New SHRIMP geochronology for the Western Fold Belt of the Mount Isa Inlier: Developing a 1800-1650 Ma event framework

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Previous geochronology in the Western Fold Belt

- Geochronology between 1970 & 1995 focused on dating of regional igneous units.
- From the mid-1990’s, NABRE and AMIRA P552 projects integrated SHRIMP U-Pb zircon geochronology with sequence stratigraphy and facies analysis for the Isa Superbasin
  - focused on the dating of redeposited tuffaceous beds and shallow level intrusives
Event chart for the Isa Superbasin

- Development of a regional chronostratigraphic framework for sedimentary packages.
- Identification of a number of regional supersequences which are bounded by unconformities.
- Strong focus on the Isa Superbasin
Leichhardt and Calvert Superbasins

Only age constraints:
• Base = U-Pb conventional age = 1790 ± 9 Ma
• Top = SHRIMP age = 1709 ± 3 Ma

6 to 8 km of stratigraphy over 80 My with no time constraints – can it be divided into supersequences bounded by unconformities?

Very few felsic volcanics within sequence to date – have to rely on maximum depositional ages from detritals in sedimentary samples.
U-Pb zircon dating – ages & interpretations

- **Intrusive rocks = magmatic age**
  Also identify inheritance and/or later metamorphism

- **Tuffs, volcaniclastics, peperites, pinkites**
  = magmatic age + age of sediment deposition
  *Field relationship interpretations important*

- **Sedimentary rocks = constraints on the maximum age of deposition (youngest grains)**
  Also provenance age spectra
Geochronology in the Leichhardt and Calvert Superbasins

- Analysis of all sedimentary units within the stratigraphy
- Analysis of main stratigraphic units from one detailed section (Mistake Creek)
- Analysis of stratigraphic units from different parts of the basin to evaluate changes in facies and provenance

10 new SHRIMP detrital samples and 1 new SHRIMP volcanic age
Lower Mount Guide Quartzite

- Detrital spectra = clusters at ~1790 and ~1860 Ma plus three Archaean ages
- Maximum depositional age defined by youngest cluster = 1793 ± 9 Ma
Lena Quartzite

**Detrital spectra** = clusters at ~1780 and ~1870 Ma plus older individuals to 2820 Ma

**Maximum depositional age** defined by youngest cluster = 1779 ± 4 Ma
Bortala Formation – field relationships
Bortala Formation - zircons

Bortala sediment zircons

Bortala volcaniclastic zircons
Bortala Formation volcaniclastic

- Single age = 1773 ± 2 Ma
  = depositional age for Bortala Formation
- Best age constraint for the Myally supersequence

* Compare with maximum depositional age of 1779 ± 4 Ma for Lena Quartzite – also part of the Myally supersequence
- Detrital spectra = one dominant cluster at ~1750 Ma plus older individuals to 2625 Ma
- Maximum depositional age defined by youngest cluster = 1748 ± 4 Ma
- Best age constraint for the Quilalar Supersequence
New WFB event chart for 1800-1650 Ma basins

Can divide the Leichhardt and Calvert Superbasins into five sedimentary supersequences:

- Guide
- Myally
- Quilalar
- Big
- Prize
Temporal relationships between basin formation and magmatism?

Many ages for magmatic units in the WFB and MKZ derived from conventional U-Pb zircon methods – potential for ‘mixed ages’ in complex multi-aged rocks, often resulting in large errors

8 new SHRIMP ages for selected magmatic units which either separate or occur within the Leichhardt, Calvert and Isa Superbasins:
- Burstall Granite
- Lunch Creek Gabbro
- Weberra Granite
- Sybella Granite
Burstall Granite and Lunch Creek Gabbro

*Co-magmatic mafic and felsic event*
New ages for the Burstall Granite and Lunch Creek Gabbro

Previous data for the Burstall Event

New data for the Burstall Event

Age of the Wonga Event?

Burstall Event refined to 1740-1735 Ma
New event chart for the Western Fold Belt

- Refined ages for:
  - Burstall event ~1740 Ma
  - Fiery event ~1710 Ma
  - Sybella event ~1670 Ma
  - ? Wonga event

- Detailed stratigraphic event chart for the ‘post-basement’ record in the Western Fold Belt