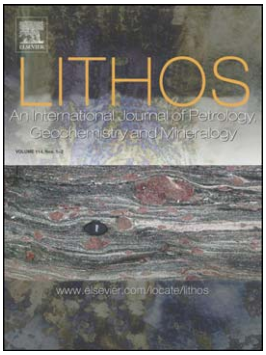

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Magmatic zircon Lu-Hf isotopic record of juvenile addition and crustal reworking in the Gawler Craton, Australia

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Abstract

New in situ zircon Lu-Hf isotopic data are presented from magmatic rocks distributed across the Gawler Craton, Australia. These rocks range in composition from granite to gabbro, with the majority being granite or granodiorite and moderately peraluminous in composition. The new Lu-Hf isotopic data, together with previously published data, provide insight into the magmatic evolution of the craton and crust and mantle interaction through time. Increased juvenile content of magmatic rocks correlate with periods of extensional tectonism, in particular basin formation and associated magmatism during the Neoarchean to earliest Paleoproterozoic (c. 2555–2480 Ma), middle Paleoproterozoic (c. 2000–1710 Ma) and late Paleoproterozoic (c. 1630–1600 Ma). In contrast, magmatic rocks associated with periods of orogenic activity show greater proportions of crustal derivation, particularly the magmatic rocks generated during the c. 1730–1690 Ma Kimban Orogeny. The final two major magmatic events of the Gawler Craton at c. 1630–1604 Ma and c. 1595–1575 Ma both represent periods of juvenile input into the Gawler Craton, with $\varepsilon_{Hf}(t)$ values extending to as positive as +8. However, widespread crustal melting at this time is also indicated by the presence of more evolved $\varepsilon_{Hf}(t)$ values to -6.5. The mixing between crust and mantle sources during these two