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Meteorological and fire impacts on tropospheric ozone concentration over tropical forest in the Congo Basin

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Tropospheric ozone is a greenhouse gas, and high tropospheric ozone levels can directly impact plant growth and human health. In the Congo basin, simulations predict high ozone concentrations, induced by high ozone precursor (VOC and NOx) concentrations and high solar irradiation, which trigger the chemical reactions that form ozone. Additionally, biomass burning activities are widespread on the African continent, playing a crucial role in ozone precursor production. How these potentially high ozone levels impact tropical forest primary productivity remains poorly understood, and field-based ozone monitoring is completely lacking from the Congo basin. This study intends to show preliminary results from the first full year of in situ measurements of ozone concentration in the Congo Basin (i.e., Yangambi, Democratic Republic of the Congo). We show the relationships between meteorological variables (temperature, precipitation, radiation, wind direction and speed), fire occurrence (derived from remote sensing products) and ozone concentrations at a new continuous monitoring station in the heart of the Congo Basin. First results show higher daily mean ozone levels (e.g. 43 ppb registered in January 2020) during dry season months (December-February). We identify a strong diurnal cycle, where minimum values of ozone (almost near zero) are registered during night hours, and maximum values (near 100 ppb) are registered during the daytime. We also verify that around 2.5% of the ozone measurements exceeds a toxicity level (potential for ozone to damage vegetation) of 40 ppb. In the longer term, these measurements should improve the accuracy of future model simulations in the Congo Basin and will be used to assess the impact of ozone on the tropical forest's primary productivity.