Geophysical Research Abstracts
Vol. 17, EGU2015-14397, 2015
EGU General Assembly 2015

Continuous measurement of carbon black in a densely populated area of Mexico City

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Abstract

The black carbon (BC) is a byproduct of burning fossil fuels and is an important short-lived climate forcer because it absorbs solar radiation altering the Earth's radiative budget and climate. It is also an atmospheric pollutant that promotes reactions of other compounds in the atmosphere. Despite its importance for health and climate, in Mexico there are very few studies on ambient concentrations of BC in urban areas and virtually no information of continuous measurements over long periods (more than a month of measurements). So, in order to develop more efficient local and regional mitigation strategies and policies that allow reducing ambient concentrations of BC, it is necessary to know BC seasonal evolution, contribution to radiative budget and impacts on health.

This study shows continuous measurements (from July 2013 to July 2014) of BC to perform an analysis of seasonal variations. The selected monitoring site is located at Iztapalapa, a densely populated area with high traffic on the southeastern part of Mexico City. BC concentrations were obtained by two aethalometers (Magee Scientific Company, models AET31 and AET42) placed 15 meters above the ground. The aethalometers operate in the wavelength range of 370-950 nm and use a standard value of mass absorption coefficient MAC = 10.8 m2/g to calculate BC environmental concentration. To correct the aethalometers readings to the conditions of Mexico City, it was employed MAC = to 6.7 m2/g, which was determined for PM2.5 with a carbon analyzer (UIC, Inc.) and represents the mass absorption coefficient of soot emitted in Mexico City. The average value of the corrected concentration of BC in Mexico City during the period from July 2013 to July 2014 was 5.39 $\pm$ 1.89 μg/m3 (1.6 higher than readings recorded by aethalometers), which is greater than that measured in Shanghai in 2014 (annual average 2.33 μg/m3) and those reported for some U.S. cities; the value implies a potential danger to the health of inhabitants in Mexico City.