Biomarkers vs. body fossils – Insights from the Mesoproterozoic Lakhanda and Ui Groups

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Introduction

The Mesoproterozoic Lakhanda and Ui Groups are situated in the Uchur-Maya region of the Siberian Craton. They are conformably overlying, largely clastic, marine sequences dated to >1010 Ma [1]. The Lakhanda Group has previously been known for spectacular fossil preservation [2]. Here we report the extraction of indigenous biomarkers directly associated with the fossils of the Lakhanda and Ui Groups. The hydrocarbons represent only the third clearly indigenous biomarker assemblage of Mesoproterozoic age.

Biomarkers from the Lakhanda and Ui Groups

Typical Precambrian characteristics are high concentrations of monomethylated and dimethylated alkanes relative to *n*-alkanes, and a large unresolved complex mixture. Acyclic isoprenoids pristane and phytane were only detected in very low concentrations. Although hopanes are preserved, steranes and aromatic steroids were below detection limits, even using the most sensitive GC-MS/MS techniques. The overall hydrocarbon distribution pattern did not vary significantly within or between the two formations.

Discussion of Results

There is a stark contrast between the biomarker and body fossil record of the Lakhanda and Ui Groups. Whilst the predominant input into the biomarker record originated most probably from cyanobacteria [3], the fossil record is dominated by eukaryotic remains. These superficially conflicting data may be the consequence of ecological dominance of prokaryotes in Mesoproterozoic ecosystems and different patterns of preservational bias in the molecular and body fossil records.

[1] Rainbird *et al*. (1998) *Earth Planet. Sci. Let.* **164**, 409-420. [2] Hermann (1999) *Organic World Billion Year Ago*. Nauka, Leningrad. [3] Kenig *et al*. (1995) *GCA*, **59**, 2999-3015.

A calcium isotope excursion across the Permian-Triassic boundary

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We measured the calcium isotope composition ($\delta^{44}Ca$) of marine carbonate sediments spanning the Permian-Triassic boundary on an isolated carbonate platform in the Nanpanjiang Basin of southern China. The calcium isotope composition ($\delta^{44}Ca$) of the sediments exhibits a transient negative excursion of 0.2‰ to 0.3‰ across the end-Permian extinction horizon which persists through the basal Triassic *Hindeodus parvus* conodont zone. Strata within the overlying *Isarcicella isarcica* zone exhibit heavier values, similar to those observed in pre-extinction strata. The excursion could reflect either a change in the local fractionation between seawater Ca and carbonate minerals or a shift in the $\delta^{44}Ca$ composition of seawater. If the values measured do reflect an excursion in the isotope composition of calcium in the oceans, they imply a transient increase of approximately 20% in the marine calcium concentration over a few hundred thousand years or less. Such an increase could result from ocean acidification via the addition of CO_2 (and possibly SO_2) to the ocean and atmosphere. Such a scenario could also account for the coeval negative excursion in $\delta^{13}C$ and the preferential extinction of heavily calcified marine invertebrates.