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Sulfur isotope studies in early Archaean sediments from Isua, West Greenland: Implications for the antiquity of bacterial sulfate reduction

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Abstract

The sulfur contents and sulfur isotope ratios ( $\delta^{34}\text{S}$ ) have been measured for samples collected from the Isua area of West Greenland in an effort to place narrower limits on the time of the rise of sulfate respirers during the Precambrian.

The  $\delta^{34}\text{S}$  values of the Isua sediments (3.7  $\times 10^9$  yr old) including the various facies of the banded iron-formations have their mean values close to zero ‰ (CDT) ( $\hat{\pm}0.5\%$ ) with a standard deviation of less than 1%. This comes extremely close to the respective means yielded by the presumed tuffaceous amphibolites (+ 0.3  $\hat{\pm} 0.9\%$ ) and by the somewhat younger, between 3.1 and 3.7  $\hat{\pm} 10^9$  yr, basaltic Ameralik dykes of the

somewhat younger, between 3.1 and 3.7 AE 10<sup>3</sup> yr, basallic and mafic dykes of the region (+ 0.6 Å± 1.1%).

In view of the regional distribution of the Isua banded iron-formation sediments, the variety of environmental conditions under which the various facies were deposited and the complete absence of isotopic evidence for sulfate reducers, in contrast to the banded iron-formations of the middle Archaean ( $\delta^{34}\text{S}$  varies from -20 to +20%), it seems most unlikely that evidence for 'sulfate reducers' existed or will be found in other sediments of Isua age.

The very small spread in  $\delta^{34}\text{S}$  values for the Isua sediments is interpreted as due to minor fractionation during the passage of endogenic sulfur phases to their present sites of emplacement within the sedimentary succession.



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