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A new statistical approach to improve the satellite-based estimation of the radiative forcing by aerosol–cloud interactions

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Table S1: The seasonal and regional variation of fitting parameters α1-α6 obtained from both multilinear and nonlinear fitting approaches.

Area	Season	Nonlinear fit						Multilinear regression fit					
		α1	**α2**	**α3**	**α4**	**α5**	**α6**	**α1**	**α2**	**α3**	**α4**	**α5**	**α6**
Arabian Sea	Winter	0.158	0.023	0.376	0.232	0.199	0.943	0.098	0.101	0.002	0.005	1.000	0.303
	Pre-Monsoon	0.136	0.021	-0.046	0.205	0.201	0.888	0.089	0.067	0.008	0.010	1.000	0.416
	Monsoon	0.109	0.029	-0.046	0.395	0.201	0.888	0.092	0.049	0.009	0.012	1.000	0.422
	Post-Monsoon	0.154	0.026	0.108	0.010	1.192	0.172	0.091	0.097	0.044	0.024	1.000	0.558
Bay of Bengal	Winter	0.158	0.024	-0.084	0.209	0.140	0.652	0.100	0.084	0.345	0.088	1.000	0.136
	Pre-Monsoon	0.127	0.012	-0.043	0.081	0.081	0.474	0.092	0.060	0.004	0.002	1.000	0.324
	Monsoon	0.126	0.011	-0.398	0.415	0.006	0.473	0.095	0.046	0.011	0.005	1.000	0.414
	Post-Monsoon	0.150	0.020	0.331	0.311	0.119	1.097	0.100	0.071	0.014	0.007	1.000	0.364
Central India	Winter	0.215	0.010	-0.278	0.685	0.105	1.236	0.187	0.026	0.079	0.084	1.000	0.269
	Pre-Monsoon	0.183	0.003	-0.259	0.662	0.099	1.339	0.171	0.018	0.020	0.009	1.000	0.278
	Monsoon	0.187	0.007	0.322	0.390	0.098	0.555	0.168	0.024	0.002	0.005	1.000	0.319
	Post-Monsoon	0.210	0.016	-0.291	0.684	0.105	1.444	0.174	0.042	0.000	0.005	1.000	0.253

Table S2: Mean seasonal variation of anthropogenic and natural fraction of aerosol optical depth over all three regions estimated using methodology by *Kim et al., (2007)*.

	Arabian Sea (AS)		Bay of Bengal (BOB)		Central India (CI)	
	Anthro*	Nat*	Anthro	Nat	Anthro	Nat
Winter	0.146±0.029	0.112±0.022	0.16±0.032	0.142±0.028	0.376±0.055	0.279±0.056
Pre-Monsoon	0.305±0.061	0.347±0.069	0.309±0.062	0.327±0.065	0.407±0.081	0.46±0.092
Monsoon	0.113±0.023	0.346±0.069	0.16±0.032	0.276±0.055	0.435±0.087	0.655±0.101
Post-Monsoon	0.309±0.062	0.298±0.059	0.305±0.061	0.234±0.046	0.627±0.095	0.505±0.089

*Anthro represents anthropogenic and Nat represents natural

Table S3(a): The statistics calculated for a different plausible values of surface albedo over land.

Calculated (MODIS) Vs. Simulated (SBDART)	Land type	Land Surface Albedo	Nonlinear fit		Multilinear fit	
			R	RMSE	R	RMSE
Planetary albedo	Present study	0.15	0.74	0.017	0.65	0.065
	Forest	0.14	0.72	0.019	0.63	0.067
	Cropland	0.20	0.69	0.023	0.59	0.071
	Grass land	0.21	0.67	0.025	0.56	0.074
	Barren land	0.38	0.62	0.033	0.50	0.079
First Indirect Forcing by Anthropogenic fraction	Present study	0.15	0.83	0.037	0.62	0.048
	Forest	0.14	0.73	0.039	0.55	0.050
	Cropland	0.20	0.69	0.043	0.50	0.055
	Grass land	0.21	0.66	0.044	0.49	0.057
	Barren land	0.38	0.60	0.050	0.45	0.062
First Indirect Forcing by Natural fraction	Present study	0.15	0.77	0.042	0.54	0.049
	Forest	0.14	0.71	0.043	0.50	0.050
	Cropland	0.20	0.66	0.045	0.48	0.051
	Grass land	0.21	0.62	0.047	0.47	0.053
	Barren land	0.38	0.59	0.052	0.45	0.060

Table S3(b): The statistics calculated for the different plausible values of surface albedo over ocean.

Calculated (MODIS) Vs. Simulated (SBDART)	Ocean Surface Albedo	Nonlinear fit				Multilinear fit			
		R		RMSE		R		RMSE	
		AS	BOB	AS	BOB	AS	BOB	AS	BOB
Planetary albedo	Present study	0.79	0.76	0.010	0.019	0.70	0.67	0.042	0.049
	0.13	0.69	0.67	0.021	0.029	0.61	0.59	0.059	0.059
	0.11	0.75	0.73	0.013	0.022	0.66	0.63	0.047	0.052
	0.08	0.71	0.7	0.017	0.026	0.63	0.61	0.053	0.055
	0.06	0.68	0.65	0.023	0.03	0.59	0.58	0.056	0.061
First Indirect Forcing by Anthropogenic fraction	Present study	0.89	0.87	0.035	0.037	0.68	0.68	0.047	0.048
	0.13	0.83	0.8	0.041	0.043	0.60	0.59	0.060	0.061
	0.11	0.87	0.85	0.037	0.04	0.64	0.64	0.055	0.054
	0.08	0.81	0.83	0.039	0.041	0.60	0.61	0.059	0.057
	0.06	0.78	0.78	0.042	0.045	0.58	0.56	0.065	0.067
First Indirect Forcing by Natural fraction	Present study	0.86	0.85	0.039	0.038	0.61	0.65	0.049	0.051
	0.13	0.74	0.76	0.046	0.047	0.51	0.57	0.055	0.060
	0.11	0.83	0.83	0.040	0.041	0.58	0.62	0.051	0.053
	0.08	0.80	0.79	0.042	0.044	0.54	0.60	0.054	0.057
	0.06	0.72	0.75	0.049	0.051	0.50	0.55	0.058	0.061

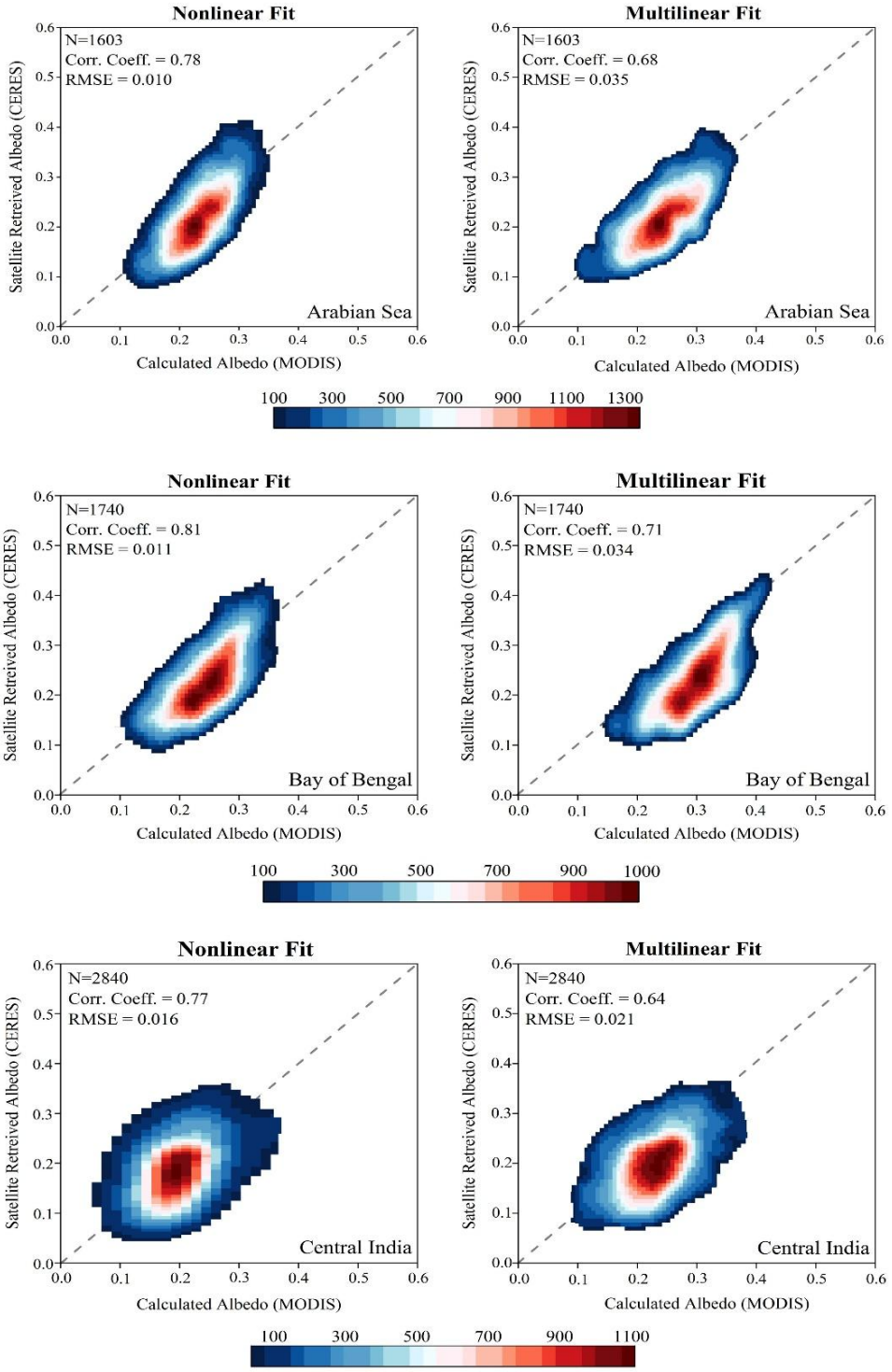

Figure S1: Scatter density plots CERES-retrieved α vs. calculated α for all three regions.