Supplementary Material for

Aerosols drive monsoon rainfall spatial modulations over the Indian subcontinent: anthropogenic and dust aerosols impact, mechanism, and control

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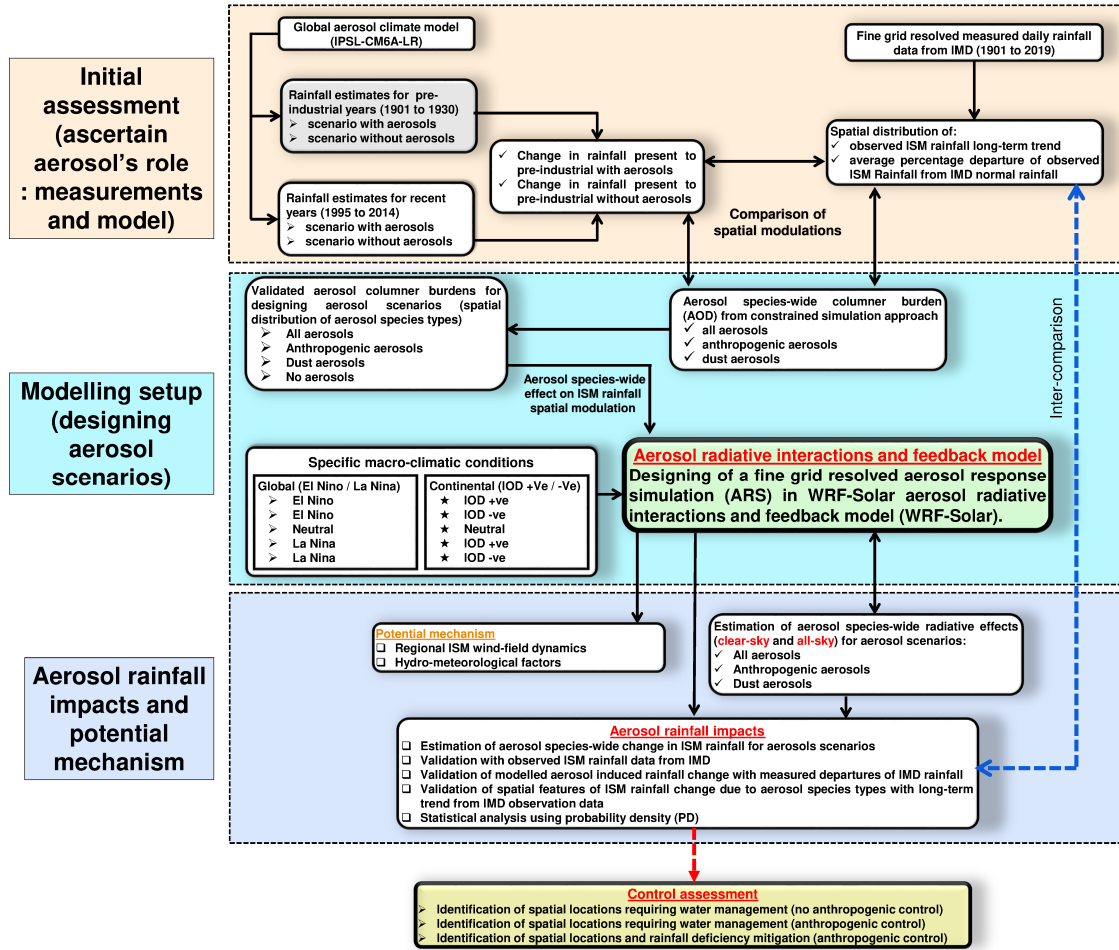
Figure S1: Integrated Modelling Framework

Flowchart of the methodology for assessing aerosol-induced changes in monsoon rainfall, mechanisms, and controls targeting anthropogenic aerosols.

Table S1: Simulation Design

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

Simulation No.	Climatic Scenario		Year	Aerosol Type	Aerosol Season used	Met Season used
	Global	Subcontinental				
1			2010	All		
2		Positive IOD	2010	Anthro		
3			2010	Dust		
4	La Niña		2010	None		
5			2011	All		
6		Negative IOD	2011	Anthro		
7			2011	Dust		
8			2011	None		

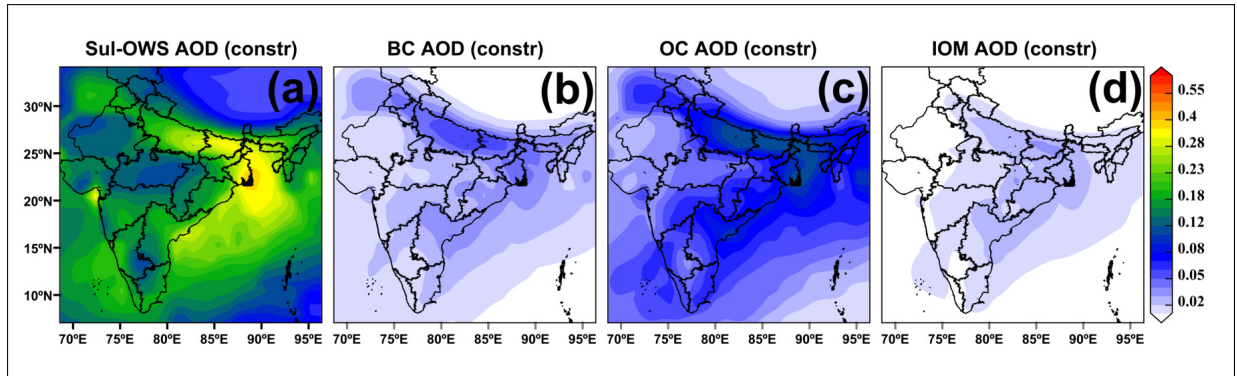
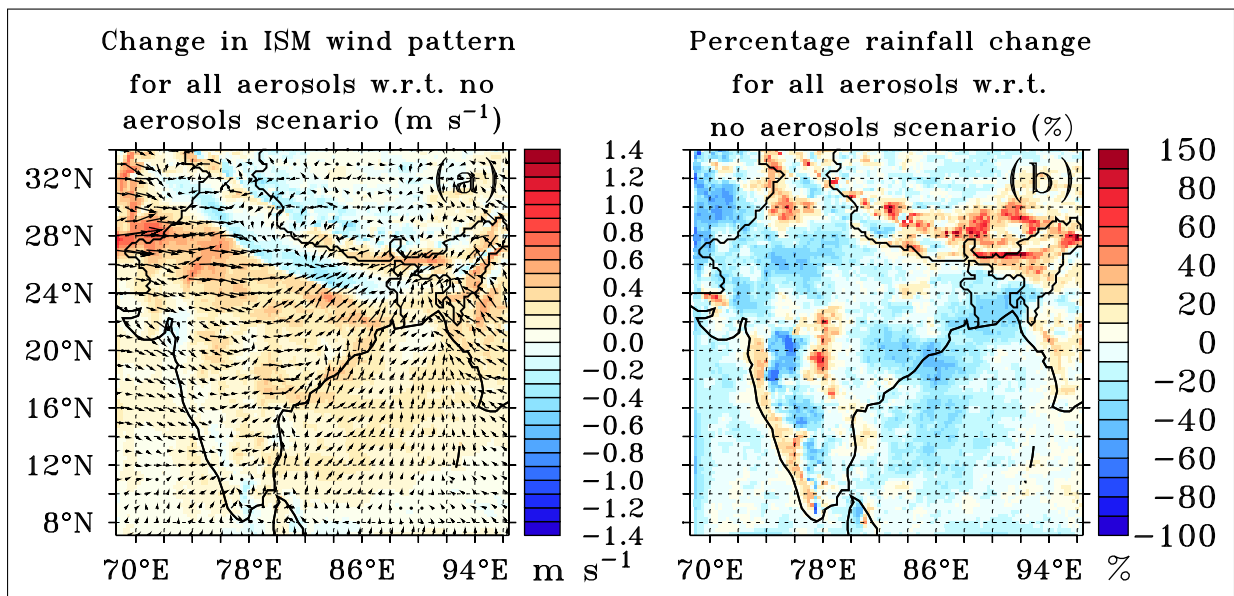
Figure S2: Aerosol Optical Depth Components Monsoon (JJA)   Monsoon (JJA)

AOD due to (a) sulfate/other solubles, (b) black carbon, (c) organic carbon, (d) inorganic matter.

Table S2: Rainfall Comparison (Model vs IMD)

	Region 1		Region 2	
	Dust Aerosols	All Aerosols	Anthro Aerosols	All Aerosols
Model (ARS)	15 (29) [51]	9 (18) [46]	-17 (-28) [-48]	-16 (-28) [-41]
IMD rainfall	16 (21) [33]		-21 (-29) [-36]	

Comparison in mm of modelled vs observed rainfall modulation. Values are average (10th percentile) [max].

Figure S3: Wind and Rainfall Change

Spatial distribution of change in (a) wind fields and (b) ISM rainfall for all-aerosol vs no-aerosol scenario.