EGU22-11099
https://doi.org/10.5194/egusphere-egu22-11099
EGU General Assembly 2022

Reconstructing fire regimes using micro-charcoal in modern marine sediments off Africa

Aritina Haliuc[1], Anne-Laure Daniau[1], Florent Mouillot[2], Wentao Chen[2], Valérie David[1], Vincent Hanquiez[1], Bernard Dennielou[3], Enno Schefuß[4], Germain Bayon[5], and Xavier Crosta[1]

[1]Univ. Bordeaux, CNRS, EPHE, EPOC, UMR 5805, F-33600 Pessac, France
[2]UMR CEFE, Univ. Montpellier, CNRS, EPHE, IRD, Univ. Paul Valery Montpellier 3, 1919 route de Mende,34293, Montpellier, CEDEX 5, France
[3]IFREMER, Centre de Brest, Unité de Recherche Géosciences Marines, 29280 Plouzané, France
[4]MARUM – Center for Marine Environmental Sciences, University of Bremen, Leobener Strasse 8, 28359 Bremen, Germany
[5]IFREMER, Unité de Recherche Géosciences Marines, 29280, Plouzané, France

Fire is a pervasive component of almost every terrestrial ecosystem, but the African continent is rather unique, holding the most vulnerable ecosystems to fire which account for most of the global burned area and for more than half of fire-carbon emissions. Fire has a significant role in ecosystem functioning though our understanding of this complex process is still limited which hinders our ability to model and predict fire.

Paleofire records go beyond the short instrumental records of the last decades and can provide long-term information about fire, but only at a descriptive scale and with difficulties in relating it to the fire regime. To address these limitations, we attempt to develop a quantitative calibration model based on the examination of micro-charcoal from 137 surface sediment samples collected offshore the African continent in conjunction with a set of fire parameters (burnt perimeter, fire radiative power, fire spread) derived from satellite data, environmental information (hydrographic basins, vegetation cover, climatic parameters) and a wind dispersal particle model. Our results show that changes in charcoal concentration and morphometry are linked with fire regime and the type of burnt vegetation on the adjacent continent. In (sub)tropical settings, elongated micro-charcoal particles in high concentrations relate to rare but intense fires spreading in graminoid-mixed ecosystems whereas squared particles in low concentrations are typical for frequent but low intensity fires, characteristic for tree-dominated ecosystems.

This work provides the first calibration model of micro-charcoal in marine sediments which can be applied to long marine charcoal records to help reconstruct past fire regimes. This investigation addresses a key issue in unlocking specific methodological and theoretical problems related to fire research; it provides a better understanding of the local to regional processes that govern the fire signal and contextualize current and past environmental changes.