

Organosulfur evidence for the ocean redox in South China during Ediacaran-Cambrian transition

CHUNJIANG WANG^{1,2}, BO XU², FANGWEN DAI², TIAN LAN², ZHAOHUI MA², FANGTING MENG²

¹ State Key Laboratory of Petroleum Resources and Prospecting, China University of Petroleum, Beijing 102249, China (wchj333@126.com)

² College of Geosciences, China University of Petroleum, Beijing 102249, China

Based on the geochemistry of isotopes, element and mineral species, the relationship between marine oxidation and the evolution of metazoa during the Ediacaran and early Cambrian periods has been extensively discussed. However, the application of organic geochemistry in this research field is greatly limited because of the over-maturation of the organic matters. Here, we use an aromatic sulfur-containing molecular parameter (DBTc) as a proxy of the organosulfur content in the sediments to understand the deep-water redox, ocean sulfate concentration as well as the ocean oxidation.

We analysed the organic-rich rocks from the typical Ediacaran-Cambrian sections in South China, including the Jiulongwan section in the Yangtze Gorges area, Hubei province and Beidoushan section in Weng'an, Guizhou province. The results show that the DBTc is very low in Member II and III, but increases dramatically (about one order of magnitude, in average) in the Member IV of the Doushantuo Fm. at Jiulongwan section. While the DBTc value is also very high in the phosphate-rich black shale interval at Weng'an section, which is correlated with the upper Member II in the Yangtze Gorges area. In addition, at the Wuhe section in Guizhou province, the deep-water facies black shales in Member II, III and IV show medium DBTc values, indicating the euxinic condition. We suggest that the organic-rich dolomitic shales of Doushantuo Member II in Yangtze Gorges area were typically of ferruginous condition. In addition, the early Cambrian Yanjiahe and Shuijingtuo Formations show distinct DBTc fluctuations, indicating bottom-water changing from anoxic to euxinic condition.

The extremely enhanced DBTc in the early Ediacaran must have been triggered by a great increase of ocean sulfate concentration, in terms of long-term low DBTc in the pre-Ediacaran sediments. Our results suggest that the ocean oxidation began in early Ediacaran, but were spatial and temporal heterogeneous in South China during Ediacaran-early Cambrian.