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Temporal variability of Black Carbon in Kigali

Kigali, the capital city of Rwanda, is characterized by an increasing population and a rising rate of transport facilities. African countries, including Rwanda, are concerned with the air pollution problem. Different pollutants produced by burning wood for cooking and household chores, cookstoves, generators and engines with substandard fuel use and others, could be detected. This study provides the daily data of BC at UR-CST, Nyarugenge campus site, during different seasons continuously for the period from September 2019 up to July 2020 and different conditions with a special emphasis on the COVID-19 Lockdown period, using a Magee Scientific 7-wavelength Aethalometer® Model AE33-7. Different trends were done and analyzed. The seasonal variation of BC showed that the September-October-November (SON) and March-April-May (MAM) seasons had the lowest mean concentration of 4.130410 µg/m3 and 3.493238 µg/m3 respectively. This is explained in the first place by the fact that the wet removal is believed to be the primary removal of BC in the atmosphere, and secondly by the COVID-19 lockdown period that reduced many activities in Kigali. On the other hand, December-January-February (DJF) season presents higher BC concentration with a mean of 5.665593 µg/m3 followed by the months of June-July with an average of 5.613771 µg/m3. The data for August were missing, but previous studies indicate that the Long dry season (JJA) presents the highest BC concentration compared to other seasons as it has been proven that there is a positive correlation of BC with temperature, and the JJA season presents the highest average annual temperature. The weekdays, weekends and hours of the day's differences in BC concentrations showed that BC concentrations follow a daytime pattern with peaks in the morning because of traffic density and late afternoon in hours of leaving offices and late in the evening during cooking hours with less pollution found in office hours. The study also found an overall pollution during weekdays and less pollution in weekends which is explained by less activities in weekends that generates BC. The study also shows that nighttime presents higher BC concentrations compared to daytime and that BC pollution can be globally transported.

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