

Re-Os and the Permo-Triassic mass extinction, Hovea-3, Perth Basin, western Australia

H. J. STEIN¹²³, G. YANG¹, K. GRICE³, S. V. GEORGIEV¹
AND J. L. HANNAH¹²

¹AIRIE Program, Colorado State University, USA

²CEED Centre of Excellence, University of Oslo, Norway

³WA-OIGC, Curtin University, Perth, Western Australia

Re-Os isotope geochemistry on a well-studied onshore section in the Perth Basin helps define the global reach of marine-terrestrial poisoning leading to the greatest Phanerozoic mass extinction. The lowermost Kockatea Shale (Hovea Member) from drill hole Hovea-3, debatably [1], may contain the complete sedimentological and biological record from latest Permian into earliest Triassic [2]. The Hovea Member contains an upper *Sapropelic Interval* (algal, finely laminated shale-limestone, pyritic, no bioturbation) and a lower *Inertinitic Interval* (charcoal, wood debris, siltstone-shale, variably bioturbated). The boundary between *Intervals*, designated as the Permo-Triassic (P-Tr) division, is visually subtle, but chemically and biologically abrupt and without transition (e.g., the C₃₃ alkylcyclohexane is only present in the Early Triassic [1]). Our 6-cm core section (1981.25-1981.31m) is positioned just 30 cm below the P-Tr boundary.

We report the first radiometric age for this shallow marine section. Using all analyses, a 7-point Model 3 isochron age of ~252 Ma ($\pm 1\%$, MSWD=11) places the core section at the P-Tr boundary. A slightly older 5-point Model 1 age of ~255 Ma ($\pm <0.5\%$, MSWD=2.3) is possible if two points are eliminated without reason. A remarkable <2 cm interval within this 6-cm core records a 10-fold increase in Re and a jump in ¹⁸⁷Re/¹⁸⁸Os to nearly 2500. The background single digit ppb Re and abrupt increases in Re and ¹⁸⁷Re/¹⁸⁸Os are reminiscent of those in latest Permian shales from East Greenland and the mid-Norwegian shelf; this combination argues for warm and acidic seawater in the latest Permian [3]. Significantly, the Boreal section was deposited in an open but nascent seaway, whereas the Hovea-3 section developed on the margin of the restricted Tethyan Sea. Continued work on Hovea-3 will determine the extent and severity of Re intoxication, whereas our work thus far captures a remarkable poisoning and cleansing of seawater within the span of a few mm of sediment. Our Re-Os data indicate the globally delicate and transient state of latest Permian seawater punctuated by variable metal input and/or redox drawdown.

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[1] Grice et al 2005 *EPSL* **236**:315-321; [2] Thomas and Barber 2004 *APPEA Jour* **44**:59-92; [3] Georgiev et al 2011 *EPSL* **310**:389-400.