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Diahopanes indicate aerobic respiration in 1.4 billion years ago

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The Mesoproterozoic Era (1600 to 1000 million years ago, Ma) was a time of profound biological transitions. In a widely held view, limited oxygen availability may have restricted the evolution and diversification of eukaryote clades, including animals, until a permissive environment emerged with a rise in oxygen levels in the late Neoproterozoic Era. Unfortunately, there are few constraints on oxygen levels during the Mesoproterozoic Era.

Recently, the study of chromium suggested an atmospheric oxygen levels of$\leqslant$0.1% PAL (Planavsky et al., 2014), while an ocean water column carbon-cycle model revealing a minimum value of $\geqslant$4 PAL oxygen from (Zhang et al., 2016). Clearly, other lines of evidence are required to constrain the evolution of Mesoproterozoic Era atmospheric oxygen and its role in biological evolution.

Here, we focus on evidence from unit 3 of the 1400 Ma Xiamaling Formation. Unit 3 has been proved to be an OMZ (Zhang et al., 2016). The low maturity of the sediments ensures indigenous organic signatures. Hopanes and diahopanes are predominated in the whole biomarker composition in this OMZ sediment. It is believed the high concentration of diahopanes in XML marine sediments is connected with the oxidizing nature of the environment comparable with the diahopane formation mechanism in the Tertiary terrestrial crude oil (Muhammad Asif, 2011) and the formation mechanism of diahopanes (Moldowan,1986). So the sediment should be formed in oxic environment, confirmed the oxic bottom water. This research confirms the high oxygen level at Mesoproterozoic.

Reference:

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