SANAP Geological Research program (2) 2024-2026 in western Dronning Maud Land, Antarctica

Geoff Grantham
Dept. Geology, University of Johannesburg,
Auckland Park 2006
ghgrantham@uj.ac.za

UNIVERSITY OF JOHANNESBURG

NRF National Research Foundation

2nd Project -Provenance and Paleomagnetics of the rocks of the Grunehogna Craton in Western Dronning Maud Land

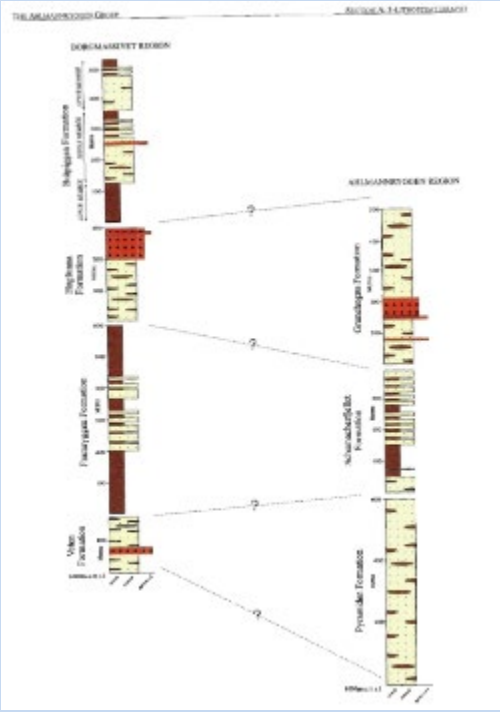
•3 field seasons planned.

- 2024-2025 Ahlmanryggen - Borgmassivet area.

(1) Detrital zircon studies to improve correlation of layers between nunataks and to improve our understanding of the source of the sedimentary rocks Ahlmanryggen/Borgmassivet and intercontinentally (Mkondo Group Zimbabwe). Will be improved with quicker less expensive LA-ICP MS age dating at U. Johannesburg and build on data from the below studies.

(S. Perrit (2001) THE AHLMANNRYGGEN GROUP, WESTERN DRONNING MAUD LAND, ANTARCTICA. PhD Thesis, University of Natal. Thesis presented limited SHRIMP age data. Will be improved with quicker less expensive LA-ICP MS age dating at U. Johannesburg)

and (Horst R. Marschall, Chris J. Hawkesworth, Philip T. Leat (2013) Mesoproterozoic subduction under the eastern edge of theKalahari-Grunehogna Craton preceding Rodinia assembly: The Ritscherflya detrital zircon record, Ahlmannryggen, Dronning Maud Land, Antarctica. Precambrian Research 236 (2013) 31– 45 .



(2) Collect samples to better constrain the paleomagnetic pole of the ~1120 Ma Borgmassivet Intrusions.

(3) Locate and collect additional samples from the ~720 Ma Fingeren Dykes identified in the 2017/2018 field season.

A sample collected during the 2017/2018 season yielded an age of 720Ma, the first time dykes of this age are recorded from Ahlmanryggen-Borgmassivet and are potentially correlatable with the Mutare Dyke Swarm in Zimbabwe. These data may be compared with data from Angola/Tanzanian Craton blocks . (Ashley P. Gumsley, Michiel de Kock, Richard Ernst, Anna Gumsley, Richard Hanson, Sandra Kamo, Michael Knoper , Marek Lewandowski, Bartłomiej Luks, Antony Mamuse and| Ulf Söderlund (2024) The Mutare–Fingeren dyke swarm: the enigma of the Kalahari Craton's exit from supercontinent Rodinia. Geological Society, London, Special Publications, 537, 359 - 380.)

2025-2026

- Ahlmanryggen - Borgmassivet area.

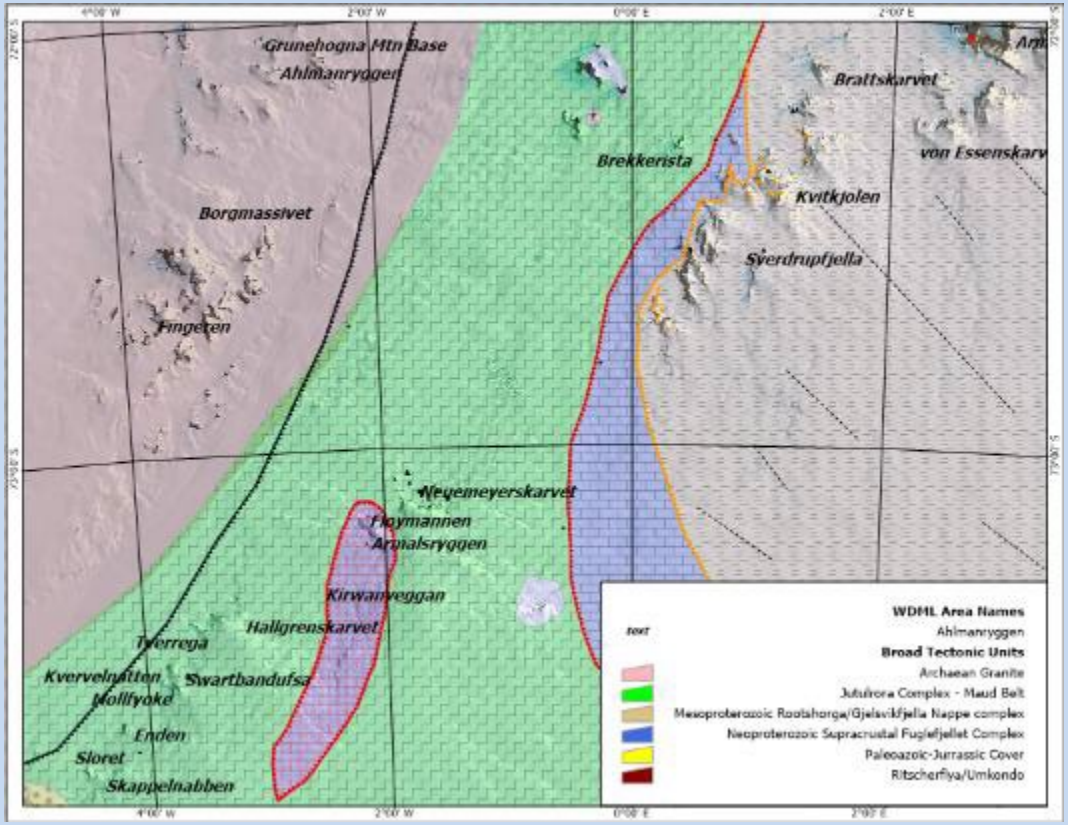
(1) Detrital zircon studies to improve correlation of layers between nunataks and to improve our understanding of the source of the sedimentary rocks locally and intercontinentally (Zimbabwe).

(2) Collect samples to better constrain the paleomagnetic pole of the ~1120 Ma Borgmassivet Intrusions.

- Kirwanveggan

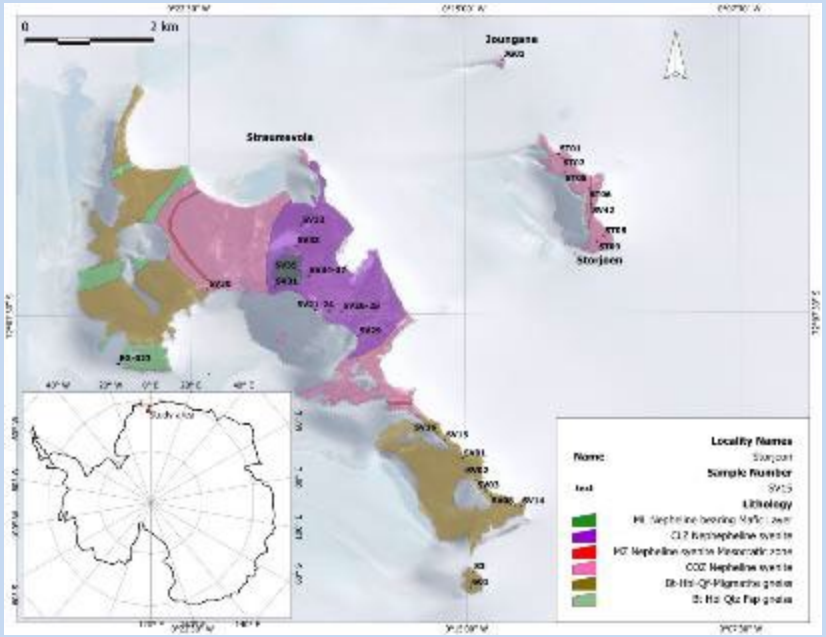
(3) Locate and collect additional samples of possible ~720 Ma Fingeren Dykes in Kirwanveggan for geochemical comparison and possible age dating.

(4) Collect samples and structural data from the Armalsryggen nunatak group for whole rock chemical mineralogical and geochronological age dating for comparison with eastern Sverdrupfjella and CDML as a possible klippe structure.

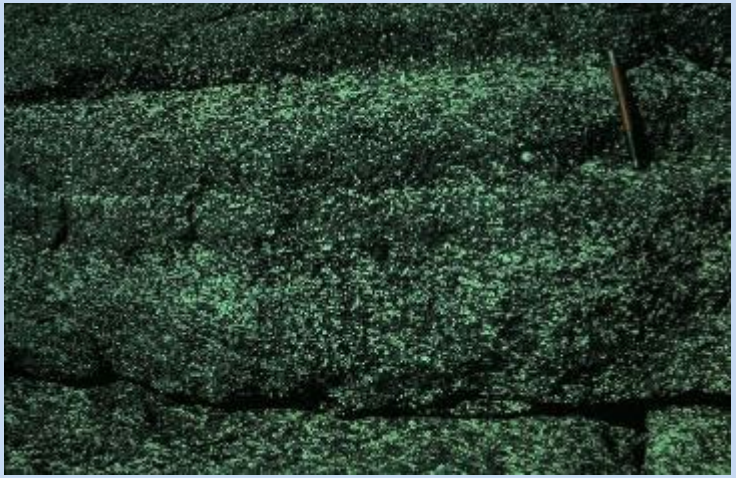


2026-2027

- Recognising the complexity and difficulty of trying to get paleomagnetic pole date from dikes due to limited sample area from multiple dykes, combined with uncertain age constraints on multiple dykes, it is planned to sample the Straumsvola Alkaline Complex for a paleomagnetic study.



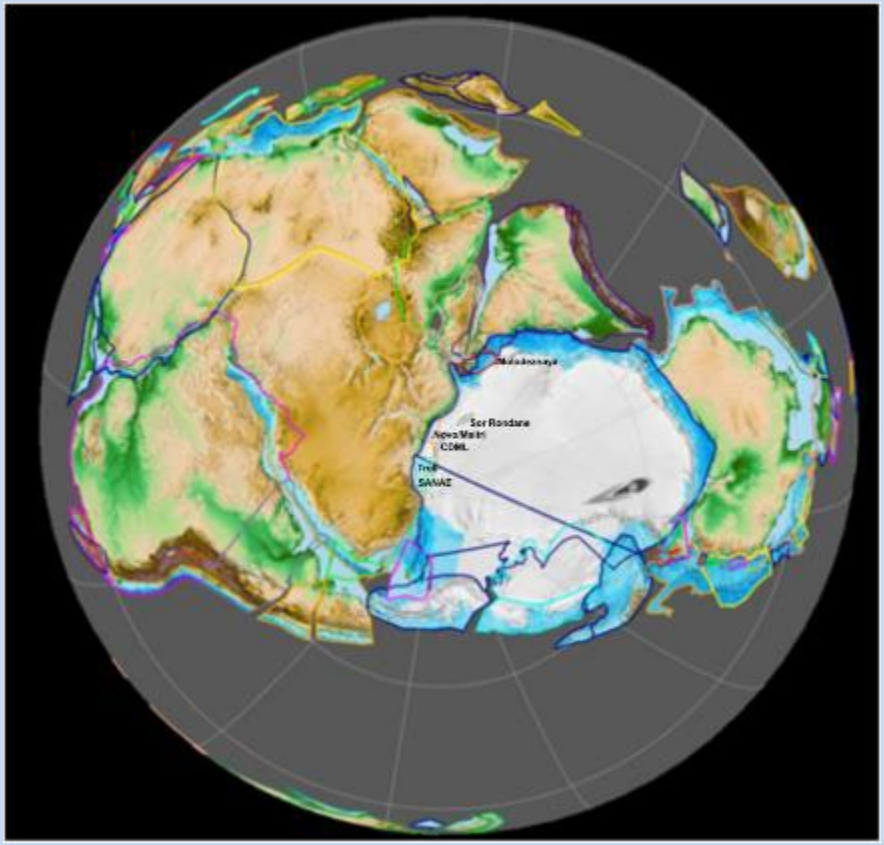
The complex has a probable diameter of ~5km.
The complex is strongly layered as shown in the images below which show near horizontal layering.
Three Ar/Ar ages indicate an age of 178-179 Ma.
A paleomagnetic pole from that age will confirm if Antarctica had already drifted a long way from southern Africa by that stage.

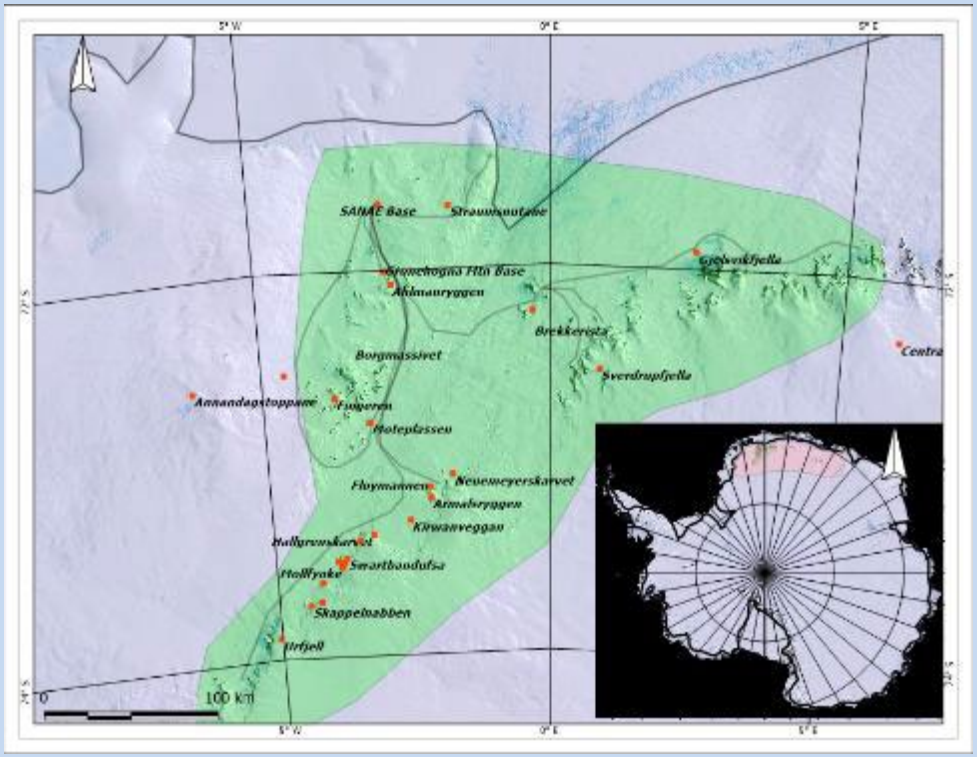


Forward looking perspective

- Reconnaisance mapping ~1953-1960 Norway, Russia, Belgium.
- Formal mapping by Geol Survey SA. 1960-1974 and universities 1980-1993 (27 years of field seasons) with map compilation published 2006 with follow up research.
- Geology of WDML is reasonably well understood with insights that can be applied regionally eastwards toward Novolarevskaya and beyond and south westwards toward Vestfjella and Heimefrontfjella.

Geographic limits





- SA has interests in understanding the continuation of Antarctic geology into Africa and vice versa, with SA being the only African country with involvement in Antarctic Research.
- southern Africa has a geological interface with Antarctica of broadly equivalent to those of India/Asia and Australia with remaining countries of Sri Lanka, New Zealand and the crustal fragments Falkland Islands, Maurice Ewing Banks plateau, Haag Nunatacks and Elsworth Whitmore block being very small (above left).
- To date the areas shown in green (figure above right) and blue_green (figure above left) represent the areas where SA researchers have accessed by skidoo and sledge (with varying amounts of helicopter support) operating mostly from SANAE and lesser extent Troll with assistance from Norway

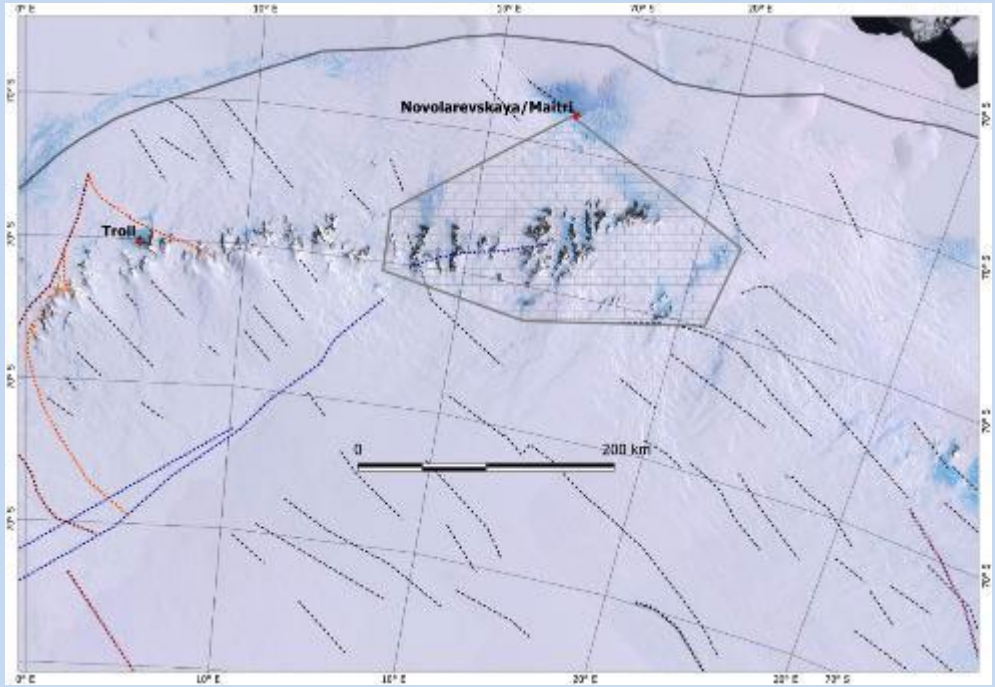
Future and possible ways forward for Antarctic Land-based Geological Research

• From SCAR 2024. The proposal to initiate a new program AGE was accepted (Antarctic Geological Evolution) (initiated at the 2019 Incheon Korea, ISAES meeting and led by J.Jacobs Bergen University, Norway).

•The Program Planning Group will now prepare a proposal to SCAR for a formal SCAR Scientific Research Program focusing on the geology and geophysics of Antarctica.

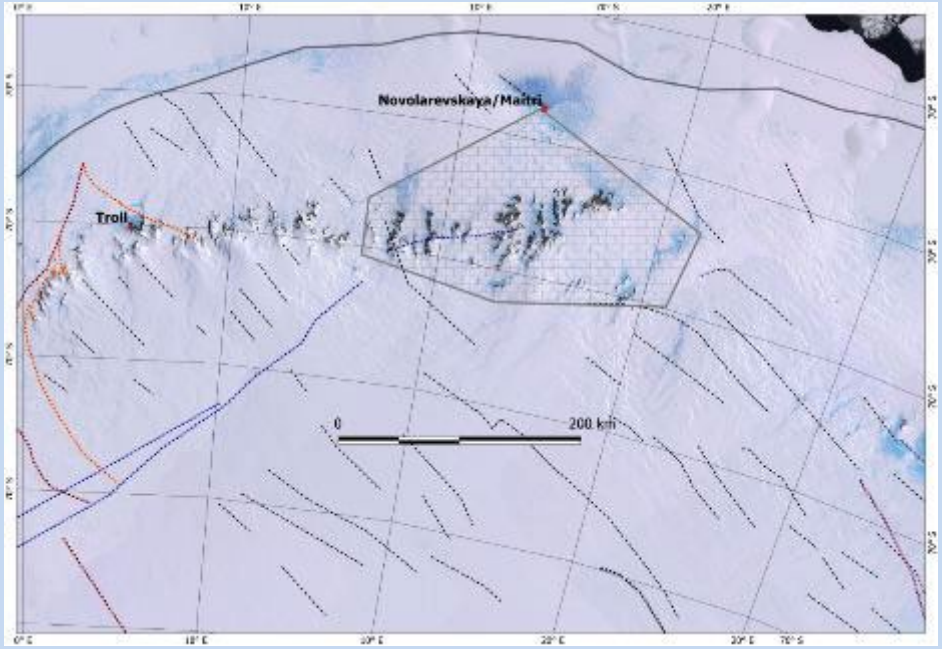
• This would provide formal SCAR support for possible International expeditions operating out of Troll and Novolarevskaya/Maitri at Schirmacher Oasis to explore CDML, which is perhaps one of the least studied areas of Antarctica .

• Increasing air support for logistics is being developed besides the Ilyushin 76 of Dromlan with landing strips also at Troll and a new one being developed by White Desert SE of Novolarevskaya.



Proposal for future Geological collaboration

- A possible collaborative project between South Africa and Russia could involve joint field mapping campaigns operating out of Novolarevskaya contributing to the generation of new data – geochronology, structural, lithological and petrological.
- The value of geochronology in gaining insights is critical as reflected in its contribution to date in WDML. Whereas SA has reasonable LA-ICPMS geochronological facilities, access to the SHRIMP in St. Petersburg for more complex samples would be valuable. Informal discussions with Mr Nikita Borovkov at the SCAR OSC in Chile suggested possible collaboration with analytical support with samples from Antarctica and Mozambique.
- Preliminary discussions with Wits University on a geophysical seismic tomography.



Thanks

- I would like to thank the Arctic and Antarctic Research Institute for this opportunity to discuss possible collaboration.
- Thanks also to Tracy Klarenbeek for arranging and facilitating this opportunity.

- Contact ghgrantham@uj.ac.za