National Argon Map: an AuScope initiative

Data Acquisition Project Proposal

This form should be completed and returned to Geoff Fraser (Geoff.Fraser@ga.gov.au) for consideration by the National Argon Map Oversight Panel

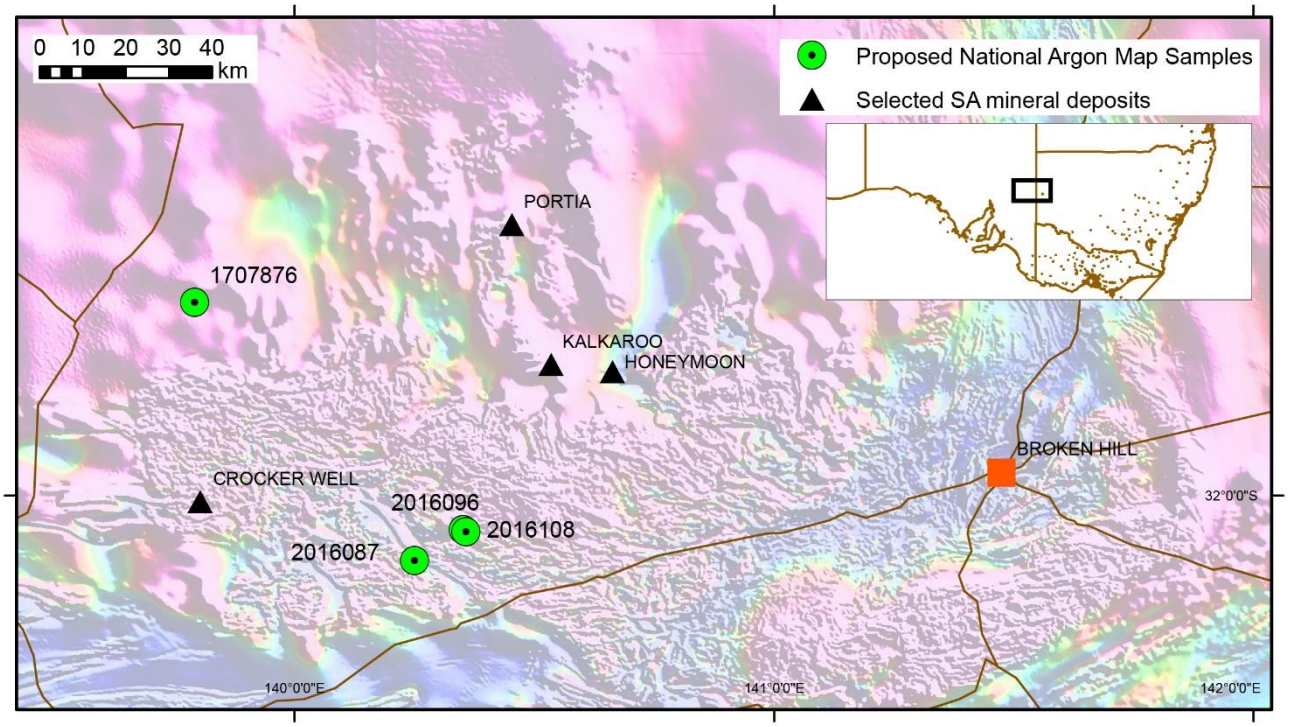
Project Proponent

Name: Anthony Reid
Affiliation and position: Senior Principal Geoscientist, Geological Survey of South Australia
Collaborators: Dr Marnie Forster
Project Title: **Reconnaissance thermochronology of Curnamona Province**
Geographic Region: **Olary Domain**
Geological Province or Tectonic Unit: Curnamona Province

Brief Project Description:

Approximately 500 word maximum. Include what geological process/problem will be addressed, and how new $^{40}Ar/^{39}Ar$ data from the specific samples to be dated will contribute. Please include reference to pre-existing geochronological constraints, if any exist. Please include a simple location map which showing the spatial distribution of samples in their geological context (with scale).

The Curnamona Province is host to one of the world's largest mineral deposits at Broken Hill and has prospectivity for IOCG mineral systems as witnessed by deposits such as Kalkaroo and Portia. There is however, very little argon geochronology from the Curnamona Province, in particularly the South Australian portion of the region. The samples selected are from the Bimbowrie region and from a regional drill hole that will assist with gaining baseline information on the thermal evolution of the Curnamona Province.



Location map of Curnamona Province samples. Backgroundlayer is national Total Magnetic Intensity image, Geoscience Australia.

Approximate number of samples proposed for $^{40}Ar/^{39}Ar$ analyses:

Four samples. Each has both muscovite and biotite that can be analysed. No existing geochronology has been conducted on the three outcrop samples. SHRIMP U-Pb zircon age from sample 1707876 is 1594 ± 8 Ma (Jagodzinski and Fricke, 2010).

Lithologies and minerals proposed for $^{40}Ar/^{39}Ar$ analyses:

Below table shows lithologies and minerals for analysis.

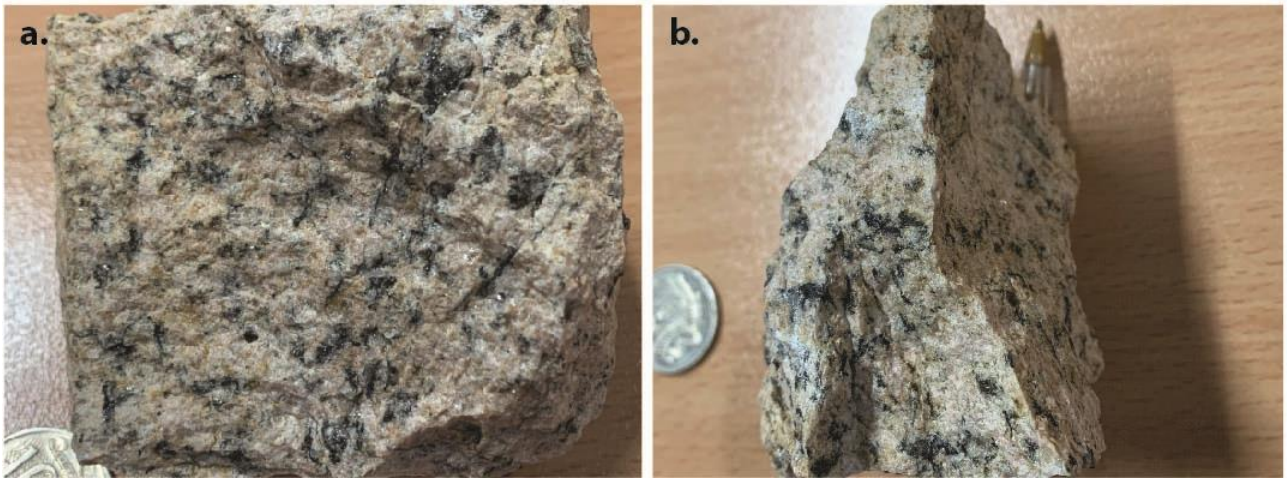
Sample	Lithology	target mineral	Drill_hole	depth-from	depth-to	Dlat	Dlong
2016096	weakly foliated two mica granite	muscovite, biotite				-32.070844	140.350837
2016087	granite	muscovite, biotite				-32.135595	140.248904
2016108	granite	muscovite, biotite				-32.075518	140.356324
1707876	granite	muscovite, biotite	Frome 12	**1513**	**1519**	-31.5976533	139.7896739

Samples are described below. The samples represent the spectrum from syn-tectonic to post-tectonic magmatism in the Olary Domain.

Sample 2016108 is a granitic segregation within a diatextite migmatite. The sample contains biotite and muscovite suitable for dating and may also contain K-feldspar. A thin section is in preparation to help assist with identification of possible feldspar for analysis.

Photograph of sample 2016108.

Sample 2016096 is a weakly foliated two mica granite typical of the Bimbowrie Suite from the Bimbowrie region of the Curnamona Province. The sample is ideal for defining the thermal history of the Curnamona Province as expressed in the Bimbowrie Suite granites. Muscovite and biotite are present and can be analysed. The feldspar in this rock may be K-feldspar however, pervasive sodicalteration is widespread in the Curnamona Province and therefore the feldspar may now be albite-dominated. A thin section is in preparation to help assist with identification of possible feldspar for analysis.



Photographs of sample 2016096. a. shows general texture. b. shows the weak foliation of the granite (vertical in the image) defined by alignment of mica and fracture planes within feldspar.

Sample 2016087 is a granite of the Bimbowrie Suite. The granite contains biotite and muscovite. The granite is slightly weathered. K-feldspar may not be suitable for argon dating. The granite is a typical very late stage granite in the Bimbowrie Suite and having been emplaced subsequent to the Olarian Orogeny at c. 1585 Ma. A thin section is in preparation to help assist with identification of possible feldspar for analysis.

Photograph of sample 2016087.

Sample 1707876 is a medium grained two mica granite from the drill hole Frome 12. The drill hole is located on the western edge of the Benagerie Ridge in the central Curnamona Province. The granite contains both muscovite and biotite that are suitable for $^{40}Ar/^{39}Ar$ dating.

Photograph of sample 1707876.

Do you have a preferred ^{40}Ar-^{39}Ar laboratory? (ANU, Curtin, UQ, UMelb):
ANU.

Reference

Jagodzinski, E.A., Fricke, C.E., 2010. Compilation of new SHRIMP U-Pb geochronological data for the southern Curnamona Province, South Australia, 2010. South Australia. Department of Primary Industries and Resources. Report Book 2010/00014.

Guidelines and Criteria

Project Proposals for funding support as part of the AuScope National Argon Map initiative will be assessed on the following criteria.

Australian: Samples must come from Australia (this may include Australian offshore regions)

Non-confidential: $^{40}Ar/^{39}Ar$ data must be made publicly-available (ie non-confidential)

Impact: to what extent new $^{40}Ar/^{39}Ar$ data from the proposed samples will contribute to geographic data coverage, or address key geological questions

Feasibility: whether the nature of the work is tractable via $^{40}Ar/^{39}Ar$ geochronology and the scale of the proposal is realistic within the time frame of the National Argon Map initiative (January 2020 – June 2021)?

Appropriate sample material: whether the proposed samples are (i) appropriate for $^{40}Ar/^{39}Ar$ analyses, and (ii) available within the time-frames of the National Argon Map initiative?

Oversight Panel

Dr Geoff Fraser, Geoscience Australia
Professor Zheng-Xiang Li,
Dr Anthony Reid, Geological Survey of South Australia
Peter Rea, MIM/Glencore
Dr Catherine Spaggiari, Geological Survey of Western Australia
Dr David Giles, MinEx CRC
Dr Marnie Forster (observer role as Project Coordinator)

Expectations

AuScope funding will cover the costs of sample irradiation and isotopic analyses.

Project Proponents will be responsible for:

- Provision of appropriate sample material. This includes mineral separation, which can be arranged at the relevant $^{40}Ar/^{39}Ar$ laboratories (in many cases this is preferred), but costs of mineral separation will be borne by the project proponent. The relevant laboratory reserves the right not to analyse material if it is deemed unsuitable for $^{40}Ar/^{39}Ar$ analysis.
- Provision of appropriate sample information. A sample submission template will be provided. Information in these sample submission sheets will form the basis of data delivery/publication, and the oversight committee or relevant laboratory reserves the right not to proceed with analyses unless and until appropriate sample details are provided. This includes description and geological context for each sample.
- Leading the preparation of reports and/or publications to deliver $^{40}Ar/^{39}Ar$ results into the public domain within the duration of the National Argon Map initiative (January 2020 – June 2021).
- Project Proponents will be expected to communicate directly with the relevant $^{40}Ar/^{39}Ar$ laboratory once a project has been accepted by the Oversight Committee, in order to clarify project expectations, arrange sample delivery, discuss results, collaborate on reporting and data delivery etc.

Participating Ar Laboratories will be responsible for:

- Providing advice to project proponents regarding suitable sample material and feasibility of proposed work
- Irradiation of sample material
- $^{40}Ar/^{39}Ar$ isotopic analyses
- Delivery of data tables, and analytical metadata to project proponents

Queries regarding possible projects as part of the National Argon Map initiative can be directed to Marnie Forster (Marnie.Forster@anu.edu.au) or Geoff Fraser (Geoff.Fraser@ga.gov.au)