

Microphysical and optical properties of aerosols in Buenos Aires

Ana Graciela Ulke¹, Marcela María Torres Brizuela¹,
Graciela Raga², Darrel Baumgardner²

¹*Depto. de Cs. de la Atmósfera y los Océanos, Fac. de Cs. Exactas y Naturales,
Universidad de Buenos Aires, Buenos Aires, Argentina*

²*Centro de Ciencias de la Atmósfera
Universidad Nacional Autónoma de México, México
e-mail: ulke@at.fcen.uba.ar*

1. Introduction

Buenos Aires combines a high number of inhabitants and a variety of sources of air pollution. The mobile ones have the greater contribution, followed by the power generation plants and industries (Arkouli et al. 2010) and products of remote and near biomass burning (Gassmann and Ulke 2008, Ulke 2009). The nature of aerosol pollution, in terms of lifetime, relationship with sources and transformation processes in which they can participate, and their effects, requires on-going research.

2. Data

A suite of sensors was installed at Ciudad Universitaria, Buenos Aires (34° 35' S, 58° 22' W), to make continuous measurements over one year, since April 2011. Among others, the effective black carbon (BC), total condensation nuclei (CN) and Particle-Bound Polycyclic Aromatic Hydrocarbons (PPAH) are measured. A ceilometer gives continuous information on the vertical distribution of aerosols. A meteorological station measures the state parameters and wind.

3. Results and discussion

Figure 1 shows the relationships between the concentrations of BC, PPAH and CN for the wind sectors: NE (from the de La Plata River), SE (from the power plants and industries), SW (from the city and suburbs) and NW (from the northern region of the city). In the

NW sector the variables are well correlated and have the largest concentrations, in the SE sector relatively lower BC and PPAH concentrations are registered; the SW sector has a bifurcation for high CN values and the NE sector corresponds to clean air masses.

The time evolution of CN, PPAH and BC concentrations and the wind is in Figure 2. High values of CN, PPAH, BC are associated with winds from W and NW (urban sources). Intermediate BC, low CN and very low PPAH values are present with variable wind directions. Strong easterly winds (clean air from the de La Plata River) are related to intermediate BC, very low CN and PPAH concentrations. The CN reached 60000 cm^{-3} , BC peaked at 800 ngm^{-3} and PPAH exceeded 500 ngm^{-3} .

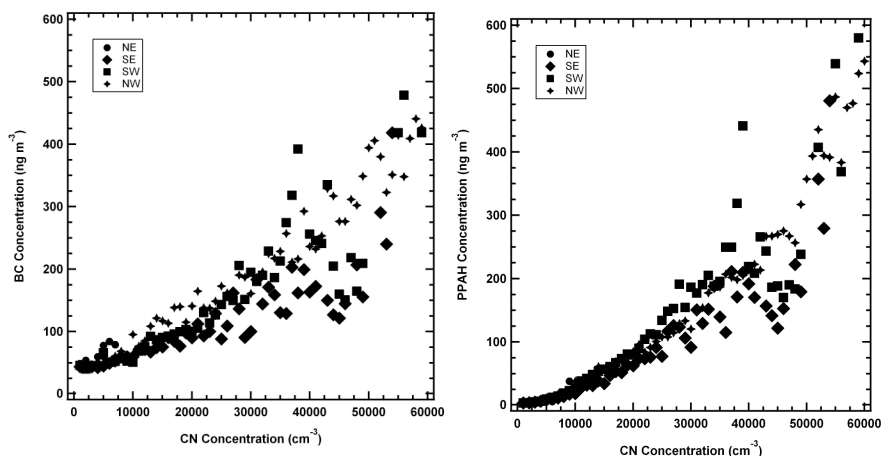


Figure 1. BC and PPAH concentrations (ngm^{-3}) versus CN concentrations (cm^{-3}) by wind sector

The ceilometer provided the vertical distribution of aerosols and the boundary layer variation and also of the ash plume from the volcano Puyehue in Chile was detected (Fig. 3). There is also agreement with the aerosol optical thickness derived from the AERONET site (34.5° S , 58° W).

Acknowledgements

UBACyT-X224, ANPCyT-2008-1739 and SEMARNAT-CONACYT-23498 projects. Brent Holben for the AERONET data.

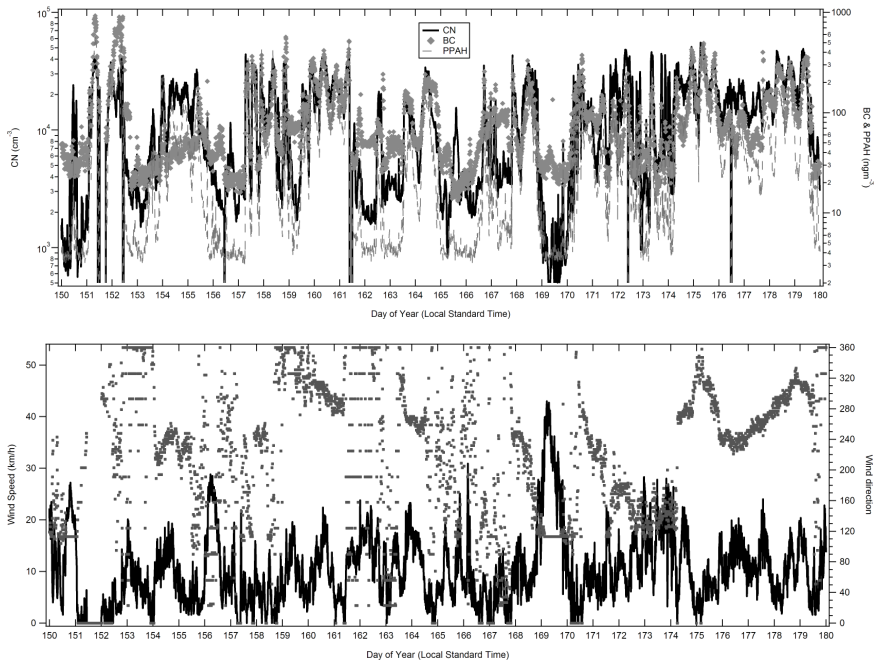


Figure 2. Time series of CN, BC and PPAH concentrations (*upper panel*) and wind (*bottom panel*)

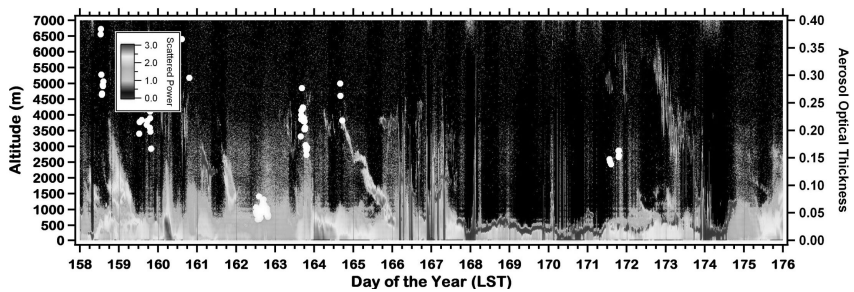


Figure 3. Evolution and vertical distribution of aerosols (*shaded*) and aerosol optical thickness (*dots*). (*ash: arrows*)

References

Arkouli M., Ulke Ana G., Endlicher W., Baumbach G., E. Schultz, U. Vogt, M. Müller, L. Dawidowski, A. Faggi, U. Wolf-Benning, Scheffknecht G.: Distribution and temporal behaviour of particulate matter over the urban area of Buenos Aires, *Atmospheric Pollution Research*, 1, 1-8, 2010.

Gassmann M.I. and Ulke A.G.: A Case Study of Biomass Burning and its Smoke Dispersion to Buenos Aires city, Argentina, *IJEP*; 32, 3, 311-331, 2008.

Ulke Ana G.: Aerosol characterization in Buenos Aires and relationships with transport patterns in South America, *Ciência e Natura*, 193-196, 2009.