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Light stable isotope composition ($\delta^{13}C_{carb}$, $\delta^{18}O_{carb}$, $\delta^{18}O_{phos}$) of early Cambrian phosphorites, Yangtze Platform (South China)

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The Precambrian-Cambrian (PcC) boundary is one of the most pivotal episodes in Earth's history, as global changes in tectonics, climate and ocean chemistry likely favoured the Cambrian bioradiation and a concomitant ecosphere revolution. This time interval is further characterized by the first appearance of widespread and economically-valuable calcium phosphate deposits, however, the environmental circumstances of phosphorite genesis are not yet fully understood.

In Yunnan Province in south China, several well-exposed and unmetamorphosed sedimentary successions document phosphorite formation during rapid biodiversification, following the continuous drowning and flooding of the end Precambrian low-latitude, shallow-water carbonate platform. Applying a multi-proxy approach involving petrographic, geochemical and isotopic ($\delta^{13}C_{carb}$, $\delta^{18}O_{carb}$, $\delta^{18}O_{phos}$) methods, we aim to (1) reconstruct ambient paleoenvironmental conditions leading to the formation of the early Cambrian phosphorites as well as (2) examine the degree of potential post-depositional diagenetic alteration.

Our results show that carbonate carbon and oxygen isotopic values are generally low, ranging between -5.43 and 2.83 ‰ PDB, and -14.51 and -6.33 ‰ PDB, respectively. A positive correlation between $\delta^{13}C_{carb}$ and $\delta^{18}O_{carb}$ has often been interpreted to indicate diagenetic resetting. Isotopic signatures are however uncorrelated over a wide range of both carbon and oxygen isotope compositions, thus indicative of a likely primary signal. This finding is further supported via the independent evaluation of Mn/Sr ratios. Phosphate oxygen isotopic values are also low, ranging between 13.3 and 14.9 ‰ (V-SMOW). This might be either the result of (1) diagenetic alteration, (2) high ambient seawater temperatures or (3) secular changes in $\delta^{18}O_{SW}$ over Earth's history with our results suggesting an isotopically light seawater oxygen composition. Triple oxygen analysis are therefore planned on the same samples to unravel this hypothesis.