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Supplement of

Parameterization of single-scattering albedo (SSA) and absorption Ångström exponent (AAE) with EC / OC for aerosol emissions from biomass burning

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Table S1. Summary of fuels analyzed in this study and sampling locations.

Fuel	Stack Burn	Room Burn	Fuel type	Sampling location
African grass (tall)	0	1	Savana/Sourveld/Tall grass	Kruger National Park, R.S.A
African grass (short)	4	0	Savana/Sourveld/Short grass	Kruger National Park, R.S.A
Giant Cutgrass	0	1	Marsh	Jasper CO., SC
Wiregrass	0	1	Pine forest understory	Chesterfield Co., SC
Peat (CAN)	2	0	Boreal Peat	Ontario & Alberta, Canada
Peat (NC)	2	1	Temperate Peat	Green Swamp & Alligator River NWR, NC
Peat (IN)	2	0	Indonesian Peat	Central Kalimantan
Organic Hay	1	2	Crop residue	Fort Collins, CO
Organic Wheat Straw	1	2	Crop residue	Fort Collins, CO
Conv. Wheat Straw	0	1	Crop residue	Walla Walla CO., WA
Sugar Cane	0	1	Crop residue	Thibodaux, LA
Rice Straw	1	2	Crop residue	CA, China, Malaysia, Taiwan
Ponderosa Pine	5	4	Temperate Forest	Outskirts of Missoula, MT
Black Spruce	0	3	Boreal Forest	South of Fairbanks, AK
Chamise	1	1	Chaparral	San Jacinto Mountains, CA
Manzanita	1	1	Chaparral	San Jacinto Mountains, CA
Total	20	21		

Table S2. SSA, AAE, MCE, EC to OC ratio, and mass of fuel burned for all fuels measured during stack and room burns of this work. S and K represent the short and tall African grass and the number after S or K indicate the collection plots. The ± values after AAE are the one standard deviation of the slope and for EC/OC is the propagated error from EC and OC uncertainty. Errors for SSA are not shown because of space considerations, but are ± 7% of the quantity (1-SSA) for 532 and 660 nm, whereas ± 18% of the quantity (1-SSA) for 405 nm. For instance, the error for an SSA of 0.95 is ± 0.004 while the error at an SSA of 0.5 is ± 0.036 for 532 and 660 nm.

		SSA						
ID	**Fuel Type**	**405**	**532**	**660**	**AAE**	**MCE**	**EC/OC**	**Mass (g)**
9	Manzanita	0.79	0.8	0.79	2.05 ± 0.37	0.93	NA	270
18	Ponderosa Pine	0.88	0.95	0.95	3.69 ± 0.48	0.918	0.062 ± 0.018	202
20	Chamise	0.79	0.78	0.83	2.52 ± 1.58	0.913	NA	250
32	Rice Straw	0.71	0.86	0.91	4.16 ± 0.11	0.943	0.111 ± 0.028	430
61	NC Peat	0.94	1	1	10.43 ± 1.11	0.683	ND	NA
62	Ponderosa Pine	0.83	0.91	0.89	2.85 ± 0.48	0.946	0.084 ± 0.016	4029
70	Ponderosa Pine	0.93	0.99	0.99	5.95 ± 0.79	0.848	0.021 ± 0.018	274
81	African Grass S2	0.72	0.78	0.81	2.25 ± 0.33	0.97	NA	436
82	African Grass S1	0.53	0.55	0.54	1.92 ± 0.27	0.978	NA	416
84	Ponderosa Pine	0.82	0.87	0.87	2.05 ± 0.23	0.925	NA	3860
87	Organic Hay	0.81	0.91	0.94	3.46 ± 0.08	0.941	NA	412
91	African Grass S1	0.84	0.92	0.87	3.05 ± 0.39	0.97	NA	580
92	African Grass S2	0.58	0.62	0.58	1.72 ± 0.08	0.972	NA	455
95	Ponderosa Pine	0.78	0.85	0.85	2.48 ± 0.08	0.933	NA	150
96	Organic Wheat	0.73	0.76	0.87	3.43 ± 1.13	0.965	0.239 ± 0.054	154
112	Canadian Peat	0.97	1	1	5.11 ± 1.58	0.811	0.011 ± 0.012	NA
113	NC Peat	0.94	0.98	0.98	3.68 ± 0.47	0.692	0.008 ± 0.007	NA
114	Indonesian Peat	0.93	1	0.99	7.44 ± 3.27	0.744	0.005 ± 0.010	NA
124	Canadian Peat	0.91	0.99	0.99	6.78 ± 0.26	0.798	NA	NA
125	Indonesian Peat	0.93	0.98	0.99	8.03 ± 2.50	0.872	NA	NA
129	Ponderosa Pine brown/green	0.92	0.98	0.98	4.92 ± 0.46	0.839	0.068 ± 0.018	200
130	California Rice Straw	0.75	0.84	0.84	2.98 ± 0.20	0.961	0.192 ± 0.031	147
131	Black Spruce	0.87	0.93	0.93	2.98 ± 0.05	0.957	0.095 ± 0.018	639
132	Organic Wheat	0.82	0.88	0.88	2.58 ± 0.01	0.956	0.127 ± 0.024	638
133	Conventional Wheat	0.79	0.85	0.86	2.67 ± 0.03	0.956	0.150 ± 0.023	494
134	Black Spruce	0.87	0.93	0.93	2.97 ± 0.12	0.957	NA	1077
135	Chamise	0.58	0.61	0.54	1.95 ± 0.06	0.954	NA	667
136	Manzanita	0.52	0.56	0.46	1.68 ± 0.09	0.959	0.711 ± 0.060	1064
137	Black Spruce	0.82	0.9	0.84	2.32 ± 0.70	0.962	NA	1602
138	Organic Hay	0.85	0.94	0.92	3.25 ± 0.79	0.95	NA	592.2

140	Ponderosa Pine	0.88	0.94	0.91	2.21 ± 0.61	0.928	0.039 ± 0.012	1672
141	Wire Grass	0.36	0.38	0.35	0.85 ± 0.21	0.969	1.386 ± 0.113	540
142	Ponderosa Pine brown/green	0.79	0.83	0.82	2.19 ± 0.19	0.952	NA	1529
143	California Rice Straw	0.87	0.95	0.97	4.48 ± 0.05	0.939	NA	902
144	Ponderosa Pine	0.86	0.91	0.93	2.68 ± 0.21	0.927	0.037 ± 0.013	1731
145	African Grass K3	0.45	0.32	0.26	1.29 ± 0.48	0.975	1.206 ± 0.097	1078
146	Organic Hay	0.85	0.94	0.96	3.55 ± 0.08	0.937	0.027 ± 0.010	1335
147	Sugarcane	0.85	0.93	0.94	4.02 ± 0.13	0.934	0.052 ± 0.021	867
148	Giant Saw Grass	0.39	0.43	0.44	1.83 ± 0.34	0.925	2.148 ± 0.177	2000
149	Organic Wheat	0.77	0.83	0.83	2.58 ± 0.08	0.962	0.185 ± 0.029	393
150	North Carolina Peat	0.95	0.99	1	6.25 ± 0.63	0.803	NA	NA

Table S3. Same as Table 5 of main text, but for 405 nm.

Biomass Types	MCE[1]	BC/OC[1]	SSA_405 MCE Approach	SSA_405 EC/OC Approach	SSA_405 EC/(EC+OC) Approach	% Difference In Predicted SSA
Tropical Forest	0.95	0.11	0.74	0.81	0.83	-9 /-12
Savanna	0.96	0.14	0.63	0.78	0.80	-24 /-27
Crop Residue	0.94	0.33	0.77	0.69	0.70	10 /9
Pasture Maintenance	0.92	0.09	0.84	0.82	0.84	2 /0
Boreal Forest	0.92	-	0.84		-	-
Temperate Forest	0.95	-	0.73		-	-
Extra tropical Forest	0.93	0.07	0.83	0.85	0.86	-2 / -4
Peat land	0.9	0.03	0.90	0.89	0.89	1 /1
Chaparral	0.96	0.35	0.64	0.68	0.68	-6 /-6
Open Cooking	0.95	0.29	0.70	0.71	0.72	-1 /-3
Patsari Stoves	0.97	0.39	0.54	0.67	0.67	-24 /-24
Charcoal Making	0.86	0.03	0.93	0.89	0.89	4 /4
Charcoal Burning	0.93	0.77	0.82	0.55	0.53	33 /35
Dung Burning	0.89	0.29	0.90	0.7	0.71	22 /21
Garbage Burning	0.97	0.12	0.54	0.8	0.82	-48 /52

[1]Data from Akagi et al., 2011

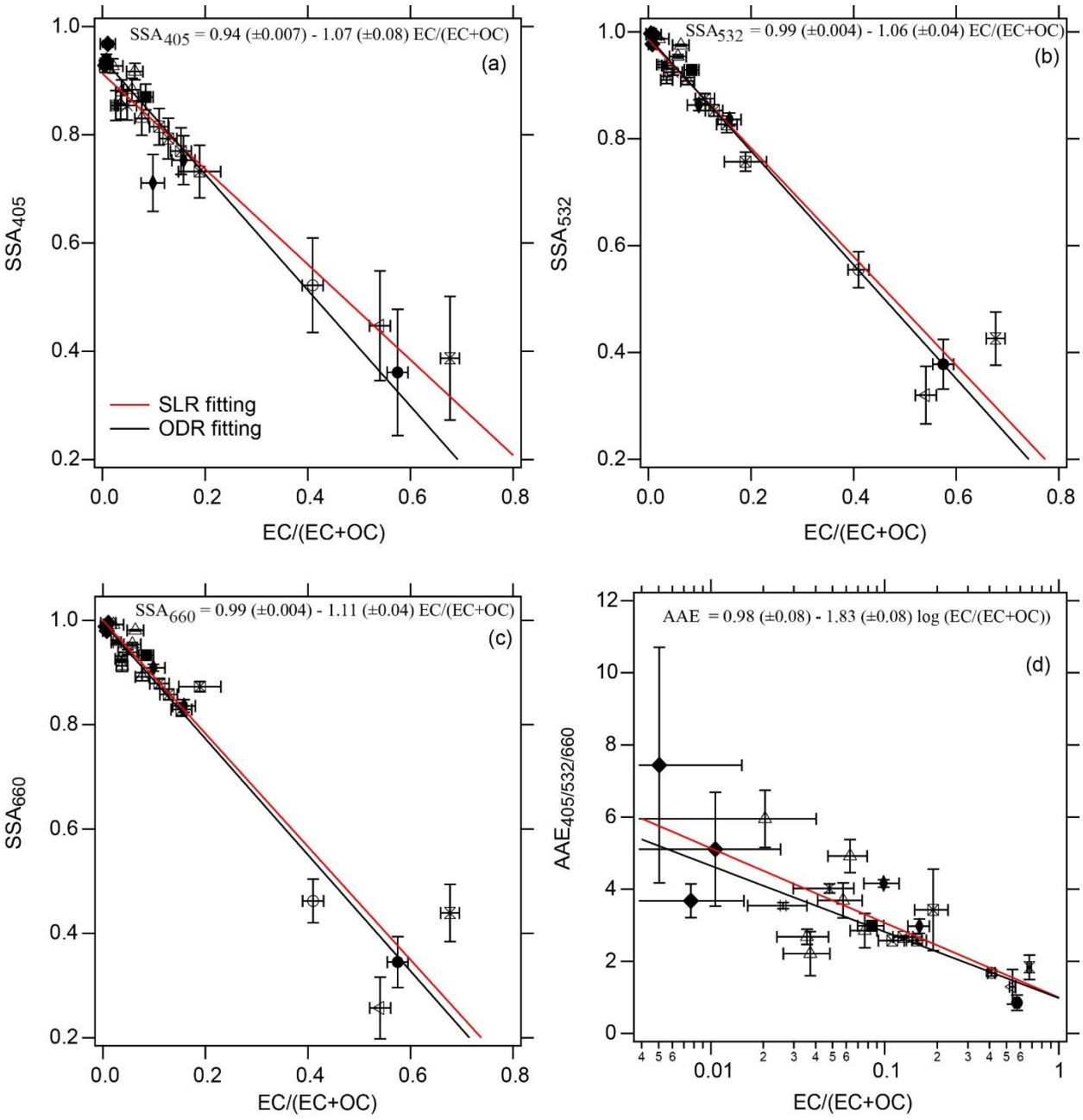

Figure S1. SSA at (a) 405 nm, (b) 532 nm, (c) 660 nm, and (d) AAE plotted as a function of EC/(EC+OC). Solid red lines are simple linear regression fitting lines and solid black lines are orthogonal distance regression fitting lines. Equations presented in each figures are the ODR best fit equations for respective SSA and AAE.

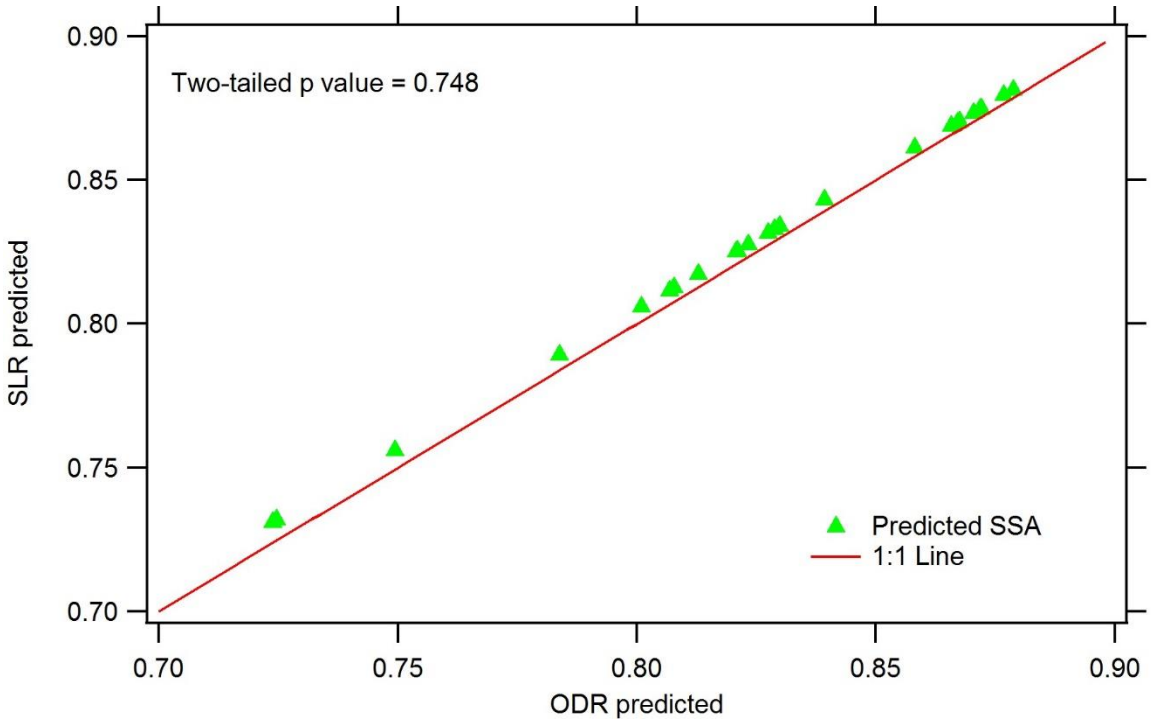

Figure S2. Comparison of predicted SSA values based on SLR and ODR models. Solid red line is one to one line.