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The impact of subaerial LIPs weathering and landmass emergence on the seawater Nd isotopic composition at the onset of the GOE.

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One driving mechanism for the rise of atmospheric O_2 attending the Great Oxidation Event (GOE) between 2.45 and 2.2 Ga could be the emergence of continental landmasses and the increase of subaerial igneous province weathering. We tested this model in the Hamersley Basin of Western Australia because here the Turee Creek Group and the underlying Hamersley and Fortescue groups hosting the Woongarra, Weeli Wolli and Fortescue LIPs, form a continuous sedimentary sequence deposited between ~2.76 and 2.45 Ga. Here, we report Nd isotope composition of the different sedimentary rocks (shales, carbonates and glacial diamictites of the Meteorite Bore Member) forming the 2.45 to 2.1 Ga Turee Creek Group and underlying 2.45 Ga old Boolgeeda Iron Formation and associated glacial diamictites of the Hamersley Group.

In a mafic-felsic-weathering (MFW) diagram, BIFs, shales, glacial diamictites and carbonates overlap the Fortescue mafic/ultramafic and Woongarra felsic LIPs. In a $\varepsilon Nd_{(t)}$ vs. $^{147}Sm/^{144}Nd$ diagram, these sediments define two trends originating from a similar hydrothermal component but diverging towards two different subaerial continental reservoirs. One reservoir is radiogenic and is represented by the Fortescue LIP komatiites while the other one, similar to the present day upper continental crust, is characterized by the crustally-contaminated basalts of the Fortescue LIPs and rhyolites of the Woongarra LIP. Additionally, Al-poor (< 1 wt.%) BIFs with seawater-like REY patterns and $\varepsilon Nd_{(t)}$ values overlapping the LIPs reservoirs indicate that chemical weathering was also active during sediment deposition. Overall, we see a major shift in the Nd-isotopic composition in the Hamersley basin at ~ 2.45 Ga. This could reflect either a change in the sedimentary source, or the drastic emergence of continental landmasses that might have exposed different rocks types to weathering, which collectively approximate the present day continental crust. These results are further discussed in light of trace element and Nd isotope data available from other Archean-Paleoproterozoic basins worldwide.