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Precipitation variability within the West Pacific Warm Pool over the past 120 ka: evidence from offshore southern Mindano, Philippines

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The West Pacific Warm Pool (WPWP) has a strong influence on the Asian Monsoon system, and in turn global climate, through the transfer of heat and moisture from the tropics to mid and high latitudes. In the WPWP, isotopic records derived from foraminifera and speleothems have been widely used to reconstruct changes in convective activity, however understanding the regional precipitation response to these changes requires independent records of precipitation. We present high-resolution stable isotope, Uk'37 sea-surface temperature, X-ray fluorescence (XRF) core scanning and coccolithophore-derived palaeoproductivity records covering the past 120 ka from International Marine Global Change (IMAGES) Program Core MD06-3075 (6°29 N, 125°50 E, water depth 1878m), situated in the Davao Gulf on the southern side of Mindanao. XRF-scanner derived log(Ti/Ca) and palaeoproductivity records provide a robust proxy for sedimentary discharge, and by extension precipitation, at Mindanao. Significant precessional-scale variability in precipitation occurred during Marine Isotope Stages (MIS) 4 and 5, with rainfall peaks occurring contemporaneously with boreal summer insolation minima and vice versa. This precession-driven precipitation pattern is in anti-phase with speleothem-derived isotopic records of East Asian Monsoon intensity from China, suggesting that reduced precipitation on land is balanced by increased precipitation over the West Pacific. We attribute this to the latitudinal migration of the Intertropical Convergence Zone over the WPWP together with variability in the strength of the Walker circulation acting on precessional timescales. During the last glacial period (MIS 2 and 3), sedimentary discharge at Mindanao was muted, displaying little orbital- or millennial-scale variability, likely in response to weakened precessional insolation forcing, lower temperatures and reduced atmospheric moisture content. These results highlight the high degree of regional variability in the precipitation response to tropical warming and cooling in the WPWP.