

P control on millennial scale productivity in subtropical north Pacific over the past 92 kyr

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P, N and Fe determines marine primary productivity (PP), regulating the intensity of biological pump and atmospheric CO₂. The existence of bipolar seesaw underscores the change of relative importance in different time and space. Among global oceans, the north Pacific was less explored in geographical variations of PP and its teleconnection over time. We present sedimentary P speciation over the past 92 kyr for subtropical western north Pacific. Reactive P, which represents export productivity (EP), exhibits remarkable synchronicity with Greenland temperature record. Reactive P drops during the cold period and millennial Heinrich events when dust supply is abundant and denitrification is less intensive, and vice versa in warm periods and episodes. In terms of export production and atmospheric CO₂ drawdown at millennial scale, the NP is in concert with the South Ocean bipolar seesaw. Such rapid change in response, meanwhile, the temporal variability of P reactive is consistent with Ba/Al record in subarctic indicating that other than Fe and N, P exerts a major control on EP in north Pacific. Taking South Ocean and north Pacific together, we postulate that both of these two regions contributed to the atmospheric CO₂ drop on glacial-interglacial time scales, whereas South Ocean dominated the millennial oscillation of atmospheric CO₂.