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Millennial-scale variability of diatom paleoproductivity during the last 50 ka: an equator-to-subtropics comparison along western Africa

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Coastal upwelling accounts for ∼50% of the global export production in eastern boundary current systems. In these areas, diatoms deliver a substantial part of the ocean's primary productivity. Although productivity variations in coastal areas are usually attributed to wind stress-forced changes in upwelling intensity, the dynamics of primary production along the western African coast is less straightforward due to the complex atmospheric and hydrographic settings. In this study, we compare high-resolution diatom records encompassing the last 50 ka, which were generated at three hemipelagic sites drilled along the western African coast between 20ºN and 25ºS. The studied cores are: GeoB3606-1 (SE Atlantic, off Namibia), GeoB4905 (Guinea Basin), and GeoB7926-2 (NE Atlantic, off Mauritania). Though the three sites are coastal in location, the processes and mechanisms behind the preserved signal differ. This is clearly mirrored in both the variations of total diatom concentration and the qualitative composition of the community at each core site. While the inflow of silica-rich waters of Southern Ocean origin played a significant role off Namibia, precipitation-controlled riverine input of dissolved silica was decisive in the Guinea Basin. Off northwestern Africa, changes in wind intensity, the subsequent upwelling of dissolved silica and the seaward extension of the chlorophyll filament were responsible for diatom production. The implications of our observations for the late Quaternary productivity and the nutrient dynamics from low-latitude ocean areas, the possible effect of abrupt climate changes as well as interhemispheric teleconnections at both Milankovitch and millennial time-scales are discussed.