



Study of CO₂, CO, CH₄ variabilities at an urban site of western India using cavity ring down spectroscopy (CRDS) technique.

Naveen Chandra, Sethuraman Venkataramani, and Shyam Lal
Physical Research Laboratory, India

Atmospheric abundances of the two important greenhouse gases namely CO₂ and CH₄ are being affected mainly by emissions from various anthropogenic sources. However, budgets of these emissions are poorly estimated for the developing Indian region. An attempt has been made to study the variability of the levels of these gases at an urban site Ahmedabad (23.03°N, 72.58°E, 55m AMSL), in the western India using a highly sensitive cavity ring down spectroscopy technique. The average levels of CO₂ and CH₄ at this site are 399 – 425 ppmv and 1.8 – 2.6 ppmv respectively. However the diurnal amplitude of CO₂ and CH₄ falls in the range of 6 – 50 ppmv and 0.05 – 1 ppmv respectively, depending on the seasons. The co-relations of CO₂, CH₄ with co-emitted CO gas are used to identify the dominant source types. The measurements show that atmospheric CO correlates well with CO₂ during the autumn and winter. The slope of CO and CO₂ ($\Delta\text{CO}/\Delta\text{CO}_2$) is found to be in the range of 0.02 and 0.03 which agrees well with the emission ratio for India as per Asian inventory proposed by Street et al., (2003) and connote the influence of mixed sources (fossil fuel as well as biomass burning) during this period. In July, CO doesn't correlate well with CO₂ ($r^2 = 0.14$), but the slope is around 0.005. This indicates the dominance of fossil fuel during this time. The correlation and slope (slope ~ 0.02 and $r^2 \sim 0.55$) of CH₄ with CO₂ remain fairly constant which demonstrate that the study area does not have significant changes in the common source of these gases throughout the study period. More details of the levels, amplitude of diurnal variations of CO₂, CO, CH₄ in different seasons as well as their mutual interrelationship will be presented.