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Diatom productivity in the eastern Gulf of Guinea during the last 20,000 years

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Biogenic silica and diatom accumulation rates are used to document siliceous productivity in the Gulf of Guinea in relation to oceanographic and climatic changes. Diatom assemblages were identified in core GeoB4905-4, retrieved off the Sanaga River, to congruently track oceanographic changes in the eastern Gulf of Guinea, precipitation and wind regime changes in equatorial Africa. Diatom productivity was greatest during the 12000-11000 and 9000-6000 calendar years BP periods (cal yr BP) when sea-surface temperature were warmer (Weldeab et al., 2007). At the assemblage level, greater diatom productivity periods demonstrated higher relative abundances of sub-tropical and freshwater diatoms and lower relative abundances of meroplanktonic diatoms and brackish water diatoms. Windblown diatoms were also absent during these periods. Diatom productivity was lowest during the 20000-12000 and 5000-0 cal yr BP periods when relative abundances of sub-tropical and freshwater diatoms decreased and abundances of meroplanktonic and brackish water diatoms increased. Windblown diatoms appeared solely during these periods. These results indicate that diatom productivity and oceanography in the eastern part of the Gulf of Guinea (governed by the Guinea Current in surface and the Equatorial Under-Current in sub-surface) are decoupled. Similarly, the wind regime can not explain the Holocene pattern of diatom productivity recorded here. Siliceous productivity is rather controlled by riverine input by the Sanaga and Niger rivers and therefore precipitation over western/central equatorial Africa. More precisely, diatom accumulation rates and assemblages argue for enhanced precipitation during the Early and Mid-Holocene periods and drier conditions during the last glacial, the Younger Dryas and the Late Holocene in agreement with studies of lake levels in eastern equatorial Africa (Gasse, 2000; Gasse et al., 2009) and geochemical data from the Gulf of Guinea (Schefuss et al., 2005; Weldeab et al., 2005; Weijers et al., 2009). Late glacial and Holocene changes in precipitation and wind activity may result from the combined influence of the Asian monsoon and the Inter-Tropical Convergence Zone (ITCZ) latitudinal migration.

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