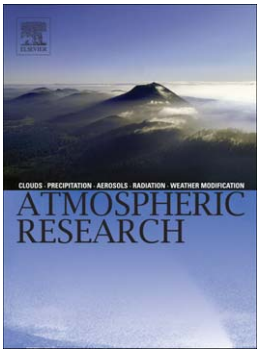

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PII: S0169-8095(17)30013-3
DOI: doi: 10.1016/j.atmosres.2017.05.007
Reference: ATMOS 3957

To appear in: *Atmospheric Research*

Received date: 18 January 2017
Revised date: 27 April 2017
Accepted date: 10 May 2017

Please cite this article as: Verma, S., Reddy, D. Manigopal, Ghosh, S., Kumar, D. Bharath, Chowdhury, A. Kundu, Estimates of spatially and temporally resolved constrained black carbon emission over Indian region using a strategic integrated modelling approach, *Atmospheric Research* (2017), doi: 10.1016/j.atmosres.2017.05.007

Estimates of spatially and temporally resolved constrained black carbon emission over Indian region using a strategic integrated modelling approach

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Abstract

We estimated the latest spatially and temporally resolved gridded constrained black carbon (BC) emissions over the Indian region using a strategic integrated modelling approach. This was done extracting information on initial bottom-up emissions and atmospheric BC concentration from a general circulation model (GCM) simulation in conjunction with the receptor modelling approach. Monthly BC emission (83–364 Gg) obtained from the present study exhibited a spatial and temporal variability with this being the highest (lowest) during February (July). Monthly BC emission flux was considerably high ($>$ 100 kg km^{-2}) over the entire Indo-Gangetic plain (IGP), east and the west coast during winter months. This was relatively higher over the central and western India than over the IGP during summer months. Annual BC emission rate was 2534 Gg y^{-1} with that over the IGP and central India respectively comprising of 50% and 40% of the total annual BC emissions over India. A high relative increase was observed in modified BC emissions (more than five times the initial emissions) over most part of the IGP, east coast, central/northwestern India. The relative predominance of monthly BC emission flux over a region (as depicted from z-score distribution maps) was inferred being consistent with the prevalence of region- and season-specific anthropogenic activity.

Keywords: black carbon; emission inventory; receptor modelling approach; bottom-up and top-down emissions; monthly BC emission flux; GCM simulation; z score distribution

1. Introduction

Aerosols play an important role in modifying the climate system by scattering and absorbing the solar energy (Ramanathan and Carmichael, 2008; Andreae, 2007). Among aerosol constituents,

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