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Late Neogene carbonate productivity and terrigenous input in the central Western Pacific Warm Pool (IODP Site U1488)

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As the largest modern reservoir of oceanic heat, the Western Pacific Warm Pool (WPWP) plays an important role in atmospheric and oceanic circulation patterns. Little is known about how regional deposition patterns have changed over the past 10 Ma. To understand the interplay between regional processes and global climate evolution in the WPWP, we explore the late Neogene evolution of biogenic (carbonate/siliceous) versus terrigenous deposition.

We collected high-resolution (2 cm/~0.5 kyr) X-Ray fluorescence (XRF) core scanning data at IODP Site U1488 (Exp. 363) in the central WPWP. These data were especially useful for estimating the carbonate, siliceous and terrigenous components below 65 m CCSF, where the shipboard track data were less robust. The shipboard splice was verified and revised using the Ba/Sr ratio to ensure a continuous composite section down to ~330 m revised CCSF-A at Site U1488. Fe and Si likely reflect terrigenous and partially biogenic silica components. We calibrated the high-resolution $\ln(\text{Ca}/\text{K})$ record to $\% \text{CaCO}_3$ using discrete shipboard $\% \text{CaCO}_3$ measurements.

Fe and Si decrease, whilst $\ln(\text{Ca}/\text{K})$ increases downcore, in agreement with shipboard data showing increasing $\% \text{CaCO}_3$ and decreasing terrigenous/siliceous input. During the late Pleistocene, the site shows high amplitude $\% \text{CaCO}_3$, Fe and Si cycles superimposed on low carbonate. The amplitude decreases during the early Pleistocene-mid Pliocene, although clear variability remains. The early Pliocene-late Miocene is dominated by high CaCO_3 (80-90%). The $\% \text{CaCO}_3$, Fe and Si variability is considerably reduced, although clear obliquity-precession interference patterns are visible, in addition to longer-term ~400 kyr eccentricity modulation. The high-carbonate interval at IODP Site U1488 likely reflects the early Pliocene to late Miocene Biogenic Bloom (LMBB). The expression of the LMBB in the WPWP is distinctly different to the Atlantic and eastern equatorial Pacific. This indicates that although productivity was enhanced during the late Miocene-early Pliocene, regional processes determined the exact expression and timing of the LMBB in different areas.

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