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High Interglacial Diatom Paleoproductivity in the Western Indo-Pacific Warm Pool During the Last Glacial Cycle

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A high-resolution (< 1 ka) study of the variations of the composition and concentration of the diatom assemblage at site GeoB10038-4, recovered off Southern Sumatra, closely tracks changes of the diatom productivity variations in the westernmost Indo-Pacific Warm Pool during the last glacial cycle. The diatom record reveals a clear glacial-interglacial pattern of variability, and provides evidence that diatom productivity was highest during interglacials. The co-variation of diatom concentration and eastern Asian monsoon proxies suggests a direct response of (diatom) productivity and upwelling intensity to Northern Hemisphere forcing. In addition to the Milankovitch variability, spectral analysis of total diatom concentration indicates spectral power to be concentrated in precessional and half-precessional periods only during MIS5. Downcore temporal shifts of the diverse diatom community correspond well with the latitudinal migration pattern of the monsoon and the strengthening and weakening phases of upwelling along the southern coast of Sumatra. Resting spores of Chaetoceros, typical of nutrient-rich waters, dominant during periods of highest diatom paleoproductivity, responded to the influence of the SE monsoon, while oligo- to mesotrophic water diatoms characterized intermonsoon periods. The interglacial highs and glacial lows at site GeoB10038-4 is unique pattern for the tropics. Data are compared with high-resolution diatom records from other low-latitude ocean regions and the effect of wind systems, the depth variations of the thermocline, and the availability of silica in surface waters on diatom productivity on both the Milankovitch and sub-Milankovitch timescales are discussed.