Stable Sr isotopes of the Middle Permian carbonate: its implication of ocean Sr budget change

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Strontium isotopic compositions of seawater are uniform globally and can be valid proxies for ancient ocean Sr budget. The radiogenic Sr isotope compositions ($^{87}Sr/^{86}Sr$) of ancient seawater, which are archived in carbonates, mainly driven by the balance between two ifluxes; radiogenic continental flux and unradiogenic mantle flux (e.g., Burke et al., 1982). The stable Sr isotope compositions ($\delta^{88}Sr = [(^{88}Sr/^{86}Sr)_{sample}/(^{88}Sr/^{86}Sr)_{std} - 1] \times 10^3$) reflect sensitively input/output (burial/dissolution) flux of oceanic carbonates rather than the continental flux and mantle flux, because $\delta^{88}Sr$ values of oceanic carbonates have significantly lower than that of seawater (e.g., Vollstaedt et al., 2014). In the entire Phanerozoic $^{87}Sr/^{86}Sr$ curve, the value trend to decline through Paleozoic long-term, although with minor fluctuations, and reach the Phanerozoic lowest value in Middle Permian Capitainan, called "the Capitanian mimimum" (Veizer et al., 1999; Korte et al., 2003, 2006; Kani et al., 2008; McArthur et al., 2012). After the minimum, the trend drastically increase in magnitude and rate from Late Permian to Early Trias (Korte et al., 2006). The $^{87}Sr/^{86}Sr$ records indicate that the oceanic Sr budget could have changed in Middle Permian. Here we present Sr isotopic results ($^{88}Sr/^{86}Sr$ and $^{87}Sr/^{86}Sr$) of the Middle Permian oceanic carbonates obtained by ^{84}Sr-^{87}Sr double spike thermal ionization mass-spectrometry and discuss the environmental changes relevant to the driving mechanism of the global Sr cycle. Analyzed carbonate samples with detailed biostratigraphy, which deposited on shelf at low paleolatitude eastern margin of supercontinent Pangea, were collected from South China. The $\delta^{88}Sr$ values were low in Middle Permian and then began to rise in Late Permian. The present results confirmed that the relatively low $\delta^{88}Sr$ value (0.2-0.3) lasted until the end of Capitanian. The extremely low $^{87}Sr/^{86}Sr$ value in Capitanian likely reflect suppression of time-integrated highly radiogenic continental silicate weathering/erosion caused by intracontinental arid climate and expansion of ice sheet covering. The low $\delta^{88}Sr$ values in seawater might be related with enhancing carbonate weathering and reducing of reef building on shelf settings due to the coeval global sea-level drop and cooling event.

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