Multi-method geochronological insights into the tectonics of final Nuna suturing, NE Australia

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The final assembly of the early Mesoproterozoic supercontinent Nuna was marked by the collision of Australia and Laurentia (North America) between ca. 1.62 and 1.50 Ga; however, it remains largely uncertain how the Australian orogenic record relates to continental collision, as it is characterised by low-*P/T* metamorphism.

Nordsvan et al. [1] demonstrated that the 1.65–1.50 Ga Nunan suture must be concealed in NE Australia, separating Laurentia-derived terrane(s) to the east from the eastern margin of the North Australian Craton. To unravel the tectonic evolution of the Australian and Laurentian terranes, we apply several geochronological methods to the Proterozoic inliers of NE Australia, including zircon U–Pb+Hf analysis of felsic magmatic rocks, garnet Lu–Hf and monazite U–Pb dating of metamorphic rocks, and a regional multi-mineral Ar–Ar thermochronology survey.

Zircon $^{207}Pb/^{206}Pb$–εHf data for orthogneiss and migmatite from the Yambo and Dargalong inliers depict a decreasing trend from ~1.65 to ~1.5 Ga. Gradual isotopic enrichement took place at a higher rate than in crustal growth models, and is interpreted to reflect continental collision processes.

Prograde medium–*P*/*T* metamorphism in the Georgetown Inlier, recording moderate crustal thickening, is dated at 1.60 Ga (Lu–Hf in garnet). Subsequent low–*P*/*T* metamorphism, associated with a shallow-dipping planar fabric, is dated at 1.56–1.54 Ga (U–Pb in monazite), interpreted as a post-collisional thermal event.

The combination of different geochronological methods with field observations, structural analysis, metamorphic *P–T* estimation, provenance analysis, and seismic interpretation sheds new light on tectonic processes related to supercontinent assemby in Earth's "Middle Age".

[1] Nordsvan *et al.* (2018) *Geology*, **46**, 521–524