5.038 The application of long-term observations of NOx and CO to constrain a global emissions inventory.

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Abstract:

Accurate knowledge of tropospheric ozone is important for understanding its current and future effects on human health, air quality, and climate. However, global chemistry-climate models generally have problems reproducing tropospheric ozone concentrations, seasonal cycles and interannual trends. Successful tropospheric ozone simulations require high quality information on the emissions of ozone precursors, including nitrogen oxides (NOx), carbon monoxide (CO) and volatile organic compounds (VOCs).
We analyzed CO and NOx measurements from four megacities (Los Angeles, New York City, London, and Paris). It has been shown that CO and VOC emissions are highly correlated in urban areas. However, CO is more extensively measured than VOCs. Therefore, we compared the long-term evolution of the measured NOx/CO enhancement ratio in each city to the ratio of the emissions of these two pollutants reported by the MACCity global emissions inventory at the inventory grid points nearest the city. The longest available measurement record (~50 years) is from Los Angeles, where the measured NOx/CO ratios are consistently smaller than the emission ratio in the MACCity inventory and the slope of the long-term trend in measured NOx/CO ratios is of significantly larger magnitude than for MACCity. The other three cities do not have as long of a data record, but the evolution of their NOx/CO ratios also implies that the

MACCity NOx/CO emissions trends are not steep enough. However, the agreement between the measured and inventory ratios is better for the shorter time period where measurements are available in these three cities.
Comparisons of MACCity with fuel-based emission estimates for Los Angeles (for the 1990s and 2000s) suggest that the CO emissions are underestimated in the inventory, which results in the higher inventory NOx/CO ratios.