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Comparison of measurements of peroxyacyl nitrates and primary carbonaceous aerosol concentrations in Mexico City determined in 1997 and 2003

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Abstract. The concentrations of peroxyacetyl nitrate (PAN) in ambient air can be a good indicator of air quality and the effectiveness of control strategies for reducing ozone levels in urban areas. As PAN is formed by the oxidation of reactive hydrocarbons in the presence of nitrogen dioxide (NO₂), it is a direct measure of the peroxyacyl radical levels produced from reactive organic emissions in the urban air shed. Carbon soot, known as black carbon (BC) or elemental carbon (EC), is a primary atmospheric aerosol species and is a good indicator of the levels of combustion emissions, particularly from diesel engines, in major cities. Mexico City is the second largest megacity in the world and has long suffered from poor air quality. Reported here are atmospheric measurements of PAN and BC obtained in Mexico City during the Mexico Megacity 2003 field study. These results are compared with measurements obtained earlier during the *Investigación sobre Materia Particulada y Deterioro Atmosférico – Aerosol and Visibility Research* (IMADA-AVER) campaign in 1997 to obtain an estimate of the changes in emissions in Mexico City and the effectiveness of control strategies adopted during that time. Concentrations of PAN in 1997 reached a maximum of 34 ppb with an average daily maximum of 15 ppb. The PAN levels recorded in 2003 were quite different, with an average daily maximum of 3 ppb. This dramatic reduction in PAN levels observed in 2003 indicate that reactive hydrocarbon emissions have been reduced in the city due to controls on olefins in liquefied petroleum gas (LPG) and also due to the significant number of newer vehicles with catalytic converters that have replaced older higher emission vehicles. In contrast, black/elemental carbon levels were similar in 1997 and 2003 indicating little improvement likely due to the lack of controls on diesel vehicles in the city. Thus, while air quality and ozone production have improved, Mexico City and other megacities continue to be a major source of black carbon aerosols, which can be an important species in determining regional radiative balance and climate.

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