



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.

Thesis Title:

Black and Brown Carbon Particles in the Atmosphere of a Northeast Indian City – Study of properties, sources, and impacts through field study and modelling

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SHORT ABSTRACT

This research was about the quantification of Black Carbon (BC), and Brown Carbon (BrC) found in the atmosphere of Guwahati. The radiative properties of BC and BrC particles and their source apportionment have been done for the winter season in 2020. This research emphasizes using the site-specific properties and absorption coefficient of particles originating from biomass and fossil fuels, which are apportioned by an Aethalometer (AE33) using standard absorption coefficients. The source apportionment method was thus refined using the site-specific properties, which improved the source apportionment between fossil fuel and biomass. Further, the light absorption due to winter BC and BrC in a complex terrain region of Northeast India has been studied. AERMOD model was used to estimate the BC concentrations from fossil fuel (mainly automobiles) sources in hilly terrain and compared with the observations. The modelling outcomes revealed that the hilly terrain in the study area facilitates the trapping of BC aerosols and blocks the low-level flow's lateral dispersion. Apart from source apportionment and the light absorption properties, exposure to BC in winter, which might cause a higher health risk, has been estimated to be equivalent to passive cigarette smoking per day. These results and the methodology developed in the research are useful for health-oriented policy framework and also for mitigating BC particles from our atmosphere by reducing it at the source. This is one of its kind study of the atmosphere of Northeast India, which will promote the implementation of strict regulations aiming to improve deteriorating air quality in the hilly regions of the Brahmaputra River Basin.