# Organic matter $\delta^{34}$S as a redox proxy on the Yangtze Block across the Ediacaran-Cambrian transition

YUYANG YUAN[1], CHUNFANG CAI[2]*, YONGLIN LIU[3]

[1] College of Engineering and Technology, Zunyi Normal University, Zunyi, China (158171687@qq.com)

[2] Institute of Geology and Geophysics, Chinese Academy of Sciences, China (*correspondence:cai_cf@mail.iggcas.ac.cn)

[3] Geography and Tourism College, Chongqing Normal University, China (liu3986130@163.com)

Upper Ediacaran Piyuancun Formation chert (~540-550Ma) and Lower Cambrian Hetang Formation mudstone (~520-540Ma) were deposited in lower slope to basin environments and are well exposed at Diben Section, Zhejiang Province. Organic matter $\delta^{34}S_{Kero}$ values were measured to range from 15.1 to 25.7‰ with an average of 20.2‰ (n=8) in Piyuancun Formation, and from 3.6 to 29.2‰ with an average of 12.6‰ (n=7) in Hetang Formation, with a trend to decrease in the Hetang Formation toward the lowest value at the upper part. The differences between seawater $\delta^{34}S_{SW}$ and pyrite $\delta^{34}S_{Py}$ and between $\delta^{34}S_{SW}$ and organic matter $\delta^{34}S_{Kero}$ in Piyuancun Formation are lower than those in Hetang Formation, respectively, suggesting that sulfate concentrations were increased as the result of increasing ocean oxidization. This proposal is supported by iron speciation showing that there are several episodic decrease trends in FeHR/FeT ratio or increasing oxygenation towards the late stage of Hetang Formation although the ocean during this period was dominantly anoxic and ferruginous. Interestingly, we find that the difference between organic matter $\delta^{34}S_{kero}$ and $\delta^{34}S_{Py}$ rises with increasing FePy/FeHR ratio when FePy/FeHR < 0.5, then drops down and keeps low values when FePy/FeHR > 0.7. That is, $\delta^{34}S_{kero}$ value in the ferruginous environment becomes more and more heavy relative to $\delta^{34}S_{py}$ with increasing anoxic degrees. This feature is explained as increasing pyrite precipitation from water column, a relatively open system, and thus total pyrite has lighter values. In contrast, under sulfidic conditions, both pyrite and organic sulfur may have part of $H_2S$ derived from diffusion from the overlying water columns, and this $H_2S$ is S isotopically homogeneous, thus $\delta^{34}S_{kero}$ value is closer to $\delta^{34}S_{py}$. Thus, we propose that $\delta^{34}S_{kero}$ in combination with $\delta^{34}S_{py}$ and iron speciation can be used to constrain water redox in this section, and thus $\delta^{34}S_{kero}$ is a potential proxy to reflect redox.