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Long-term glacial-interglacial variations in organic carbon burial in the Northwest Pacific Ocean and its implications for climate sensitivity

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The carbon cycle at the Earth's surface is linked to long-term variations in atmospheric CO_2, while the burial of particulate organic carbon (OC) in marine sediments is also highly sensitive to the global climate over geological time scales, but little is known about OC burial and its regulations over glacial-interglacial cycles. Here, we present a long-term OC record from the Northwest Pacific Ocean over the past ~380 kyr, which is an ideal region for studying OC burial and its environmental implications in glacial-interglacial cycles. We observed a distinct cyclicity of higher OC burial (about 70% marine-sourced OC and 30% terrestrial OC) in glacial periods, which was coupled with input from Asian dust and the Kuroshio Current but seemingly decoupled with biogenic element contents, implying a limited relationship between OC burial, marine productivity, and dust input. Moreover, the sedimentary record of OC was synchronous with the oceanic redox conditions, especially the redox sensitive elements at the sediment-water interface, indicating a relatively reductive condition that enhanced OC preservation in glacial periods. Overall, the glacial-interglacial OC burial regime could be conceptually constructed, which showed a higher efficiency of OC burial during glacial periods and more significant degradation during interglacial periods. The findings of this study emphasized the additional contributions of better preservation controls on OC burial owing to relatively reductive stage, demonstrating pronounced sensitivity of the carbon cycle towards global climate at the orbital scale.