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A top-down approach to determine carbon monoxide (CO) emissions in the Mexico Megacity using ground based FTIR solar and lunar absorption spectroscopy

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The carbon monoxide (CO) total column has been measured by ground based solar and lunar FTIR absorption spectroscopy with 0.5 cm-1 resolution since October 2007 at the UNAM Campus in Mexico City (19,33°N, 99.18°W). The CO column density is retrieved using the SFIT2 retrieval code based on the optimal estimation theory (Rodgers 1976). The time series of the CO-column retrievals show different diurnal behaviours compared to the surface CO concentration. This is explained by the change in the vertical distribution which is dominated by the evolution of the mixing layer height (MLH). The CO column shows a diurnal and weekly pattern depending on the wind speed and traffic, but is not directly dependent on the mixing layer height. A comparison of the measured CO-column, CO-surface concentration and the reconstructed MLH with results from regional MCCM (Grell et al , 2000) model will be presented.

Based on the information of the vertical structure, the surface wind fields and surface CO concentrations that are provided by LIDAR measurements, the meteorological and air quality networks, it is possible to estimate the horizontal CO-transport. The CO surface emissions can therefore be calculated from the CO column growth rate. For horizontal homogeneous conditions, the CO column density growth-rate directly gives the surface emission. A first top-down CO emission estimation is presented and compared with the official inventory (bottom-up approach) and other estimations used in recent studies on Mexico City. Monitoring of CO columns in megacities provides new information of the anthropogenic emissions on a regional scale and helps to link the understanding of the CO budget from local to the global scale.