

Supplementary Materials for

Role of anthropogenic and dust aerosols in spatially modulating the rainfall over India

Sauvik Santra *et al.*

Corresponding author : Shubha Verma, shubha@iitkgp.ac.in

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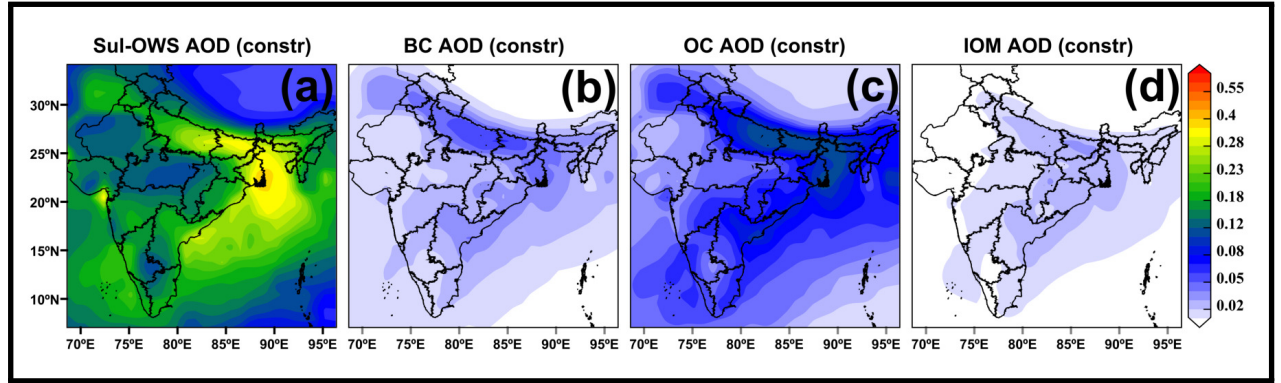


FIGURE S1: Spatial distribution of AOD due to (a) sulfate and other water soluble (Sul-ows) aerosols ; (b) Black carbon (BC) ; (c) Organic carbon (OC) ; and (d) Inorganic matter (IOM) aerosols (Kumar et al., 2018)

The anthropogenic AOD (AOD-anthro) over the Indian mainland (see Figure S1) is primarily due to sulphate and other water-solubles ($AOD_{Sul-ows}$: as large as 0.4), and followed by organic carbon (AOD_{OC} : 0.1-0.2), black carbon (AOD_{BC} : 0.04-0.07), and inorganic matter (AOD_{IOM} : 0.02-0.04). As mentioned in the manuscript, the aerosol species-wide optical properties for the monsoon season are estimated with OPTical properties SIMulation (OPTSIM) Stromatas et al. (2012) (OPTSIM) using the atmospheric layer-wide (19-vertical layers) concentration of aerosol species derived in our previous study Kumar et al. (2018) from the constrained aerosol simulation approach (*constrsimu*).

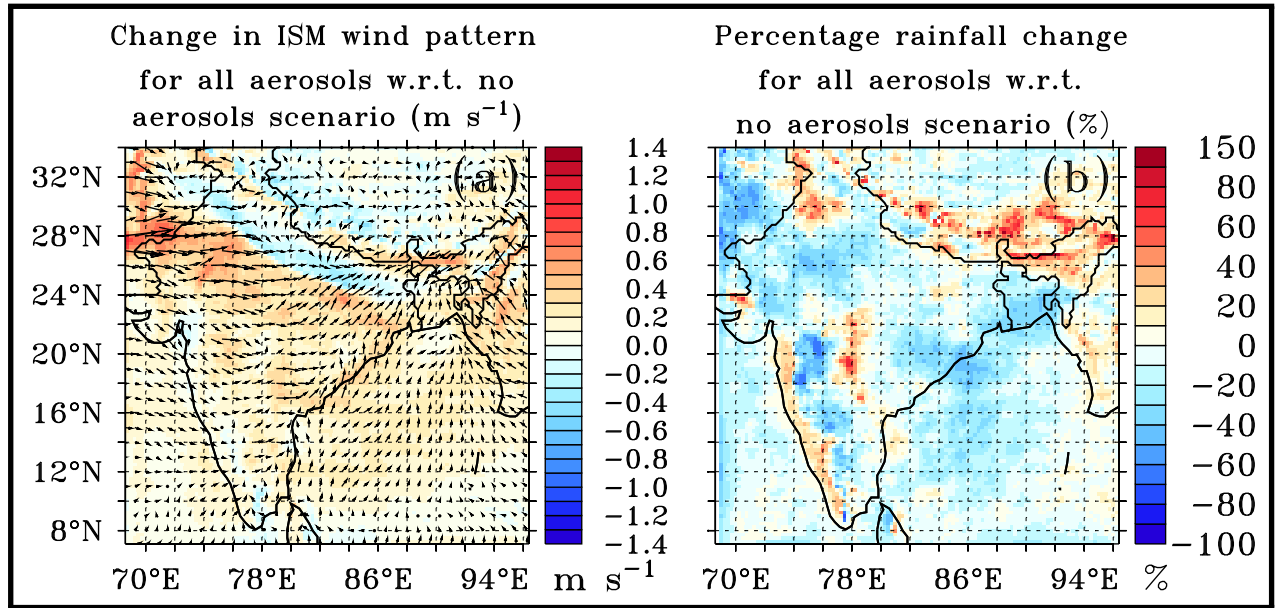


FIGURE S2: Spatial distribution of simulated change in (a) wind fields, (b) ISM rainfall due to all-aerosols scenario with-respect-to no-aerosol scenario considering clear-sky aerosol radiative effects

TABLE S1: Designed simulations of rainfall for aerosol scenarios under five climatic conditions prevalent during ISM

Simulation No.	Climatic Scenario		Year	Aerosol Type	Seasonal distribution used for aerosols	Season used for meteorology
	Global	Subcontinental				
1	La Niña	Positive IOD	2010	All	Monsoon (June to September)	Monsoon (June to September)
2				Anthro		
3				Dust		
4				None		
5		Negative IOD	2011	All		
6				Anthro		
7				Dust		
8				None		
9	Neutral	Neutral	2018	All		
10				Anthro		
11				Dust		
12				None		
13	El Niño	Positive IOD	2019	All		
14				Anthro		
15				Dust		
16				None		
17		Negative IOD	2015	All		
18				Anthro		
19				Dust		
20				None		

Références

- Kumar, D. B., Verma, S., Boucher, O., Wang, R., 2018. Constrained simulation of aerosol species and sources during pre-monsoon season over the Indian subcontinent. *Atmospheric Research* 214, 91–108.
- Stromatas, S., Turquety, S., Menut, L., Chepfer, H., Pere, J.-C., Cesana, G., Bessagnet, B., 2012. Lidar signal simulation for the evaluation of aerosols in chemistry transport models. *Geoscientific Model Development* 5 (6), 1543–1564.