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13-Yr SPOT-VEGETATION time series to detect the vegetation phenology in tropical rainforest of the Congo Basin

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Compared to the Amazon Basin, the Congo Basin is overlooked in term of vegetation phenology detection. Seasonal carbon dynamics have been largely studied in last years for the Amazon rainforest, especially through seasonal patterns of canopy greenness with satellite-based observations leading to a better and unexpected understanding of carbon fluxes. These results, compared with flux tower measurements, showed that greenness occurs during the dry months while land surface and terrestrial model simulations predicted the opposite. The hypothesis of green-up during the dry season argues that vegetation tend to maximize the photosynthetic carbon uptake when cloudiness is at a minimum and light availability is at a maximum. 13 years of SPOT-VEGETATION time series (1-km of spatial resolution) are used in this study for the seasonal characterization of leaf phenology of tropical rainforest for the Amazon and Congo Basins through the Enhanced Vegetation Index (EVI). Results, analyzed at local and basin scales, reveal several characteristics unique to the Congo Basin. The four main differences compared to the Amazon Basin are (i) an inverse phenology from the North to the South of the basin, (ii) the dual seasons over the North of the region, (iii) spatial distribution in amplitude of EVI with large difference throughout the basin, and (iv) a higher cloud cover during the wet season instead of the dry season. These properties lead to a more complex vegetation phenology characterization at the basin scale. The only similar conclusion about vegetation dynamics in Congo Basin and Amazon Basin is that phenology in both tropical forests seems to be driven by light availability and not by rainfall. As the EVI patterns at local scales show very good agreement with gross primary production derived from the fluxtower measurements in the Amazon Basin, it suggests that the EVI provides useful information about vegetation behavior over time and could be used as a proxy to vegetation properties like productivity in dynamic vegetation models. This study demonstrates that earth observations at moderate resolution seem to be valuable to detect phenology in tropical rainforests, but need a careful interpretation.