

Chemostratigraphic fingerprints of palaeo-salinity, oxidised oceans and global anoxic events throughout the Cambrian, Australia.

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The Cambrian succession of the Australian Amadeus Basin is part of the greater Central Australian Superbasin, which started forming during the Neoproterozoic. The oldest Cambrian sediments (Stage 2) were deposited after the Petermann Orogeny (570-530Ma). Deposition ceased within the basin during rifting between 520 and 511 Ma and was followed by deposition of nearshore to shallow marine sediments during the remaining Cambrian and Ordovician.

The majority of sediments were deposited under shallow marine-restricted, lacustrine, oxidising conditions with intermittent anoxia. This study reveals that the depositional environment was favourable for anoxic conditions that are stratigraphically-expressed in carbon isotope excursions. The carbon isotope $\delta^{13}\text{C}$ excursions are linked to globally occurring events and correlate to the SPICE, DICE, and ROECE excursions. The cause of those excursions and sudden shift from oxidising to reducing conditions remains enigmatic. However, the ROECE event coincides with the eruption of the Kalkarindji Flood Basalts in northern Australia and may have caused a change in atmospheric CO_2 flux, subsequently shifting the depositional environment from oxidising to reducing conditions within the Amadeus Basin.

While the $\delta^{13}\text{C}$ excursion express relatively short-lived events, the oxygen isotopes $\delta^{18}\text{O}$ reveal palaeo-environmental conditions during carbonate deposition. The negative shift of $\sim 3\text{‰}$ $\delta^{18}\text{O}$ in combination with the decrease of evaporites and deposition of dominantly pisolitic limestones in the Undillian (upper Drumian) suggest a change towards low saline, higher energy conditions. This culminated in the basin-wide transgression during the Paibian and deposition of the Goyder Formation dolostones. The shift in $\delta^{18}\text{O}$ and its use as palaeo-salinity indicator is supported by geochemical trends of evaporitic elements such as Sr (celestine) and S (gypsum, anhydrite).