# Elemental-sulfur reducing or disproportionating organisms in a ~3,5 Myr-old seafloor setting

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We report multiple-isotope sulfur analyses ($^{32}S$, $^{33}S$, $^{34}S$) of sulfides and sulfates from a unique collection of pristine drill core samples (Pilbara Drilling Project; Van Kranendonk *et al*., 2006) from the 3,490 Myr old Dresser Formation at North Pole, Western Australia. We show that the strongly $^{34}S$-depleted microscopic sulfides preserved in barite crystals that have been interpreted as evidence for sulfate-reducing organisms during the early Archean (Shen *et al*., 2001; Shen and Buick, 2004) have mass independently-fractionated sulfur isotopic anomalies ($\Delta^{33}S$) different from their host barite and therefore that they cannot have been produced by sulfate reducing microbes. Instead, we interpret the combined negative $\delta^{34}S$ and positive $\Delta^{33}S$ signature of these microscopic sulfides as evidence for the early existence of organisms or consortia that reduce or disproportionate elemental sulfur. These results support the prediction arising from phylogenetic reconstruction that elemental sulfur reduction is among most deeply-rooted metabolic pathway in both of the prokaryotic Domains.

## References

Shen Y. and Buick R. (2004), The antiquity of microbial sulfate reduction. *Earth-Science Rev.* **64**, 243-272.

Shen Y., Buick R., and Canfield D. E. (2001), Isotopic evidence for microbial sulphate reduction in the early Archaean era. *Nature* **410**, 77-81.

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# Supercontinental warming, plumes, and mantle evolution

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Large-scale magmatism is often linked to the breakup of a supercontinent, but it is not established whether it is caused by a plume head or a global temperature increase of the mantle. On the basis of convection modeling in an internally heated mantle, we have shown that continental aggregation promotes large-scale melting without requiring the involvement of plumes (Coltice *et al*., 2007). When only internal heat sources in the mantle are considered, the formation of a supercontinent causes the enlargement of the wavelength of the flow and subcontinental warming as large as 100 °C. We will show how plumes interact with supercontinental warming in order to better understand the evolution of melting during the opening of Pangea.

We will also describe the importance of the supercontinental warming model over the course of the evolution of the Earth's mantle and the growth of the continental crust.