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Remelting and Remobilization in a Magmatic Arc: the St Peter Suite, South Australia

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Thermo-mechanical models of magmatic arcs suggest that intermittent intrusion of magma batches should lead to remelting and remobilization of earlier intrusive rocks as a result of fluctuations in temperature and water content. However, examples of remelting and remobilization of earlier intrusive rocks, formed during arc-building, are surprisingly rare. We investigate the evolution of magmatic rocks of the Palaeoproterozoic St Peter Suite, in the Gawler Craton, South Australia. This suite records multiple intrusions, magma hybridization, and the remelting and remobilization of these intrusions to form migmatites and newly-formed leucocratic magmas.
In this paper we detail first how multiple magma batches interact with one another as liquids and mushes during syn-magmatic deformation phases, and then detail the nature of migmatites resulting from anatexis of these same magmatic rocks and the resulting channel ways that allowed for magma remobilization. LA-ICP/MS U/Pb zircon dating yielded crystallization ages of 1647±12 Ma for an early diorite-to-granite suite, and 1604±12 Ma for a later magmatic suite of broadly similar composition. Both these suites underwent anatectic events. Titanite from late-formed leucosomes found within D2 shear zones in the older suite, yielded SHRIMP U/Pb age of 1605±7 Ma, within error of the age of the younger suite. We therefore infer that intrusion, crystallization and remelting/remobilization of this younger suite of rocks occurred within 10-15 M.yr. Thus, the St Peter Suite exposures record many of the key processes expected in arcs, including the prediction that early intrusive arc rocks remelt to form younger more fractionated magmas.