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The dual tracer, ^{236}U and ^{14}C, records in coral core in the western Pacific

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During the 1950s, several nuclear weapon tests were operated in the Pacific Proving Grounds in the central Pacific Ocean, releasing large amounts of anthropogenic nuclides into the environment, including ^{236}U and ^{14}C. Both nuclides were transported by the air and surface ocean currents, becoming potential tracers to scrutinize ocean circulation. ^{14}C is a widely used biogeochemical tracer due to its role in metabolism and calcification, while ^{236}U behaves as a conservative radiotracer through time. Thus, the dual-tracer approach allows us to look into the circulation further than using either tracer alone. New $^{236}U/^{238}U$ analytical technique enable bimonthly temporal resolution [1]. Here, we reconstruct continuous records of $^{236}U/^{238}U$, ^{14}C, and stable oxygen isotope from a coral core in Nanwan Bay, southern Taiwan, where the South China Sea and the Pacific seawater interact. Our ^{14}C result is consistent with Houbihu and Ishigaki records, and they all show a peak value in midâ€ 1955, a year after the Operation Castle bomb detonations in mid-1954. Nanwan coral $^{236}U/^{238}U$ ratios sustained a low value in 1940-1952 and had two identifiable peaks, prior to the major 1954 ^{14}C peak, in response to smaller operations in 1951 and 1952. From 1953 to 1961, the maximum Nanwan $^{236}U/^{238}U$ values were about five times higher than those in Japan corals [2] [3]. Furthermore, the bimonthly $^{236}U/^{238}U$ highly fluctuated, with maxima occurred in winter and minima in summer, likely attributed to the seasonal variation of the Kuroshio intrusion into the northern South China Sea in the winter. In contrast, the seasonality in the ^{14}C record is obscured during the same period [4]. It implies that coral $^{236}U/^{238}U$ could be a more suitable proxy of surface circulation while the ocean is a relatively large reservoir of carbon. From the dual-tracer approach, we can differentiate the nuclide characteristics and their subsequent application as ocean tracers.

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