



**Paper 12**  
**SCAR SRP**  
SG

**Agenda 2.2**  
**SERCE**  
PS/LS/GS

Person  
Responsible:

Pippa  
Whitehouse,  
Matt King

## **SCAR Executive Committee Meeting 2017**

**Brno, Czech Republic, July 2017**

# **Solid Earth Response and influence on Cryosphere Evolution (SERCE) 2016-2017 Report**

**Report Author(s): Pippa Whitehouse (Durham University, UK)  
Matt King (University of Tasmania, Australia)**

### **Summary of activities from 2016-17 and any other important issues or factors (<150 words):**

Leadership of SERCE passed from Terry Wilson to Matt King and Pippa Whitehouse during SCAR2016. Steering committee membership has been updated; it now comprises 17 members at a range of career stages, from 12 different countries.

A SCAR-hosted mailing list has been created for SERCE (195 subscribers), and the SERCE website has been updated to include statements in support of Antarctic infrastructure (geodetic and seismic), and open access data sharing.

SERCE-facing conference sessions have taken place at SCAR 2016 (including co-sponsorship of a mini-symposium), EGU 2016/17, AGU 2016/17, AGU-JpGU, and IAG-IASPEI.

A Glacial Seismology Training School was held in June 2017 (USA), and a workshop on Glacial Isostatic Adjustment (GIA) and Elastic Deformation will take place in September 2017 (Iceland). Both activities received significant funds from SERCE.

A data sub-group has been formed, and is working with Quantarctica developers to upload SERCE-facing data sets to this open source resource.

**Recommendations that EXCOM and Scientific Group Chief Officers should consider (if any):** *Please indicate if approval is necessary or if they are just asked to note information.*

Representation has been made to SCAR regarding the retention of geodetic monuments following instrument decommissioning. These stable markers are directly connected to bedrock, and they ensure that instruments can be deployed in exactly the same position multiple times. Funding for geodetic networks is currently in a very fragile situation, with a significant number of currently-occupied GPS sites, including the majority of UK and US-installed sites, due for decommissioning by ~2020 if pending funding requests are not successful. There is therefore a high probability that instruments will need to be removed in the near future; if this occurs, we recommend that the fixed geodetic marker be maintained, to allow sites to be precisely re-occupied in the future if further funding becomes available. To reflect this potential course of action we have requested a revision to point 25 of the Environmental Code of Conduct for Terrestrial Scientific Field Research in Antarctica, which is currently under review. This recommendation is also supported by the SCAR Expert Group GIANT.

## Progress and Plans:

### **Major Activities and Significant Progress from the past year (<500 words):**

#### New Joint Chief Officers

Matt King and Pippa Whitehouse assumed co-leadership of SERCE following the SCAR 2016 OSC. Former chief officer Terry Wilson retains close contact with SERCE activities via membership of the steering committee. Membership of this committee has been updated to reflect the breadth of activities taking place under the banner of SERCE. At the SERCE side meeting, held in conjunction with the SCAR 2016 OSC, the opportunity was taken to review the aims and objectives of SERCE. As a result, and partly in response to recommendations from the External Review, a number of statements were added to the SERCE website to clarify our position with regard to Antarctic scientific infrastructure and data sharing. We have also added a note requesting that SERCE be mentioned in the acknowledgements of research publications where SERCE activities have contributed to the thinking or ideas behind that publication; thus making it easier for use to keep track of SERCE-facing research.

#### Glacial Seismology Training School

This training school was held in Fort Collins, USA, 11-17 June 2017. It was jointly-funded by SERCE, IGS, IACS, NSF and the IUGG, with the \$25,000 SERCE contribution being used to provide financial support for travel and living costs for 18 overseas attendees (15 of which were Early Career Researchers; ECRs). The lead organizer was Rick Aster (USA), and training on a range of aspects associated with glacial seismology was delivered by 10 instructors (from USA, Switzerland, and Germany) over the course of the week. The 45 participants came from 16 different countries, including a number of countries with developing Antarctic programs (Switzerland, Canada, Romania, Chile, and Costa Rica). 41 out of 45 participants were ECRs. All course material is available to download from the Training School website (<http://polenet.org/glacial-seismology-school-presentations>) enabling those who could not attend to still benefit from this activity.

#### Quantarctica liaison activity

A data sub-group has been formed with the remit of working with the Quantarctica (<http://quantarctica.npolar.no/>) development team to ensure that SERCE-facing data sets (e.g. seismic, geodetic, geological, geothermal, GIA model output) are accessible to as wide a network of scientists as possible via this open-source resource. The data sub-group provides expertise in identifying suitable data sets, submitting them for inclusion in Quantarctica, and providing feedback on the presentation of the data and the metadata to be included.

#### Research Activity

A number of recent publications (see list below) reflect SERCE-related research in the fields of: ice-sheet mass balance, polar geodesy, Antarctic

Earth structure, Antarctic GIA modelling (including complex Earth structure), coupled ice sheet-GIA modelling, glacial seismology, and geothermal heat flux. The list of abstracts submitted to the forthcoming workshop on Glacial Isostatic Adjustment and Elastic Deformation (<http://www.polar.dtu.dk/english/Workshop-on-Glacial-isostatic-adjustment-and-elastic-deformation-2017>) reflects the wide scope of SERCE-related research that is currently ongoing, much of which directly tackles key questions identified during the recent SCAR Horizon Scan.

**Major Future Initiatives and Actions, including rough timeline, for at least the next 2 years (<500 words):**

**2017**

Workshop on Glacial Isostatic Adjustment and Elastic Deformation

This activity, to be held in Reykjavik, Iceland, 5-7 September 2017, is jointly funded by SERCE, European Space Agency, and the Technical University of Denmark; it is held in association with the International Association of Geodesy. Lead organiser is Abbas Khan (Denmark); co-organisers are Matt King (Australia) and Pippa Whitehouse (UK). SERCE funds (\$15,000) will be used to provide travel support for predominantly Early Career Researchers (~90% of funds will go to ECRs) and/or scientists from countries with a developing Antarctic program (~25% of funds will go to scientists from such countries). The 3-day workshop covers four scientific themes related to observation and modelling of past and present ice-sheet change, and the solid Earth response to such change. 77 abstracts have been received. The meeting will include oral and poster sessions, and dedicated discussion time.

**2018**

'Taking the Temperature of the Antarctic Continent'

This workshop will be held in Hobart, Australia, 21-23 March 2018, and is jointly sponsored by SERCE (\$10,000) and the ARC Antarctic Gateway Partnership. Lead organisers are Jacqui Halpin and Anya Reading (both Australia), co-organisers are from Germany, USA and Belgium. SERCE funds will be predominantly used to provide travel support. The workshop will provide an opportunity for scientists to discuss current efforts, collaborations, and future directions in Antarctic heat flux research.

SCAR Summer School on Polar Geodesy

This summer school will take place near St. Petersburg, Russia during May 2018, and will provide training in polar geodetic techniques. Lead organizer is Mirko Scheinert (Germany); co-organizers are members of the Russian Antarctic Expedition. SERCE will provide \$3500 travel funding towards this activity, which will be run in conjunction with the SCAR Expert Group GIANT.

POLAR2018 session: 'Interactions between ice mass balance, the solid Earth, and sea-level changes'

This SERCE-facing session, jointly organized with ISMASS, invites contributions from researchers working on any aspect of ice-sheet mass balance, from modelling or observational perspectives, with particular focus

on interactions between ice-mass change and solid Earth deformation. Lead convener is Catherine Ritz (France), co-conveners are from Switzerland, Canada, UK, Belgium and Australia. The conference will take place in Davos, Switzerland, 19-23 June 2018, and is jointly organized by SCAR and IASC.

## 2019

### Workshop on GIA-ice-solid Earth feedbacks

This activity is proposed to take place in Ottawa, Canada, in the first half of 2019. The lead organizer is Tom James (Canada), and the scope of the workshop will cover GIA modelling, ice-sheet modelling, and feedbacks between the two, as well as the impact of lateral rheological variations on GIA.

### GIA summer school

We propose to hold a GIA summer school in Europe during the second half of 2019, building on the format successfully used in 2015. Numbers will be capped, but off-site students will again be able to participate fully via an online portal. This is an expensive activity; we will seek additional funding from other sources, including the NSF-funded POLENET project (PI Terry Wilson) if a pending funding decision is successful.

## **Please list any new outputs and deliverables (including publications and products that your group feels are part of your achievements):**

Recent SERCE-facing publications:

- Burton-Johnson, A., Halpin, J.A., Whittaker, J.M., Graham, F.S. & Watson, S.J., 2017. A new heat flux model for the Antarctic Peninsula incorporating spatially variable upper crustal radiogenic heat production, *Geophys Res Lett*, 44, 5436-5446.
- de Boer, B., Stocchi, P., Whitehouse, P.L. & van de Wal, R.S.W., 2017. Current state and future perspectives on coupled ice-sheet - sea-level modelling, *Quat. Sci. Rev.*, 169, 13-28.
- Hansen, S.E., Kenyon, L.M., Graw, J.H., Park, Y. & Nyblade, A.A., 2016. Crustal structure beneath the Northern Transantarctic Mountains and Wilkes Subglacial Basin: Implications for tectonic origins, *J Geophys Res-Sol Ea*, 121, 812-825.
- Hay, C.C., Lau, H.C.P., Gomez, N., Austermann, J., Powell, E., Mitrovica, J.X., Latychev, K. & Wiens, D.A., 2017. Sea-level fingerprints in a region of complex Earth structure: The case of WAIS, *J Climate*.
- Heeszel, D.S., Wiens, D.A., Anandakrishnan, S., Aster, R.C., Dalziel, I.W.D., Huerta, A.D., Nyblade, A.A., Wilson, T.J. & Winberry, J.P., 2016. Upper mantle structure of central and West Antarctica from array analysis of Rayleigh wave phase velocities, *Journal of Geophysical Research: Solid Earth*, 121.
- King, M.A., Whitehouse, P.L. & van der Wal, W., 2016. Incomplete separability of Antarctic plate rotation from glacial isostatic adjustment deformation within geodetic observations, *Geophys J Int*, 204, 324-330.

## SERCE: 2016-2017 Annual Report, cont.

- Martin-Espanol, A., King, M.A., Zammit-Mangion, A., Andrews, S.B., Moore, P. & Bamber, J.L., 2016a. An assessment of forward and inverse GIA solutions for Antarctica, *J Geophys Res-Sol Ea*, 121, 6947-6965.
- Martin-Espanol, A., Zammit-Mangion, A., Clarke, P.J., Flament, T., Helm, V., King, M.A., Luthcke, S.B., Petrie, E., Remy, F., Schon, N., Wouters, B. & Bamber, J.L., 2016b. Spatial and temporal Antarctic Ice Sheet mass trends, glacio-isostatic adjustment, and surface processes from a joint inversion of satellite altimeter, gravity, and GPS data, *J Geophys Res-Earth*, 121, 182-200.
- Nield, G.A., Whitehouse, P.L., King, M.A. & Clarke, P.J., 2016. Glacial Isostatic Adjustment in response to changing Late Holocene behaviour of ice streams on the Siple Coast, West Antarctica, *Geophys J Int*, 205, 1-21.
- O'Donnell, J.P., Selway, K., Nyblade, A.A., Brazier, R.A., Wiens, D.A., Anandakrishnan, S., Aster, R.C., Huerta, A.D., Wilson, T. & Winberry, J.P., 2017. The uppermost mantle seismic velocity and viscosity structure of central West Antarctica, *Earth Planet. Sci. Lett.*, 472, 38-49.
- Ramirez, C., Nyblade, A., Hansen, S.E., Wiens, D.A., Anandakrishnan, S., Aster, R.C., Huerta, A.D., Shore, P. & Wilson, T., 2016. Crustal and upper-mantle structure beneath ice-covered regions in Antarctica from S-wave receiver functions and implications for heat flow, *Geophys J Int*, 204, 1636-1648.
- Zhao, C., King, M.A., Watson, C.S., Barletta, V.R., Bordoni, A., Dell, M. & Whitehouse, P.L., 2017. Rapid ice unloading in the Fleming Glacier region, southern Antarctic Peninsula, and its effect on bedrock uplift rates, *Earth Planet. Sci. Lett.*, 473, 164-176.

### **Significant Deviations from the Implementation Plan, if any:**

- GIA-ice sheet feedback workshop (Canada) to be held in 2019 rather than 2018
- GIA Training School (Europe) to be held in 2019 rather than 2018
- These two activities have been re-scheduled due to the large number of Antarctic activities and meetings already proposed for 2018. In light of this, we request that unspent funds from 2018 are carried over to 2019 (details below under 'Budget').

### **Steps taken to address individual points from your External Review, if any:**

- The SERCE implementation plan has been completed
- In the last year we have pursued a number of activities that will facilitate data exchange between individual projects and nations. A new

## SERCE: 2016-2017 Annual Report, cont.

activity between GIANT and SERCE is attempting to consolidate GPS data (project name: GIANT-REGAIN). In addition, provision of data sets to Quantarctica will improve the visibility of a sub-set of SERCE-facing data types and model output.

- A recommendation has been added to our website requesting that SERCE be acknowledged in research publications where SERCE activities have contributed to the thinking or ideas behind that publication.
- Links have been established between SERCE and the WCRP Grand Challenges Sea Level Sciences group

**If your SRP produces data, please report any new data generated and links to inclusions to the Antarctic Master Directory, etc.**

Our SRP does not produce data, but prompted by feedback from the External Review we have undertaken an initiative to compile SERCE-facing open access data sets, and submit them for potential inclusion in the open-source GIS resource Quantarctica (<http://quantarctica.npolar.no/>).

## Budget

### Planned use of funds for 2017 and 2018

| Month/Year<br>(MM-YY)   | Purpose/Activity                                 | Amount<br>(in USD) | Contact<br>Name | Contact Email                 |
|---|--|--------------------|-----------------|-------------------------------|
| June-17   | Glacial Seismology Training School, USA          | \$25,000           | Rick Aster      | Rick.Aster@colostate.edu      |
| Sept-17   | Workshop on GIA and Elastic Deformation, Iceland | \$15,000           | Matt King       | matt.king@utas.edu.au         |
| March-18  | Geothermal Heat Flux workshop, Australia         | \$10,000           | Jacqui Halpin   | Jacqueline.Halpin@utas.edu.au |
| May-18  | Polar Geodesy Summer School, Russia              | \$3,500            | Mirko Scheinert | Mirko.Scheinert@tu-dresden.de |
| Remaining 2018 funds (~\$7500) to be carried over to 2019 – see below |  |                    |                 |                               |

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

##### Glacial Seismology Training School (June 2017)

SERCE funds were preferentially allocated to provide travel stipends for international student participants (NSF funds supported U.S. participants and instructors), including support for their living and dining costs at Colorado State University during the event. Total International Student Support Costs (18 students, covering travel stipends plus housing) came to \$26,272 US (which slightly exceeded the SERCE fund transfer of \$25k).

##### Workshop on GIA and Elastic Deformation (September 2017)

All of the SERCE funds assigned to this activity will be used to provide travel funds. The majority (~90%) of funds have been assigned to ECRs and/or scientists from countries with developing Antarctic programs.

##### Geothermal Heat Flux workshop (March 2018)

It is anticipated that 70-80% of the funds provided by SERCE will be used to provide travel support, predominantly for ECRs and scientists from countries with developing Antarctic programs. The remaining funds will cover any workshop overheads that are not covered by registration fees. The budget for this activity will be finalized by end of July 2017.

##### Polar Geodesy Summer School (May 2018)

It is anticipated that all of the SERCE funds assigned to this activity will be used to provide travel funds for predominantly ECRs and scientists from countries with developing Antarctic programs. The lead organizer of this activity is currently on fieldwork in Greenland; details of how the funds will be spent will be finalized when they return.

Requested carry-over of funds from 2018 to 2019

We propose to hold a GIA/Ice-sheet Modelling Workshop (\$10k) and a GIA summer school (\$20k+) in 2019 and therefore request that unspent funds from 2018 be carried over to 2019. We carefully considered the possibility of holding one of these activities in 2018, to use up funds within the year they are allocated, but a suitable time could not be found due to the occurrence other SERCE-relevant activities in 2018, in particular the POLAR2018 SCAR/IASC conference. If we are not allowed to carry funds over to 2019 then any unspent funds from 2018 will be used to provide travel support to ECR's and scientists from countries with developing Antarctic programs to enable them to attend POLAR2018. However, this is not our preferred course of action since it will likely leave us with insufficient funds to deliver one of the important activities proposed for 2019.

**Provide an estimate on the % of the budget to be used for support of early career researchers:**

2017

- GIA workshop (Iceland): ~90% of the funds assigned to this activity
- Glacial Seismology Training School (USA): ~83% of the funds assigned to this activity

2018

- Geothermal Heat Flux workshop (Australia): 60-70% of the funds assigned to this activity
- Polar Geodesy Summer School (Russia): at least 50% of the funds assigned to this activity

**Provide an estimate on the % of the budget to be used for support of scientists from countries with developing Antarctic programmes (as listed here: <http://www.scar.org/finances/contributions>):**

2017

- GIA workshop (Iceland): ~25% of the funds assigned to this activity
- Glacial Seismology Training School (USA): precise percentage not known, but all funds were used to support overseas attendees (18 students), 6 of those attendees came from countries with developing Antarctic programs

2018

- Geothermal Heat Flux workshop (Australia): 20-30% of the funds assigned to this activity
- Polar Geodesy Summer School (Russia): ~30% of the funds assigned to this activity

## Linkages

**Please describe any direct support you receive for your activities beyond SCAR** (eg. *Funds from another organization for a workshop*):

- Additional funding for the Glacial Seismology Training School (USA, June 2017) was provided by IGS, IACS, NSF and IUGG
- Additional funding for the Workshop on GIA and Elastic Deformation (Iceland, September 2017) has been provided by the European Space Agency (5000 Euros) and the Technical University of Denmark (2000 Euros)
- Additional funding for the Antarctic Heat Flux Workshop (Australia, March 2018) will be sought from the Australian Research Council (ARC) Antarctic Gateway Partnership Special Research Initiative
- Additional funding for the Workshop on GIA-Ice Sheet modelling (Canada, 2019) will be sought from Polar Knowledge Canada
- Additional funding for the GIA Summer School (Europe, 2019) will be provided by the NSF-funded POLENET project if the current funding proposal for this project is successful (as detailed in that proposal)

**Please list any major collaborations your SRP has with other SCAR groups and with organisations/groups beyond SCAR:**

- GIANT (SCAR) – ongoing joint project to consolidate Antarctica GPS data
- PAIS/AntClim21 (SCAR) – co-organizers of mini-symposium at SCAR 2016
- ISMASS (SCAR) – co-organizers of SERCE-facing session at POLAR2018
- International Association of Geodesy – parent organization hosting the 2017 workshop on Glacial Isostatic Adjustment and Elastic Deformation
- WCRP Grand Challenges Sea Level Sciences group – SERCE leadership now provides input to this activity

## Outreach and Capacity Building

**Please describe your outreach, communication and capacity building activities. Also provide information on activities that demonstrate effectiveness as a network.** (*coordinating activity for your discipline/topic, i.e. mailing list and diversity of scientists involved*) (<250 words):

- Lecture material associated with the 2015 GIA summer school and the 2017 Glacial Seismology Training School are available online, linked from the SERCE webpage.

- Students who were unable to attend the 2015 GIA summer school were provided with the opportunity to participate remotely via an online portal. Their participation was monitored in real-time, and they were able to pose questions to the lecturers just as if they were in the room. We plan to repeat this approach for the 2019 GIA summer school.
- A SCAR-hosted SERCE mailing list has been set up, and serves not only as a tool to improve the effectiveness of SERCE, but also as a centralized resourced to share news associated with the field of Glacial Isostatic Adjustment; such a mailing list did not previously exist.
- Capacity building: the vast majority of SERCE funds are directed towards enabling Early Career Researchers or scientists from countries with a developing Antarctic program to participate in medium-sized (30-100 people) workshops. By attending such workshops these scientists will be exposed to both discipline-specific and highly inter-disciplinary cutting-edge science, and they will have the opportunity to network with scientists from a diverse range of research fields.

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.**

Matt King (matt.king@utas.edu.au)

## Membership

### Leadership

| Role                | First Name | Last Name  | Affiliation            | Country   | Email                         | Date Started | Date Term is to End |
|---------------------|------------|------------|------------------------|-----------|-------------------------------|--------------|---------------------|
| Joint Chief Officer | Matt       | King       | University of Tasmania | Australia | matt.king@utas.edu.au         | 2016         | 2020                |
| Joint Chief Officer | Pippa      | Whitehouse | Durham University      | UK        | pippa.whitehouse@durham.ac.uk | 2016         | 2020                |

*\* Please include any APECS representative / Junior Officers*

### Other members

| First Name | Last Name | Affiliation                            | Country    | Email              |
|------------|-----------|--|------------|--------------------|
| Songtao    | Ai        | Wuhan University                       | P.R. China | ast@whu.edu.cn     |
| Meijian    | An        | Chinese Academy of Geological Sciences | P.R. China | meijianan@live.com |

SERCE: 2016-2017 Annual Report, cont.

|           |           |   |             |                                 |
|-----------|-----------|---|-------------|---------------------------------|
| Mike      | Bentley   | Durham University                           | UK          | m.j.bentley@durham.ac.uk        |
| Rene      | Forsberg  | Danish Technical University                 | Denmark     | rf@space.dtu.dk                 |
| Natalya   | Gomez     | McGill University                           | Canada      | natalya.gomez@mcgill.ca         |
| Jacqui    | Halpin    | University of Tasmania                      | Australia   | Jacqueline.Halpin@utas.edu.au   |
| Samantha  | Hansen    | University of Alabama                       | USA         | shansen@ua.edu                  |
| Thomas    | James     | Natural Resources Canada                    | Canada      | tjames@nrcan.gc.ca              |
| Masaki    | Kanao     | National Institute of Polar Research (NIPR) | Japan       | kanao@nipr.ac.jp                |
| Adam      | Martin    | GNS   | New Zealand | a.martin@gns.cri.nz             |
| Anthony   | Memin     | Géoazur, Université Nice Sophia Antipolis   | France      | Anthony.MEMIN@unice.fr          |
| Yongcheol | Park      | Korea Polar Research Institute (KOPRI)      | South Korea | ypark@kopri.re.kr               |
| Pattyn    | Frank     | Université libre de Bruxelles               | Belgium     | fpattyn@ulb.ac.be               |
| Mirko     | Scheinert | TU Dresden (Technische Universität)         | Germany     | Mirko.Scheinert@tu-dresden.de   |
| Dusty     | Schroeder | Stanford University                         | USA         | Dustin.M.Schroeder@stanford.edu |
| Alex      | Simms     | University of California, Santa Barbara     | USA         | asimms@geol.ucsb.edu            |
| Terry     | Wilson    | Ohio State University                       | USA         | wilson.43@osu.edu               |

**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:*