Supporting Information

Brownness of Organics in Anthropogenic Biomass Burning Aerosols over South Asia

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S1. The equation used for the shaded area in Figure 2

$$w = 7.6 \times \exp(-12.4 \times k_{550}) \quad \text{…… (Saleh et al., 2018)}$$

$$w = \frac{0.2081}{10^{\left(\frac{k_{550}-0.03925}{0.016}\right)+0.0699}} \quad \text{…….. (Saleh et al., 2014)}$$

$$w = -2.64 \times \frac{k_{550}-0.004}{0.060} + 5.26 \quad \text{…….. (Luo et al., 2022)}$$

$$w = \frac{\ln(\frac{k_{550}}{0.0372})}{-0.468} \quad \text{……. (Lu et al., 2015)}$$

S2. The equation used for the shaded area in Figure 4a

$$k_{BrC,550} = 0.016 \times \log_{10}\left(\frac{BC}{OA}\right) + 0.03925 \quad \text{…… (Saleh et al., 2014)}$$

$$k_{BrC,550} = 0.060 \times \left(\frac{BC}{OA}\right) + 0.03925 \quad \text{……..…..(Luo et al., 2022)}$$

$$k_{BrC,550} = 0.0372 \times \exp(-0.468 \times w) \quad \text{…….(Lu et al., 2015)}$$

S3. The equation used for the shaded area in Figure 4b

$$w = \frac{0.2081}{\frac{BC}{OA}+0.0699} \quad \text{……(Saleh et al., 2014)}$$

$$w = -2.64 \times \frac{BC}{OA} + 5.26 \quad \text{…..……..(Luo et al., 2022)}$$

$$w = -0.607 \times \log_{10}\left(\frac{BC}{OA}\right) - 0.0251 \quad \text{…….(Lu et al., 2015)}$$

Table S1. Source-specific summary of BrC properties at 365 nm. The same fuel is used in the BRICK, hence sub category indicates the stage of burning. Values in the squared brackets show standard deviation.

Source	Fuel	$AAE_{365/550}$	$MAC_{BrC,365}$	$K_{BrC,365}$	$W_{365/550}$
AGRI	Banana	6.62 [0.15]	1.73 [0.05]	0.075 [0.002]	5.6 [0.1]
AGRI	Cotton	5.34 [1.72]	1.73 [1.08]	0.076 [0.047]	4.3 [1.7]
AGRI	Pigeon Pea	3.09 [1.14]	4.01 [0.91]	0.175 [0.040]	2.1 [1.1]
AGRI	Wheat	6.21 [2.32]	1.64 [2.08]	0.071 [0.091]	5.2 [2.3]
BRICK	Initial	5.10 [2.42]	1.51 [1.00]	0.066 [0.044]	4.1 [2.4]
BRICK	Final	6.26 [1.34]	1.30 [0.57]	0.057 [0.025]	5.3 [1.3]
BRICK	Mid	4.91 [1.40]	1.05 [0.28]	0.046 [0.012]	3.9 [1.4]
COOK	Crop Residue	5.52 [-]	1.99 [-]	0.087 [-]	4.5 [-]
COOK	Firewood	5.77 [0.32]	2.59 [0.47]	0.113 [0.020]	4.8 [0.3]
COOK	Mix	5.73 [0.90]	2.30 [0.67]	0.100 [0.029]	4.7 [0.9]
HEAT	Crop Residue	6.40 [1.56]	0.46 [0.26]	0.020 [0.011]	5.4 [1.6]
HEAT	Dung Cake	6.26 [0.66]	1.79 [0.57]	0.078 [0.025]	5.3 [0.7]
HEAT	Firewood	6.37 [0.70]	2.56 [0.56]	0.111 [0.024]	5.4 [0.7]
HEAT	Mix	6.60 [1.80]	2.12 [0.79]	0.092 [0.034]	5.6 [1.8]

Table S2. Source-specific summary of BrC properties at 550 nm. The same fuel is used in the BRICK, hence sub category indicates the stage of burning. Values in the squared brackets show standard deviation. Here OA is 1.8 times OC and EC is treated as BC.

Source	Fuel	$MAC_{BrC,550}$	$K_{BrC,550}$	BC to OA
AGRI	Banana	0.11 [0.004]	0.008 [0.001]	0.030 [0.013]
AGRI	Cotton	0.27 [0.30]	0.018 [0.020]	0.408 [0.170]
AGRI	Pigeon Pea	1.25 [0.81]	0.082 [0.053]	2.054 [0.294]
AGRI	Wheat	0.33 [0.53]	0.022 [0.035]	0.620 [0.139]
BRICK	Initial	0.33 [0.55]	0.022 [0.036]	0.142 [0.065]
BRICK	Final	0.10 [0.04]	0.006 [0.003]	0.083 [0.026]
BRICK	Mid	0.15 [0.07]	0.010 [0.005]	0.182 [0.062]
COOK	Crop Residue	0.21 [-]	0.014 [-]	0.324 [-]
COOK	Firewood	0.25 [0.07]	0.016 [0.005]	0.257 [0.125]
COOK	Mix	0.22 [0.05]	0.014 [0.003]	0.126 [0.054]
HEAT	Crop Residue	0.03 [0.001]	0.002 [0.00]	0.078 [0.014]
HEAT	Dung Cake	0.15 [0.08]	0.010 [0.005]	0.096 [0.072]
HEAT	Firewood	0.20 [0.09]	0.013 [0.006]	0.172 [0.074]
HEAT	Mix	0.14 [0.05]	0.009 [0.003]	0.350 [0.224]

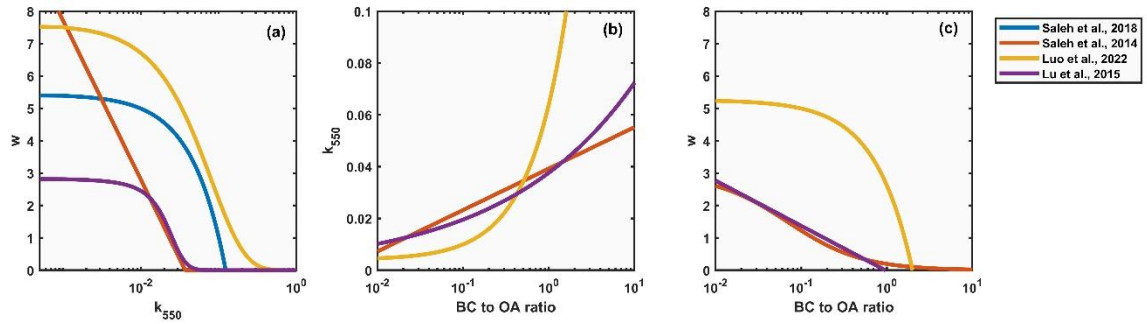

Figure S1. Line curves of the equations shown in the sections S1, S2, and S3.

Figure S2. The COALESCE field measurement campaign images.

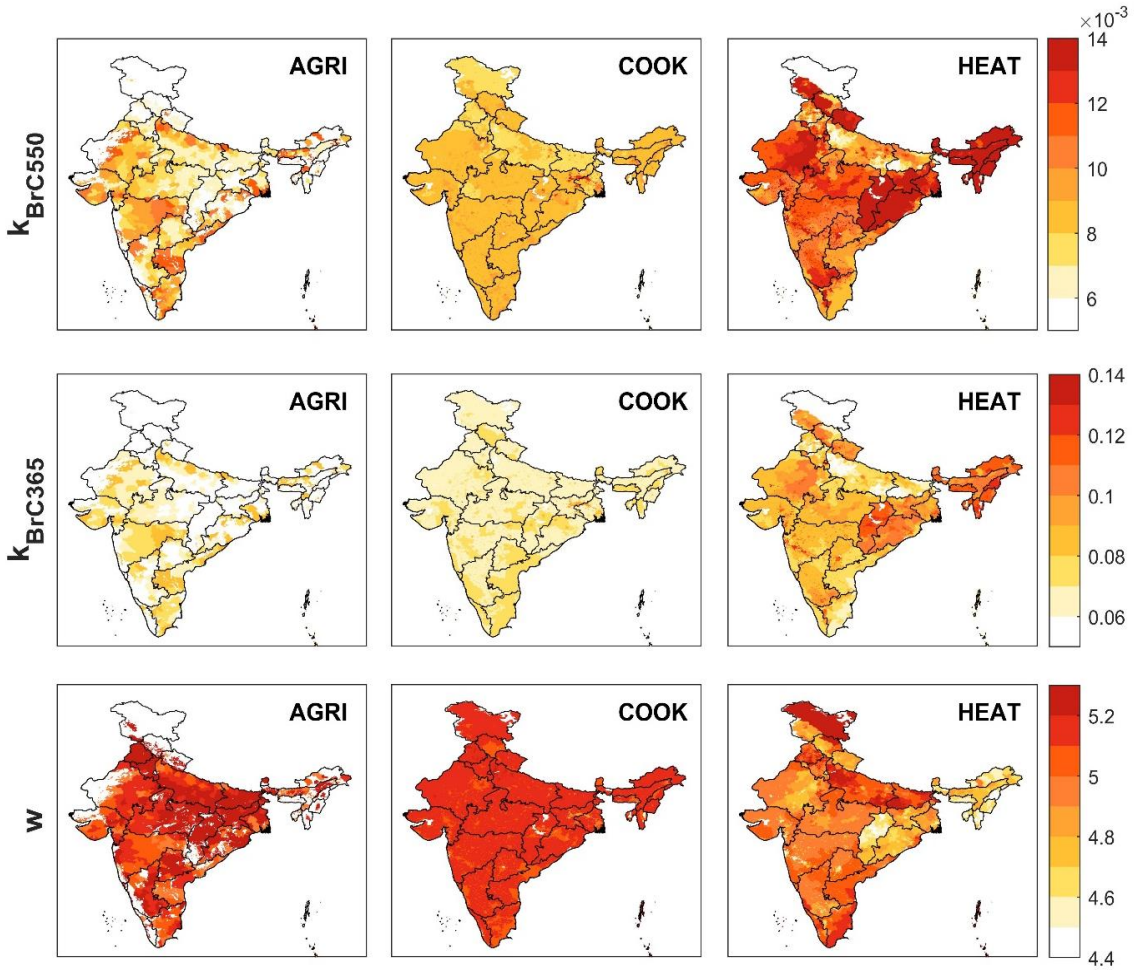

Figure S3. Source-specific $k_{BrC,550}$, $k_{BrC,365}$ and w over the Indian region.

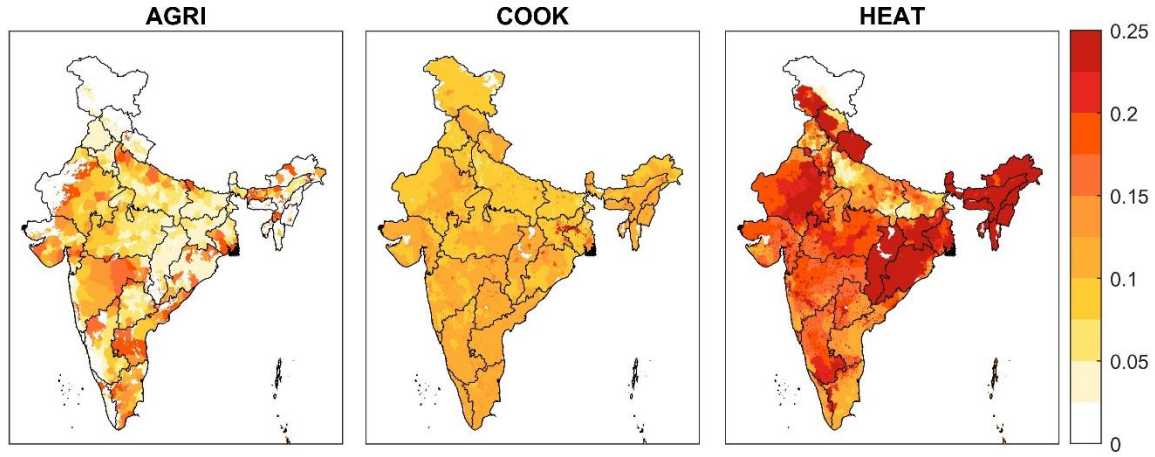

Figure S4. BC to OA used to estimate k_{BrC} and w.

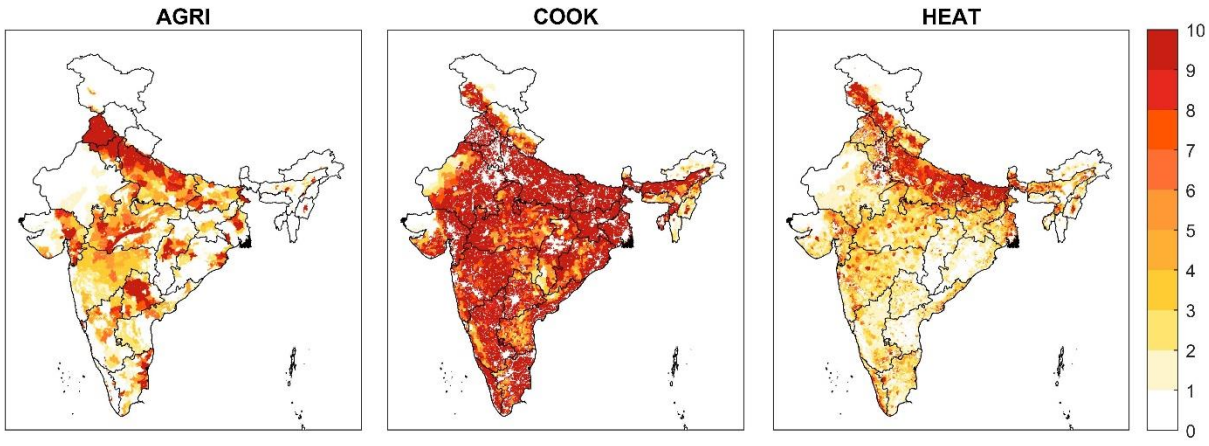

Figure S5. OC emissions from three major OC sources (Mg y^{-1} $pixel^{-1}$).

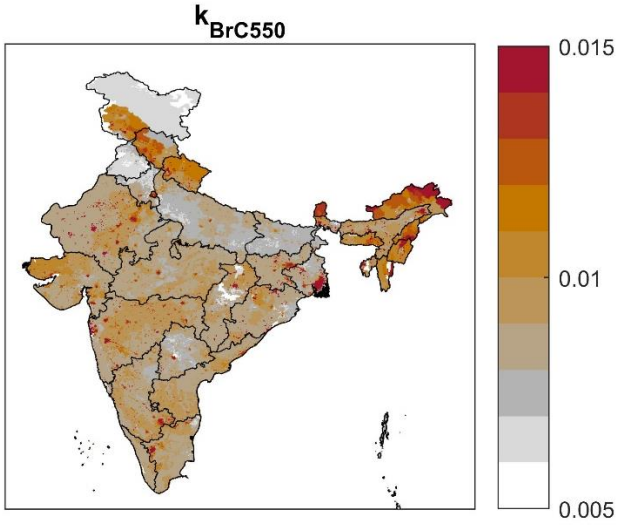

Figure S6. $k_{BrC,550}$ over India.

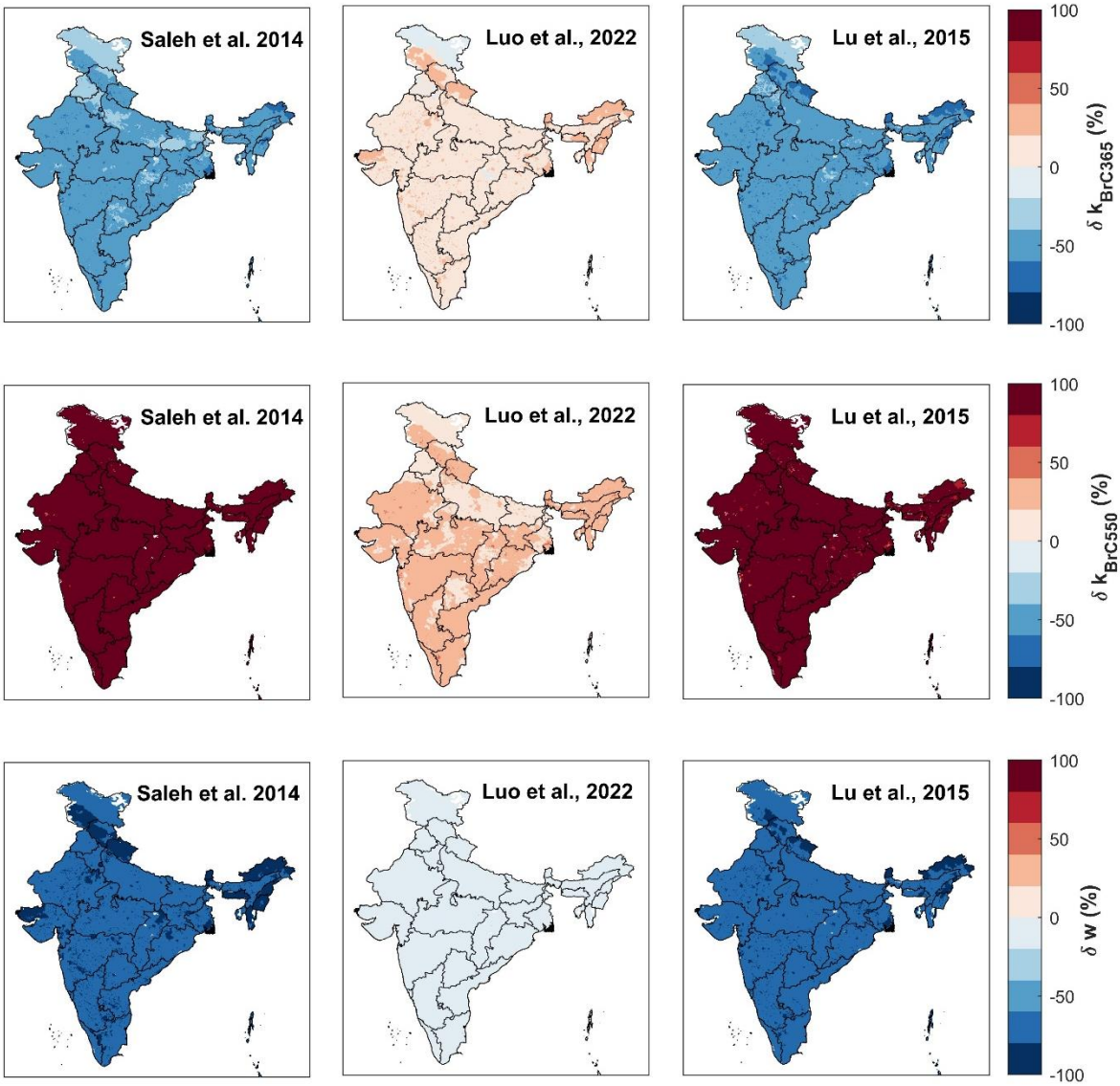

Figure S7. Percentage change in k_{BrC365}, k_{BrC550} and w estimated by Saleh et al., 2014, Lou et al., 2022 and Lu et al., 2015 with reference to this study.

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