



SCAR Sub-Group

SG

Person

Responsible:

AntVolc

GS

Adelina Geyer

## SCAR Delegates Report 2020

# Antarctic Volcanism (ANTVOLC) EG

## 2018-2020 Report

### Summary

#### Report Author(s):

Adelina Geyer ([ageyer@ictja.csic.es](mailto:ageyer@ictja.csic.es) - Spain), Alessio Di Roberto ([alessio.diroberto@ingv.it](mailto:alessio.diroberto@ingv.it) - Italy), AntVolc Steering Board members

#### Summary of activities from 2018-2020

##### *Membership and Leadership:*

- Membership of AntVolc has stabilised at c. 110 members, representing 16 countries (Spain, Italy, New Zealand, USA, UK, Argentina, Germany, South Korea, Japan, Australia, Poland, Iceland, Bulgaria, Greece, Romania and France)
- Adelina Geyer (Spain) took over from John Smellie (UK) as Chair at the end of 2018, with a term of office of 2 years.
- Alessio Di Roberto (Italy) took over from Adelina Geyer (Spain) as Deputy Chair at the end of 2018, with a term of office of 2 years.
- The AntVolc website, hosted at the Institute of Earth Sciences Jaume Almera (ICTJA-CSIC) (<https://antvolcscar.wordpress.com/>), is under continuous update and new dedicated AntVolc Twitter (@antvolc) and Facebook accounts have been created.

##### *Dissemination and Outreach activities:*

- **EGU2018:** Vienna | Austria | 8–13 April 2018  
Session: Arctic, Antarctic and other glaciated terranes volcanism – magmatic, tectonic, geomorphic and climatic implications
- **SCAR & IASC POLAR 2018:** Davos | Switzerland | 19-23 June 2018  
Session: "Magmatic, tectonic, and geodynamic investigations of the Polar Regions". *Comment: this event was extraordinarily successful, with 84 abstracts submitted.*
- **EGU2019:** Vienna | Austria | 7–12 April 2019  
Session: Arctic, Antarctic and other glaciated terranes volcanism – magmatic, tectonic, geomorphic and climatic implications
- **IUGG2019:** Montreal | Canada | 8-18 July 2019  
Session: Arctic & Antarctic volcanism in space & time – magmatic, tectonic and palaeoenvironmental aspects & linkages
- **XIII ISAES 2019:** Incheon | Republic of Korea | 22-26 July 2019  
Session: Antarctic Volcanism and Magmatism: Past, Present and Future

*Main Outcomes:*

The major deliverable of AntVolc during the 2018-2020 period is the review volume titled '*Volcanism in Antarctica: 200 million years of subduction, rifting & continental break-up*', editors John Smellie, Kurt Panter and Adelina Geyer, to be published as a Geological Society of London -GSL- Memoir. All chapters have been accepted for publication on May 2020 and are currently in press. The GSL has now begun the editing & proofing tasks and publication is theoretically guaranteed by end-2020. Nonetheless, it is not clear yet how the COVID-19 pandemic shall impact the publishing process and a short delay may be unavoidable.

Taking into consideration the SCAR carbon management plan aimed at reaching net zero CO<sub>2</sub> emissions by 2030, the AntVolc Steering Committee decided by mid-2019 that the AntVolc "White Paper" Workshop, with less than 50 participants, should take place electronically. The roadmap for the preparation of the AntVolc "White Paper" was established on November 2019 and submitted to all participants by the AntVolc Steering Committee. The first step, to be completed by end of January 2020, was the creation of individual working groups for the different topics to be included in the White Paper, which are in line with AntVolc priority lines. It was strongly encouraged by the coordinators to consider incorporating Early Career Scientist in the working groups. The different working groups are currently working on the specific topics and the final document is expected to be finished by the end of 2020.

AntVolc has offered two student (undergraduate, master or PhD) travel grants (up to 1000 euros each) to attend the EGU2020 session sponsored by AntVolc: GMPV9.3: Volcano-glacier interactions: Arctic, Antarctic, and globally. However, due to COVID-19 pandemic, the meeting was cancelled and so the travel grants.

**Major Future Initiatives and Actions:**

To get underway by end 2020 the 'White Paper' for SCAR summarizing the state of research into Antarctic volcanism and providing a roadmap for future volcanic research.

Encourage completion of an online database of tephra analyses including major and trace elements data (when possible) for tephra identified in the continental, lacustrine and marine records of Antarctica, which is only partly complete so far (due to lack of funds) but already available for scrutiny online <http://www.tephrochronology.org/AntT/index.html>

Support and encourage the compilation and completion of a volume titled 'The Antarctic mantle' (editors: Adam Martin & Wouter van der Wal), a review volume similar in intention to the volume on 'Volcanism in Antarctica' but with a different focus. This is a new deliverable of AntVolc.

Open a Research Project call for students to cover some research for their PhD or Master Degrees. This will encourage the research activity of early career researchers. This initiative is pending for approval from the SCAR financial department.

**Summary Budget 2019 to 2022**

	2019	2020	2021	2022
	Spent	Allocated	Request	Request
(US\$)	----	5000	2500	2500

## Progress to date

### Sub-group Outcomes Summary

(Summarize the above and in each case provide your sub-group name in left hand column to assist Science Group COs in compiling their reports)

Sub-group	Activity/Outcome/Benefit/Achievement
ANTVOLC	Organisation of 5 scientific sessions (EGU2018/2019-POLAR2018 – IUGG2019- ISAES2019)
ANTVOLC	Geological Society of London Memoir : “ <i>Volcanism in Antarctica: 200 million years of subduction, rifting &amp; continental break-up</i> ” (editors: John Smellie, Kurt Panter and Adelina Geyer)
ANTVOLC	Database of tephra analyses for Antarctica: <a href="http://www.tephrochronology.org/AntT/index.html">http://www.tephrochronology.org/AntT/index.html</a>
ANTVOLC	Review volume: ‘The Antarctic mantle’ (editors: Adam Martin & Wouter van der Wal)
ANTVOLC	Student Travel Grants to attend EGU2020 Antvolc session
ANTVOLC	Participation in the SCAR-SERCE White Paper on Antarctic Geothermal Heat Flow <a href="https://www.scar.org/scar-library/search/science-4/research-programmes/serce/5454-scar-serce-white-paper-on-antarctic-geothermal-heat-flow/">https://www.scar.org/scar-library/search/science-4/research-programmes/serce/5454-scar-serce-white-paper-on-antarctic-geothermal-heat-flow/</a>  Burton-Johnson, A., Dziadek, R., Martin, C., Halpin, J., Whitehouse, P.L., Ebbing, J., Martos, Y.M., Martin, A.P., Schroeder, D., Shen, W., Ritz, C., Goodge, J., Van Liefferinge, B., Pattyn, F., Reading, A., Ferraccioli, F., 2020. Antarctic Geothermal Heat Flow: Future research directions. Scientific Committee on Antarctic Research (SCAR) White Paper, Miscellaneous publication.

### Sub-group Cash Flow

(From previous Delegates meeting to date)

Sub-group	Allocation	Amount spent		
		2018	2019	2020
ANTVOLC	\$2,924 (2018) + \$5,000	\$2556,72	----	----

## Future plans

### Planned activities in 2020 to 2022

Sub-group	Planned activity
ANTVOLC	SCAR White Paper on the state of Antarctic volcanic research and future directions. 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.
ANTVOLC	Establish a link between AntVolc and the International Association of Volcanology and Chemistry of the Earth's Interior -IAVCEI- commission on tephra (INTAV – i.e. International Focus Group on Tephrochronology and Volcanism)
ANTVOLC	Proposal of a special issue of a specialist journal (e.g. JVGR) focussed on Antarctic volcanism
ANTVOLC	Increase AntVolc presence on social media and the participation of Early Career Scientists
ANTVOLC	IAVCEI 2021 (now postponed) conference session: Volcanism in Antarctica and the Southern Oceans
ANTVOLC	Open a Research Project call for students to cover some research for their PhD or Master Degrees.

### Planned use of funds for 2020 to 2022

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2020	Research Project call	5000	Adelina Geyer	ageyer@ictja.csic.es
2021	Student Travel Grants for International Conferences	2500	Adelina Geyer	ageyer@ictja.csic.es
2022	Student Travel Grants for International Conferences	2500	Adelina Geyer	ageyer@ictja.csic.es

### Any additional detail on funds usage and desired results/outcomes

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

2020: 100%  
 2021: 100%  
 2022: 100%

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

The Research Project and Travel Grant calls are both open to the whole community working on Antarctic Volcanism. Hence, any early-career researcher from any of those countries has the possibility to apply.

## Membership

### Leadership

Role	First Name	Last Name	Affiliation	Country	Email	Date Started	Date Term is to End
Chair	Adelina	Geyer	CSIC	Spain	ageyer@ictja.csic.es	2019	2020
Deputy Chair	Alessio	Di Roberto	INGV	Italy	alessio.diroberto@ingv.it	2019	2020
Former Chair	John	Smellie	Leicester Univ.	UK	jls55@leicester.ac.uk	2017	2018
Former Chair	Massimo	Pompilio	INGV	Italy	massimo.pompilio@ingv.it	2015	2016
Steering Committee	Nelia	Dunbar	Mexico Tech	USA	Nelia.Dunbar@nmt.edu	2017	2020
Steering Committee	Adam	Martin	GNS Science	NZ	A.Martin@gns.cri.nz	2017	2020
Steering Committee	Kurt	Panter	Bowling Univ.	USA	kpanter@bgsu.edu	2017	2020
Steering Committee	Don	Blankeship	Texas Univ.	USA	blank@ig.utexas.edu	2017	2020
Steering Committee	Jenn	Cooper	Cornell Univ.	USA	jrc323@cornell.edu	2017	2020
Steering Committee	Massimo	Pompilio	INGV	Italy	massimo.pompilio@ingv.it	2017	2020
* Steering Committee	Max	Van Wyk de Vries	Minnesota Univ.	USA	vanwy048@umn.edu	2019	2020

Please identify early-career researchers with \* in first column

### Other members

Membership of AntVolc has stabilised at c. 110 members, representing 16 countries (Spain, Italy, New Zealand, USA, UK, Argentina, Germany, South Korea, Japan, Australia, Poland, Iceland, Bulgaria, Greece, Romania and France)

## Additional information (optional)

### Notable Papers

A complete and updated list of the papers published by AntVolc is included here:

<https://antvolcscar.wordpress.com/publications/>

#### 2018

Panter, K.S., Castillo, P., Krans, S., Deering, C., McIntosh, W., Valley, J., Kitajima, K., Kyle, P., Hart, S., Blusztajn J. (2018), Melt origin across a rifted continental margin: a case for subduction-related metasomatic agents in the lithospheric source of alkaline basalt, northwestern Ross Sea, Antarctica. *Journal of Petrology* 59 (3), 517-558, <https://doi.org/10.1093/petrology/egy036>.

*This paper describes the geochemical, isotopic and age of basalts erupted across the transition from the northern Ross Sea to northern Victoria Land. The results indicate that the systematic compositional variations in basalt across the ocean-continent transect are explained by a multi-stage process controlled by extension and passive melting (i.e. non-plume).*

Field, B., Browne, G., Fielding, C., Florindo, F., Harwood, D., Judge, S., Krissek, L., Panter, K., Passchier, S., Pekar, S., Sandroni, S., Talarico, F. (2018), A sedimentological record of Early Miocene ice advance and retreat, AND-2A drill hole, McMurdo Sound, Antarctica. *Geosphere*, <https://doi.org/10.1130/GES01592.1>.

*This paper describes the Early Miocene section of the AND-2A core and conclude that there were two periods of substantial glacial retreat prior to the Middle Miocene Climatic Optimum. This proximal Antarctic record provides sedimentary evidence for substantive variations in polar ice volume during successive phases of ice shelf advance and retreat.*

Van Wyk de Vries, M., Bingham, R.G. & Andrew S. Hein, A.S. 2018. 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

*This paper provides, for the first time, an estimate of the total number of volcanic edifices lying beneath the West Antarctic Ice Sheet – WAIS. Results obtained in the paper unravel the potential existence of over hundred volcanic edifices. This may be active and represent a potential heat source and destabilisation source for the WAIS.*

Antoniades, D., Giralte, S., Geyer, A., Álvarez-Valero, A.M., Pla-Rabes, S., Granados, I., Liu, E.J., Toro, M., Smellie, J.L. and Oliva, M. 2018. The timing and widespread effects of the largest Holocene volcanic eruption in Antarctica. *Nature Scientific Reports*, 8: 17279; doi:10.1038/s41598-018-35460-x

*This paper provides, for the first time, a precise age for the Deception Island paroxysmal eruption, which enables its presence as tephra to be tracked right across Antarctica (> 4000 km) and raises the possibility that the event may have had pan-continental environmental effects.*

Smellie, J.L., Rocchi, S., Johnson, J.S., Di Vincenzo, G. and Schaefer, J.M. 2018. A tuff cone erupted under frozen-bed ice (northern Victoria Land, Antarctica): linking glaciovolcanic and cosmogenic nuclide data for ice sheet reconstructions. *Bulletin of Volcanology*, 80:12; doi:10.1007/s00445-017-1185-x.

*This paper describes the eruptive mechanisms and products of an explosive eruption beneath cold-based ice, the first description of such an eruption to be published, and shows how linked volcanological—cosmogenic studies can yield important new insights into past environmental reconstructions in Antarctica.*

Peters, N.J., Oppenheimer, C., Brennan, P., Lok, L.B., Ash, M. and Kyle, P., 2018. Radar Altimetry as a Robust Tool for Monitoring the Active Lava Lake at Erebus Volcano, Antarctica. *Geophysical Research Letters*,

*This paper describes how a new tool, radar altimetry, has been applied innovatively to monitor the elevation of an active lava lake (typically obscured by dense volcanic fumes) as a*

*practical measure of quantifying the volcanic hazard associated with varying overpressures in an active volcanic conduit.*

## 2019

Di Roberto, A., Colizza, E., Del Carlo, P. et al. First marine cryptotephra in Antarctica found in sediments of the western Ross Sea correlates with englacial tephras and climate records. Sci Rep 9, 10628 (2019) doi:[10.1038/s41598-019-47188-3](https://doi.org/10.1038/s41598-019-47188-3)

*The paper presents the first evidence for the widespread 1252 ± 2 CE tephra layer, in the marine sediment record off Cape Hallett. It provides an important new and widespread stratigraphical datum with which the continental cryosphere and marine sedimentological records in Antarctica can be correlated.*

Lee, M.J., Kyle, P.R., Iverson, N.A., Lee, J.I., Han, Y. Rittmann volcano, Antarctica as the source of a widespread 1252 ± 2 CE tephra layer in Antarctica ice Earth and Planetary Science Letters, 521, 169-176, September 2019 <https://doi.org/10.1016/j.epsl.2019.06.002>

*Results presented in this paper provide a source for the widespread 1252 ± 2 CE tephra layer used as reference level in tephrochronology. Additionally, it provides an age to the last large explosive eruption of Mount Rittmann (Southern Victoria Land) indicating that the volcanic system requires to be considered active and represents a potential hazard to the numerous scientific bases located nearby.*

Geyer, A., A. M. Álvarez-Valero, G. Gisbert, M. Aulinas, D. Hernández-Barreña, A. Lobo and J. Marti, 2019. Deciphering the evolution of Deception Island's magmatic system. Scientific Reports 9(1): 373. <https://doi.org/10.1038/s41598-018-36188-4>

*Results presented in this paper provide a complete picture of Deception Island's plumbing system, one of Antarctica's most active volcanoes. Understanding the current state of the island's magmatic system, and its potential evolution in the future, is fundamental to increase the effectiveness of interpreting monitoring data during volcanic unrest periods and hence, for future eruption forecasting.*

## **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)*

### **ICTJA- CSIC – in kind support**

## **Major collaborations your Science Group has with other SCAR groups and with organisations/groups beyond SCAR**

*(Numbered list of substantive collaborations)*

### **Within SCAR**

1. SERCE

### **Outside SCAR**

1. IAVCEI

## Outreach, communication and capacity-building activities

AntVolc now has a new priority line to promote Education and Outreach. Our first step here has been setting up active social media accounts for our group. These are now online and can be found on twitter and facebook by searching @antvolc (or here: <https://twitter.com/antvolc> ; <https://www.facebook.com/AntVolc>). The coordinator is an Early Career Scientist, Max Van Wyk de Vries ([vanwy048@umn.edu](mailto:vanwy048@umn.edu)). The main objectives are:

- Sharing the details and results of ongoing projects and research online in an accessible media-friendly way specifically catering to young researchers
- Setting up and maintaining AntVolc social media pages and stimulating discussion
- Creating links with other organizations to help organize outreach events (e.g.: Antarctica Day/Polar Week etc.)
- Making details of AntVolc meetings and conference sessions available asap, alongside photos of talks and posters available online on the AntVolc website and on social media
- Extending the gallery of photos of Antarctic fieldwork, combined with descriptive captions

## Updates for your group's SCAR web page

AntVolc webpage is to be found in: <https://antvolcscar.wordpress.com/> . A new section corresponding to the new priority line of the Expert Group "Education and Outreach" has been added: <https://antvolcscar.wordpress.com/education-and-outreach/> . Additionally, the publications page has been updated and also the conference sessions publicized.

## SCAR fellowship reviewers

*Please list one or more people (name and email address) from your group who would be willing to serve as reviewers for SCAR's award schemes over the next few years, along with 1-3 keywords on their principal expertise.*

First Name	Last Name	Email	Principal Expertise
<b>Adelina</b>	Geyer	<a href="mailto:ageyer@ictja.csic.es">ageyer@ictja.csic.es</a>	Active volcanism; Deception Island
<b>Alessio Kurt</b>	Di Roberto Panter	<a href="mailto:Alessio.diroberto@ingv.it">Alessio.diroberto@ingv.it</a> <a href="mailto:kpanter@bgsu.edu">kpanter@bgsu.edu</a>	Tephrochronology Igneous petrology/geochemistry/mantle geochemistry
<b>John L.</b>	Smellie	<a href="mailto:jls55@leicester.ac.uk">jls55@leicester.ac.uk</a>	physical volcanology, especially glaciovolcanism, eruptive palaeoenvironments
<b>Adam</b>	Martin	<a href="mailto:a.martin@gns.cri.nz">a.martin@gns.cri.nz</a>	Mantle petrology; igneous chemistry; Erebus volcanic province
<b>Max</b>	Maximillian Van Wyk de Vries	<a href="mailto:vanwy048@umn.edu">vanwy048@umn.edu</a>	volcano-ice interactions, glaciology, volcanic hazard modelling.