THE PERMIAN-TRIASSIC BOUNDARY IN AUSTRALIA – ORGANIC CARBON ISOTOPIC ANOMALIES RELATE TO ORGANOFACIES, NOT A BIOGEOCHEMICAL 'EVENT'. C. B. Foster, G. A. Logan and R. E. Summons, Australian Geological Survey Organisation, PO Box 378 Canberra, ACT 2601 Australia.

Introduction: Placement of the Permian-Triassic boundary in Australia, and Gondwana in general, is hampered by the rarity of marine index fossils, particularly conodonts, that restrict correlation with the marine standard sections of northern hemisphere deposits. In eastern Australia's predominantly terrestrial sequences, the boundary has been taken as roughly coincident with the change from coal measures (Permian) to non-coaly sediments, principally redbeds (Triassic). Palaeontological studies have focussed on the demise of the *Glossopteris* flora as a marker for the upper boundary of the Permian System. More recently, palynological data have enabled broad links to the Pakistan Salt Range section and show that the close of coal measure sedimentation took place in the early Changhsingian. SHRIMP dating from Australian samples and zircons from the type Meishan section has confirmed these broad links but still does not provide an unambiguous boundary solution. Accordingly, we examined the detail of carbon isotopic variations that may provide a facies-independent datum to mark the boundary in both terrestrial and marine sections.

Results and Discussion: Carbon isotopic analysis of carbonate and organic matter at the contact between Permian and Triassic marine sediments in the Woodada-2 borehole[1] revealed a signal similar to that reported in other Australian sections that were earlier proposed as a boundary proxy[2]. Although there was no systematic shift in the δ^{13}Ccarb, organic carbon showed an apparent shift of -8‰ across the contact (Fig. 1).

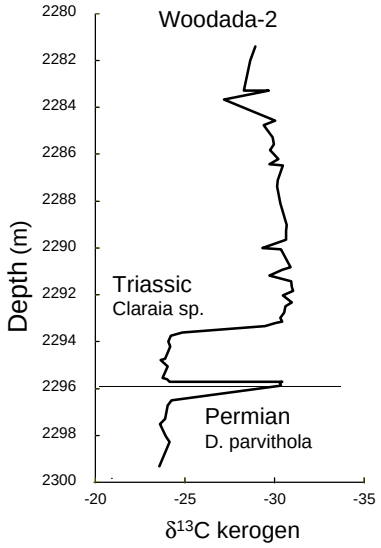

Figure 1. δ^{13}C of bulk organic carbon at the Permian-Triassic contact in a marine section in Woodada-2 in the Perth Basin, Western Australia.

Detailed geochemical and palynological analysis of the samples showed that the 'anomaly' was clearly not due to biogeochemical changes related to a boundary 'event' but associated with a predominance of isotopically heavy and re-worked woody material in the Permian section and an isotopically light acritarch-rich kerogen in the earliest Triassic. A cross plot of the inorganic and organic carbon isotopic data shows that the organic matter types are from fundamentally different sources (Fig. 2). Similar results were obtained from the equivalent age section in the Tern-3 well in the Bonaparte Basin in northwestern Australia so the observation is not an isolated phenomenon.

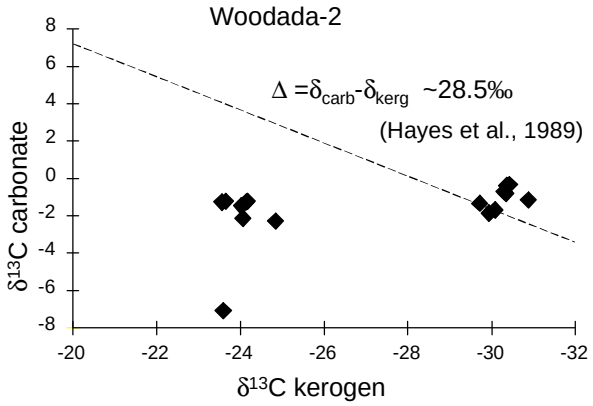

Figure 2. Carbon isotopic cross-plot showing fundamentally different organic carbon sources contribute to a lithologically uniform P-T contact in Woodada-2.

We conclude that trends or anomalies in carbon isotopes of bulk organic matter do not provide a reliable chemostratigraphic tool for identifying the Permian-Triassic boundary[3]. Any use of bulk organic carbon isotopic shifts to study global biogeochemical changes in the oceans that accompanied the Permian-Triassic extinction event must be done with great care.

References: [1] Foster C.B., Logan G.A., Summons R.E.,Gorter J.D. & Edwards D.S. (1997) *APPEA J.* 37, 472 488. [2] Morante R., Veevers J.J., Andrew A.S. & Hamilton P.J. (1994) *APEA J.* 34, 330-36. [3] Foster C.B., Logan G.A. and Summons.R.E. (1999) *Proc. Roy. Soc. Vic.* 110, 247-266.