ISOTOPIC AND GEOCHEMICAL CONSTRAINTS ON PROTEROZOIC CRUSTAL GROWTH FROM THE MT PAINTER INLIER.

By

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Key to abbreviations used in text and diagrams.

Although abbreviations are defined where appropriate throughout the thesis, in the interests of completeness and easy referencing a summary of all abbreviations is presented below:

BEG	British Empire Granite
bt	biotite
cd	cordierite
CHUR	Chondritic Undifferentiated Reservoir
COLG	Collisional Granites
cor	corundum
FHQ	Freeling Heights Quartzite
fspar	feldspar
Ga	Giga-anna, = billions of years before present.
GRV	Gawler Range Volcanics
gt	garnet
HREE	Heavy Rare Earth Elements
KI	Kangaroo Island
kspar	Potassium feldspar
LBF	Lady Buxton Fault
LFB	Lachlan Fold Belt
LREE	Light Rare Earth Elements
MAQ	Mount Adams Quartzite
Ma	Mega-anna, = Millions of years before present.
micro	microcline
MNG	Mount Neill Granite
mu	muscovite
OIA	Ocean Island Arc
ORG	Ocean Ridge Granites
phlog	phlogopite
plag	plagioclase
qtz	quartz
RCM	Radium Creek Metamorphics
REE	Rare Earth Elements
T_{CHUR}	Model age from CHUR
T_{DM}	Model age from depleted mantle
tour	tourmaline
VAG	Volcanic Arc Granites
WPG	Within Plate Granites
YP	Yagdlin Phyllite

ABSTRACT

The Mt Painter Inlier comprises sequences of Palaeo- Mesoproterozoic metasediments, granitoids and granites. The igneous suites are geochemically similar to penecontemporaneous Australian I- and A-type granites, and contain elevated immobile element concentrations relative to Phanerozoic analogues. The metasedimentary sequences indicate shallow water, intracontinental depositional environments and isotope studies suggest short transport distance and local provenance. Nd depleted mantle model ages for the oldest granitoids and metasediments are clustered around 2.1-2.4 Ga, with the *younger* granitic units returning *older* model ages of 2.9-3.3 Ga. The 2.1-2.4 Ga event is correlated with events of similar age from other Australian terrains, and interpreted to represent a period of major continental crustal growth in Australia. The Archaean model ages for the younger granite suites are older than those of the neighbouring Gawler Craton, and may represent the juxtaposition of a hitherto undocumented Archaean terrain prior to ~1700 Ma. Proterozoic tectonic processes must therefore be responsible for the relative movement of stable cratonic nucleii on large scales in order to produce allocthonous juxtaposition. The Mt Painter Inlier therefore records an active tectonic evolution throughout the Proterozoic, incorporating continental crustal growth periods between 2.1-2.4 and at ~3 Ga. Tectonic activity continues to the present day, with both the Delamerian Orogeny and ongoing Tertiary thrusting processes being responsible for the current morphology of the inlier.