Analysis of causal factors of fire regimes in Sub-Saharan Africa

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Wildfires are a wide spread global phenomenon. Their activity peaks in the tropical savannas, especially in the African continent, where fires are a key component of ecosystem dynamics. Fires affect the ecological balance between trees and grasses in savannas with concomitant effects on biodiversity, soil fertility and biogeochemical cycles. Large amounts of trace greenhouse gases and aerosols from wildfires are emitted each year in Africa, but the underlying dynamics of such wildfires and what drives them remain poorly understood.

In general terms, the magnitude and the inter-annual variability of fire activity depend on fire frequency and its spatial distribution, also referred to as fire regimes. These are, in turn, determined by the environmental conditions at the time of burning, ignition sources, fuel type, fuel availability, and its moisture content.

This study analysed the driving factors of fire regimes at continental level for a period of 5 years (2002-2007). We considered the following variables: climate (rainfall, temperature, humidity), population density, land cover and the burned areas derived from the MODIS MCD45A1 product at 500m resolution. GIS and multi-variate regression techniques were used to analyse the data.

Understanding fire driving factors is fundamentally important for developing process-based simulation models of fire occurrence under future climate and environmental change scenarios. This is particularly relevant if we consider that the IPCC 4th Assessment report indicates that a change in the rainfall patterns has been observed in the last 40 years over most of Africa with a decrease of precipitation around 20-40% in West Africa and more intense and widespread droughts in Southern Africa. The simultaneous increase of temperatures can potentially lead to higher fire occurrence and modify the current fire regimes. This work contributes to climate change research with new insights and understanding about how fires are controlled by bioclimatic and demographic factors in African ecosystems.