Atmospheric organic aerosols in the Indo-Gangetic Plain: A synthesis

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Large-scale dispersal of atmospheric pollutants from biomass burning emissions (BBEs) and fossil-fuel combustion (FFc) sources in the Indo-Gangetic Plain (IGP); and a thick layer of haze advecting to the Bay of Bengal (BoB) is a conspicuous seasonal feature under favourable meteorological conditions during the wintertime (December-March). Our sustained studies in the source region of north-west-IGP have provided significant new understanding based on diagnostic ratios of OC/EC (10 ± 2), WSOC/OC (0.52 ± 0.02), nss-K^+/OC (0.60 ± 0.03) and $\sum$PAHs/EC (1.3 ± 0.2 mg/g) emitted from agricultural-waste (paddy-residue) burning in October-November that are significantly different from FFc sources. On average, organic aerosols account for ~ 63 % and inorganic species about 23 % of $PM_{2.5}$; whereas abundance of EC is no more than 4 %. Therefore, scattering species (organic and inorganic) have dominant impact on regional atmospheric chemistry and radiative forcing due to aerosols. The mass absorption efficiency (MAE) of EC (3.8 ± 1.3 m^2 g^{-1}) exhibits significant decrease with increase in the concentrations of OC, nss-SO_4^{2-} and NO_3^-. A scatter-plot for OC/EC and nss-SO_4^{2-}/EC characteristically differentiates biomass burning emissions in the IGP than those from FFc sources in south-east Asia. Likewise, cross-plot of PAHs-isomers serve as potential tracers for BBEs in the IGP. Results emerging from these studies have major implications to re-assessment of model parameters for atmospheric radiative forcing due to black carbon from BBEs in the IGP, along the foot-hills of Himalaya and downwind marine atmospheric boundary layer over the Indian Ocean. Please fill in your abstract text.