

Enhanced Continental Weathering and Marine Authigenesis From the Late Ediacaran to Early Cambrian in South China—A Lithium Isotope Perspective

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The transition from late Ediacaran to early Cambrian marks the great appearance of early animals in ocean, likely due to the elevated atmospheric and marine O₂ level. The rise of new biota also requires sufficient nutrients supply that mainly come from the continents by the chemical weathering of primary rocks (e.g. igneous rock, sedimentary rock). However, the continental weathering regime remains controversial due to lack of efficient proxies. In recent decade, lithium isotope has been proved to be an ideal tool to dig out weathering information throughout geological time [1]. Here, we present a coupled lithium isotopic composition of carbonate components ($\delta^7\text{Li}_{\text{carb}}$) and carbonate-hosted silicate components ($\delta^7\text{Li}_{\text{sili}}$) from two Precambrian to Cambrian carbonate sections. Both sections show high $\delta^7\text{Li}_{\text{carb}}$ value in limestone layers from Dengying Formation, indicating two stages of enhanced continental weathering. Additionally, High Li/Th weight ratio is observed in silicate fractions, together with high $\delta^7\text{Li}_{\text{sili}}$ value, likely suggesting an enhanced marine authigenesis around Precambrian-Cambrian Boundary (PCB). On Earth's surface cycle, continental weathering plays an important role in sequestering atmospheric CO₂, on the contrary, reverse weathering is thought to be the main process working against continental weathering [2]. The formation of marine authigenic clays releases CO₂ back into the atmosphere and thus regulate surface temperature. Together, substantial riverine supply from a strong continental weathering regime and the enhanced reverse weathering in the studied area work together to balance a long and stable environment from late Ediacaran to early Cambrian, thus provide a suitable condition for early life expansion.

Reference

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- [2] T. T. Isson, N. J. Planavsky, Reverse weathering as a long-term stabilizer of marine pH and planetary climate. *Nature* **560**, 471–475 (2018).