Secular variations in organic and inorganic carbon isotope of the Mesoproterozoic (1.7–1.3 Ga) sedimentary successions on the North China Craton

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The North China Craton (NCC) is one of the representative research regions for revealing the biological and marine environmental co-evolution during the early-middle Mesoproterozoic (1.7–1.3Ga) [1]. The secular variations in C-isotope of carbonates of the Jixian Section on the NCC have been reported [2]. Here, we report the results of a comprehensive C-isotopic study of carbonates and organic matters, based on high-resolution sampling from 6 sections and 5 drill cores (JQ1, 2, 3, 4, and XQ1) in the north region of the NCC, with emphasis on the four organic-rich sedimentary sequences of deepwater facies.

The Mesoproterozoic sedimentary successions on the NCC record a suit of negative $\delta^{13}C_{carb}$ values varying from -2.6‰ (Thuanshanzi Fm) to -2.3‰ (Gaoyuzhuang Fm), -1.4‰ (Wumishan Fm), -2.9‰ (Hongshuizhuang Fm), -1.5‰ (Tieling Fm), and to -1.5‰ (Xiamaling Fm) in average. This secular trend is more negative than the uniform $\delta^{13}C_{carb}$ value (around 0.0‰) of the Mesoproterozoic sedimentary successions worldwide [3]. It may suggest that the primary production and organic carbon burial in the NCC were lower than other regions in the world during the Mesoproterozoic. The organic-rich sediments from Chuanlinggou, Gaoyuzhuang, Hongshuizhuang and Xiamaling Fm uniformly present the negative $\delta^{13}C_{org}$ values of -34.4‰, -34.1‰, -32.8‰ and -33.9‰ in average, respectively. The negative $\delta^{13}C_{org}$ values, being consistent with the biomarker evidence [1], suggest that anoxygenic or micro-oxygenic prokaryotic microbial mats may have predominantly contributed to organic carbon burial. The $\delta^{13}C_{carb}$–$\delta^{13}C_{org}$ coupling analysis shows that no large DOC reservoir occurred during the Mesoproterozoic (1.7–1.3 Ga).

[1] Wang *et al* (2012) *Mineral Mag* **76**, 2510. [2] Chu *et al* (2007) *GCA* **71**, 4668–4692. [3] Frank *et al* (2003) *Geol Mag* **140**, 397–420.