Characteristics of organic aerosols and organic carbon-to-organic mass conversion factor in the atmospheric outflow from south Asia

MANMOHAN SARIN[1*] AND BIKKINA SRINIVAS[12]

[1]Physical Research Laboratory, Ahmedabad 380009, India (*correspondence: sarin@prl.res.in)
[2]Now at: Bolin Center for Climate Research, Stockholm University, Stockholm, Sweden (srinivas.prl@gmail.com)

Concentrations of $PM_{2.5}$, organic and elemental carbon (OC and EC), mineral dust, water-soluble organic carbon (WSOC) and inorganic species (WSIS) have been studied from a continental site in north-east India representing the atmospheric outflow from south Asia (SA) to the Indian Ocean. On average, organic mass (OM) accounts for 47% of $PM_{2.5}$ (Av ≈ 90 μg m^{-3}); whereas contribution of EC is no more than 5% and that of mineral dust is 12%. The diagnostic ratios of carbonaceous species [OC/EC ≈ 7.0 ± 2.2, WSOC/OC ≈ 0.52 ± 0.16, and K^+/EC ≈ 0.48 ± 0.17] suggest dominance of biomass burning emissions in the SA atmospheric outflow. The high abundance of sulphate (SO_4^{2-} ≈ 6.9 - 25.3 μg m^{-3}; SO_4^{2-}/ΣWSIS= 45 - 77%) and characteristic ratios of nss-SO_4^{2-}/EC (3.9 ± 2.1) and nss-SO_4^{2-}/OC (0.61 ± 0.46) have implications to relative impact of absorbing and scattering species on the temporal variability of mass absorption efficiency of EC (σ_{EC}: 1.9 – 5.3 m^2 g^{-1}). The mass fraction of WSOC (10 – 23 %) in $PM_{2.5}$ and mass absorption efficiency of Brown Carbon ($\sigma_{abs\text{-}BrC}$: 0.5 – 1.2 m^2 g^{-1}) bring to focus its significance in the atmospheric radiative forcing due to anthropogenic aerosols over south Asia. From the quantitative assessment of individual components of $PM_{2.5}$, we provide the first data set on organic carbon-to-organic mass (OC to OM) conversion factor centring at 1.5 ± 0.2 (Range: 1.3 - 2.7) in the atmospheric outflow from south Asia.