Wildfire and Environmental Feedbacks in the Western Sahel: Responses to Cenozoic Boundary Shifts

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Wildfires are essential to terrestrial ecosystems, playing a crucial role in nutrient and carbon cycles, particularly in highly seasonal environments like the Western Sahel. Their occurrence is linked to complex feedback mechanisms between climate, landscape structure, vegetation and the carbon cycle. It is therefore central to understand wildfire dynamics in the context of paleoclimatic and environmental change. Here we present a record of 3 to 7 ringed polyaromatic hydrocarbons (PAHs), from five targeted study windows throughout the last 25 million years from ODP Site 959 in the Gulf of Guinea. The time windows target the effects of orbital forcings of the West African Monsoon on wildfire and vegetation responses in different boundary conditions in the Oligocene, Miocene, Pliocene, and Pleistocene, including shifts in global temperatures, greenhouse gas concentrations, and regional land surface. Orbitally resolved PAH biomarkers can provide insight into fire activity and be coupled with changing precipitation patterns and biomes. We discuss PAH sources and how wildfire frequency is linked to the observed drying trend, climate variability, and vegetation expansion throughout the Cenozoic in the Western Sahel. These findings are central for understanding future wildfire dynamics in the vulnerable Western Sahel region in the light of global warming.

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