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Progressive increase of Ca concentration in Ediacaran ocean, evidenced from stable Ca isotope stratigraphy.

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The Ediacaran to Cambrian period is one of the most important intervals for the evolution of life. The occurrence of the cnidarians, sponge, cloudina and Namacalathus (Li et al. 1998; Chen et al., 2002; Amthor et al., 2003) from the Ediacaran rocks suggests that the possible onset of Ca-biomineralization started. Ca is one of the essential elements for life and skeletal organisms. Therefore, Decoding the Ca cycle and seawater Ca concentration from Ediacaran to Cambrian time provides an important information for biological evolution.
Recently, some works reported the Ca isotopic compositions of carbonate rocks in the Ediacaran (Kaseman et al., 2005; Komiya et al., 2008). According to these works, Ca isotope compositions of carbonate rocks were much higher than those of Phanerozoic carbonate, which imply that Ca cycle in Ediacaran were differed from those in Phanerozoic. However, sporadic and insufficient Ca isotopic data remain two questions,
When this Ediacaran-type Ca cycle was replaced by Phanerozoic-type Ca cycle?
Why Ca isotopic ratios of Ediacaran carbonate were much higher than those of Phanerozoic carbonate?
South China is one of the best places for decoding surface environments during the Ediacaran and Cambrian. We carried out on-land drilling of the Ediacaran to Cambrian sedimentary succession in Three Gorges area, South China. The drill-sampling allows us to minimize the effect of secondary alteration and oxidation on the surface and to make a very continuous chemostratigraphy at intervals of centimeters. This work presents a new detailed chemostratigraphy of d44Ca during the Ediacaran and Cambrian periods in the Three Gorges region in South China.
The chemostratigraphy of d44Ca ratios of the drilled samples displays a smooth curve. Cap carbonate (beginning of Ediacaran) have remarkably low d44Ca ratio (0.15%(permillage)), but shortly thereafter d44Ca value have highest value (1.29%). d44Ca ratios gradually decrease down to ca. 0.4% at ca. 550 Ma. During Cambrian, d44Ca ratios fluctuate between 0.6% and 0.4%. It is well-known that carbonate have lower d44Ca ratios than those in coexistent seawater. Ediacaran carbonates have relatively high d44Ca ratios (0.7-1.0%) and these high ratios are equivalent to seawater. Therefore, we suggest that low Ca concentration in Ediacaran disturb inherent capability to fractionate Ca isotopes.

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