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Weekly patterns of México City's surface concentrations of CO, NO_x, PM₁₀ and O₃ during 1986–2007

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Abstract. Surface pollutant concentrations in México City show a distinct pattern of weekly variations similar to that observed in many other cities of the world. Measurements of the concentrations of carbon monoxide (CO), nitrogen oxides (NO_x=NO+NO₂), particulate matter smaller than 10 μm (PM₁₀), and ozone (O₃) collected hourly over 22 years (1986–2007) at 39 urban monitoring locations were analyzed. Morning concentrations of CO, NO_x, and PM₁₀ are lower on Saturdays and even more so on Sundays, compared to workdays (Monday–Friday), while afternoon O₃ concentrations change minimally and are occasionally even higher. This weekend effect is empirical evidence that photochemical O₃ production is NO_x-inhibited, and to the extent that emissions of CO are proportional to those of reactive volatile organic compounds (VOCs), it is VOC-limited, at least in the urban areas for which the monitoring stations are representative. The VOC-limitation has increased in the past decade, due to decreases in the concentrations of CO (and presumably VOCs) and consequent decreases in the CO/NO_x and VOC/NO_x ratios. Enhancements of photolysis frequencies resulting from smaller weekend aerosol burdens are not negligible, but fall short of being an alternate explanation for the observed weekend effect. The strength of the weekend effect indicates that local radical termination occurs primarily via formation of nitric acid and other NO_x-related compounds, some of which (e.g. peroxy acyl nitrates) can contribute to the regional NO_x budget. While VOC emission reductions would be most effective in reducing local O₃ production, NO_x emission reduction may be more important for controlling regional oxidants.

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