



Influence of extreme events on health-related aerosol particle deposition in an urban site during summer

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Urban populations are exposed to aerosol particles that enter in the human respiratory track posing an important risk to human health. Particle sampling conventions have been established, expressed as curves describing “penetration” to the region of interest in terms of the particle aerodynamic diameter. The inhalable, thoracic, traqueo-bronchial and respirable fractions have been estimated according to the International Standard ISO 7708:1995.

This study presents the analysis of aerosol size distributions and its deposition in the human respiratory tract according to ISO 7708. The influence of ambient conditions in an urban area affected by heat waves and wildfires in the summer months has been analyzed.

A laser spectrometer PCASP-X was used to characterize the aerosol size distributions. This device registers particle sizes between 0.1 and 10 microns in 31 channels. The spectrometer was installed in the city of León (Spain), between June and September 2012, and 24 measurements were carried out daily to determine the size of the ambient particles in the urban area. The measurements were averaged over 15-minute intervals. A weather station was installed at 3 m above the ground to register automatically data on precipitation, pressure, temperature, relative humidity wind speed and direction. The refractive index of the particles was estimated for each value of relative humidity, as the relative humidity of the ambient atmosphere affects the size and the complex refractive index of aerosols. Afterwards, raw size bins were corrected from the estimated refractive indices using a program based on Mie Theory.

The regional government provided data on the exact location of summer wildfires in the province of Leon, as well as data on the land area affected. A persistent and intense thermal inversion of subsidence caused an intense pollution episode in the city during the main wildfire, which broke out at a distance of about 60 km from the sampling point. Furthermore, the influence of two intense heat waves with an intrusion of Saharan dust over the city on the different respirable fractions has been studied.

Acknowledgment: This work has been partially funded by the Spanish Ministry of Science and Innovation (Grant TEC2010-19241-C02-01).