

Ocean deoxygenation after the Sturtian Snowball

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The abrupt ending of the Sturtian ‘Snowball’ glaciation was characterised by enhanced chemical weathering and carbon cycle perturbations, but there is less certainty over how oxygen levels responded to those changes. In this study, we reconcile conflicting views using a carbonate-based multiproxy dataset including sulfur, uranium, and zinc isotopes from the Taishir Formation in Mongolia. The geochemical data reveal an episode of ocean deoxygenation, followed by a shift toward less reducing, but still largely anoxic conditions in a post-glacial ocean characterised by nutrient and sulfate limitation. Ocean redox dynamics and biogeochemical cycling following the Sturtian deglaciation were likely dictated by unique tectonic and climatic regimes that facilitated the buildup of a recalcitrant dissolved organic carbon pool in the deep ocean. Post-glacial eutrophication may help to explain the delayed diversification of algal clades, but the persistence of ocean anoxia, excepting transient oxidation pulses, likely hindered the emergence of obligate aerobes, such as animals, until the Ediacaran Period.