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# Precession influenced nutrient utilization in the eastern equatorial Pacific during the early-Pleistocene using Foraminifera-bound nitrogen isotopes

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The early - Pleistocene tropical Pacific climate variability is mainly based on inferences drawn on sea surface temperature (SST) reconstructions. The SST variability in the tropical Pacific during the glacial-interglacial cycles of the early Pleistocene was observed to be controlled by obliquity periodicity (~41 kyr). The strong dependence on high latitude climate variability through ocean-atmosphere tunneling undermines the role of local insolation in driving the biogeochemical changes of the tropical Pacific driven by upwelling.

The Eastern tropical Pacific hosts three major upwelling systems (equatorial upwelling, ETSP and ETNP) transporting subsurface nutrients that support surface productivity thereby modulating the strength of the biological pump in the tropics. The modern observations show that the strength of equatorial upwelling can be deduced using the degree of nutrient utilization at the equator. The degree of nutrient utilization is imprinted on the nitrogen isotopic values of the sinking organic material. Previous studies reported incomplete nutrient utilization during stronger upwelling along the equator recording lower than subsurface (source of nitrate) $\delta^{15}N_{nitrate}$ of the sinking organic matter. On the contrary, the nutrients advected away from the equator due to Ekman transport were completely utilized recording high- $\delta^{15}N_{nitrate}$ of sinking OM.

To reconstruct the nutrient utilization in the EEP spanning the early Pleistocene, we constructed a foraminifera-bound $\delta^{15}N$ (FB-$\delta^{15}N$) record of *Trilobatus sacculifer* from IODP Site U1338 (2º30.469'N,117º58.178"W, water depth 4200 m). Our record covers the first three major glacial-interglacial Marine Isotope Stages (MIS-96, 98 and 100) after the onset of Northern Hemisphere Glaciation. Contrary to SST reconstructions from the EEP region, the nutrient utilization in the early-Pleistocene does not show glacial-interglacial climate variability. Instead, local insolation with dominant precession component is observed to contribute to equatorial climate change. We also report contemporary Mn/Ca ratios of subsurface dwelling *Neogloboquadrina dutertrei* to reconstruct the strength of oxygen minimum zone in the subsurface water mass.