SCAR Sub-Group	**CGG**
SG	GS
Person Responsible:	Joachim Jacobs

XXXVII SCAR Delegates Meeting

India, September 2022

Connecting geophysics with geology (CGG)

2020-22 Report

Summary

Report Author(s)

Joachim Jacobs, Norway
Fausto Ferraccioli, Italy
Andreas Läufer, Germany

Summary of activities from 2020-22

The past two years have been strongly influenced by the pandemic, which has resulted in considerable delays and in part cancellation of field activities.

Field activities, other activities:

BGR expedition “GANOVEX XIV-BOOST” with high-resolution aeromagnetic survey and geological field work in northern Victoria Land successfully conducted.

Planned sampling/analyses of ice-rafted debris/moraine material off/in Dronning Maud Land could not be conducted due to the pandemic. Instead, sedimentary rocks of the critical Shackleton Range were targeted, by sampling material taken during previous expeditions by BGR and stored in the German National Polar Sample Archive (NAPA) in Berlin. Mineral separation and analyses in progress.

Contribution to the new Gondwana Map (Antarctic part), editor R. Schmitt, Rio de Janeiro. The new Gondwana map is almost finalised. Last issues with respect to Antarctica addressed particularly the reconstruction of the Antarctic microblocks which still remain to be solved.

An SRP planning meeting in Bergen, Norway, originally planned for early 2021, had to be postponed due to the pandemic. We now plan to meet in autumn 2022 or 2023 either in Bergen, Hannover or Trieste.

A proposal for new aerogeophysical surveys of Princess Elizabeth Land in East Antarctica (GEOEAIS)- led by India & UK was submitted in 2020. However, NERC funding was not awarded in 2021. Whether to resubmit it, or to pursue alternative collaboration with China who have also collected new datasets in the study area will be further considered at the next planning meeting.

4D Antarctica geophysical interpretation and modelling efforts to help constrain crustal and lithosphere structure and its influence on Antarctic geothermal heat flux heterogeneity has progressed, despite major restrictions in international collaborative

visits and work. The results so far are reported in 4 new papers (see list). These activities are planned to continue at least till Spring 2023.

Contributions to the new International Lithosphere Programme on East Antarctica (2020-2025) have been made via presentations on East Antarctica delivered at AGU 2020 & AGU 2021 and EGU 2021 and EGU 2022.

A conference session on Antarctic and Arctic lithosphere structure and evolution was organized at AGU Fall Meeting 2020 (lead convenor Ferraccioli). It was successful, despite severe limitations related to the pandemic that imposed virtual only attendance. However, we decided not to propose other sessions until safer on-site conference attendance becomes more viable (e.g. EGU 2023 or AGU 2023).

Summary Budget 2021 to 2024

	2021	2022	**2023**	**2024**
	Spent	Allocated	Request	Request
(US$)	0	2500	2500+2500	2500

Budget for 2020/21 has not been spent due to the pandemic and the fact that the SRP planning meeting had to be cancelled. We would like to request that 2500 US$ been taken over into 2023 mainly for a SRP planning meeting.

Future plans

Planned activities in 2022 to 2024

Analysis, publication of “GANOVEX XIV-BOOST” data set, high-resolution aeromagnetic survey and geological field work in northern Victoria Land; integration of all three successively flown aeromagnetic high-resolution surveys along the Lanterman-Mariner Suture Zone conducted over four seasons between 2016 and 2021 in final model and publication.

Continue geophysical interpretation and modelling efforts in 4D Antarctica and beyond also as a contribution to new INSTANT SRP efforts on geothermal heat flux and geological boundary conditions for ice sheets.

Detrital zircon analyses of sedimentary rocks of the critical Shackleton Range region.

Help finalize the new Gondwana Map (Antarctic part), editor R. Schmitt, Rio de Janeiro.

SRP planning meeting in Bergen, Hannover or Trieste in autumn 2022 or spring 2023.

EGU 2023 and AGU 2024 conference sessions

Planning: new Tectonic map of Antarctica, SCAR community effort

Planned use of funds for 2022 to 2024

Year (YYYY)	Purpose/Activity	Amount (in USD)	Contact Name	Contact Email
2023	SRP planning meeting	5000	Jacobs/Ferraccioli/Läufer	jja083@uib.no
2024	SCAR OSC	2500	Jacobs/Ferraccioli/Läufer	jja083@uib.no
Total		**7500**		

Any additional detail on funds usage and desired results/outcomes

We would like to request to forward the budget from 2022 that was earmarked for participation at the SCAR OSC – India to 2023. New usage: planning meeting SRP proposal for 2024 of leadership.

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

2023: 20%

2024: 20%

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

2023: 20%

2024: 20%

Membership

Leadership

Role	First Name	Last Name	Affiliation	Country	Primary Language	Email	Date Started
Co-chair	Joachim	Jacobs	Univ. Bergen	Norway	German	Joachim.jacobs@uib.no	2012
Co-chair	Fausto	Ferraccioli	OGS Trieste	Italy	Italian	fferraccioli@ogs.it	2013
Co-chair	Andreas	Laeufer	BGR Hannover	Germany	German	andreas.laeufer@bgr.de	2018

*(Please identify early-career researchers with * in first column)*

Other members

First Name	Last Name	Affiliation	Country	Primary Language	Email
Alex	Burton-Johnson	BAS	UK	English	alerto@bas.ac.uk
Antonia*	Ruppel	BGR	Germany	German	Antonia.ruppel@bgr.de
Rafael*	Fragroso	Univ. Rio de Janeiro	Brasil	Brasilian	Rafael.arauj.fragroso@gmail.com
Laura	Crispini	Univ. Genova	Italy	Italian	Laura.crispini@unige.it
Christine	Siddoway	Colorado C	USA	English	csiddoway@coloradocollege.edu
Jaqueline	Halpin	UTAS	Australia	English	Jacqueine.halpin@utas.edu.au
Karsten	Gohl	AWI	Germany	German	Karsten.gohl@aqi.de
German	Leitchenkov	VNIIO	Russia	Russian	German_l@mail.ru
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Tom	Jordan	BAS	UK	English	
Hallgeir*	Sirevaag	Univ. Bergen	Norway	Norwegian	Hallgeir.sirevaag@uib.no
Synnøve	Elvevold	NPI	Norway	Norwegian	Synnøve.elvevold@npi.no

Additional information (optional)

Notable Papers

Capponi, M., D Sampietro, J Ebbing, F Ferraccioli, 2022. Antarctica 3-D crustal structure investigation by means of the Bayesian gravity inversion: the Wilkes Land case study, Geophys. J. Int., 229(3), 2147–2161, https://doi.org/10.1093/gji/ggac036.

In this paper we tested Bayesian inversion approaches to help estimate crust and sediment thickness within the enigmatic Wilkes Subglacial Basin in East Antarctica.

Cianfarra, P., Locatelli, M., Capponi, G., Crispini, L., Rossi, C., Salvini, F., & Federico, L., 2022. Multiple reactivations of the Rennick Graben Fault system (northern Victoria Land, Antarctica): New evidence from paleostress analysis. Tectonics, 41, e2021TC007124. https://doi.org/10.1029/2021TC007124.

In this paper we investigated strike-slip tectonics affecting the Rennick Graben in the northern Victoria Land sector of East Antarctica.

Dziadek, R., Ferraccioli, F., and Gohl, K., 2021. High Geothermal Heat Flow beneath Thwaites Glacier in West Antarctica Inferred from Aeromagnetic Data. Commun. Earth Environ. 2, 162. doi:10.1038/s43247-021-00242-3.

In this paper (published in a Nature portfolio journal), which estimates geothermal heat flux beneath the fastest changing sector of the West Antarctic Ice Sheet, we performed new magnetic analyses and geological interpretation of the West Antarctic Rift System.

Ebbing, J., Y. Dilixiati, P. Haas, F. Ferraccioli, and S. Scheiber-Enslin, 2021. East Antarctica magnetically linked to its ancient neighbours in Gondwana: Scientific Reports, 11, 1–11, doi: 10.1038/s41598-021-84834-1.

In this paper (published in a Nature portfolio journal), which conforms aeromagnetic and satellite anomaly data together for the first time, we performed new interpretations of East Antarctic provinces within Gondwana.

Johansson, Å., et al., Jacobs, J., et al., Wang, C., 2021. A geochronological review of magmatism along the external margin of Columbia and in the Grenville-age orogens forming the core of Rodinia. Precambrian Res.

Our contribution to this major community effort has been the review of Grenville age orogenesis of Kalahari with its part in East Antarctica.

Jordan, T.A., Ferraccioli, F. & Forsberg, R., 2022. An embayment in the East Antarctic basement constrains the shape of the Rodinian continental margin. Commun Earth Environ 3, 52. https://doi.org/10.1038/s43247-022-00375-z

In this paper (published in a Nature portfolio journal) we locate the edge of the East Antarctic craton at South Pole and propose that it was affected by rifting within Rodinia.

Wang, C., Jacobs, J., Elburg, M.A., Laeufer, A., Elvevold, S., 2020. Late Neoproterozoic–Cambrian magmatism in Dronning Maud Land (East Antarctica): U–Pb zircon geochronology, isotope geochemistry and implications for Gondwana assembly. Precambrian Research 350.

In this paper we have undertaken isotopic profiling across a major lithosphere boundary in East Antarctica demonstrating that the Kalahari part of East Antarctica is a long-lasting accretionary orogen in late Mesoproterozoic-Neoproterozoic times.

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

Within SCAR

1. ADMAP
2. GEOMAP
3. SERCE
4. PAIS
5. INSTANT
6. Geothermal Heat Flux sub-group
7. RINGS

Outside SCAR

1. IGCP 628: Gondwana map project, by involving CGG specialists to review various key areas
2. IGCP 648: Supercontinent cycles & global geodynamics
3. IUGG
4. ESA Antarctic initiatives and projects

Outreach, communication and capacity-building activities

Press release on papers on the new magnetic anomaly compilation of Gondwana and the paper on the interpretation of new magnetic anomaly data at South Pole

Contributions to equality, diversity, and inclusion (EDI)

(Any specific actions the group has undertaken to advance EDI within the group and/or within SCAR)

SCAR fellowship reviewers

First Name	Last Name	Email	Principal Expertise
Joachim	Jacobs	joachim.jacobs@uib.no	Tectonics, geodynamics, geochronology
Fausto	Ferraccioli	fferraccioli@ogs.it	Potential fields, tectonophysics, geodynamics
Andreas	Läufer	andreas.laeufer@bgr.no	Tectonics, geochronology, geodynamics
Laura	Crispini	laura.crispini@unige.it	Structural geology geodynamics
Antonia	Ruppel	antonia.ruppel@bgr.de	Geophysics, geodynamics