="mailto:lucilla.alfonsi@ingv.it">lucilla.alfonsi@ingv.it</a>	IONOSPHERE
Monia	Negusini	negusini@ira.inaf.it	WATER VAPOR
Emilia	Correia	ecorreia@craam.mackenzie.br	Multi-instrument upper atmosphere monitoring

## Membership

The complete list of membership is available at [www.grape.scar.org](http://www.grape.scar.org)

### Leadership

#### Leadership

Role	First Name	Last Name	Affiliation	County	Email	Date Started	Date Term is to End
Chief officer	Giorgiana	De Franceschi	INGV	Italy	Giorgiana.defranceschi@ingv.it	August 2012	
Deputy chief officer	Nicolas	Bergeot	OMA	Belgium	<a href="mailto:nicolas.bergeot@oma.be">nicolas.bergeot@oma.be</a>	August 2016	

Please identify Early Career Scientists with \* in first column

### Other members

First Name	Last Name	Affiliation	County	Email

Please identify Early Career Scientists with \* in first column

## Requests to the Secretariat

(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)



SCAR Sub-Group

IBCSO

SG

GS

Person Responsible: Boris Dorschel,  
Jan Erik Arndt

## SCAR Delegates Meeting 2018

Davos, Switzerland, June 2018

# IBCSO 2016-2018 Report

### Report Author(s)

Boris Dorschel (Alfred Wegener Institute, Germany)

Jan Erik Arndt (Alfred Wegener Institute, Germany)

### Summary of activities from 2016-18 and any other important issues or factors

(*<200 words*)

The main IBCSO activities from 2016-18 were the implementation of IBCSO V2.0 extended to 50°S. During the Arctic-Antarctic Mapping Meeting in Monaco (12-13<sup>th</sup> June 2016) – a dedicated IBCSO meeting of the polar mapping community to further develop the IBCSO project – the Antarctic mapping community agreed to this plan. The outcome of the Arctic-Antarctic Mapping Meeting was presented at the IBCSO side-Meeting at the 2016 SCAR Meeting in Kuala Lumpur and reported at the GEBCO Guiding Committee Meetings Valparaiso, Chile, 2016 and Busan, Korea, 2017. Since February 2018, IBCSO is part of the Nippon foundation – GEBCO Seabed 2030 Project supporting the Southern Ocean Regional Data Assembly and Coordination Centre (RDACC). At the IBCSO side meeting at the Polar 2018 conference in Davos, the latest developments of IBCSO and Seabed 2030 will be presented to the IBCSO community. Throughout the past two years, bathymetric data to be included in IBCSO have been collected during several research expeditions.

### Recommendations that EXCOM and Scientific Group Chief Officers should consider

(*Please indicate if approval is necessary or if they are just asked to note information*)

### Summary Budget 2017 to 2020

	2017	2018	2019	2020
	Spent	Allocated	Request	Request
(US\$)	0	5298	2500	2500

## Progress and Plans

### Sub-group Major Outcomes/Activities

*(No more than three major developments with one paragraph describing each of no more than ~ 300 words. Why important, why now?)*

Since February 2018, IBCSO is part of the Nippon Foundation – GEBCO Seabed 2030 Project. In the scope of the Seabed 2030 project and as part of Seabed 2030, IBCSO Version 2.0 will be developed. Due to the support of the Nippon Foundation, it is now possible to start work on IBCSO Version 2.0 extended to 50°S.

Over the past two years, new data sets to be included in IBCSO Version 2.0 were identified. Furthermore, new and updated data coverage files were generated to improve data acquisition. These files help to identify data gaps and support the planning of expeditions.

IBCSO has supported mapping initiatives and regional mapping projects e.g. BATDRAKE.

### Sub-group Outcomes Summary

*(Summarize the above and in each case provide your sub-group name in left hand column)*

Sub-group	Activity/Outcome/Benefit/Achievement
IBCSO	IBCSO coordination/IBCSO V2.0/ IBCSO V2.0 initiation
IBCSO	Identification of data sets and data gaps/improved data collection/up-to-date data coverages available
IBCSO	Support of mapping projects/regional mapping projects/BATDRAKE project was supported by providing data and knowhow

### Sub-group Cash Flow

*(From previous Delegates meeting to date)*

Sub-group	Allocation	Amount spent		
		2016	2017	2018
IBCSO				5298

## Notable Papers

*(Three most notable papers, if applicable)*

1. Bohoyo, F.; Larter, R.D.; Galindo-Zaldivar, J.; Leat, P.T.; Maldonado, A.; Tate, A.J.; Gowland, E.J.M.; Arndt, J.E.; Dorschel, B.; Kim, Y.D.; Hong, J.K.; Flexas, M.M.; Lopez-Martinez, J.; Maestro, A.; Bermudez, O.; Nitsche, F.O.; Livermore, R.A.; Riley, T.R.. 2016 Bathymetry and geological setting of the Drake Passage. BAS GEOMAP 2 Series. Cambridge, British Antarctic Survey.
2. Mayer, L.A., Jakobsson, M., Allen, G.L., Dorschel, B., Falconer, R., Ferrini, V., Lamarche, G., Snaith, H., Weatherall, P., 2018. The Nippon Foundation—GEBCO Seabed 2030 Project: The Quest to See the World’s Oceans Completely Mapped by 2030. *Geosciences* 8, 63, doi:10.3390/geosciences8020063.

## Forthcoming Activities

*(Plans for next two years, half-page maximum, if applicable. Why important, why now? If Sub-group is coming to a close please indicate this)*

A side meeting is organised prior to Polar 2018. At the side meeting, the IBCSO community will be informed about the latest IBCSO and Seabed 2030 developments. An additional focus of the side meeting is the identification of data sets, the exchange of metadata, and the planning of future expeditions for bathymetric data collection.

From 8.-10. October 2018, IBCSO representatives will participate in the Seabed 2030 Arctic – Antarctic – North Pacific Mapping Meeting 2018, Stockholm Sweden, October 8-10, 2018. Such meetings are planned each successive year to continue data integration to IBCSO.

The status of IBCSO will be reported yearly to the GEBCO Guiding Committee and to the ISAES community at the meeting South Korea in 2019.

## Budget

### Planned use of funds for 2018 to 2020

*(Please provide detail of all activities with total at end, start with 2020 and work back to 2018 down the table)*

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2018	Polar Mapping Meeting, 2 people	3000	Boris Dorschel	Boris.Dorschel@awi.de
2019	ISAES	2000	Jan Erik Arndt	Jan.Erik.Arndt@awi.de
<b>Total</b>		5000		

**Briefly describe what the funds will be used for and what the desired results are**

*(Use the same subtitles as the line items above with no more than 1-3 sentences per item. Please keep these high-level. Please also make clear note of expenditure associated with Davos meeting in 2018 both here and in the table above)*

The funds will be used to participate in meetings and workshops with the aim to generate IBCSO Version 2.0 extended to 50°S and for outreach. To do so, it is necessary to address the IBCSO community at the meetings mentioned “Forthcoming Activities”.

**Percentage of the budget to be used for support of early career researchers**

2018: 50%  
2019: 100%  
2020: -

**Percentage of the budget to be used for support of scientists from countries with developing Antarctic programmes**

2018: 0%  
2019: 0%  
2020: -

## Linkages

**Direct support from outside organisations received for your activities**

*(Numbered list with values indicated if direct cash support. Please restrict in-kind support to substantive in-kind support only)*

IBCSO activities are supported by the Nippon foundation – GEBCO Seabed 2030 Project.

**Major collaborations your sub-group has with other SCAR groups and with organisations/groups beyond SCAR**

*(Numbered list of substantive collaborations)*

**Within SCAR**

1. -

**Outside SCAR**

1. GEBCO  
2. IHO/IOC

## Outreach and Capacity Building

### Outreach, communication and capacity building activities

(Provide a numbered list of no more than half a page)

IBCSO Outreach activities are part of and coordinated with Nippon foundation – GEBCO Seabed 2030 Project outreach activities.

### SCAR Fellowship Reviewers

As part of SCAR's Capacity Building efforts, such as the Fellowships and Visiting Professor Awards, we are looking for people from all the SCAR groups including SRPs to form a 'review panel' so if applications in your field are submitted we have people to contact to help assess relevant applications. Please list one or more people (name and email address) from your SRP who would be willing to serve as reviewers for the next few years, along with 1-3 keywords on their principal expertise.

First Name	Last Name	E-mail	Principal Expertise
Boris	Dorschel	Boris.Dorschel@awi.de	bathymetry
Jan Erik	Arndt	Jan.Erik.Arndt@awi.de	bathymetry

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Co-Chair	Boris	Dorschel	AWI	Germany	<a href="mailto:Boris.Dorschel@awi.de">Boris.Dorschel@awi.de</a>	07-13	-
Co-Chair*	Jan Erik	Arndt	AWI	Germany	Jan.Erik.Arndt@awi.de	11-11	-

Please identify Early Career Scientists with \* in first column

**Other members**

First Name	Last Name	Affiliation	County	Email
Martin	Jakobsson	University of Stockholm	Sweden	martin.jakobsson@geo.su.se
Frank O.	Nitsche	LDEO	USA	fnitsche@ldeo.columbia.edu
Robert D.	Larter	BAS	UK	rdla@bas.ac.uk
Michele	Rebesco	OGS	Italy	mrebesco@ogs.trieste.it
Fernando	Bohoyo	IGME	Spain	f.bohoyo@igme.es
Jongkuk	Hong	KOPRI	Korea	jkhong@kopri.re.kr
Jenny	Black	GNS	New Zealand	J.Black@gns.cri.nz
Jodie	Smith	GA	Australia	Jodie.Smith@ga.gov.au
Yoshifumi	Nogi	NIPR	Japan	nogi@nipr.ac.jp

*Please identify Early Career Scientists with \* in first column*

**Requests to the Secretariat**

*(If there are specific administrative tasks you would like help with such as your webpages, mailing list, online meeting tools, etc., please include them below as a numbered list)*



**Name of the Proposed Group:**

AntArchitecture

**Names of the Lead Proponents:**

Robert Bingham (University of Edinburgh, UK)

Olaf Eisen (Alfred-Wegener Institute, Germany)

Nanna Karlsson (GEUS, Denmark)

Joseph MacGregor (NASA Goddard, USA)

Neil Ross (Newcastle University, UK)

Duncan Young (University of Texas at Austin, USA)

**Sponsoring Science Group(s):**

Geosciences and/or Physical Sciences

**Summary of Group:**

The goal of a proposed *AntArchitecture* Action Group is to develop a continent-wide age-depth model of Antarctica's ice using the internal layers and surfaces imaged by radar-sounding. The product underpins a wider goal to determine the stability of the Antarctic Ice Sheets over past glacial cycles.

## **AntArchitecture: Proposed SCAR Action Group**

### **Introduction and Background**

*AntArchitecture* is the name ascribed to an envisioned science programme which will aim for the first time to determine the stability of the Antarctic ice sheets over past glacial cycles directly from the internal architecture of the ice. Internal architecture describes the 3-D internal structure of the ice imaged by multiple radar-sounding surveys undertaken across Antarctica over the last five decades.

Determining the stability of different parts of Antarctica is crucial because there is mounting evidence that collapses of polar ice sheets fed rapid global sea level rise up to 9 m higher than today during the last interglacial period, ~127-116 ka. In this context, the volume and current behaviour of ice in Antarctica give cause for concern: both the West Antarctic and East Antarctic ice sheets (hereafter WAIS and EAIS respectively) contain sufficient ice to raise global sea levels by 58 m. Since the onset of satellite observations in the 1990s, both have lost mass. Present losses from the WAIS contribute an estimated 10% of observed global sea-level rise, are occurring at ever-increasing rates, and appear to support the longstanding hypothesis that the WAIS is “unstable”; in other words capable of diminishing rapidly with concomitant impacts on global sea levels. There is also a growing awareness that parts of the EAIS may also be as unstable as parts of the WAIS. There is, therefore, a pressing societal imperative to assess the (in)stability of both the WAIS and EAIS, thereby to gauge how rapidly future changes to both of these ice sheets will contribute to future global sea-level rise.

The only feasible means for understanding and predicting future Antarctic ice-sheet behaviour is to use an ice-sheet model (ISM). Crucially, ISMs are typically evaluated with recourse to how well they can produce past behaviour: the user gauges how well the ISM simulates advance or retreat of the ice (typically from dated ice limits) in response to a given climate forcing (derived from deep ice-core records). When the match is “good,” the ISM is considered reasonable, and it can then, in principle, be used to predict the future ice-sheet response to projected future climate scenarios. While the last decade has witnessed significant development and expansion of ISM investigations of Antarctic ice-sheet behaviour, weaknesses in their approach include the sparsity of known glacial limits around Antarctica for the purposes of ISM validation, and a dearth of constraints for ice behaviour in the ice-sheet interior across glacial/interglacial cycles. To address these limitations, *AntArchitecture* will take the novel approach of assembling and interrogating, with ice-sheet modelling, information that the ice itself has recorded about its past behaviour: information that is provided by the radar-surveyed “internal architecture” of the Antarctic ice sheets.

What is proposed here is an ambitious programme of multidisciplinary research, wherein the first critical stage, and the focus of *AntArchitecture* as a SCAR Action Group, is the assembly of a pan-continental archive of the radar-imaged internal architecture of the Antarctic Ice Sheet. The recent publication of an equivalent dataset for the Greenland Ice Sheet (Figure 1), and the application of this dataset to reconstructing Greenland’s paleoclimate, show what is possible for Antarctica using similar datasets. To undertake the same exercise across Antarctica is, however, challenged by the fundamental issue that, unlike for Greenland where the ice sheet has been comprehensively surveyed with a single tool (the US Center for Remote Sensing of Ice Sheets, CReSIS, radar system), Antarctica has been surveyed by multiple radar systems by multiple institutions exercising multiple practices for processing and archiving data.

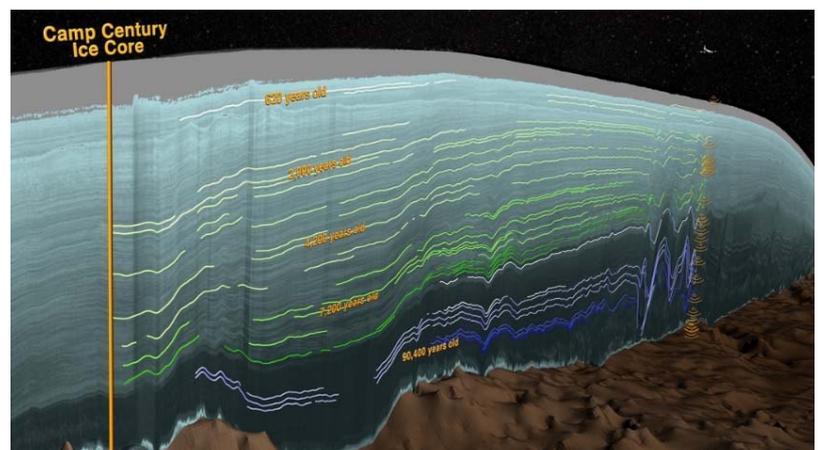


Figure 1: Example of traced internal architecture from the Greenland Ice Sheet, used to produce an age-depth structure for the whole ice sheet. Image from <https://svs.gsfc.nasa.gov/4249>; research published in MacGregor et al., 2015, *Journal of Geophysical Research*.

The *AntArchitecture* SCAR Action Group will bring together key datasets on Antarctic Ice Sheet internal layering from the principal institutions and scientists who have been responsible for acquiring, processing and storing them over the last four decades. Key activities will be coordinating data transfer and data lodging exercises between institutions/countries that will allow datasets acquired by different radar systems to be combined for pan-continental analysis, and the development of an optimised processing flow for analysis of past data and advice on where future data acquisition needs to be targeted. A fuller list of aims, goals and objectives is provided in the next section.

We stress the timeliness of *AntArchitecture* and its fit with existing SCAR activities as follows. The proposed activities directly address two priorities for Antarctic science as outlined by the 2014 SCAR Horizon Scan, namely *Understanding how, where and why ice sheets lose mass* and *Revealing Antarctica's history*. More specifically, the development of a pan-continental age-depth database of Antarctic ice will inform the International Partnerships for Ice Core Sciences (IPICS) activities, including the current major initiative to locate the site to obtain Antarctica's oldest ice core. Similarly, interaction with IPICS scientists will be crucial for providing dating control on an age-depth model for Antarctica using internal layering. *AntArchitecture's* age-depth volume across Antarctica will provide a resource for testing ideas developed under the remit of SCAR's Past Antarctic Ice-Sheet Dynamics (PAIS) Science Research Programme, and will provide datasets of high relevance to the AntClim<sup>21</sup> Group. Finally, we note that *AntArchitecture's* vision to provide maps of internal surfaces of given ice age across Antarctica builds upon the SCAR-coordinated Bedmap2 and ADMAP efforts, wherein distinct datasets were successfully brought together to produce reconciled maps of Antarctica's subglacial topography and magnetic signals. Therefore, a model for successful collaboration between the relevant data providers spread throughout the SCAR community already exists.

### **Aims, Goals, Objectives/Timeline**

The long-term (10 years) goal of *AntArchitecture* is to determine the stability of the Antarctic ice sheets over past glacial cycles by interrogating the internal architecture of the ice.

The aim of the proposed *AntArchitecture* Action Group (initial scope 4 years) is to undertake an important first step towards the above goal, namely to assemble the first pan-Antarctic database of radar-imaged palaeo-surfaces. The group will provide a forum for coordinating proposals to national funding agencies and foundations to support this work.

In July 2017, a two-day workshop at the University of Edinburgh was convened to identify the main challenges in assembling an Antarctic-wide database from radar data. The full report of the Edinburgh workshop may be downloaded here:

<http://www.sages.ac.uk/wp-content/uploads/2018/03/BINGHAM-R-EDi-2017-AntArchitecture-Workshop-Final-Report.pdf>

From this workshop, the following objectives were identified, here given aspirational timescales:

- Starting activities: Bring together Antarctic radar data providers; compile a list of the main users and applications of Antarctic radar data; identify the wider possibilities by integrating with ice-sheet modellers, members of IPICS, and other relevant science groups as may be identified.
- Years 1-2: Identify with numerical modellers the data formats required to drive models. Identify best format and practices for lodging and sharing data on radar-imaged internal architecture. Converge on standards for metadata and data formats, and nomenclature. Undertake radar-system intercomparison exercises where overlapping areas have been surveyed with different instruments. Develop a document outlining the optimised processing flow for internal layering analysis of different datasets, which will also guide future data collection.
- Milestone at end of Year 2: Produce a white paper, intended for submission to a relevant interdisciplinary peer-reviewed journal, e.g. *Global and Planetary Change*, *Climate of the Past*, *Frontiers of Earth Sciences*, outlining the need for an Antarctic radar-layers database, the potential applications, and methods for achieving it. Activities in the bullet points above will underpin this activity.
- Years 3-4: Compile the first pan-Antarctic database of ice-sheet stratigraphy from radar internal architecture, in a form suitable for informing numerical models, and informed by ice-core age-depth profiles.
- Milestone at end of Year 4: Publication of an online dataset and paper reporting the 3D internal architecture of the Antarctic Ice Sheet.

## Capacity Building, Education and Outreach Plans

*AntArchitecture* offers a mechanism for building capacity, and offering significant training opportunities and knowledge transfer in geophysics across the SCAR community. The various proposed activities provide manifold research topics for postdoctoral researchers and a range of graduate and undergraduate students who would all make significant contributions to addressing a pressing Antarctic science challenge. They also facilitate multiple opportunities for international collaboration – for example, when comparing datasets acquired by different institutions; and in the process of synthesising age-depth models compiled by different groups for different regions of Antarctica.

We anticipate the main methods of collaboration being through researcher exchanges between countries/institutions, including through the SCAR Visiting Professorship and Fellowship schemes, and in annual meetings of the *AntArchitecture* consortium hosted at SCAR meetings or other appropriate international symposia.

We will undertake to publish all materials from *AntArchitecture* in open-source repositories and open-access journal papers. Where appropriate, we will also liaise with our institutional media offices to report high-impact results arising from the activities to the press. All the lead proponents have considerable experience in these regards.

Finally, we anticipate that the age-depth model of Antarctic ice that *AntArchitecture* aims to develop has potential to be represented in a strikingly visual manner with appropriate use of 3-D visualisation technology. We will work with experts in data visualisation, both in our institutions and exploring commercial contacts, in ways of best representing the results to the wider community and the public.

## Data Management Plans

The starting point for *AntArchitecture* is to work with radar datasets that have already been acquired and are variously available on the institutional repositories of the data collectors. For our purposes there is no need to relocate these raw data, which can easily exceed several terrabytes.

There will be a requirement, as work progresses on the project, to store processed data files, and ultimately the end product of the action group, a 3-D age-depth volume of the Antarctic Ice Sheet. Here we anticipate following a similar strategy to the SCAR Bedmap2 process, wherein data processing and lodging is handled by the data owners, while the final product is reposed in an open access location, e.g. Pangaea. Many of the data owners are already making raw and processed data openly available too, which is a practice *AntArchitecture* will encourage through its commitment to open publishing and open data access.

A key requirement for the final product of the *AntArchitecture* Action Group will be to develop data products, in file formats that will allow the internal structure of Antarctica's ice to be used as input and calibration/validation for numerical modelling experiments. We will therefore liaise with experienced numerical modellers, e.g. from the International Ice Sheet Model Intercomparison Project (ISMIP, led by Professor Frank Pattyn) and CMIP (Climate Model Intercomparison Project (CMIP) communities, on the formats required as we proceed.

## Terms of Reference

*AntArchitecture's* primary goal is to determine the stability of the Antarctic ice sheets over past glacial cycles by interrogating the internal architecture of the ice.

As a SCAR Action Group, *AntArchitecture* aims to:

- Unite the international Antarctic communities concerned with the acquisition and application of geophysical data;
- Synthesise geophysical datasets with the common objective of recovering pan-Antarctic age-depth structure;
- Bring together expertise from geophysical imaging, ice-core sciences and numerical modelling with the common aim of using the internal architecture of the Antarctic Ice Sheet as a major resource for Antarctica and Southern Ocean palaeoclimate reconstruction and projection of future ice behaviour.

Membership of *AntArchitecture* is open to all scientists, and will be of particular interest to those operating or interested in operating in the fields of polar geophysics, climate reconstruction, ice-sheet history and dynamics, ice-core science and numerical modelling.

We propose the *AntArchitecture* Action Group to last for 4 years with objectives and activities guided by the same Chair (Bingham) and a Steering Committee initially consisting of the five additional leads of this document (Eisen, Karlsson, MacGregor, Ross, Young) and 1-2 Early Career Researchers (subject to open call should the Action Group be confirmed). We will review this structure internally at annual *AntArchitecture* workshops and, after 3 years, assess the scope for *AntArchitecture* to become a SCAR Science Programme.

### **Budget and Justification**

We request an annual budget of \$5000, subject to annual review by SCAR. Our main requirement is to facilitate annual workshops of the group which we will target to be held in association with major conferences (e.g. biannual SCAR OSC meetings, SCAR ISAES meetings, AGU, EGU). Bringing members together at larger conferences is more cost- and carbon-footprint- effective than organising workshops at individual institutions, and has the added benefit that we will be able to interest other relevant conference attendees in participating in the workshops. We propose to offer funding only to participants who can match-fund, and to prioritise Early Career Researchers. In our experience, being in the position of being able to offer match funds to encourage conference attendance hugely increases the critical mass of researchers that can be attracted to a given meeting, and will greatly enhance the required interaction amongst different international institutions that is required to make *AntArchitecture* a success.

### **Confirmed and/or Potential Members**

Two meetings of a proto-*AntArchitecture* group have already taken place, firstly a dedicated Town Hall Meeting at the 2016 AGU, and secondly a 2-day Workshop held at the University of Edinburgh in July 2017. The list below gives attendees/speakers of both meetings and additional members of the scientific community who have explicitly expressed support for the initiative. They can all be considered Confirmed Members. Early Career Researchers are indicated with \*\*.

Sridhar Anandakrishnan (Pennsylvania State University, USA); David Ashmore (University of Liverpool, UK)\*\*; Robin Bell (Columbia University, USA); Robert Bingham (University of Edinburgh, UK); Don Blankenship (University of Texas, USA); Edward Brook (Oregon State University, USA); Marie Cavitte (University of Texas, USA)\*\*; Knut Christianson (University of Washington, USA); Winnie Chu (Stanford University, USA)\*\*; Tim Creyts (Columbia University, USA); Dorte Dahl-Jensen (University of Copenhagen, Denmark); Indrani Das (Columbia University, USA); Damon Davies (University of Edinburgh, UK)\*\*; Anja Diez (Norwegian Polar Institute, Norway)\*\*; Reinhard Drews (University of Tübingen, Germany); Julian Dowdeswell (University of Cambridge, UK); Olaf Eisen (Alfred Wegener Institute, Germany); Fausto Ferraccioli (British Antarctic Survey, UK); Rene Forsberg (Technical University Denmark); Nick Frearson (Columbia University, USA); Nicholas Holschuh (University of Washington)\*\*; Edward King (British Antarctic Survey, UK); Jonathan Kingslake (Columbia University, USA)\*\*; Michelle Koutnik (University of Washington; USA); Daniela Jansen (Alfred Wegener Institute, Germany)\*\*; Tom Jordan (British Antarctic Survey, UK); Gwendolyn Leysinger Vieli (University of Zürich, Switzerland); Joseph MacGregor (NASA Goddard, USA); Carlos Martin (British Antarctic Survey, UK); Kenichi Matsuoka (Norwegian Polar Institute, Norway); Gail Muldoon (University of Texas, USA)\*\*; John Paden (Kansas University, USA); Frédéric Parrenin (Joseph Fourier University, France); Frank Pattyn (Universite Libre Brussels, Belgium); Hamish Pritchard (British Antarctic Survey, UK); Neil Ross (Newcastle University, UK); Dustin Schroeder (Stanford University, USA); Martin Siegert (Imperial College London, UK); Eric Steig (University of Washington, USA); Johannes Sutter (Alfred Wegener Institute, Germany)\*\*; (David Vaughan (British Antarctic Survey, UK); Anna Winter (Alfred Wegener Institute, Germany)\*\*; Kate Winter (Northumbria University, UK)\*\*; Eric Wolff (University of Cambridge, UK); John Woodward (Northumbria University, UK); Duncan Young (University of Texas, USA).

### **Webpages and Communication Plans**

We are pleased SCAR will provide our group with a webpage and will send information upon approval. We would also like to set up a mailing list, and would welcome advice from SCAR on communicating our activities via social media and other channels.