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Elemental and isotopic (C, O, Sr, Nd) compositions of Late Paleozoic carbonated eclogite and marble from the SW Tianshan UHP belt, NW China: implications for deep carbon cycle

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Abstract

Subduction zones are important for understanding of the global carbon cycle from the surface to deep part of the mantle. The processes involved the metamorphism of carbonate-bearing rocks largely control the fate of carbon and contribute to local carbon isotopic heterogeneities of the mantle. In this study, we present petrological and geochemical results for marbles and carbonated eclogites in the Southwestern Tianshan UHP belt, NW China. Marbles are interlayered with coesite-bearing pelitic schists, and have Sr-Nd isotopic values ($\epsilon_{\text{Nd}}(T=320\text{Ma}) = -3.7 \sim -8.9$, $^{87}\text{Sr}/^{86}\text{Sr}_{(i)} = 0.7084 \sim 0.7089$), typical of marine carbonates. The marbles have dispersed low $\delta^{18}\text{O}_{\text{VSMOW}}$ values (ranging from 14 to 29 ‰) and unaffected carbon isotope ($\delta^{13}\text{C}_{\text{VPDB}} = -0.2 \sim 3.6$ ‰), possibly due to infiltration of external H₂O-rich fluids. Recycling of these marbles into mantle may play a key role in the carbon budget and contributed to the mantle carbon isotope heterogeneity.

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