I-T-9

CHARACTERISTICS AND SOURCES OF ATMOSPHERIC CARBONACEOUS SPECIES OVER INDIAN REGION

M.M.Sarin

Physical Research Laboratory, Navrangpura, Ahmedabad - 380 009, India.

INTRODUCTION

Atmospheric carbonaceous species (EC and OC) have been the subject of a number of regional and global modeling studies that are aimed at linking their sources with ambient concentrations as well as hygroscopic and optical properties through the simulation of atmospheric transport, chemistry and removal; and ultimately evaluating their effects on radiative forcing and climate change. The major sources of OC and EC are biomass and fossil fuel burning, vehicular and industrial emissions. Over the south-east Asian region, where projected emissions are exceedingly high, the carbonaceous aerosols have the potential to modify the local meteorology (by acting as CCN) and climatology (by absorbing/scattering the solar radiation). In this context, black carbon (or EC) has been proposed as the second most important greenhouse species after CO_2. On the other hand, effects of OC on climate are not yet well established but their significance in the radiation budget by negative forcing as well as changes in the precipitation pattern are being increasingly debated in the present-day context of growing anthropogenic activities. Long-term continuous measurements using ground-based networks are, thus, essential to evaluate the seasonal variations in the carbonaceous aerosol concentrations and OC/EC ratios for the modeling studies rather than using the predicted properties based on emission inventories.

RESULTS AND DISCUSSION

Through the analysis of bulk-aerosols samples, collected on pre-combusted tissuquartz filters from selected sites in northern and western India, ambient concentration of OC, EC and OC/EC ratios have been studied. A common feature of the data from various sites is reflected by the pronounced temporal variability in the abundances of carbonaceous species; with higher concentrations occurring during winter months and lower during summer time and the period of SW-monsoon. The predominance of atmospheric dust and efficient wet-scavenging are the main causes for the observed variability in the abundance pattern during the summer/monsoon season. Relatively high concentrations during wintertime are dominated by the regional-scale emission sources (biomass burning). On average, mass-fraction of carbonaceous material (EC+OC) in the north Indian region is 30%; with OC (28%) as a dominant component and exhibits statistically significant relationship with nss-K^+ (a proxy of biomass burning). The observed EC/(TC = OC+EC) ratios centering around 0.15 further suggests the dominance of biomass burning sources. The frequency distribution of OC/EC ratios show values as high as factor 3 to 4 in comparison to typical ratios in urban aerosols (OC/EC ratios of ~2) under the influence of primary emissions. This brings to focus the significant contribution of OC and secondary organic carbon (SOC) to the atmospheric carbonaceous species from local biomass burning sources. Such higher OC/EC ratios (~ 6 to 8) and the estimates of SOC require reassessment of their parameterization in the regional and global scale models.