Multiple sulphur isotopes unveil mechanism for the Neoproterozoic Oxygenation Event

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Résumé

We explore the connection between the Neoproterozoic Oxygenation Event (NOE) and the evolution of the sedimentary sulphate pool using multiple sulphur isotopes, including the less abundant 33S and 36S in addition to 34S and 32S(Farquhar et al., 2003). The NOE is widely believed to have been one of the key steps in the establishment of present day Earth's atmosphere and may have paved the way for the appearance and proliferation of animals(Shields-Zhou and Och, 2011). This event is recognized in the sedimentary record by significant changes in redox-tracers abundance, including trace metals (Mo, V, U), Rare Earth Elements, iron speciation, Cr and C isotopes(Frei et al., 2009; Partin et al., 2013; Sahoo et al., 2012; Shields-Zhou and Och, 2011). It also coincides with strong positive excursions in oceanic 34S/32S ratios(Shields-Zhou and Och, 2011). Based on results from Brazilian carbonates covering late Cryogenian (_˜635 Ma) glacial deposits and data from the literature for coeval units(Johnston et al., 2005), we propose a scenario in which pyrite burial rate exceeds by far continental sulphate inputs in the aftermath of glaciation, decreasing the global sulphate watercolumn concentration. Such a strong depletion in the sulphate reservoir could be related to an increase in BSR activity which would limit O2 consumption by oxic respiration, resulting in a net accumulation of O2 in the ocean-atmosphere system during the early Ediacaran.

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