**Charcoal identifications reveal linkages in Holocene fire, vegetation and climate dynamics across the Central African rainforest**

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Charcoal fragments extracted from soils under present-day Central African rainforest represent a high-quality sedimentary archive that remains largely unexplored. Radiocarbon dating and identification of charcoal can be used to reconstruct fire and vegetation dynamics which in turn explain or illustrate paleoclimatic and anthropogenic shifts (Di Pasquale et al. 2008; Tovar et al. 2014).

Therefore, we recently developed a transparent charcoal identification procedure using large databases and well defined characters (Hubau et al. 2012). Moreover, we illustrated how combining imaging techniques can provide optimal visualization of charcoal anatomy, such that specific difficulties encountered during charcoal examination can be evaluated and fine anatomical characters can be observed enabling high level identification of charcoal taxa (Hubau et al., 2013).

Here we present how these techniques resulted in charcoal records demonstrating a direct temporal link between Holocene droughts, palaeofire and vegetation change in the southern Mayumbe forest, Democratic Republic of Congo (Hubau et al. 2015). During and after these Holocene droughts the Central African rainforest landscape was characterised by a fragmented pattern with fire-prone open patches, especially near the boundary of the southern Mayumbe forest. Furthermore, the dominance of pioneer and woodland savanna taxa in younger charcoal assemblages indicates that rainforest regeneration was hampered by increasingly severe drought conditions after 0.8 ka BP. These results support the notion of a dynamic forest ecosystem at multi-century time scales. Finally, we present preliminary results of the ongoing AFRIFORD project which aims at revealing climate-vegetation-fire linkages in sites across the Central African rainforest.

**References**

Di Pasquale, G. et al. (2008). The Holocene tree line in the northern Andes (Ecuador): First evidence from soil charcoal. *Palaeogeography, Palaeoclimatology, Palaeoecology* 259: 17-34.

Hubau, W. et al. (2012). Charcoal identification in species-rich biomes: A protocol for Central Africa optimised for the Mayumbe forest. *Review of Palaeobotany and Palynology* 171: 164-178.

Hubau, W. et al. (2013). Complementary imaging techniques for charcoal examination and identification. *IAWA Journal* 34: 147-168.

Hubau, W. et al. (2015). Charcoal-inferred Holocene fire and vegetation history linked to drought periods in the Democratic Republic of Congo. *Global Change Biology* 21: 2296-2308.

Tovar, C. et al. (2014). Influence of 1100 years of burning on the central African rainforest. *Ecography* 37: 1139-1148