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An appraisal of Paleoproterozoic oxygenation trends in the time of the Nuna supercontinent

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The O_2 content of the atmosphere-ocean system increased markedly during the Great Oxidation Event (GOE) as shown in the geological record just above the Archean-Proterozoic boundary. The latest collection of geological and geochemical proxy data reveals dynamic and variable O_2 trends after the GOE; of note is a convergence of evidence that indicates a decline in the O_2 content of the atmosphere-ocean system. This "Deoxidation Event" coincides with ca. 2.0 to 1.8 Ga Himalaya-scale orogenic events, such as the Trans-Hudson orogen, during the amalgamation of the supercontinent Nuna. This is curious because major mountain building events should lead to higher oxygen levels, not lower. Many indicators of modern-style plate tectonics appeared ca. 2.0 to 1.8 Ga, including seafloor spreading (e.g., ophiolite sequences) and subduction (e.g., eclogite-facies metamorphic rocks) in the operation of a Wilson cycle. Thus, the influence of the transition to modern-style plate tectonics on biogeochemical cycling needs to be considered to understand these dynamic trends. Global plate tectonics during the building of Nuna could have tipped the scales in favor of oxygen sinks, including an increased flux of reducing gases from widespread metamorphism and volcanism associated with ocean-continent and continent-continent collisions, and the oxidative weathering of uplifted rocks in Himalaya-scale mountains. To this end, this contribution reflects on the major O_2 sinks that would be predicted in this time interval by meshing these expectations with constraints from the geological record. Understanding synergies between solid-Earth (e.g., plate tectonics, large igneous province events) and surface processes is key to unraveling the paradox of the Deoxidation Event.