



Continuous monitoring of atmospheric aerosols in the Observatory of Bouzaréah (Algiers)

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Abstract:

Atmospheric aerosols affect the radiation balance of the Earth by scattering and / or absorption of sunlight. As an example of direct effect: the black carbon (BC) absorbs sunlight causing a warming effect. In various studies, aerosols have been linked to adverse health effects. We present in this study the results generated by the aethalometer (AE33) which is a device for measuring aerosols continuously from their absorption of light at several wavelengths ($\lambda = 370-950\text{nm}$). The sampling is done at the Observatory headquarters Bouzaréah CDER to 3m in height.

Developments diurnal, nocturnal and daily concentrations of atmospheric aerosols were well established. PM peaks exceeding $14,000\text{ng/m}^3$ were recorded. The concentrations also varied diurnally, high at rush hours and low in the afternoon. The nature, source and aging issues were studied using diagnostic reports.

In general, the results show that the Observatory of Bouzaréah where is situated the CDER is not directly affected by the pollution of Algiers in winter and therefore can be considered a good site for the study of pollution dispersion and exchanges and atmospheric dynamics.

Objectifs:



Near-real-time continuous measurements of mass concentration of BC were made from 26 February 2014 to 23 March 2014 using an Aethalometer (model AE-33 of Magee Scientific, USA) at the station. In this technique, atmospheric air is pumped through an inlet at the desired flow rate of 5.0 L/min. *The sampling is carried out at the Algiers old Observatory located at Bouzaréah CDER (345 m asl, 36,8° lat and 3° long) to 3m in height with an interval set of 1 min.*

Local meteorological parameters such as air temperature, relative humidity, wind speed and direction and atmospheric pressure were measured at 5 min intervals using instruments situated near the Aethalometer controlled by researchers of CHEMS network of CDER.

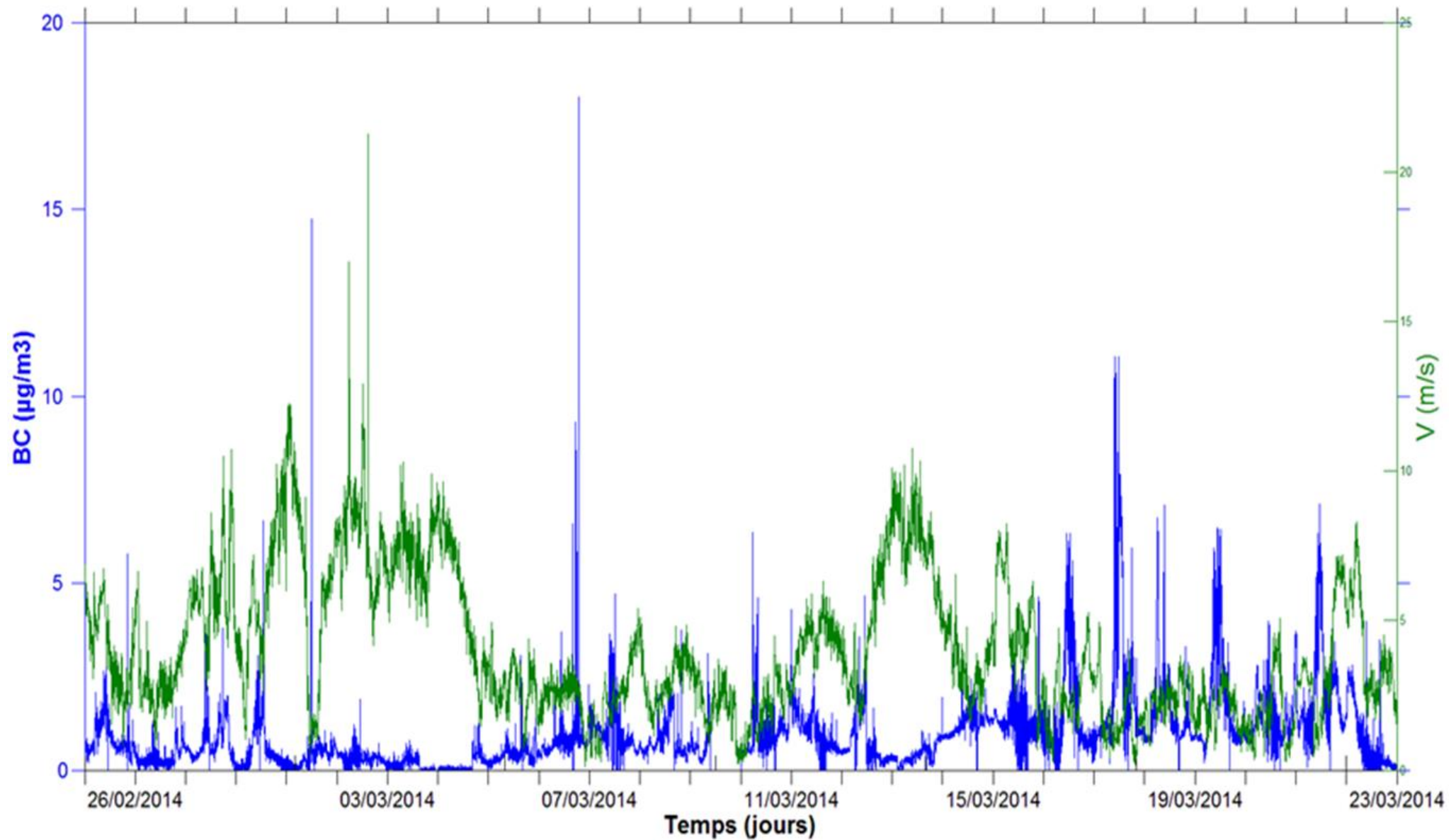


Fig. 1: Evolution of black carbon and wind speed for the study period

Low concentrations of BC were recorded when wind speed is greater than 3m/s.

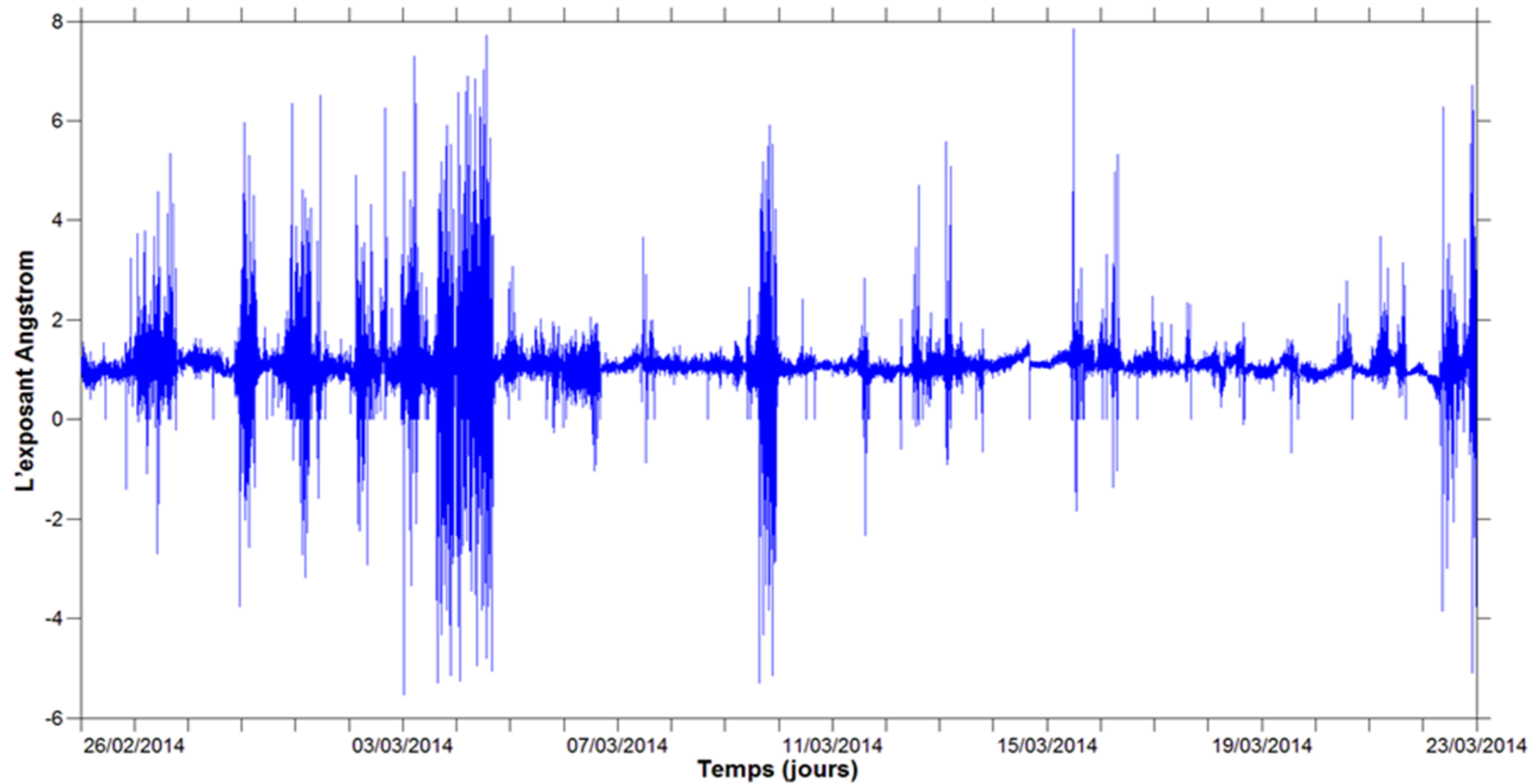


Fig. 3: Evolution of absorption exponent

In our case , almost of the absorption exponent (α 470-950nm) calculated are roughly estimated to be 1 which is explained by the traffic emissions. Nevertheless, we found sometimes an absorption exponent greater than 2 which is assumed to wood burning source.

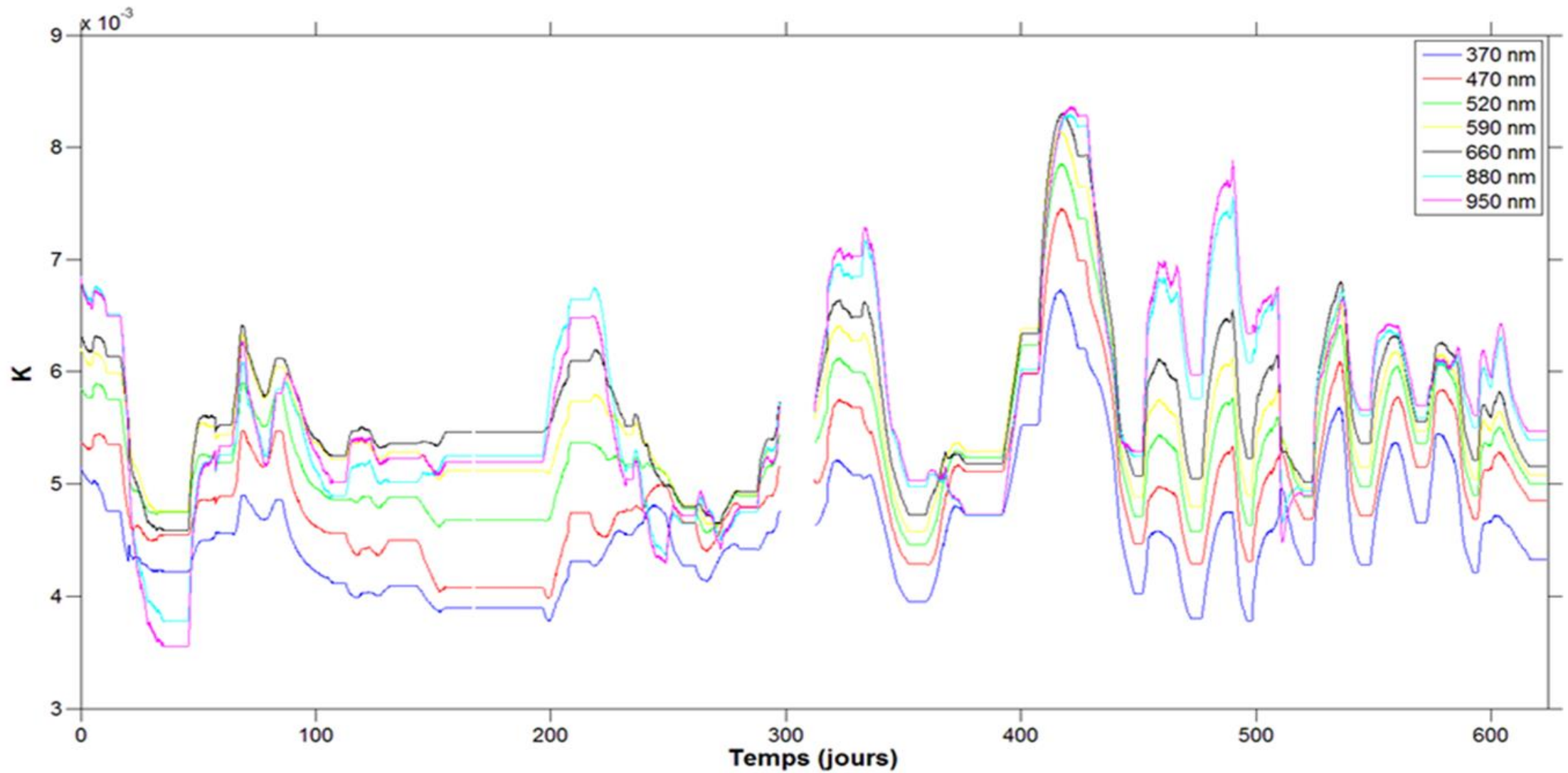


Fig. 4: Evolution of K parameter

In the present study, the K factor ranged between 0.004 and 0.007 suggested that the BC at the Observatory are freshly emitted aerosols.

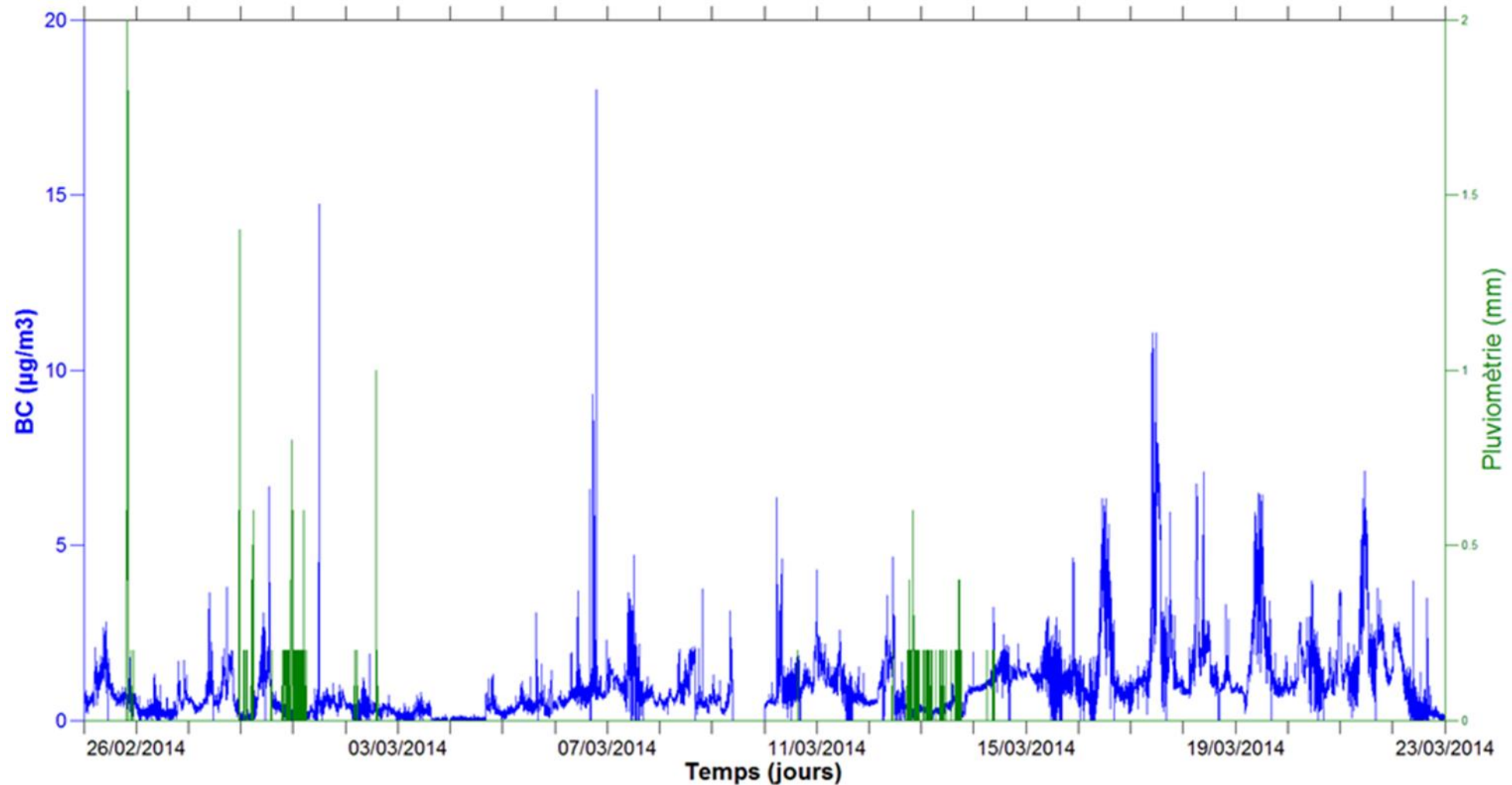


Fig. 5: Evolution of black carbon and precipitations

The precipitation induced diminution of BC concentration in many occasions due to the air pollution scavenging.

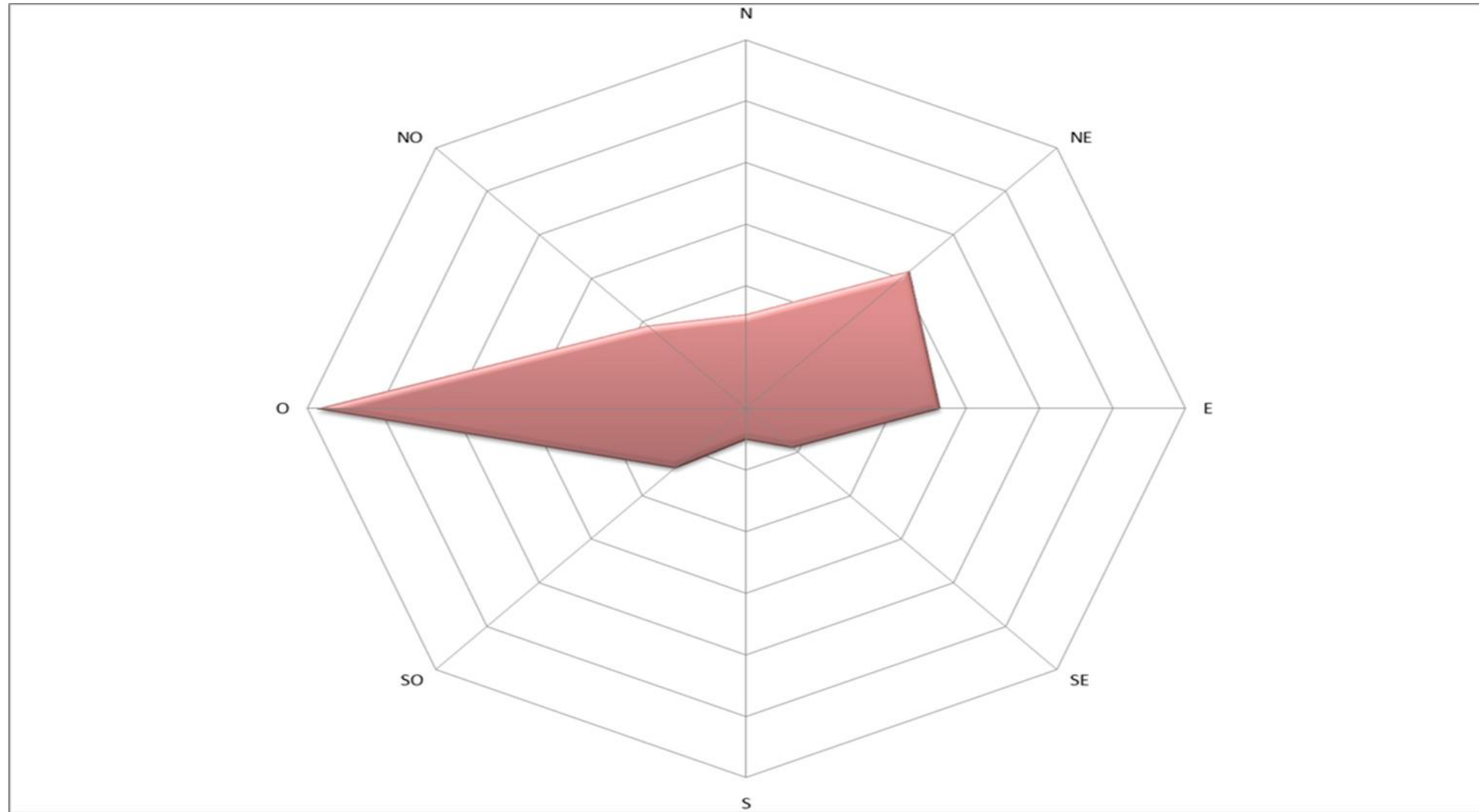


Fig. 6: *The compass during the period of study*

Conclusion:

A comprehensive analysis of BC concentrations in sub-urban CDER area was performed based on continuous measurements of BC between February and March 2014.

Measurements suggested that hourly mean BC loading in sub-urban Bouzaréah ranged from 200 to 18,000 ng/m³, with a mean of 3128 ± 1865 ng/m³ in an rush hour (10AM: 1PM) of March 17th 2014.

The large diel variation of BC showed that BC loadings were high at rush hours due to vehicle emissions and low in afternoon.

The prevailing winds at the observatory were from eastern, northeastern, and dominant from western direction where a heavy traffic Highway is located.