Absorption Enhancement and Radiative Forcing due to Brown Carbon Aerosols

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Measurement of Aerosol Absorption

We present simultaneous measurements of aerosol absorption coefficient at 405, 532 and 781 nm wavelengths and corresponding Organic Carbon (OC) and Black Carbon (BC) mass concentrations from Indo-Gangetic Plain (IGP) during February, March 2013. Enhancement in absorption, defined as the ratio of ambient absorption to the denuded absorption shows high values at 405 and 532 nm compared to 781 nm indicating presence of absorbing organic carbon or otherwise known as Brown Carbon (BrC). Positive Matrix Analysis (PMF) of OC from HR-ToF-AMS shows four distinct factors in which absorption increases with increase in the fraction of Semi Volatile Oxygenated Organic Aerosols (SVOOA). On the other hand absorption decreases with increase in mass fraction of Low-Volatile Oxygenated Organic Aerosols (LVOOA) indicating differentially absorbing aerosols within OC. PMF factors such as Hydro-carbon like Organic Aerosol (HOA) and Biomass Burning Organic Aerosol (BBOA) show similar trend as that of SVOOA. Regression analysis shows strong dependence of absorption at 405 and 532 nm with factors mass loading but weak dependence at 781 nm.

Radiative Forcing due to Aerosols

Radiative forcing due to aerosols is calculated at top of atmosphere, Surface and Atmosphere for clear days (low aerosol loading) and biomass burning days (high aerosol loading). Input parameters in forcing calculations are constrained using ground based measurement and satellite derived parameters. The magnitude of radiative forcing due to aerosols on biomass burning days was found to be larger compared to clear days. Radiative forcing is calculated with and without OC loading to determine the forcing due to organics. Forcing with OC is always found to be higher.