Goldschmidt 2026 Abstract
https://doi.org/10.46427/gold2026.35339

Evidence from Nitrogen in Strongly Peraluminous Granites for Rising Biomass Burial and Oxygen Levels before the Neoproterozoic Oxygenation Event.

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The Neoproterozoic Oxygenation Event (NOE) marks a major increase in atmospheric and oceanic oxygen (pO_2), widely thought to have contributed to the Cambrian explosion. Enhanced burial of organic biomass is one hypothesised mechanism for increased oxygen production during the NOE. However, the timing and magnitude of changes in biomass burial through deep time remain poorly constrained due to progressive loss of the sedimentary archive with increasing geological age.

Recent work by Mikhail et al. (2024) proposed that nitrogen concentrations ([N]) in strongly peraluminous granites (SPGs) provide an indirect proxy for biomass burial through time, because SPGs form by partial melting of metasedimentary rocks and can retain the chemical signature of their sedimentary protoliths. Using this proxy, they identified an increase in biomass burial at some point between 1.4 and 0.5 Ga [1].

In our study [2], we present new SPG [N] measurements from 1.0 – 0.7 Ga providing improved temporal resolution across the Mesoproterozoic–Neoproterozoic transition. We observe systematic increases in SPG [N] across both the Mesoproterozoic–Neoproterozoic boundary (1.0 Ga) and the Neoproterozoic–Phanerozoic boundary (0.5 Ga), which we interpret as increases in biomass burial. We further quantify the additional oxygen produced by enhanced burial across the 1.0 Ga boundary and find that this oxygen production is large enough to have plausibly contributed to the oxygenation events leading up to the NOE.

References

[1] Mikhail et al., 2024, *Geology*, 52, 87-91.

[2] Holland et al., 2026, *Earth Planet. Sci. Lett.*, 679, https://doi.org/10.1016/j.epsl.2026.119890