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A global simulation of brown carbon: implications for photochemistry and direct radiative effect

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Table S1. BC emission ratios between 2007 and 2000 for each region and month. Regions used in this table are defined by the ACCMIP inventory.

Region	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Canada	0.60	1.04	0.86	0.79	0.59	0.43	0.24	0.12	0.24	0.41	0.64	0.83	1.01
USA	0.56	0.97	0.80	0.74	0.55	0.40	0.22	0.11	0.23	0.39	0.60	0.78	0.94
Mexico	0.95	1.63	1.35	1.25	0.94	0.69	0.39	0.22	0.40	0.66	1.02	1.30	1.58
Rest_Central_America	1.02	1.61	1.35	1.28	1.01	0.79	0.52	0.36	0.52	0.76	1.08	1.33	1.58
Brazil	1.01	0.39	0.51	0.79	1.04	1.36	1.50	1.57	1.41	1.22	1.04	0.78	0.57
Venezuela	1.02	1.38	1.19	1.19	1.01	0.90	0.71	0.59	0.69	0.85	1.07	1.23	1.39
Argentina	1.01	0.21	0.38	0.72	1.05	1.44	1.64	1.75	1.54	1.29	1.03	0.70	0.41
Rest_South_America	1.01	0.61	0.66	0.88	1.03	1.26	1.32	1.35	1.25	1.14	1.04	0.88	0.75
Nothren_Africa	1.09	1.89	1.56	1.45	1.08	0.78	0.43	0.22	0.44	0.75	1.17	1.51	1.84
Western_Africa	1.39	1.64	1.46	1.53	1.39	1.34	1.16	1.04	1.12	1.25	1.46	1.57	1.70
Eastern_Africa	1.16	1.27	1.15	1.24	1.16	1.16	1.04	0.96	1.00	1.08	1.21	1.27	1.33
Rest_Southern_Africa	1.21	0.61	0.71	1.00	1.23	1.55	1.67	1.73	1.58	1.40	1.24	0.99	0.79
South_Africa	2.04	0.41	0.77	1.45	2.10	2.90	3.30	3.52	3.10	2.60	2.07	1.40	0.83
France	0.87	1.50	1.24	1.15	0.85	0.62	0.34	0.18	0.35	0.60	0.93	1.20	1.46
Germany	0.87	1.51	1.24	1.15	0.86	0.62	0.34	0.18	0.35	0.60	0.93	1.20	1.46
Italy	0.86	1.48	1.22	1.13	0.84	0.61	0.34	0.17	0.35	0.59	0.91	1.18	1.44
United_Kingdom	0.85	1.48	1.22	1.13	0.84	0.61	0.34	0.17	0.35	0.59	0.91	1.18	1.43
Rest_Western_Europe	0.89	1.54	1.27	1.18	0.88	0.63	0.35	0.18	0.36	0.61	0.95	1.23	1.49
Rest_Central_Europe	0.97	1.67	1.38	1.28	0.95	0.69	0.38	0.20	0.39	0.67	1.03	1.33	1.62

Baltic_States	0.72	1.24	1.02	0.95	0.71	0.51	0.28	0.15	0.29	0.49	0.77	0.99	1.21
Turkey	0.85	1.47	1.21	1.12	0.84	0.60	0.33	0.17	0.35	0.59	0.91	1.17	1.43
Ukraine	0.60	1.04	0.86	0.80	0.59	0.43	0.24	0.12	0.25	0.42	0.64	0.83	1.01
Asia-Stan	0.64	1.11	0.92	0.85	0.63	0.46	0.25	0.13	0.26	0.44	0.69	0.89	1.08
Russia	0.69	1.20	0.99	0.92	0.68	0.49	0.27	0.14	0.28	0.48	0.74	0.96	1.16
Middle_East	3.41	5.87	4.85	4.50	3.36	2.44	1.36	0.72	1.41	2.36	3.64	4.69	5.70
zIndia	1.10	1.85	1.53	1.43	1.09	0.81	0.48	0.28	0.49	0.78	1.17	1.49	1.80
Rest_South_Asia	1.11	1.87	1.55	1.45	1.09	0.81	0.48	0.28	0.49	0.78	1.18	1.51	1.82
South_Korea	0.97	1.67	1.38	1.28	0.95	0.69	0.38	0.20	0.39	0.67	1.03	1.33	1.62
North_Korea	1.06	1.84	1.52	1.41	1.05	0.76	0.42	0.22	0.43	0.73	1.14	1.47	1.79
China	1.12	1.94	1.60	1.48	1.10	0.80	0.44	0.23	0.46	0.77	1.20	1.55	1.88
Taiwan	1.22	2.10	1.74	1.61	1.20	0.87	0.48	0.25	0.49	0.84	1.30	1.68	2.04
Thailand	1.07	1.64	1.38	1.33	1.06	0.86	0.59	0.42	0.59	0.82	1.13	1.38	1.62
Rest_Southeastern_Asia	1.03	1.60	1.35	1.29	1.02	0.82	0.56	0.40	0.56	0.79	1.10	1.34	1.58
Indonesia	0.97	0.75	0.75	0.91	0.98	1.12	1.12	1.12	1.07	1.02	1.00	0.91	0.85
Japan	0.54	0.93	0.76	0.71	0.53	0.38	0.21	0.11	0.22	0.37	0.57	0.74	0.90
Australia	0.71	0.15	0.27	0.51	0.74	1.01	1.15	1.23	1.09	0.91	0.73	0.49	0.29
New_Zealand	0.67	0.14	0.26	0.48	0.70	0.96	1.09	1.16	1.03	0.86	0.68	0.46	0.27
Rest_Oceania	1.06	0.40	0.53	0.83	1.09	1.43	1.58	1.66	1.49	1.29	1.09	0.81	0.58

Table S2. Same as Table S1 but for OC emission ratios.

Region	Annual	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Canada	0.86	1.48	1.22	1.13	0.84	0.61	0.34	0.17	0.35	0.59	0.91	1.18	1.44
USA	0.82	1.41	1.16	1.08	0.80	0.58	0.32	0.17	0.33	0.56	0.87	1.12	1.37
Mexico	1.14	1.94	1.61	1.49	1.12	0.82	0.47	0.26	0.48	0.79	1.21	1.56	1.89
Rest_Central_America	1.05	1.63	1.37	1.31	1.04	0.84	0.57	0.40	0.57	0.80	1.11	1.36	1.60
Brazil	1.12	0.43	0.56	0.87	1.15	1.50	1.66	1.74	1.56	1.35	1.14	0.86	0.62
Venezuela	1.63	2.21	1.91	1.91	1.63	1.45	1.14	0.95	1.11	1.36	1.72	1.97	2.22
Argentina	1.20	0.24	0.46	0.86	1.24	1.71	1.95	2.08	1.83	1.54	1.22	0.83	0.49
Rest_South_America	1.06	0.64	0.69	0.92	1.08	1.31	1.37	1.40	1.30	1.19	1.09	0.92	0.78
Nothren_Africa	1.09	1.89	1.56	1.45	1.08	0.78	0.43	0.22	0.45	0.75	1.17	1.51	1.84
Western_Africa	1.28	1.51	1.34	1.41	1.29	1.25	1.08	0.97	1.04	1.16	1.35	1.45	1.56
Eastern_Africa	1.10	1.23	1.11	1.19	1.11	1.10	0.98	0.91	0.95	1.02	1.15	1.21	1.28
Rest_Southern_Africa	1.15	0.58	0.68	0.96	1.18	1.47	1.58	1.64	1.50	1.33	1.18	0.95	0.76
South_Africa	2.38	0.49	0.90	1.69	2.46	3.39	3.86	4.12	3.63	3.04	2.42	1.64	0.97
France	0.76	1.31	1.08	1.00	0.75	0.54	0.30	0.15	0.31	0.52	0.81	1.04	1.27
Germany	0.75	1.30	1.07	0.99	0.74	0.54	0.30	0.15	0.31	0.52	0.80	1.04	1.26
Italy	0.75	1.29	1.07	0.99	0.73	0.53	0.29	0.15	0.30	0.51	0.80	1.03	1.25
United_Kingdom	0.73	1.26	1.04	0.96	0.72	0.52	0.29	0.15	0.30	0.50	0.78	1.00	1.22
Rest_Western_Europe	0.80	1.39	1.15	1.06	0.79	0.57	0.32	0.16	0.33	0.55	0.86	1.11	1.35
Rest_Central_Europe	0.83	1.43	1.18	1.10	0.82	0.59	0.33	0.17	0.34	0.57	0.89	1.14	1.39
Baltic_States	0.81	1.39	1.15	1.07	0.79	0.57	0.32	0.16	0.33	0.56	0.86	1.11	1.35

Turkey	0.79	1.37	1.13	1.05	0.78	0.56	0.31	0.16	0.32	0.55	0.85	1.09	1.33
Ukraine	0.75	1.30	1.07	0.99	0.74	0.53	0.29	0.15	0.30	0.52	0.80	1.03	1.26
Asia-Stan	0.76	1.32	1.09	1.01	0.75	0.54	0.30	0.16	0.31	0.52	0.81	1.05	1.28
Russia	0.80	1.38	1.14	1.06	0.79	0.57	0.31	0.16	0.32	0.55	0.85	1.10	1.34
Middle_East	3.39	5.85	4.83	4.48	3.34	2.43	1.36	0.72	1.40	2.35	3.63	4.67	5.68
India	1.11	1.86	1.54	1.44	1.09	0.82	0.48	0.28	0.49	0.79	1.18	1.50	1.81
Rest_South_Asia	1.11	1.87	1.55	1.44	1.09	0.81	0.47	0.27	0.48	0.78	1.18	1.51	1.82
South_Korea	1.24	2.14	1.77	1.64	1.22	0.88	0.49	0.25	0.50	0.85	1.32	1.71	2.08
North_Korea	0.99	1.71	1.41	1.31	0.97	0.70	0.39	0.20	0.40	0.68	1.06	1.36	1.66
China	0.99	1.72	1.42	1.31	0.98	0.71	0.39	0.20	0.40	0.68	1.06	1.37	1.66
Taiwan	7.20	12.46	10.29	9.53	7.09	5.13	2.83	1.47	2.93	4.96	7.70	9.93	12.10
Thailand	1.21	1.86	1.57	1.50	1.20	0.97	0.66	0.48	0.66	0.92	1.28	1.56	1.83
Rest_Southeastern_Asia	1.02	1.58	1.33	1.27	1.01	0.81	0.55	0.39	0.55	0.77	1.08	1.32	1.56
Indonesia	1.00	0.77	0.77	0.94	1.01	1.15	1.16	1.15	1.10	1.05	1.03	0.94	0.88
Japan	0.53	0.92	0.76	0.70	0.52	0.38	0.21	0.11	0.22	0.37	0.57	0.73	0.89
Australia	0.79	0.17	0.30	0.57	0.82	1.12	1.28	1.36	1.20	1.01	0.80	0.55	0.33
New_Zealand	0.77	0.16	0.29	0.55	0.80	1.10	1.25	1.33	1.18	0.99	0.78	0.53	0.31
Rest_Oceania	1.36	0.53	0.69	1.07	1.40	1.82	2.01	2.10	1.89	1.64	1.39	1.05	0.76

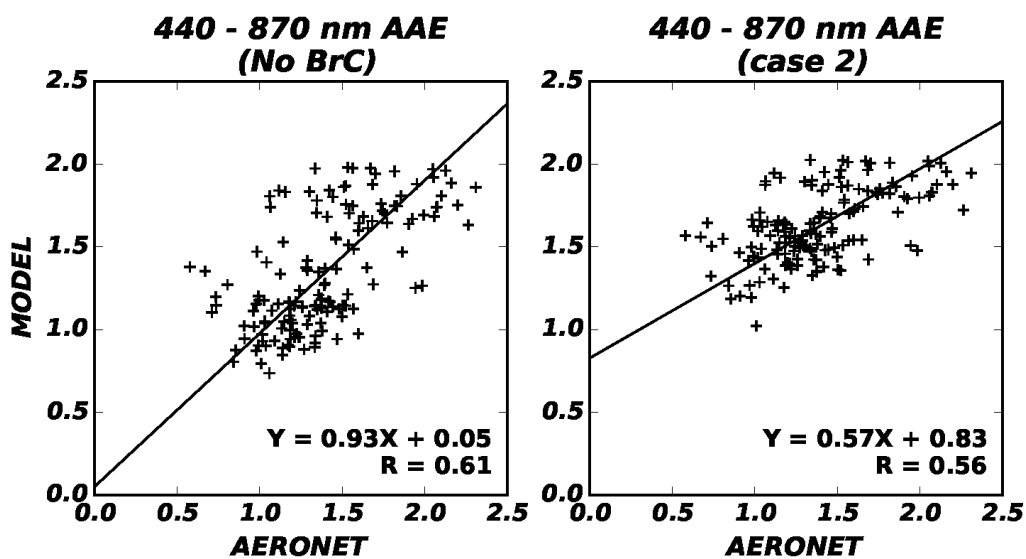


Figure S1. Scatterplots of simulated versus AERONET 440 – 870 nm AAE for the without BrC (left) and with BrC of case 2 (right).

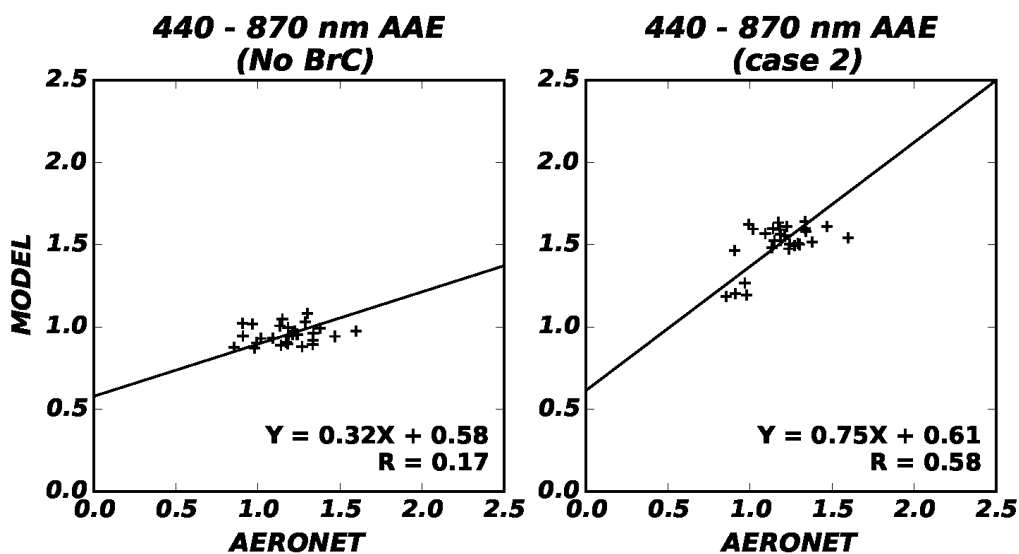


Figure S2. Same as Figure S1 above but for the regions where the BC emission ratios between our model and top-down estimates from Cohen and Wang (2014) are less than 2.

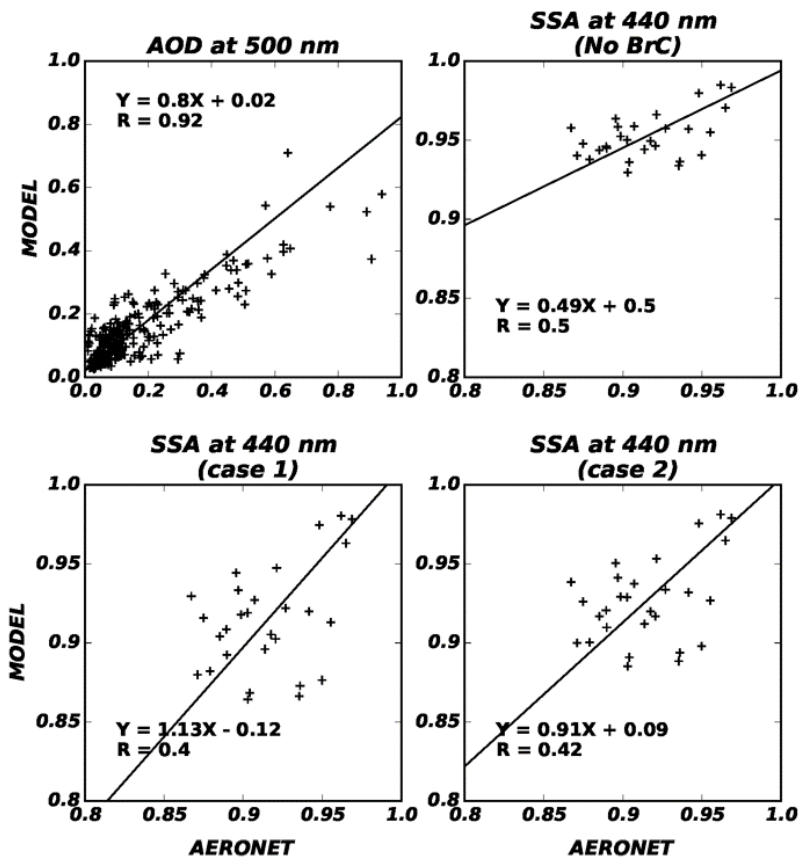


Figure S3. Same as Figure 5 but for the regions where the BC emission ratios between our model and top-down estimates from Cohen and Wang (2014) are less than 2.

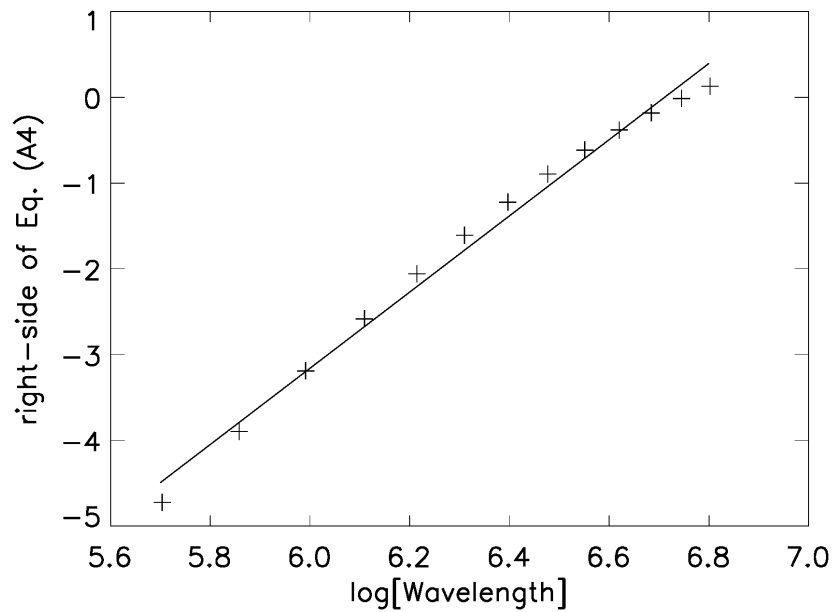


Figure S4. Linear regression fitting of Eq. (A4) when $F = 4.0$. X-axis is logarithm of wavelength and Y-axis is right side of Eq. (A4).