Black Carbon Aerosol Measurements and its Radiative Impact over Nainital: A High Altitude Station in the Central Himalayas

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Ground-based measurements of aerosol black carbon (BC), from a high altitude location Manora Peak, Nainital in the central Himalayas from June 2006 to May 2007 are used to study its temporal variability and impact on the atmospheric radiative forcing, using a seven channel Aethalometer (Model AE-42) of Magee Scientific Company, USA, Diurnal variation of BC mass concentration shows single enhanced peak in the evening hours (around 17:00 hrs local time (LT)). The peak is rather pronounced in winter months due to shallow and stable boundary layer condition which is highly associated with low surface temperature. Maximum mass concentration in the monthly mean of BC aerosols was found in the month of April 2007. The prevailing surface winds over the site reveals the transport of BC from distant sources to the observing site. Atmospheric forcing due to BC aerosols has been estimated using SBDART model in conjunction with OPAC model. Results show BC forcing at TOA, surface and in the atmosphere varies between about -3 to -7, -6 to -14 and +3 to +6 W m-2, respectively which is more pronounced in the spring then in the monsoon depending upon the BC mass loading. Forcing causes significantly large atmospheric heating during spring as compare to monsoon.