PERMIAN-TRIASSIC STABLE ISOTOPE STRATIGRAPHY OF AUSTRALIA

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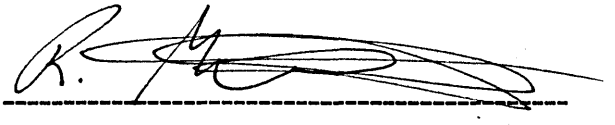

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ABSTRACT

The Permian-Triassic boundary mass extinction is the largest in the Phanerozoic and therefore is the major event in the Phanerozoic. The mass extinction cause is problematical but studying global geochemical and geophysical signatures about the Permian-Triassic boundary can provide insights into the cause of the mass extinction. Global events about the Permian-Triassic boundary are marked by changes in:

- $\delta^{13}C$ values of carbon
- $^{87}Sr/^{86}Sr$ in unaltered marine calcite
- magnetic polarity.

This study aims to identify these features in the sedimentary record and to test the ca libration of the Australian biostratigraphical schemes to the global geological timescale.

The following features are found in the Permian-Triassic sediments of Australia:

- a $\delta^{13}C_{org}$ in Total Organic Carbon excursion in 12 marine and nonmarine sections from Northwest to Eastern Australia
- a $^{87}Sr/^{86}Sr$ minimum in a composite section mainly from the Bowen Basin
- a magnetic polarity reversal in the Cooper Basin, central Australia.

The Australian sections are thus time correlated, as follows:

The negative $\delta^{13}C_{org}$ excursion indicates the Permian-Triassic boundary and occurs:

1) in Eastern and Central Australia at the change from coal measures to barren measures with red beds at the beginning of the Early Triassic coal gap;

2) in Northwest Australia about the boundary between the Hyland Bay Formation and the Mount Goodwin Formation in the Bonaparte Basin and at the boundary between the Hardman Formation and the Blina Shale in the Canning Basin.

The base of the negative $\delta^{13}C_{org}$ excursion lies at or near the base of the *Protohaploxypinus microcorpus* palynological zone.

The $^{87}Sr/^{86}Sr$ minimum determined about the Guadalupian/Ochoan stage boundary in North America is found in the Bowen Basin about the boundary between the Ingelara and Peawaddy Formations.

The $\delta^{13}C_{org}$ excursion in the Cooper Basin is near a magnetic reversal within the Permo-Triassic mixed superchron.

The implications of these findings include:

- confirmation of the traditional placement of the Permian-Triassic boundary at the coal measures/ barren measures with redbeds boundary in Eastern Australia
- the linking of the the Permian-Triassic boundary to a mass extinction of plant species on land and the beginning of the Triassic coal gap indicated by the *Falcisporites* Superzone base that is coincident with the negative $\delta^{13}C_{org}$ excursion

- a mass extinction causal model that links the $^{87}Sr/^{86}Sr$ minimum determined about the Guadalupian/Ochoan stage boundary to a fall in sealevel that led to changing global environmental conditions. The model invokes greenhouse warming as a contributing cause of the mass extinction.