# Pleistocene hydroclimate variability in the heart of the Western Pacific Warm Pool

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Seasonal to interannual climate variations in the Western Pacific Warm Pool (WPWP) are dominated by fluctuations in precipitation associated with the seasonal strengthening of the monsoon system, migration of the Intertropical Convergence Zone, and the El Niño Southern Oscillation [1, 2, 3]. Thus far, our understanding of the relative influence of these forcings under different climate background states has been limited by a lack of long-term records from the Australian-Indonesian monsoon region. Here, we present a late Pleistocene (~0.8 My) paleo-runoff record from coastal Papua New Guinea at International Ocean Discovery Program (IODP) Site U1486 (02°22.34'S 144°36.08'E, 1332 m), collected within the heart of the WPWP near the northern edge of the Australian-Indonesian monsoon region. Elemental content was measured using X-ray fluorescence core scanning every 2 cm, or every ~350 y. The intensity of the carbonate free Ti concentration ($Ti_{cfb}$), an indicator of the coarse river particulate fraction, displays a significant 23 ky spectral peak, reflecting the influence of precession, and precession alone, on rainfall over northern PNG. This result is consistent with speleothem $\delta^{18}O$ records of monsoon strength from sites within the Asian-Australian monsoon system [e.g. 4, 5] and highlights a remarkably uniform response of regional rainfall to the annual cycle of solar insolation both north and south of the equator. In contrast, a 282-ky paleo-runoff record, based on planktic foraminiferal Nd/Ca, from the eastern coast of Papua New Guinea, records significant power at the precession *and* obliquity bands [6]. Identification of significant 41 ky and 100 ky spectral peaks, as well as the 23 ky precession peak, in indicators of clay mineral abundances ($Fe_{cfb}$, $Rb_{cfb}$) at Site U1486 suggests the observed 41-ky signature in foraminiferal Nd/Ca reflects the delivery of clay minerals rather than coarse river particles offshore. Clays require less energy, and therefore less runoff to be transported offshore.

[1] Webster *et al*. (1998) *J. Geophys Res* **103**, 14451-14510. [2] Trenberth *et al*. (2000) *AMS* **13**, 3969-3993. [3] Wang *et al*. (2017) *Ear Sci Rev* **174**, 84-121. [4] Wang *et al*. (2001) *Scienc*e **294**, 2345-2348. [5] Carolin *et al*. (2013) *Science* **340**, 1564-1566. [6] Liu *et al*. (2015) *Nat Comm* **6**.