

GEOCHEMICAL RECORDS OF TWO EDIACARAN-EARLY CAMBRIAN STRATA IN SOUTH CHINA: IMPLICATION FOR THEIR PALEOENVIRONMENTAL EVOLUTION

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The Ediacaran-Cambrian transition is a critical interval in geological history, during which dramatic changes occurred both in seawater chemistry and biological evolution. The relationship between biological evolution and environmental change in this period has been discussed intensively whereas the causal link between them still remains to be solved through more high-resolution geochemical studies.

The Ediacaran-Cambrian strata in South China are well preserved, which provides a good chance for better understanding the linkage of the paleo-ocean environment and life evolution. In the present study, a total of 141 samples was collected from the Dongkanshang section and the Fengtan section in Hunan, South China, depositing in slope and basinal settings respectively. The geochemical analyses including total organic carbon (TOC) content, carbon, and oxygen isotope composition ($\delta^{13}\text{C}$ and $\delta^{18}\text{O}$), mineral composition, organic carbon isotope composition ($\delta^{13}\text{C}_{\text{org}}$) were reported.

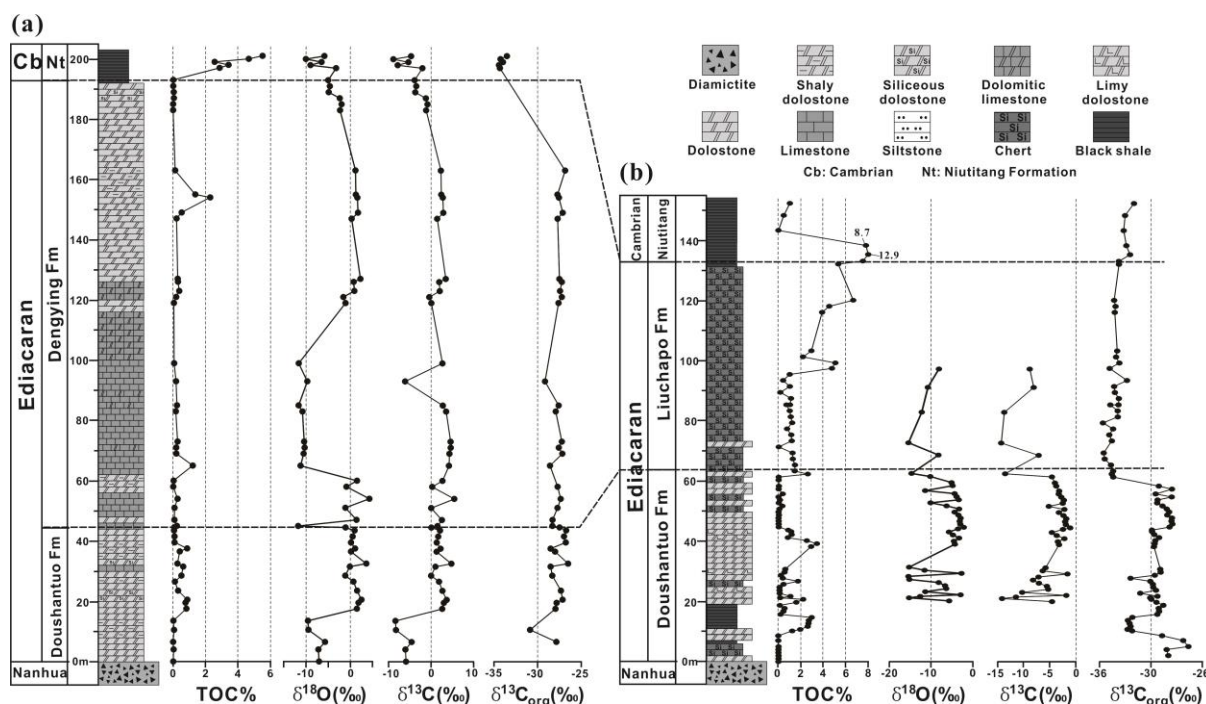


Figure 1 TOC, $\delta^{18}\text{O}$, $\delta^{13}\text{C}$, and $\delta^{13}\text{C}_{\text{org}}$ profiles of the Dongkanshang section (a) and the Fengtan section (b) in South China.

The slope Dongkanshang section mainly consists of dolostone and black shale, with TOC contents ranging from 0.02 to 5.5%, among which much higher in the Niutitang formation. The values of $\delta^{18}\text{O}$ and $\delta^{13}\text{C}$ of carbonate range from -11.8 to 4.3‰, and from -8.8 to 5.5‰, respectively. A significant negative $\delta^{13}\text{C}$ excursion near the Ediacaran-Cambrian boundary is

observed, which could be correlated on a global scale (Li et al., 2009). The $\delta^{13}\text{C}_{\text{org}}$ values range from -34.3 to -26.5‰, which are more negative in the Niutitang formation (Figure 1).

The basinal Fengtan section consists of dolostone, chert, and black shale, with TOC contents ranging from 0.02 to 12.9%, generally higher than those of the Dongkanshang section. The $\delta^{18}\text{O}$ values range from -15.9 to -2.2‰, and the $\delta^{13}\text{C}$ values of carbonate cover a more negative range from -14.2 to -0.9‰ in contrast to the Dongkanshang section, which is consistent with the spatial variations of $\delta^{13}\text{C}$ observed in previous work (Wang et al., 2017). No $\delta^{18}\text{O}$ or $\delta^{13}\text{C}$ data were obtained for the upper Liuchapo formation and the Niutitang formation due to a lack of carbonate. The $\delta^{13}\text{C}_{\text{org}}$ values range from -35.6 to -27.3‰, which are obviously constrained by lithofacies (Figure 1).

The comparison of geochemical records from the two sections reflects a significant spatial-temporal heterogeneity of ocean chemistry during Ediacaran-early Cambrian. In addition, frequent fluctuations in $\delta^{13}\text{C}$ and $\delta^{13}\text{C}_{\text{org}}$ are most likely due to changes in marine environment and perturbations in the carbon cycle during this period. All above may have had a major impact on the distribution and diversity of metazoans.

References

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