

Auxiliary material for Paper

Examination of aerosol distributions and radiative effects over the Bay of Bengal and the Arabian Sea region during ICARB using satellite data and a general circulation model

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Table S1. Linear regression statistics between the ship-based remote sensing measurements, MODIS observations and model simulated AODs during Bay of Bengal and Arabian Sea cruise period.

Statistics	Sunphotometer vs. MODIS		Sunphotometer vs. HAM		MODIS vs. HAM	
	All days	Cloud free days	All days	Cloud free days	All days	Cloud free days
Correlation coefficient (R)	0.85	0.92	0.69	0.78	0.70	0.72
Slope	0.82 ± 0.08	0.92 ± 0.07	0.36 ± 0.06	0.48 ± 0.07	0.38 ± 0.06	0.44 ± 0.06
RMSE	0.09	0.06	0.16	0.13	0.15	0.13
BIAS	-0.01	-0.02	-0.10	-0.09	-0.09	-0.07

Table S2. Comparison of linear regression statistics between the ship-based remote sensing measured and MODIS retrieved AODs for the temporal (sampled at the right days along the track) and seasonal mean (ICARB period mean geographical distribution sampled along the ship track) during ICARB cruise period.

Sunphotometer vs. MODIS	Total		Bay of Bengal		Arabian Sea	
	Temporal	Seasonal mean	Temporal	Seasonal mean	Temporal	Seasonal mean
Correlation coefficient (R)	0.85	0.71	0.92	0.61	0.77	0.80
Slope	0.82 ± 0.08	0.34 ± 0.05	0.89 ± 0.08	0.25 ± 0.07	0.76 ± 0.16	0.43 ± 0.08
RMSE	0.09	0.12	0.07	0.13	0.11	0.11
BIAS	-0.01	-0.03	-0.03	-0.04	0.01	-0.02

Table S3. Mean fine mode and coarse mode contribution (% , at 550 nm) to the AOD, and Ångström exponents, over the BoB and AS legs during ICARB period.

Region	Fine mode AOD	Coarse mode AOD	Ångström Exponent (550/825 nm)
Bay of Bengal	68%	32%	1.1 ± 0.3
Arabian Sea	61%	39%	0.83 ± 0.2

Table S4. Comparison of model simulated DARF sampling along the ship track and regional-seasonal mean values over BoB and AS legs during ICARB period

HAM DARF ($W m^{-2}$)	TOA		SUR		ATM	
	Sampled along the track	Regional-seasonal mean	Sampled along the track	Regional-seasonal mean	Sampled along the track	Regional-seasonal mean
Total	-5.3	-5.3	-11	-10.4	5.8	5.1
Bay of Bengal	-4.7	-4.2	-11.3	-9.8	6.6	5.6
Arabian Sea	-6.1	-6	-10.7	-10.7	4.6	4.7

Table S5. Comparison of model simulated AOD @550 nm and Ångström Exponent (550 / 825 nm) with MODIS AOD and Ångström Exponent (550 / 865 nm) during cloud-free days and cloudy days.

	Cloud-free days			Cloudy days		
	HAM	MODIS	Ratio	HAM	MODIS	Ratio
AOD @ 550 nm	0.18	0.26	0.71	0.16	0.32	0.52
Ångström Exponent	0.99	0.94	1.05	0.78	0.61	1.28

Table S6: Regional-mean AOD during 18 and 19 March and 1 and 2 April, when the model showed particularly low dust concentrations (“Dust-missing days”) from ECHAM5-HAM and MODIS, compared to the regional-mean AOD over the entire period of the BoB cruise.

	Dust missing days			Entire BoB cruise period		
	HAM	MODIS	Ratio	HAM	MODIS	Ratio
AOD @ 550 nm	0.17	0.39	2.27	0.18	0.26	1.42

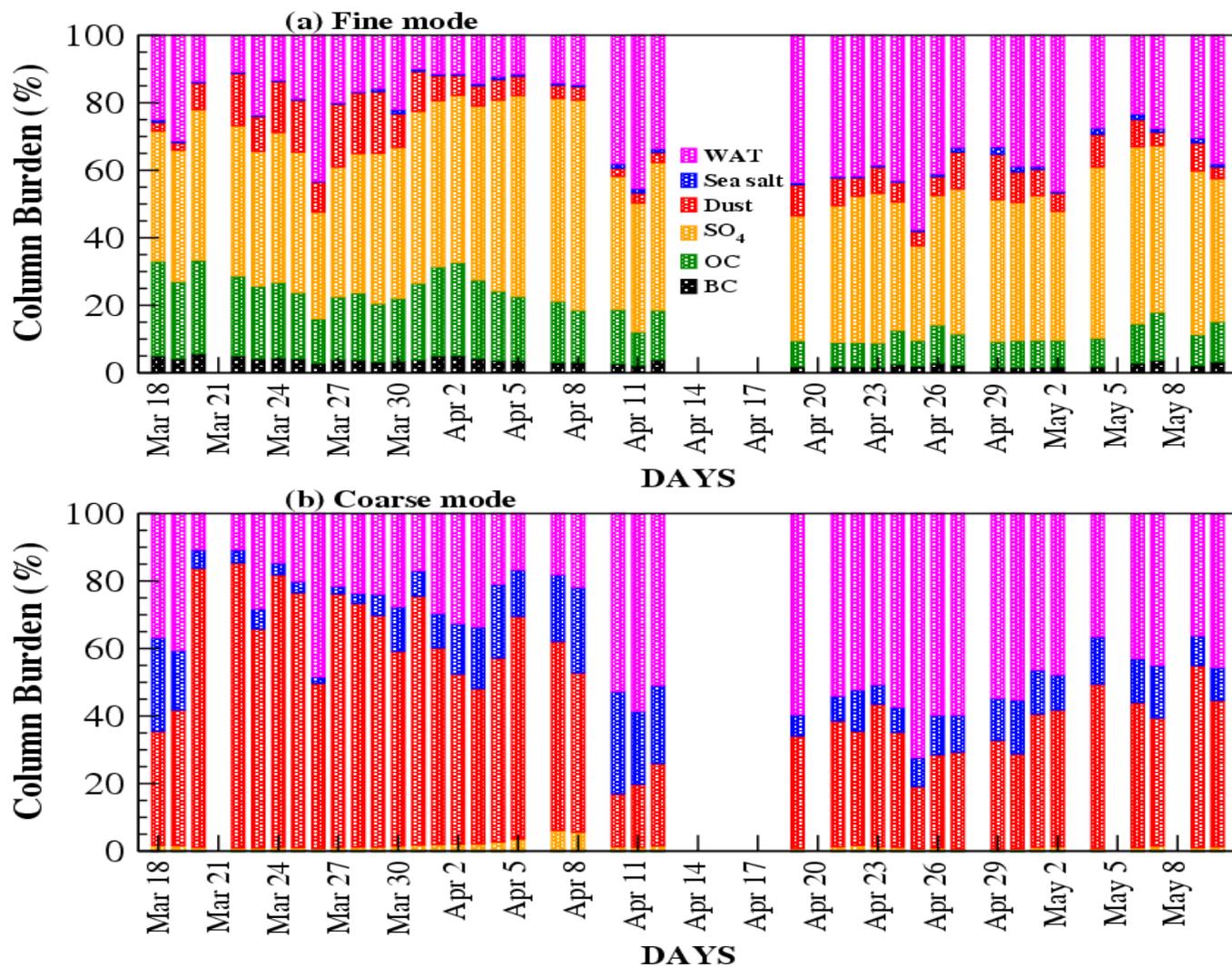


Fig. S1. The chemical composition of the simulated fine and coarse mode column burden during the ICARB cruise period.

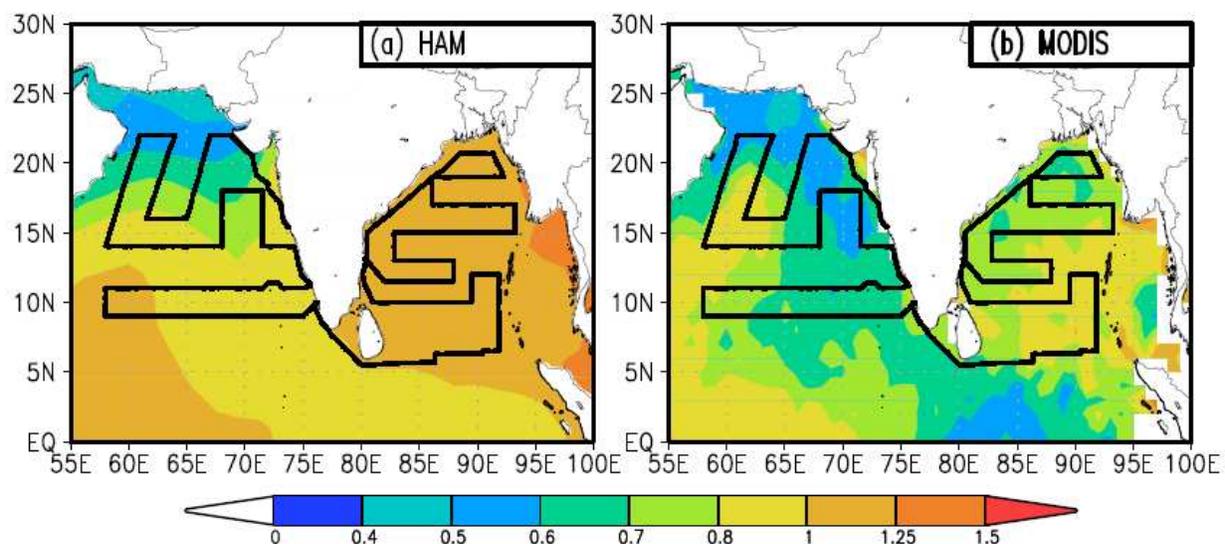


Fig. S2. Comparison of the spatial distribution of the simulated Ångström exponent (550 nm/825 nm) against MODIS derived Ångström exponent (550 nm/865 nm) during the ICARB cruise period.

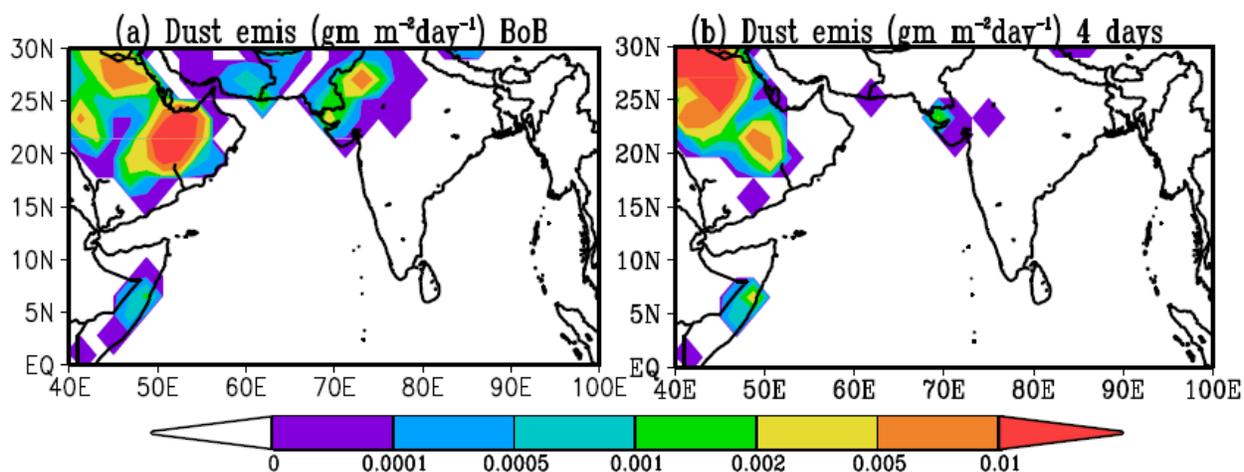


Fig. S3. Comparison of modelled dust emissions ($\text{gm m}^{-2} \text{day}^{-1}$) for the entire BoB periods (18 March – 11 April; a & c) and for the average of 4 days where ECHAM5.5-HAM failed to capture large values of coarse-mode AOD (18th March, 19th March, 1st April and 2nd April, b & d).

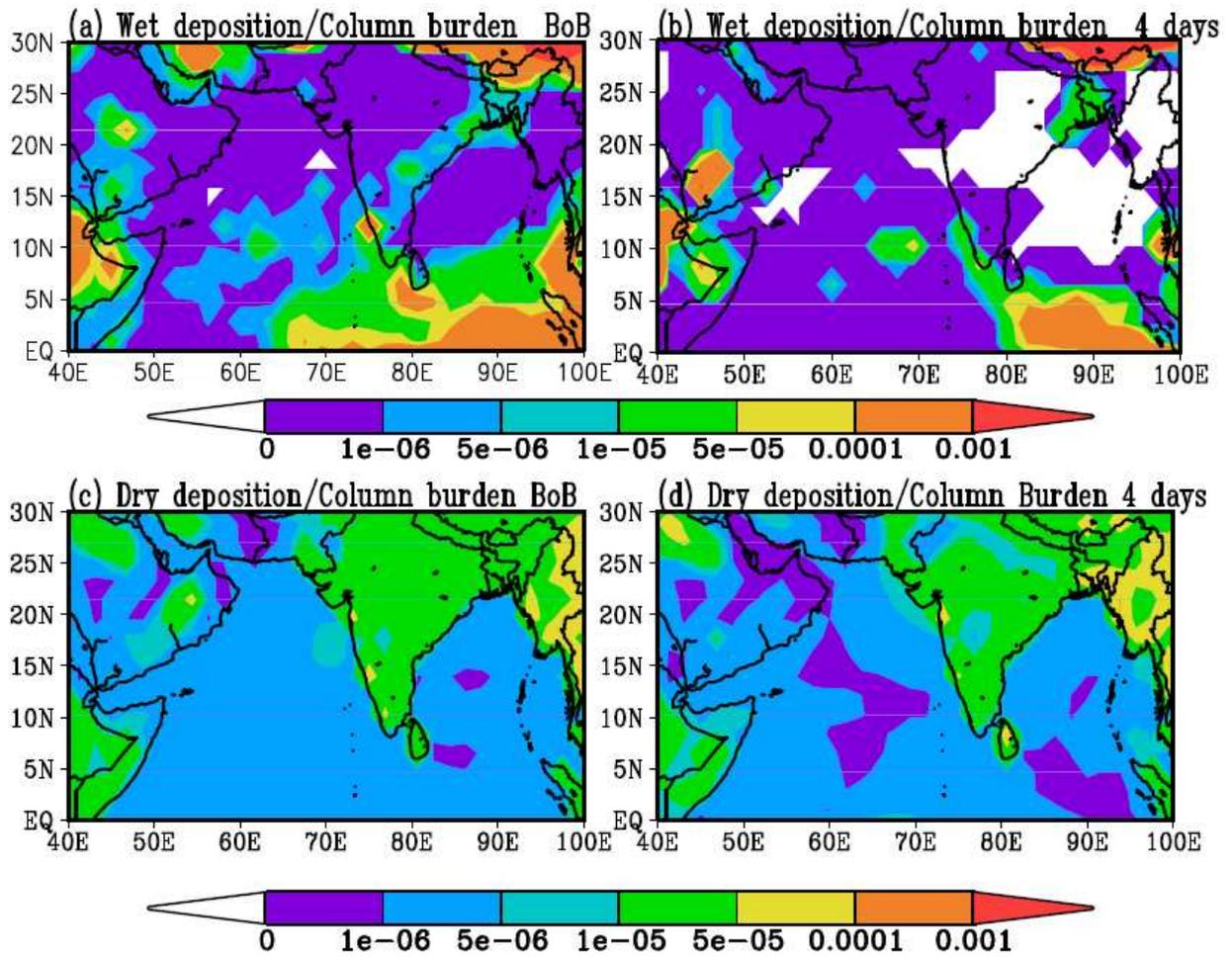


Fig. S4. Comparison of modelled normalised wet and dry deposition flux (deposition flux/column burden) for the entire BoB periods (18 March – 11 April; a & c) and for the average of 4 days where ECHAM5.5-HAM failed to capture large values of coarse-mode AOD (18th March, 19th March, 1st April and 2nd April, b & d).

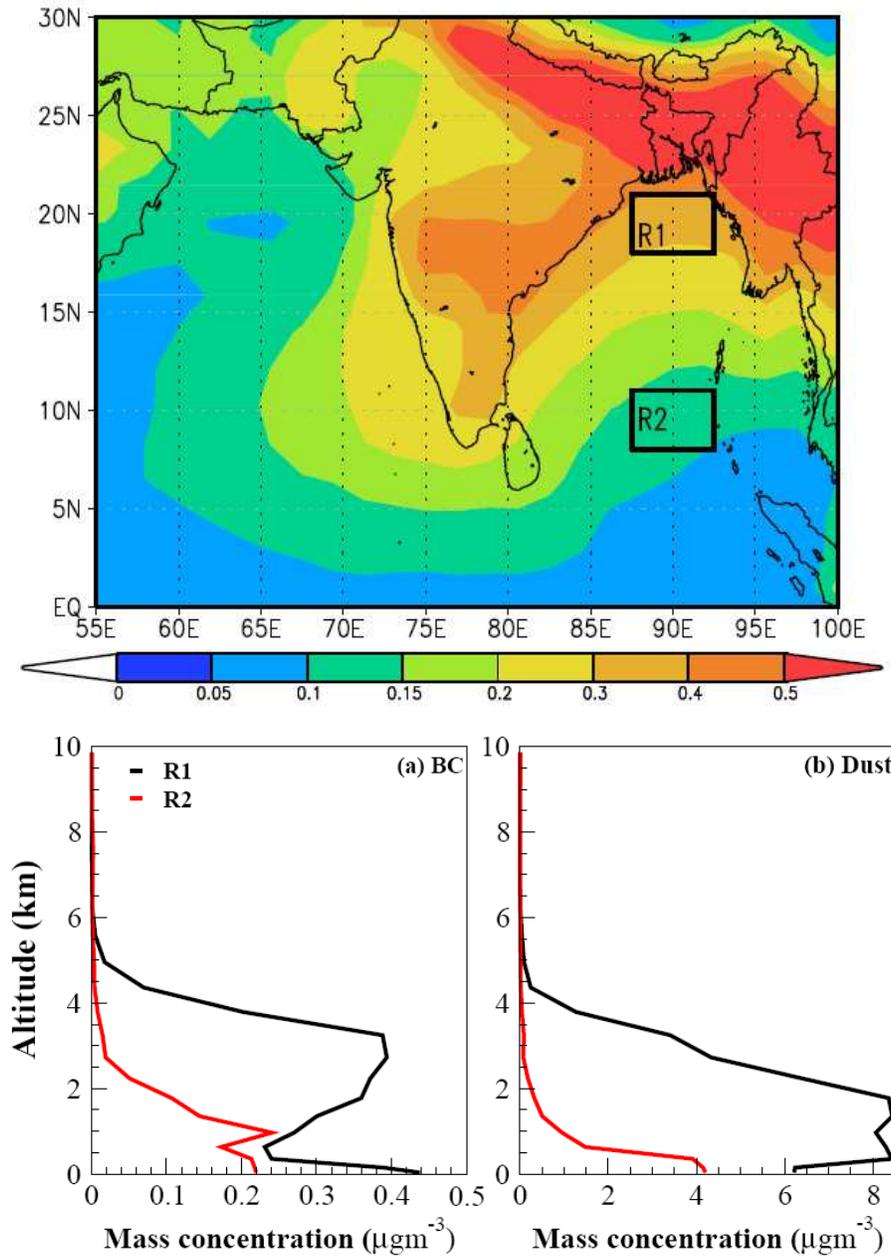


Fig. S5. The spatial distribution solar heating rate (K/day) and the vertical profile mean BC mass concentration over the northern BoB (R1) and southern BoB region during the ICARB period.