Geophysical Research Abstracts
Vol. 21, EGU2019-2740, 2019
EGU General Assembly 2019

Multiple sulfur isotope insights into oxidative sulfur cycling in the upper shelf sediments of the South China Sea

Zhiyong Lin (1,2), Christian Peters (2), Xiaoming Sun (1,3), and Harald Strauss (2)

(1) School of Marine Sciences, Sun Yat-sen University, Guangzhou 510006, China (linzhiy3@mail2.sysu.edu.cn), (2) Institut für Geologie und Paläontologie, Westfälische Wilhelms-Universität Münster, Münster 48149, Germany (linzhiy3@mail2.sysu.edu.cn), (3) Guangdong Provincial Key Laboratory of Marine Resources and Coastal Engineering, Guangzhou 510006, China (eessxm@mail.sysu.edu.cn)

The enrichment in ^{34}S in sulfides has been frequently observed in the uppermost surface part of marine sediments (e.g., Dale et al., 2009; Böttcher et al., 2010). It was argued that such isotope shift may be controlled by high rates of sulfate reduction (Fike et al., 2009) or associated oxidative sulfur cycling (Dale et al., 2009). In order to evaluate microbial sulfur cycling in the upper shelf sediment of the South China Sea, multiple sulfur isotope analysis of sedimentary pyrite and porewater sulfate from two sites was carried out in this study. The multiple sulfur isotopic compositions of pyrite show similar trends in these two cores. As expected, the $\delta^{34}S$ values for pyrite in the uppermost sediments are highest (-24 ‰ and -27 ‰ respectively), and they drop dramatically to values of -45‰ and -48 ‰ in the uppermost 15 and 50 cm of the sedimentary column. Thereafter, $\delta^{34}S$ values remain relatively constant downward to the bottom of both cores. Interestingly, the $\Delta^{33}S$ values display a mirror image to the $\delta^{34}S$ depth trend, exhibiting lowest $\Delta^{33}S$ values in the surface sediments. When applying our multiple sulfur data to the model of Johnston et al. (2007), designed for resolving different pathways of microbial sulfur metabolism, our results indicate that sulfur isotope fractionation in the shallow sediments are comparable to sulfur disproportionation rather than microbial sulfate reduction. The finding, thus, suggests that sulfur disproportionation and (possibly repeated) associated sulfide oxidation lead to the isotope shifts observed in the surface sediments of the South China Sea.

References:

Böttcher M. E., Voss M., Schulz-Bull D., Schneider R., Leipe T. and Knöller K. (2010) Environmental changes in the Pearl River Estuary (China) as reflected by light stable isotopes and organic contaminants. *J. Mar. Syst.* 82, 43-53.

Dale A.W., Bruchert V., Alperin M. and Regnier P. (2009) An integrated sulfur isotope model for Namibian shelf sediments. *Geochim. Cosmochim. Acta.* 73, 1924-1944.

Fike D. A., Finke N., Zha J., Blake G., Hoehler T. M. and Orphan, V. J. (2009). The effect of sulfate concentration on (sub)millimeter-scale sulfide $\delta^{34}S$ in hypersaline cyanobacterial mats over the diurnal cycle. *Geochim. Cosmochim. Acta.*73, 6187-6204.

Johnston D. T., Farquhar J. and Canfield D. E. (2007) Sulfur isotope insights into microbial sulfate reduction: when microbes meet models. *Geochim. Cosmochim. Acta.* 71, 3929-3947.

This study was jointly supported by the Natural Science Foundation of China (No. 41806049), and the China Postdoctoral Science Foundation (No. 2018M631015).