

Recycled carbonatite volcanic ghost sealed in the Ediacaraic carbonate rocks with carbon isotope excursions

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In the process of plate subduction, a significant quantity of carbonate rocks were carried into the Earth's interior, thereby disrupting the material balance within the Earth and potentially triggering melting processes, while also impairing the carbon balance on the Earth's surface and affecting surficial geological processes. The recycled carbonatites formed after decarbonation of sedimentary carbonate rocks in subduction zones retain most of the characteristics of the sedimentary carbonate rocks, but feature a significant negative $\delta^{13}\text{C}$.

The carbonate strata from the late Ediacaran period exhibit the most pronounced negative carbon isotope excursions. Low-temperature geochemists interpreted that as the result of the oxidation of dissolved organic matter or autogenic precipitation processes. These explanations face a series of challenges, including (1) large and asymmetric variations in C isotope, (2) extremely rapid sedimentation rates, (3) significant micro-scale variations in $\delta^{13}\text{C}$, (4) stable environmental oxygen fugacity, and (5) the presence of mineral assemblages indicating high-temperature. Low-temperature chemical sedimentation processes struggle to explain these features, but sedimentary processes related to recycled carbonatites can provide a good explanation. These late Ediacaran carbonate strata with carbon isotope excursions may offer a connection between deep and shallow carbon cycles in the Earth.

References

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