Higher oxygenation level after Sturtian glaciation meltdown despite varying local redox in Nanhua basin

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Both of the major two oxygenation events occurred coincidently with severe glaciations in the early and late Proterozoic. Causal relationship was proposed that enhanced postglacial weathering input caused high rates of productivity and organic carbon burial and thus further oxygenation of the surficial Earth (Planavsky *et al*.., 2010). Here we present data of iron speciation, pyrite sulfur isotopes and Mo isotopes of black shales and Mn-rich carbonates of the basal Datangpo Formation immediately covering the Sturtian diamictite in Tongren County, South China, to constrain the oceanic redox condition in the aftermath of the glaciation. Our iron speciation data show anoxic condition of local seawater within the Nanhua Basin, while published data for samples in Minle County (Li *et al*.., 2012), ~70 km from Tongren, show euxinic condition, indicating heterogeneous redox in the Nanhua Basin. The $\delta^{34}S_{Py}$ values of our samples are between 20.6‰ and 59.3‰, similar to those of Minle area (38.6-57.3‰). Furthermore, our samples show a negative correlation between $\delta^{34}S_{Py}$ and pyrite-sulfur contents. Low S_{Py}, anomalously high $\delta^{34}S_{Py}$ and their correlation suggest a very low seawater sulphate content which limited pyrite formation, given ferruginous condition and relatively high organic carbon content. The δ^{98}Mo values range between which should be the lower limit of the coeval ocean values as Mo-isotope fractionation may have existed during deposition in ferruginous condition. However, the high end of our data is higher than those of euxinc black shales in mid-Proterozoic ($\delta^{98}Mo \leq 1.13$, Kendall *et al*.., 2011; and in pre-Sturtian Neoproterozoic ($\delta^{98}Mo \leq 1.19$ at 750Ma, Dahl *et al*.., 2011), suggesting a higher oxygenation level of the ocean after the Sturtian glaciation.

Destruction of the North China Craton Induced by Ridge Subductions

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The destruction of the North China craton (NCC) has been attributed to a "top-down" rapid delamination or to "bottom-up" long-term thermal/chemical erosions, or hydration by subduction released fluids. Based on the distribution of one Jurassic and two Early Cretaceous adakite belts and the drifting history of the paleo-Pacific plate, here we propose that three ridge subduction events dominated the large-scale decratonization in the NCC. Both physical erosion (delamination) and magmatism (thermal/chemical erosions) induced by ridge subduction contributed to the destruction of the NCC, whereas the last ridge subduction at 130±5 Myrs was the key driving force that led to the final destruction, which mainly occurred in the Cretaceous. Integrated study of mineralogy, major and trace elements, as well as Mg isotopes, was conducted, which supports the ridge subduction model: The flat subduction of a spreading ridge had stronger physical erosion on the thick lithosphere mantle of the NCC. The final decratonization was triggered by the last ridge subduction, with both physical erosion (flat subduction) and thermal erosion (adakitic and A-type magmatisms). Given that ridge subduction occurred throughout Earth's history, the associated decratonization processes are presumably a common phenomenon that modified the chemical compositions of the continental crust.

The related paper was published in Journal of Geology (Ling, M.X. *et al*.., 2013. Destruction of the North China Craton Induced by Ridge Subductions. Journal of Geology, 121(2): 197-213).

www.minersoc.org
DOI:10.1180/minmag.2013.077.5.12