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Zonal patterns of paleoproductivity across the Equatorial Pacific over the last 150,000 years

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The Equatorial Pacific (EP) is biogeochemically diverse, with high productivity in the nutrient-rich eastern upwelling zone and decreasing productivity westward along the equator. On millennial to orbital timescales, variability in productivity is driven by nutrient delivery from subsurface waters that ultimately originate in the Southern Ocean[1,2], and this teleconnection makes EP productivity sensitive to changes in global climate and ocean circulation. In this study, we focus on the last 150,000 years, which spans two glacial terminations and one glacial inception, and reconstruct zonal paleoproductivity using ^{230}Th-normalized excess Ba fluxes from one new site in the Central EP, MGL1208-16BB (0.3˚N, 203.7˚E, 2926 m), and five previously published records from equatorial (-0.2 to 0.3˚N) sites in the Western[2,3], Central[2], and Eastern[2,4,5] EP. Productivity at our new site (~200˚E) peaked at the very end of the last two terminations (~11 ka; ~129 ka), with excess Ba fluxes nearly twice as high as the adjacent glacial and interglacial periods. Similar patterns were reconstructed in previously published records from the Western (~160˚E) and Central EP (~220˚E), but they were less prominent in the Eastern EP (~270˚E). We explore mechanisms including Southern Ocean ventilation, ENSO mean state, ITCZ dynamics, and equatorial upwelling rates to better understand the spatiotemporal variability of paleoproductivity in this region with implications for carbon storage under warm conditions.

1. Costa, K. M. et al. Productivity patterns in the Equatorial Pacific over the last 30,000 years. Global Biogeochem. Cycles 31, (2017).
2. Winckler, G. et. al. Ocean dynamics, not dust, have controlled equatorial Pacific productivity over the past 500,000 years. Proc. Natl. Acad. Sci. 113, 6119–6124 (2016).
3. Schwarz, B. & Mangini, A. Geochemistry of a piston core from Ontong Java Plateau (western equatorial Pacific): evidence for sediment redistribution and changes in paleoproductivity. Geol. Rundschau 85, 536–545 (1996).
4. Jacobel, A. W. et. al. Orbital Influences on Deep Ocean Oxygen Concentrations and Respired Carbon Storage. Global Biogeochem. Cycles 39, 1–22 (2025).
5. Loveley, M. R. et al. Millennial-scale iron fertilization of the eastern equatorial Pacific over the past 100,000 years. Nat. Geosci. 10, 1–4 (2017).