Carbon and oxygen isotope chemostratigraphies in South China: Decoding environmental changes through the Ediacaran

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The Ediacaran is one of the most important periods in the history of evolving life when multicellular animals firstly appeared on the earth. However, it is still controversial about the relationship among the abrupt biological evolution and environmental change at that time. In order to examine the environmental change through the Ediacaran, we performed to analyze carbon and oxygen isotopic compositions of carbonate rocks of drill core samples from the Three Gorge area, South China. The core samples include the Nantuo through the Doushantuo to the Dengying Formations in ascending order, and range from 630 Ma Marinoan Snowball Earth to the latest Neoproterozoic in age.

We made 388 rock powders from the drill core using a micro-drill to avoid altered portions, and analyzed their carbon, oxygen and strontium isotopic compositions as well as major and trace elements. The d13C profile displays five positive and five negative anomalies, respectively. The positive and negative intervals are named as PI-1to 5, and NI-1 to 5, respectively. The NI-5 forms its abrupt decrease and gradual recovery, which can be correlated with the Shuram-Wonoka-Pertatataka Excursion (Condon et al., 2005; LeGuerroue et al., 2006). On the other hand, preceding excursion (NI-4) show sharp spike. In this interval, regional unconformity can be seen near the minimum of the NI-4, suggesting regression event. Moreover, in the NI-4, oxygen isotopic composition show a positive excursion and is inversely correlated with the carbon isotopic profile. The high d18O may preserve primary signature, because this inverse correlation between d13C and d18O is unlikely to have produced by secondary alteration. Both the presence of unconformity and the positive d18O excursion indicate that global cooling event is related to the d13C negative anomaly of NI-4, which can be correlated with the Gaskiers glaciation at 580 Ma. In this case, the global cooling may have resulted in negative excursion of d13C through reduction of primary productivity and in the regression due to formation of extensive ice sheets.