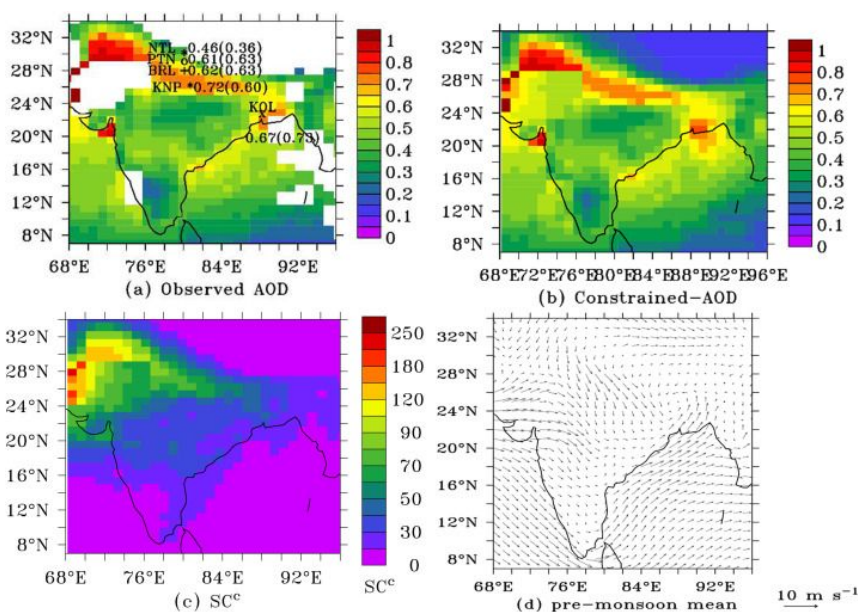


## Constrained simulation of aerosols species using GCM

Author List : D. Bharath Kumar, Shubha Verma, Olivier Boucher, Rong Wang



### Key highlights:

- A constrained aerosol simulation was formulated with the aim of better concurrence between model estimates and observations of atmospheric aerosol species and predict their spatial distribution as consistently as possible
- The constrained simulation estimates were used to examine aerosol species contributing to pre-monsoon AOD
- The present study was carried out during the pre-monsoon season and for the Tigerz experiment which was conducted at stations over the Indo-Gangetic plain (IGP) and the Himalayan foot-hills

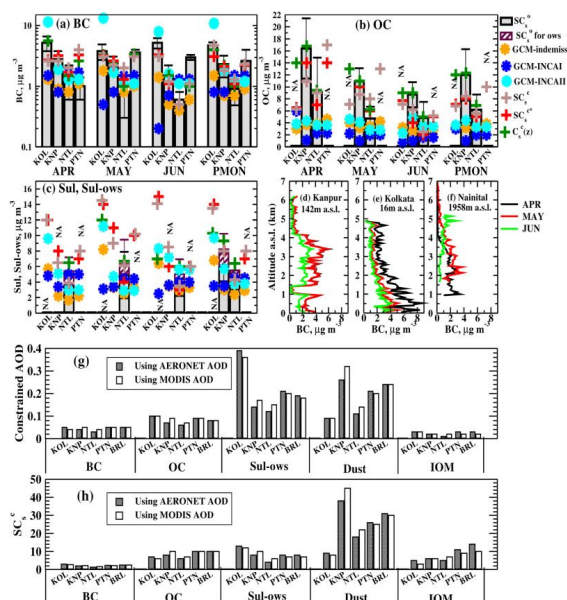
### Summary of your Research:

This study was designed to deliver a better concurrence between model estimates and observations, of atmospheric aerosol species, and predict their spatial distribution as consistently as possible. A free running aerosol simulation (freesimu) in a general circulation model (GCM) was performed, and further the simulated aerosol optical depth (AOD) was constrained with the observed AOD. The present study was carried out during the pre-monsoon season and for the Tigerz experiment which was conducted at stations over the Indo-Gangetic plain (IGP) and the Himalayan foot-hills in northern India.

Our formulation of the constrained aerosol simulation (constrsimu) was based upon an identification of the freesimu with the most consistent estimates of aerosol characteristic among the three freesimu. The three freesimu (differing in source of emissions and model horizontal resolution) were carried out with the general circulation model (GCM) of Laboratoire de Météorologie

Dynamique (LMD-ZT GCM). Black carbon (BC), organic carbon (OC), and sulfate-other water soluble (Sul-ows) estimated from constrsimu amounted to 70%–100% compared to that from freesimu being 20%–50% of their measured counterparts. A 200% increase was inferred for potential black carbon emissions to obtain a concurrence between observed and freesimu BC concentration.

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### Take away/conclusion :

- The constrained simulations estimated total submicron aerosol mass concentration revealed its alarmingly high value over the northern and north-western India
- A 200% increase was inferred for potential black carbon emission (using India emission inventory implemented in a GCM) to obtain a concurrence between observed and non-constrained BC concentration.
- Surface concentration of BC, OC, sulfate–other water soluble (Sul-ows) species from the constrained simulations were estimated amounting to 70%–100% compared to that from non-constrained simulation which being to 20%–50% of the respective measurements at most of the times

National Co-ordinator

(NCAP-COALESCe Project)  
Interdisciplinary Programme in Climate Studies

Indian Institute of Technology, Bombay  
Powai, Mumbai-400076, India

Phone: 91-22-2576-5141

<http://www.climate.iitb.ac.in/en/r-d-project-0>

