Table S1. The regional averaged monthly mean AOD at 550nm in MODIS-Aqua (i.e., MOD-a) along with model biases (i.e., model minus MODIS-a) in seven model experiments, i.e., NOBB, GFED3.1, GFED4s, FINN1.5, GFAS1.2, FEER1.0, and QFED2.4, for September and April 2008, respectively.

Dataset	BONA	TENA	CEAM	NHSA	SHSA	EURO	MIDE	NHAF	SHAF	BOAS	CEAS	SEAS	EQAS	AUST	GLOB
	September 2008														
MOD-a	0.152	0.144	0.166	0.171	0.199	0.18	0.339	0.356	0.351	0.127	0.243	0.307	0.205	0.064	0.230
NOBB	0.016*	-0.004	-0.064	-0.112	-0.140	0.052	-0.017	-0.012	-0.301	0.053	0.025	-0.040	-0.112	-0.009	-0.044
GFED3.1	0.017	-0.002	-0.063	-0.103	-0.089	0.053	-0.017	-0.008	-0.197	0.058	0.028	-0.040	-0.104	0.001	-0.027
GFED4s	0.019	-0.001	-0.063	-0.104	-0.093	0.053	-0.016	-0.008	-0.226	0.057	0.028	-0.040	-0.106	-0.002	-0.030
FINN1.5	0.017	-0.003	-0.063	-0.098	-0.052	0.047	-0.018	-0.009	-0.225	0.055	0.023	-0.048	-0.094	-0.004	-0.027
GFAS1.2	0.018	-0.003	-0.063	-0.103	-0.091	0.047	-0.018	-0.009	-0.225	0.056	0.023	-0.048	-0.089	0.001	-0.031
FEER1.0	0.020	0.001	-0.062	-0.090	-0.034	0.057	-0.014	-0.001	-0.094	0.059	0.032	-0.038	-0.095	0.011	-0.008
QFED2.4	0.035	0.025	-0.056	-0.086	0.004	0.065	-0.008	0.003	-0.059	0.068	0.039	-0.037	-0.093	0.019	0.005
	April 2008														
MOD-a	0.245	0.156	0.184	0.292	0.118	0.185	0.394	0.422	0.11	0.417	0.42	0.379	0.178	0.048	0.263
NOBB	-0.087	-0.009	-0.085	-0.18	-0.068	0.054	-0.069	-0.071	-0.056	-0.166	-0.060	-0.112	-0.095	-0.001	-0.061
GFED3.1	-0.073	-0.002	-0.079	-0.176	-0.067	0.056	-0.068	-0.067	-0.054	-0.011	-0.016	-0.095	-0.094	0.001	-0.049
GFED4s	-0.075	-0.002	-0.078	-0.175	-0.067	0.057	-0.068	-0.068	-0.053	-0.034	-0.022	-0.102	-0.094	0	-0.051
FINN1.5	-0.078	0.001	-0.058	-0.167	-0.065	0.050	-0.066	-0.056	-0.050	-0.106	0.005	-0.019	-0.091	0	-0.040
GFAS1.2	-0.068	0.001	-0.072	-0.169	-0.066	0.048	-0.067	-0.062	-0.052	0.057	0.004	-0.092	-0.092	0.001	-0.044
FEER1.0	-0.067	0.010	-0.056	-0.154	-0.064	0.065	-0.064	-0.056	-0.050	0.032	0.018	-0.065	-0.092	0.002	-0.037
QFED2.4	-0.038	0.033	-0.029	-0.149	-0.061	0.075	-0.058	-0.048	-0.044	0.283	0.124	0.006	-0.090	0.007	-0.007

*Highlighted in red if positive bias.



Figure S1. The spatial distribution of annual black carbon biomass burning emissions for 2008 estimated by six biomass burning emission datasets. The fourteen selected AERONET sites are labeled as magenta dots.



BC biomass burning emission for 2008

Figure S2. The regional total annual black carbon biomass burning emissions for 2008 in six biomass burning emission datasets (units: Tg yr-¹). Relevant statistics for the six BB emission datasets in each region are also listed under the short name of this region on the top of the panel in blue, with the mean of six BB emission datasets in the first row. Three different methods to measure the dispersion of the six BB emission datasets are shown as well: one absolute method, i.e., the standard deviation (std) in the second row, and two relative methods, i.e., the ratio of max (maximum) to min (minimum) shown in the third row, and the coefficient of variation (cv), defined as the ratio of the std to the mean, in the fourth row. The rankings of the regions regarding the dispersion of the BB emissions datasets according to cv are shown in the fifth row (i.e., a ranking of 1 means that this region shows the least spread among the six BB emissions datasets, while a ranking of 14 indicates this region has the largest spread in the 14 regions).



Monthly variation of BC biomass burning emission for 2008

Figure S3. Monthly variation of black carbon biomass burning emissions for 2008 in six biomass burning emission datasets in 14 regions and the global (GLOB, highlighted with a black box). The total annual emission is listed in the right side of each panel.