ABSTRACT

Simultaneous measurements of PM$_{2.5}$ and gaseous pollutants were performed at rural site Sikanderpur and traffic site Khandari Crossing NH-2 from May-2012 to October-2014. During the study period the average mass concentrations of PM$_{2.5}$ were 68.4±27.9 μg/m$^3$ at the rural site and 273.2±36.5 μg/m$^3$ at traffic site, respectively. Very high levels of particulate mass at traffic site may be attributed to anthropogenic emissions from vehicles and resuspended road dust. On the other hand at rural site, various local sources such as coal and biomass combustion may be the dominant sources contributing significantly to PM$_{2.5}$ mass. The annual average concentration of organic carbon (OC) and elemental carbon (EC) were 57.1±28.2 and 12.9±5.5 μg/m$^3$ at traffic site and, 21.3±12.3 and 4.9±3.5 μg/m$^3$ at rural site respectively. A significant correlation between water soluble K$^+$ and OC and EC supports that biomass burning emissions are the main source of carbonaceous species. At the traffic site in PM$_{2.5}$, the sum of the water-soluble ionic species (WSIS) ranged from 21.5 to 97.8 μg/m$^3$ with an average of 55.4 ± 20.0 μg/m$^3$. The sum of WSIS contributed an average of 20.3% of PM$_{2.5}$ mass concentration. At the rural site WSIS ranged from 16.2 to 58.2 μg/m$^3$ with an average of 32.7 ± 11.2 μg/m$^3$ and contributed 47.8% to total PM$_{2.5}$ mass concentration. At both sites the seasonal variation in ionic species followed the order: winter>summer>post-monsoon>monsoon. At the traffic site the annual average concentration of gases SO$_2$, NO$_2$, NH$_3$ and HNO$_3$ were 11.5±6.0, 18.1±0.6, 6.6±1.1 and 1.7±0.7 ppb while at the rural site concentrations were 2.5±1.8, 3.2±1.4, 8.2±6.5 and 1.1±0.3 ppb. Among all these gases concentration of NO$_2$ was highest concentration at the traffic site while at the rural site NH$_3$ showed maximum concentration. The conversion mechanisms and rates for the formation of particulates from precursor gases are important factors in controlling concentrations of these pollutants. Source apportionment was elucidated by correlation and principal component analysis. PCA indicates five factors at traffic site and four at rural site. The main sources at traffic site are biomass burning, SIA formation, combustion, vehicular emission and burning while at rural site SIA formation, soil dust, combustion and biomass combustion are the main contributors.