

DEPARTMENT OF CHEMICAL & PHYSICAL SCIENCES COLLOQUIUM SERIES

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A marine carbonate record of environmental change through Earth's early history



Marine carbonates, which precipitated from ancient oceans, record Earth's history of environmental change. Recent sedimentological and geochemical work on marine carbonates suggest a complex and protracted environmental evolution through the Precambrian and early Phanerozoic (~3 billion to 0.5 billion year ago). For example, late Precambrian marine environments were diverse habitats, with the recent discoveries of several new Neoproterozoic reef complexes in Canada, Namibia and Australia, which showcase the first modern-like reef systems. Paleoredox data (new and published Ce anomaly proxy records) from marine precipitates show a prolonged interval of highly variable redox conditions, with little evidence for a sustained step change in Precambrian oxygenation. The mineralogy of marine carbonates appears to reflect Mg-rich conditions in Precambrian seawater, linked to anoxic seawater conditions, the Earth's early crustal composition and the problem of the strange abundance of dolomite in early Earth's geological record. These insights collectively highlight that the terminal Precambrian and early Paleozoic were characterised by protracted but substantial environmental change.