

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

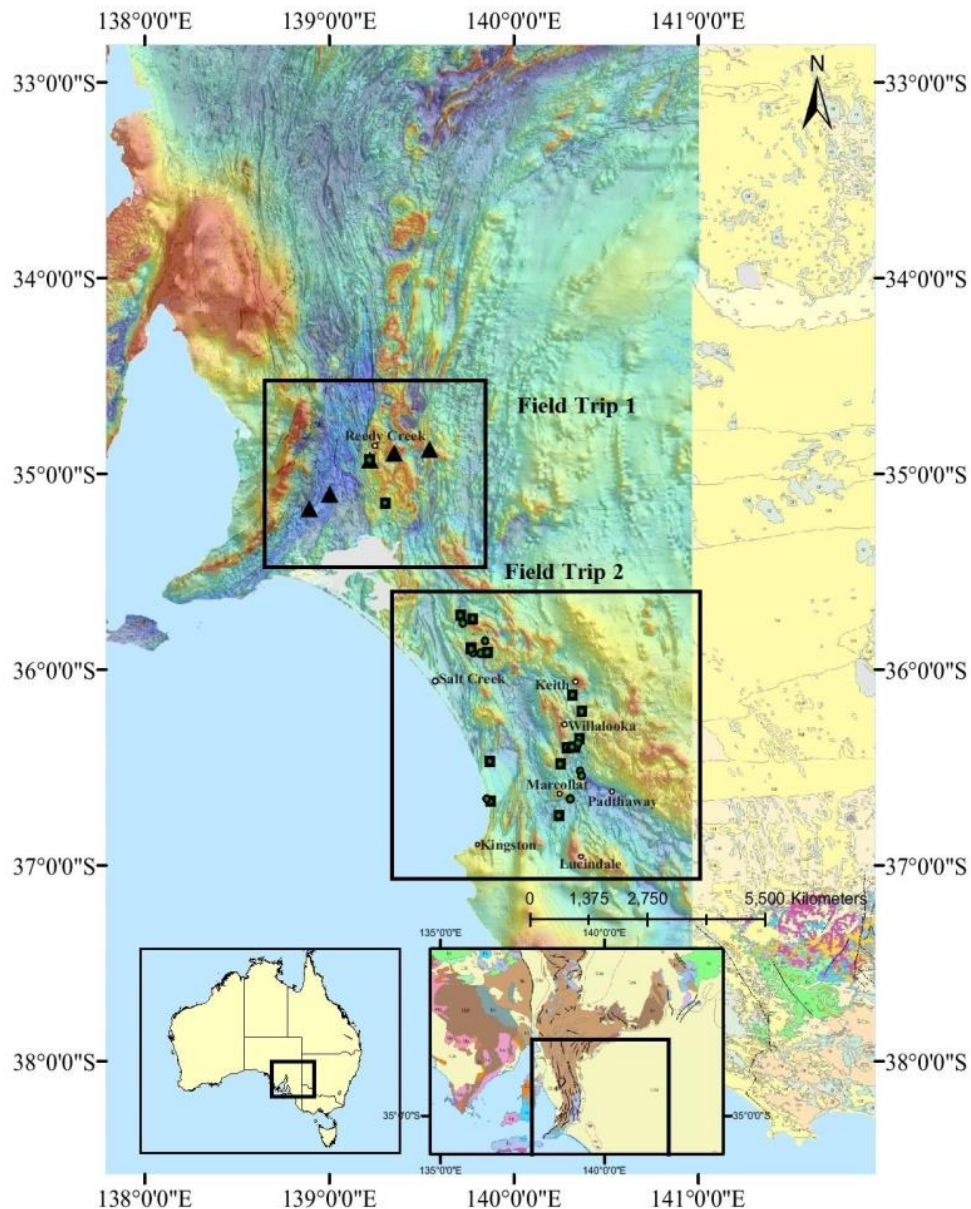
Project Proponent

Name: Naina
Affiliation and position: MinEx-CRC @ ANU, PhD student
Collaborators: Marnie Forster (ANU), Anthony Reid (GSSA), Geoff Fraser (GA)
Project Title: Cambro-Ordovician magmatism and deformation at the eastern margin of Gondwana, South Australia: Insights into tectonic processes and mineral potential.
Geographic Region: South Australia
Geological Province or Tectonic Unit: Delamerian Fold Belt

Brief Project Description:

The Cambrian-Ordovician Delamerian Orogen in South Australia comprises the Adelaide Fold Belt and its extension beneath the Murray Basin. The Delamerian Orogen marks the transition along the eastern margin of Proterozoic Australia from a passive to an active continental margin. The region is part of a major Geological Survey of South Australia program allied with MinEx-CRC. The region has potential for a range of mineral systems including porphyry, epithermal, orogenic Au, massive sulphide amongst others. This project will investigate the timing and chemical affinities of selected magmatic intrusions and related hydrothermal alteration systems within the Delamerian Orogen. Through the $^{40}\text{Ar}/^{39}\text{Ar}$ method, attempts will be made to date regional deformation fabrics at key locations. Processes related to tectonic mode switches and broader structural controls on magmatism will also be investigated in relation to selected intrusions, where temperature-time modelling will be undertaken to characterise the thermal history along this zone. The broader aim is to develop a precise chrono-stratigraphic framework for intrusion and deformation in the Delamerian Orogen to enable regional comparison with other Gondwanan tectonic systems including the Koonenberry Belt and Ross Orogen (Antarctica), and within which future MinEx-CRC drilling campaign results can be understood.

Below is a location map for this project highlighting the areas which have been sampled so far.



Approximate number of samples proposed for $^{40}\text{Ar}/^{39}\text{Ar}$ analyses: 27 samples are presently prepared for Ar/Ar analysis, a reconnaissance set of 7 samples have been completed – being a total of 34 so far. As this is an ongoing PhD project, more samples for Ar/Ar analysis are anticipated, the will most likely come from the NSW side of this orogeny.

Lithologies and minerals proposed for $^{40}\text{Ar}/^{39}\text{Ar}$ analyses: K- bearing minerals e.g. biotite, white mica, hornblende, K-Feldspar etc. would be dated using Ar/Ar from different lithologies e.g. granites, volcanics and meta-sediments. In addition, I plan on including minerals from alteration zones, done in association with Re-Os dating of mineralisation.

Do you have a preferred $^{40}\text{Ar}/^{39}\text{Ar}$ laboratory? (ANU, Curtin, UQ, UMelb):

If so, why you prefer this laboratory (e.g. student affiliation, ongoing relationship, sample type etc):
 The Argon laboratory at ANU is my preference as I am a PhD student at ANU with Marnie Forster as my supervisor who runs the ANU Argon lab, it is vital that I undertake diffusion experiments to determine the Tt-histories on many of these samples, this is only done at ANU, plus would be preferable if all my samples were undertaken one lab.

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

Impact: to what extent new $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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 $^{40}\text{Ar}/^{39}\text{Ar}$ 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
- $^{40}\text{Ar}/^{39}\text{Ar}$ 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)