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Euxinic Ocean during the Late Devonian Mass Extinction Inferred from Organic Compounds

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There were five mass extinctions of Earth life during the past 500 million years. The second crisis of the "big five" mass extinctions occurred near the Frasnian/Famennian (F/F) boundary in the Late Devonian. This extinction impacted mainly oceanic regime and resulted in 21% of families and 50% of genera among oceanic life being wiped out (Sepkoski, 1986). In particular, brachiopods, trilobites, conodonts, tabulate corals, and stromatoporoids have been severely affected and suffered high extinction rates (McGhee, 1996, 1989; Stanley, 1987). Previously, anoxic sea-water condition was considered as the candidate responsible for the F/F mass extinction simply because of the widespread black shale near the boundary worldwide (House, 1985). Both stable carbon and sulfur isotopic signals and trace metal element features indicate that the F/F mass extinction was probably caused by the development of oceanic anoxia (Riquier et al., 2006; Joachimski et al., 2001). However, little has been published on organic geochemical signals across the F/F mass extinction interval. Thus, the purpose of this study is to examine oceanic redox condition spanning the F/F boundary based on organic geochemical analysis incorporating with stable carbon isotope ratio and bioturbation levels from two geographically apart localities, Belgium and China, respectively.

A positive shift of $\delta^{13}C_{carb}$ across the F/F boundary and high values of $\delta^{13}C_{carb}$ in the lower Famennian strata are detected at the F/F boundary sections in Belgium and China, respectively. Contents of organic matter components dibenzothiophenes and 2,3,6- trimethylarylisoprenoids show peaks near the F/F boundary at these two studied sections. High values of $\delta^{13}C_{carb}$, dibenzothiophenes and 2,3,6- trimethylarylisoprenoids detected from these two geographically apart sections indicate a global spread event of anoxic or euxinic seawater, which should account for the F/F biotic crisis.

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REFERENCES CITED

House, M. R., 1985. Correlation of Mid-Palaeozoic Ammonoid Evolutionary Events with Global Sedimentary Perturbation. *Nature*, 213: 17–22

Joachimski, M. M., Ostertag-Henning, C., Pancost, R. D., et al., 2001. Water Column Anoxia, Enhanced Productivity and

Concomitant Changes in $\delta^{13}C$ and $\delta^{34}S$ across the Frasnian-Famennian Boundary (Kowala-Holy Cross Mountains/ Poland). *Chemical Geology*, 175: 109–131

McGhee, G. R. Jr., 1989. Chapter 7. The Frasnian-Famennian Event. In: Donovan, S. K., ed., Mass Extinctions. Process and Evidence. Belhaven Press, London. 133–151

McGhee, G. R. Jr., 1996. The Late Devonian Mass Extinction. The Frasnian/Famennian Crisis. Columbia University Press, N.Y.. 303

Riquier, L., Tribovillard, N., Averbuch, O., et al., 2006. The Late Frasnian Kellwasser Horizons of the Harz Mountains (Germany): Two Oxygen-Deficient Periods Resulting from Different Mechanisms. *Chemical Geology*, 233(1–2): 137–155

Sepkoski, J. J. Jr., 1986. Phanerozoic Overview of Mass Extinction. In: Raup, D. M., Jablonski, D., eds., Patterns and Process in the History of Life. Springer-Verlag, Berlin. 277–295

Stanley, S. M., 1987. Extinction. Scientific American Library 2. Freeman, W. H., N.Y.