Air quality in urban Ouagadougou

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Introduction

As in northern cities, transport is one of the main causes of air quality deterioration in southern cities, especially in West African towns. Very few studies have focused on air quality in these cities, particularly in Ouagadougou. As a result, there is a lack of scientific data to assess air quality. The last pollutant measurement campaign in Ouagadougou dates back to 2007. This campaign showed that air quality was a cause for concern, and that it was likely to deteriorate further as a result of rapid population growth, and the rapid evolution of the vehicle fleet based on the massive importation of second-hand vehicles. We present here the results of a measurement campaign using an Aerocet 531S portable analyzer for particulate air pollutants in the city of Ouagadougou and the Aeroqual AQM 65 Monitoring Station for carbon monoxide (CO). This sampling was carried out in the dry and rainy seasons of 2018 for particulate matter and in 2019. The pollutants studied were particulate matter with diameters less than or equal to 1 µm, 2.5 µm and CO gas (PM_1 $PM_{2.5}$ and CO).

Results

- **Seasonal variations in concentrations (µg.m-3)**

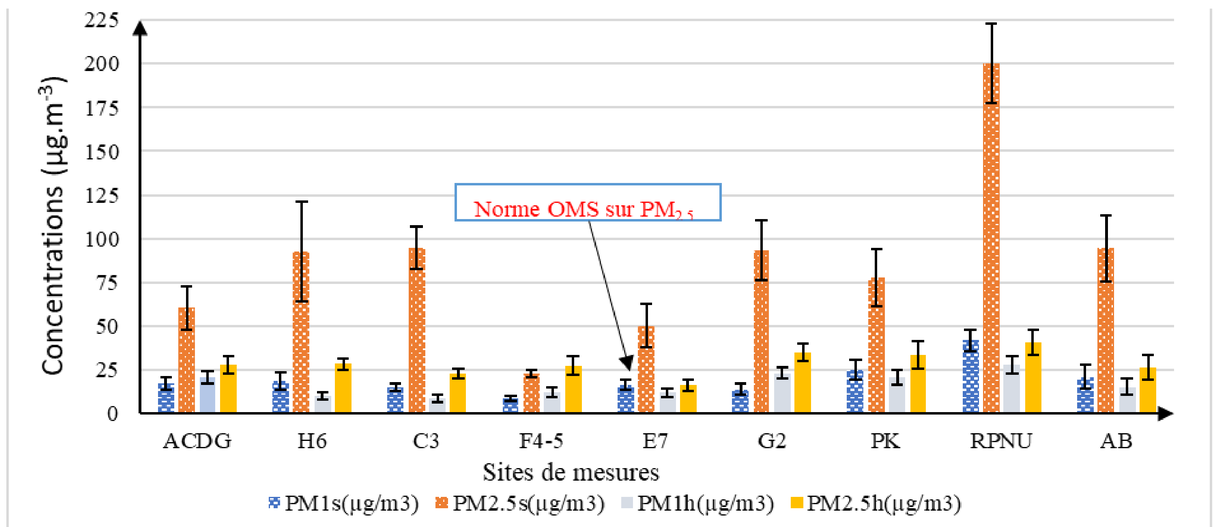

Fig. 3: **Fine particle concentrations in relation to the season**

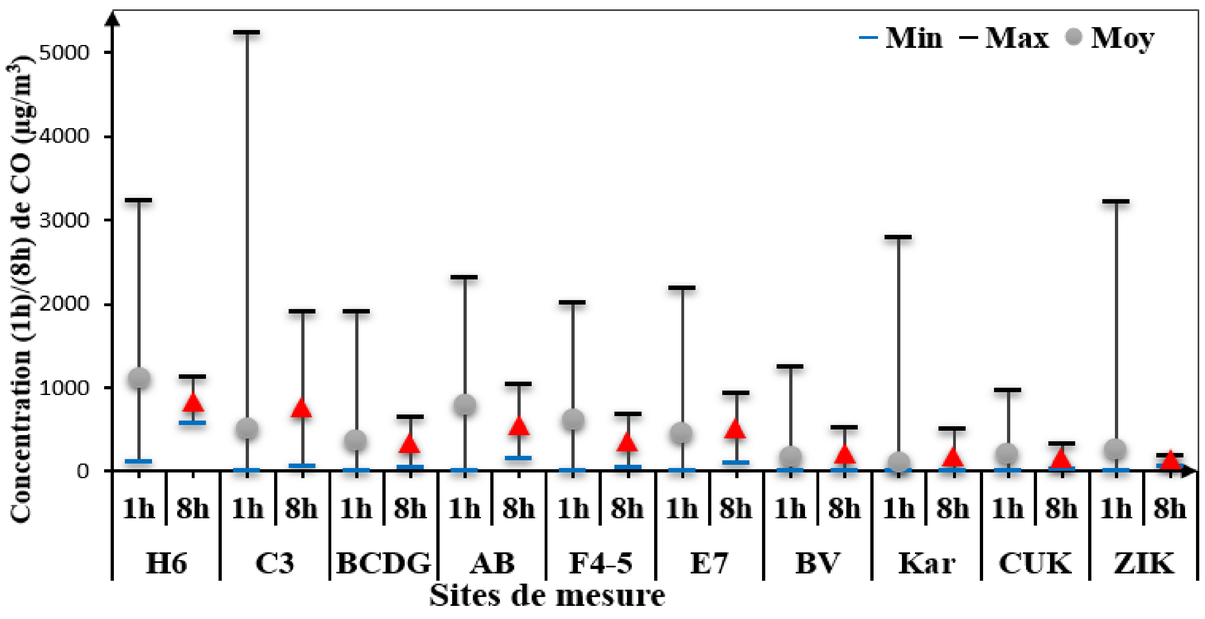

Fig. 4: **CO distribution of measured concentrations (1h) and (8h) represented respectively by the circle and triangle.**

Table1 : **Ratio of dry season concentrations to wet season ones**

Sites de mesure	d/w_PM_1	d/w_$PM_{2,5}$	d/w_PM_{10}
BCDG : Bd. Charles De Gaulle*	0,84	2,17	8,95
AB: Sonabel Bassawarga*	1,38	3,57	6,06
PK : Pont Kadiogo	1,22	2,32	2,59
RPNU : Rondpoint des UN	1,50	4,96	6,41
H6 : Complexe scolaire Bon Berger*	1,86	3,30	9,13
C3 : Complexe scolaire Notre dame	1,79	4,16	8,63
E7 : Onatel Sud*	1,37	3,10	6,23
G2 : Plateau Omnisport Somgandé	0,59	2,68	9,01
F4-5 : Ministère de l'Environnement*	0,70	0,83	0,77

Materials and methods

- Device used to measure particulate pollutants was an AEROCET 531S portable analyzer and an Aeroqual AQM 65 Monitoring Station for CO (figure 1). The analyzers were positioned at a height of between 1.5 and 2 meters above ground level, corresponding to the breathing height of a human being. Measurements were taken at 9 sites, including 4 traffic sites (sites located in the vicinity of a traffic lane) and 5 background sites (sites located in the vicinity of a traffic lane). For each site, measurements were spread over at least 24 hours.

Fig. 1: AEROQUAL AQM 65 AND AEROCET 531S

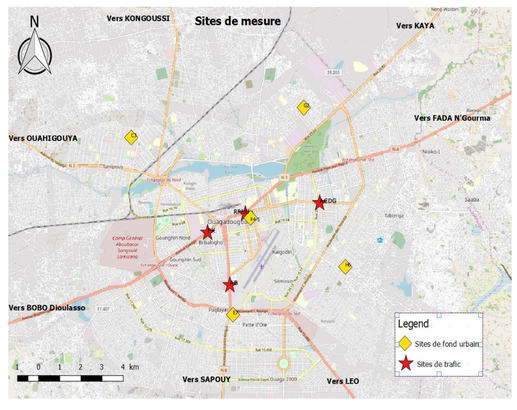

Fig. 2: Sampling sites

Conclusion

- Particulate pollution levels generally exceed the WHO tolerance threshold.
- Background sites are as polluted with PM_{10} in the dry season as traffic sites.
- Concentrations of $PM_{2.5}$ and PM_1 at traffic proximity sites are higher than at background sites. This is logical, as these particles come from the combustion processes of vehicle engines.
- Road traffic is a major source of particulate pollution in the city of Ouagadougou, through its contribution of suspended particles and exhaust emissions.
- Seasonal variability is less marked for fine particles, and more pronounced for larger particles.
- Concentrations are higher in the dry season than in the rainy season.
- Whatever the season, suspended particulates are a problem, as average concentrations exceed the threshold values recommended by the WMO, the EU or the USA.
- Suspended particulate concentrations are of the same order of magnitude as those obtained for other Sahelian cities.
- For CO, measured concentrations are within the limits of exposure values recommended by international institutions (WHO, EU, US EPA) and by Burkina Faso. The daily profiles representing concentration curves over time highlighted pollution peaks. Thus, it was revealed that there was a link between peaks and population movements.

References

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