



Impact of Drought and Normal Monsoon Scenarios on Black Carbon Induced Radiative Forcing over middle Indo-Gangetic Plain

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Observations on black carbon (BC) aerosols during the period of 2009-2011 are reported for an urban site at middle Indo-Gangetic Plain (IGP). Emphasis was made to evaluate BC variations during typical monsoon seasons (June-September, JJAS) over the years to recognize variations of BC loading with monsoonal rainfall. Black carbon mass loading and aerosol optical depth (AOD) in 2009 (a drought year) was found to be relatively higher in comparison to 2010 and 2011 (normal monsoon years). Mean hourly variation of BC during monsoon season was found to be higher during 2009 mainly attributed to boundary layer height and anthropogenic activities near sampling location. Monthly mean BC concentration during drought year (2009) was also found to be higher ($7.0 \pm 3.3 \mu\text{g}/\text{m}^3$) compared to normal monsoon years (2010: 4.9 ± 2.1 ; 2011: $4.6 \pm 2.1 \mu\text{g}/\text{m}^3$). Such enhancement in BC loading during drought year is possibly associated to high surface temperatures and low rainfall amounts which characteristically enhance BC loading in comparison to normal monsoon years. Meteorological variables viz. temperature, relative humidity and rainfall were also assessed in terms of their association with BC loading. Conclusively, aerosol chemical composition and BC loading were used for OPAC model to compute optical properties of aerosols which were further used to derive aerosol induced radiative forcing (ARF) and atmospheric heating rates both at surface and top of the atmosphere during monsoonal period.

Key words: Indo-Gangetic Plain, Drought, Monsoon, Black Carbon, Radiative forcing, Heating rate.