DID UNSTABLE REDOX TERMINATE EDIACARAN BENTHIC COMMUNITIES? EVIDENCE FROM EARLY MARINE CEMENTS

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The Ediacaran oceanic redox landscape was heterogeneous, where many basins had a shallow and highly dynamic chemocline above anoxic (ferruginous or euxinic) or low oxygen (manganous) waters. Seawater mMg/Ca ratio was also high, so promoting early diagenetic dolomitisation. How the benthos responded to these conditions is fundamental to understanding their ecological dynamics. Here we utilise redox sensitive elements in early marine carbonate cements to investigate possible water column redox controls on the distribution and growth of the oldest metazoan communities.

Skeletal communities in the Zaris Sub-Basin of the Nama Group, Namibia (~550-547 Ma), grew in shallow waters where fine-grained carbonate sediment often shows evidence of early dolomitisation. Mid-ramp *Cloudina* reefs (< 20 m) are composed of open, highly porous structures that formed multiple, successive assemblages. Each assemblage is terminated by thin (< 1 mm), layers of dolomitised sediment and dolomite cement. All dolomitic lithologies in the Nama Group analysed via Fe speciation suggest precipitation under anoxic ferruginous water column conditions.

Reef cements show a paragenetic sequence from synsedimentary to early marine cement and final burial, which we infer were precipitated under dynamic redox conditions. First, botryoidal pseudomorphed aragonite cement formed under oxic conditions (low Fe and Mn). Next, the presence of iron-rich dolomitised sediment, often associated with a recrystallised ferroan dolomite crust, suggests that originally aragonitic or calcitic sediment and a high-Mg precursor cement were preferentially dolomitised. Dolomitisation may have been enhanced via upwelling of deeper water, anoxic, ferruginous seawater, or by later fluid remobilisation from adjacent shales. A following Mn-rich calcite cement is inferred to be early marine due to its inclusion-rich, fibrous form and well-preserved CL zonation. The final blocky cement precipitated under oxic conditions, probably during shallow burial.

The cements likely record a general shallow to deeper water transect, from oxic shallow waters to low oxygen manganous waters, then to oxic, shallow burial conditions. We hypothesize that transient incursions of upwelled, anoxic, ferruginous and dolomitising waters may have occurred during short-term, transgressive cycles, although the timing for this is poorly constrained. Such incursions may have terminated Ediacaran benthic communities that grew close to the chemocline.

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