Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.18970

AusGeochem: An open-access platform for geospatial interrogation of thermochronology Big Data through deep time

SAMUEL BOONE[1,2], FABIAN KOHLMANN[3], WAYNE NOBLE[3], MORITZ THEILE[3], ROMAIN BEUCHER[3], BARRY KOHN[1], STIJN GLORIE[4], MARTIN DANISIK[5], RENJIE ZHOU[6], MALCOLM MCMILLAN[1], ANGUS NIXON[2], SABIN ZAHIROVIC[7], R. DIETMAR MÜLLER[7] AND BRENT I.A. MCINNES[8]

[1]The University of Melbourne
[2]The University of Adelaide
[3]Lithodat Pty Ltd
[4]University of Adelaide
[5]Curtin University
[6]University of Queensland
[7]University of Sydney
[8]John de Laeter Centre, Curtin University

Presenting Author: samuel.boone@unimelb.edu.au

Low-temperature thermochronology is a powerful tool for constraining the thermal evolution of the upper crust in relation to geodynamics, tectonics, landscape evolution, and natural resource formation and preservation. However, the complexities inherent to these analytical techniques can make interpreting the significance of results challenging, requiring them to be placed in their geological context through deep time.

Here, we present a novel tool for the geospatial archival, dissemination, and 4D (3D through time) interrogation of fission track and (U-Th)/He data, and thermal history models. Built as an extension to the open-access *AusGeochem* platform[1], thermochronology data can be viewed in the context of geosample metadata (e.g., lithological and mineralogical information) and other geochemical analyses stored in the platform's existing data models for secondary ion mass spectrometry U-Pb, and major, minor and trace element geochemistry, with additional models for laser ablation-inductively coupled-mass spectrometry U-Pb and Lu-Hf, and Ar-Ar currently under development. The platform's Open Rest Application Programming Interface (API) enables external software components, operating systems and applications to access and interact with AusGeochem-hosted data to facilitate a variety of tasks that include automatic machine-to-database (meta-)data upload, automated data retrieval, and the incorporation of additional data synthesis functions and machine learning algorithms. The platform also utilises Earthbyte's pyGPlates and plate models to provide researchers with a user-friendly interface to visualise and analyse samples and analytical results in their palinspastic context.

Using continental-scale thermochronology datasets from Central Gondwana and leveraging the platform's breadth of real-time data interrogation tools like dynamic plots, swath profiles, data contouring, and plate reconstructions, we visually demonstrate the intrinsic links between plate tectonics, km-scale denudation, passive margin development and topographic development.

Scientists from around the world are encouraged to freely register to use *AusGeochem* and its low-temperature thermochronology data tool at https://ausgeochem.auscope.org.au.

Figure 1. AusGeochem user interface and various displays of thermochronology data.

Figure 2. Contour map of apatite fission track ages of Central Gondwana in their reconstructed 180 Ma paleogeographic context [2].

References

[1]Boone, S.C., et al. Geostandards and Geoanalytical Research (2022): https://doi.org/10.1111/ggr.12419

[2]Merdith, A., et al. Earth-Science Reviews (2021): https://doi.org/10.1016/j.earscirev.2020.103477