A Global Modelling Framework
for Disentangling Tectonic, Geodynamic, & Climate Drivers of Deep-Time Exhumation Histories

Dr Samuel C Boone

Lecturer in Geology at The University of Sydney, School of Geosciences

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Long-term crustal exhumation histories as recorded by regional thermochronology provide an important record with which to constrain the timing and rate of a breadth of geodynamic, tectonic, magmatic and surface processes through deep time. And with the recent advent of geospatial geochemical data platforms (Boone et al., 2022) and fully relational data models for thermochronology data (Boone et al., 2023), along with a growing suite of exhumation modelling codes (e.g., Braun et al., 2012; Fox et al., 2014; van der Been & Schildgen 2023), regional exhumation histories as recorded by thermochronology data can be quantified on an ever-larger scale. Yet, holistic investigations into Earth system drivers of regional- to continental-scale crustal exhumation histories remain hindered by the lack of integrated global modelling workflows for interpreting crustal exhumation histories in a dynamic Earth system context.

Here, I present a new open-access global-scale modelling workflow for disentangling the tectonic, geodynamic, climate and erosional drivers of exhumation histories through deep time. By coupling the EarthBank (previously AusGeochem) geospatial data platform (Boone et al., 2022; 2023) with the G-Plates tectonic modelling software (Müller et al., 2018), thermochronology-derived crustal thermal histories can be interrogated in the context of plate kinematics, regional fault networks, dynamic topography as predicted by mantle convection models, and past precipitation rates derived from paleoclimate models.

References:
Boone, S.C. et al., 2022. *Geostandards and Geoanalytical Research, 46*(2), pp.245-259.
Boone, S.C. et al., 2023. *Scientific Reports, 13*(1), pp.8581.
Braun, J., et al., 2012. *Tectonophysics*, *524*, pp.1-28.
Fox, M., et al., 2014. *Earth Surface Dynamics*, *2*(1), pp.47-65.
Müller, D.R., et al., 2018. Geochemistry, Geophysics, Geosystems, 19)7), pp.2243-2261.
van der Beek, P. and Schildgen, T.F., 2023. *Geochronology*, *5*(1), pp.35-49.