Variation of spectral properties of black carbon due to biomass burning

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Biomass burning is combustion of any non- fossil or organic matter. It occurs due to natural causes viz., volcanic eruptions, forest fire and manmade causes viz., burning of crop residue, combustion of bio fuels, burning of wood, etc., are man-made causes. It is found to be the second largest contributor among gases and largest contributor of carbonaceous fine particles in troposphere. Clearing of agricultural fields by burning of vegetation such as paddy and wheat fields amount to release of large amount of solid particulate matter and gases. It is among chief source of greenhouse gases- a main culprit of global warming and adverse climatic changes.

The Black carbon (BC) emission due to biomass burning has very strong absorption rate at lower wavelengths and it is formed basically due to incomplete combustion of biomass, bio fuels and fossil fuels. This study focuses on understanding the spectral properties of BC produced by biomass burning at Agra, a sub-urban region over Indo-Gangetic Basin.

The general aim of this study is to explore the spectral dependence of biomass burning aerosols which are required for interpretation of optical properties for radiative forcing on climate. In this study we present an up-to-date picture through large number of measurements of biomass consumption and summarize biomass consumption by the major types of biomass burning. BC produced during the burning process has been measured using seven channels Aethalometer (model AE33 Magee Scientific, USA).

Table 1: Absorption coefficient and absorption coefficient normalized values

Wavelength (nm)	Absorption Coefficient (m^{-1})			β Normalized to 880 nm values (m^{-1})		
	Summer	Monsoon	Winter	Summer	Monsoon	Winter
370	4.1×10^{-5}	3.5×10^{-5}	4×10^{-5}	3.2	2.3	2.5
470	2.5×10^{-5}	2.8×10^{-5}	3.4×10^{-5}	1.9	1.9	2.1
520	2.7×10^{-5}	2.5×10^{-5}	3.5×10^{-5}	2.1	1.7	2.2
590	1.9×10^{-5}	2.3×10^{-5}	2.7×10^{-5}	1.5	1.6	1.6
660	1.6×10^{-5}	2.1×10^{-5}	2.2×10^{-5}	1.2	1.4	1.3
880	1.3×10^{-5}	1.5×10^{-5}	1.6×10^{-5}	1	1	1
950	1.2×10^{-5}	1.3×10^{-5}	1.2×10^{-5}	0.93	0.87	0.75

BC concentration is found to be higher (15.8 µg m^{-3}) during winter months (November- December) and around 5.9 µg m^{-3} during monsoon (July- October). Data recorded at seven channels (370 nm, 470 nm, 520 nm, 590 nm, 660 nm, 880 nm and 950 nm) has been used to get the wavelength dependence of absorption coefficient during three different periods. The AbsorptionAngstrom Exponent (AAE) has been calculated by fitting the absorption co-efficient values with power law. A significant increase in the value of AAE has been noted. It has been found that its properties depend on the composition of measured particle.

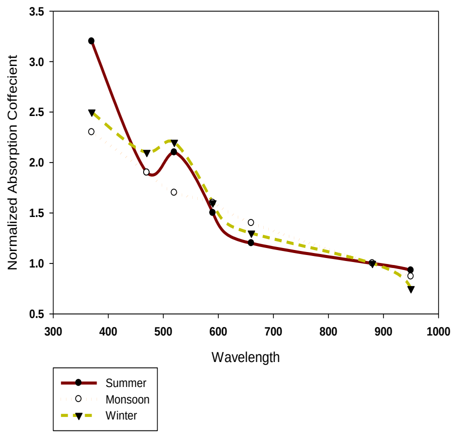

Figure 1: Normalized absorption coefficient.

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