

WILDFIRE HISTORY AND SAVANNA EXPANSION ACROSS SOUTHERN AFRICA SINCE THE LATE MIOCENE

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Abstract

The origin of the African savanna has been traced back to 10–6 million years (Ma) ago, but the mechanisms driving its evolution are hotly debated, and include global atmospheric CO₂, regional fire activity, herbivore competition, and hydrological climate change. Here, we present the first microcharcoal-based fire activity records covering the last ~7 Ma at four International Ocean Discovery Program (IODP) sites near southern Africa. The records show that fire activities in both savanna and non-savanna regions were stable during this interval. Grass vegetation in burnt biomass continued to expand from 6 Ma into the present savanna region, whereas no grass expansion was observed in non-savanna regions. A compilation of regional data suggests asynchronous C₄ grass expansion since 6 Ma on the African Continent. We consider that CO₂ concentrations and wildfires might have caused the first appearance of C₄ plants at ~10 Ma and ~ 7–6 Ma, respectively. Since 6 Ma, the regional climate promoted expansion of C₄ plants into the present-day savanna habitat.