Supplemental Material For: A Global Analysis of Wildfire Smoke Injection Height Derived from Space-based Multi-angle Imaging

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Table S1. Summary of equations used to calculate the fitting technique parameters[a].

Normal Distribution	Log-Normal Distribution
$\mu_z = \frac{\sum_{i=1}^{N} z_i}{N}$	$\mu_{lnz} = \frac{\sum_{i=1}^{N} ln(z_i)}{N}$
$\sigma_z = \sqrt{\frac{\sum_{i=1}^{N}(z_i-\mu_z)^2}{N-1}}$	$\sigma_{lnz} = \sqrt{\frac{\sum_{i=1}^{N}[ln(z_i)-\mu_z]^2}{N-1}}$
$\sigma_z^{'} = \sqrt{\sigma_z^2 + 500^2}$	$\mu_z = e^{\mu_{lnz} + \frac{\sigma_{lnz}^2}{2}}$
$\mu_z^{'} = \mu_z$	$\sigma_z = e^{\mu_{lnz} + \frac{\sigma_{lnz}^2}{2}} \sqrt{e^{\sigma_{lnz}^2} - 1}$
	$c = \sqrt{\frac{\sigma_z^2 + 500^2}{\sigma_z^2}}$
	$f = ln\left[\frac{1 + \frac{\sigma_z^2}{\mu_z^2}}{1 + c^2 \cdot \frac{\sigma_z^2}{\mu_z^2}}\right]$
	$\mu_{lnz}^{'} = \mu_{lnz} + \frac{f}{2}$
	$\sigma_{lnz}^{'} = \sqrt{\sigma_{lnz}^2 + f}$

[a] μ_z and $\sigma_z$are the mean and standard deviation (SD) of the MISR plume height retrieved points, μ_{lnz} and σ_{lnz} are the mean and SD of the natural logarithm of the MISR plume height retrieved points; the prime superscript (') denotes adjustment of the mean and SD to account for the $\pm$500 m MISR measurement uncertainty. Note that, in the case of lognormal distribution, this adjustment modifies the mean as well as the SD.

Table S2. Percentages (minimum and maximum) applied to the vertical distribution lowest level to account for small fires under detected by MISR.

	Forest	Savanna	Grassland	Cropland
North America	13–30	15–36	10–30	31–44
South America	29–43	22–33	20–34	24–38
Africa	35–50	16–44	11–25	22–31
Europa	36–50	28–47	27–49	31–48
Boreal Eurasia	23–50	8–46	28–39	36–46
South Asia	34–45	12–45	10–30	38–45
Australia	27–50	11–26	7–42	36–46

Table S3. Statistical summary of maximum plume heights and mean AOD per biome in the MISR dataset[a]

Biome	N	2008 Max Height (m agl)	2008 Mean AOD (unitless)	N	2009 Max Height (m agl)	2009 Mean AOD (unitless)	N	2010 Max Height (m agl)	2010 Mean AOD (unitless)
Everg Ndl Forest	143	1750 ± 1075	0.32 ± 0.29	48	1559 ± 762	0.16 ± 0.15	88	1786 ± 843	0.31 ± 0.25
Everg Brl Forest	547	1005 ± 475	0.27 ± 0.19	232	1099 ± 534	0.26 ± 0.20	478	1280 ± 700	0.52 ± 0.32
Decid Ndl Forest	372	1409 ± 636	0.40 ± 0.29	46	1589 ± 700	0.18 ± 0.12	20	1454 ± 518	0.19 ± 0.14
Decid Broadl Forest	124	1216 ± 751	0.21 ± 0.12	44	1571 ± 1022	0.17 ± 0.11	59	1299 ± 805	0.22 ± 0.20
Mixed Forest	578	1283 ± 648	0.30 ± 0.26	126	1295 ± 713	0.20 ± 0.18	213	1718 ± 1077	0.40 ± 0.35
Closed Shrub	9	1223 ± 373	0.11 ± 0.11	8	1920 ± 1007	0.15 ± 0.13	–	–	–
Open Shrub	461	1517 ± 771	0.29 ± 0.28	262	1524 ± 778	0.26 ± 0.20	319	1444 ± 865	0.29 ± 0.22
Woody Savanna	3762	1096 ± 519	0.28 ± 0.17	1846	1136 ± 580	0.27 ± 0.16	1123	1226 ± 648	0.25 ± 0.17
Savanna	2893	1243 ± 593	0.22 ± 0.16	1405	1282 ± 652	0.21 ± 0.14	1126	1410 ± 711	0.26 ± 0.20
Grassland	832	1365 ± 770	0.19 ± 0.17	236	1311 ± 736	0.18 ± 0.14	243	1529 ± 901	0.18 ± 0.13
Wetland	95	1006 ± 513	0.23 ± 0.18	47	1142 ± 468	0.24 ± 0.13	42	1212 ± 481	0.29 ± 0.22
Cropland	1761	1196 ± 605	0.28 ± 0.21	440	1118 ± 593	0.26 ± 0.18	420	1288 ± 862	0.21 ± 0.17

[a] Only included distributions with more than 5 observations. Reported the average$\pm$SD and number of observations

Table S4a. AOD-weighted percentages of fire smoke injection heights per fire region, main biomes and seasons, for North and South America. Note that percentages are above ground level.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
North America																
0–250	12.1	4.9	3.6	8.8	13.9	7.7	19.5	24.2	19.3	3.0	9.8	14.5	19.3	3.0	16.9	6.7
250–500	14.0	8.7	5.4	32.7	17.5	10.1	17.7	35.6	30.6	12.0	30.0	21.1	30.6	12.0	35.8	35.2
500–750	14.5	10.4	5.4	18.9	18.6	12.1	14.9	17.0	21.7	22.0	23.1	31.1	21.7	22.0	15.6	20.1
750–1000	12.0	10.4	5.3	8.6	15.2	13.1	10.4	7.8	11.6	21.7	10.8	11.7	11.6	21.7	9.2	13.4
1000–1250	8.6	10.5	5.6	5.0	11.9	13.0	9.5	6.0	7.5	16.4	8.6	10.9	7.5	16.4	11.5	7.2
1250–1500	7.8	8.9	7.5	4.4	10.4	8.6	7.2	3.0	4.1	9.3	7.0	6.2	4.1	9.3	5.7	6.4
1500–1750	5.4	6.7	8.8	4.1	5.2	6.9	5.8	2.0	2.1	6.1	4.4	1.7	2.1	6.1	2.8	4.2
1750–2000	3.4	5.4	9.2	4.3	3.3	6.4	4.6	1.7	1.2	3.7	2.4	1.5	1.2	3.7	1.3	1.3
2000–2050	2.7	4.4	7.4	4.3	1.9	7.9	2.6	1.1	0.7	2.3	2.1	0.1	0.7	2.3	0.5	1.1
2250–2500	2.2	3.9	6.1	1.9	0.9	8.8	1.9	0.4	0.5	1.5	0.8	0.2	0.5	1.5	0.4	1.1
2500-2750	1.8	3.0	4.5	0.6	0.4	3.4	2.3	0.8	0.3	0.8	0.5	0.3	0.3	0.8	0.3	0.8
2750–3000	2.2	2.5	2.5	2.4	0.3	0.9	1.6	0.3	0.1	0.6	0.3	0.5	0.1	0.6	0.0	0.6
3000–3250	2.2	2.4	2.5	0.6	0.2	0.5	0.8	0.1	0.1	0.3	0.1	0.2	0.1	0.3	0.0	0.8
3250–3500	2.1	2.2	2.3	0.9	0.1	0.3	0.3	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.0	0.1
3500–3749	2.0	2.2	2.3	2.5	0.1	0.1	0.2	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.2
3750–4000	1.8	2.2	3.0	0.0	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
4000–4250	1.5	2.1	4.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
4250–4500	1.4	2.1	5.9	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
4500–4750	1.0	2.1	3.6	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.6	2.1	2.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.3	1.3	1.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.2	0.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.1	0.5	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.1	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South America																
0–250	20.7	17.4	19.2	19.6	23.1	22.1	11.2	13.1	19.3	19.9	21.6	16.8	19.3	19.9	13.4	13.3
250–500	30.1	29.8	25.3	27.0	31.4	37.5	18.0	21.2	25.1	29.3	22.7	26.9	25.1	29.3	22.7	18.4
500–750	21.1	22.9	19.7	18.8	20.9	18.9	20.1	18.7	18.2	19.6	18.2	21.9	18.2	19.6	22.3	22.7
750–1000	9.4	14.9	13.3	14.1	10.2	9.9	16.7	14.1	14.8	12.5	12.1	14.1	14.8	12.5	18.9	23.4
1000–1250	5.7	8.2	8.0	9.7	6.3	5.0	10.9	11.9	9.3	7.7	8.2	7.6	9.3	7.7	11.2	9.9
1250–1500	6.4	3.7	4.8	5.0	4.0	2.9	6.6	7.2	5.3	4.7	5.0	4.9	5.3	4.7	5.1	5.8
1500–1750	4.0	1.6	2.9	2.5	1.7	1.8	3.7	5.2	4.2	2.6	3.7	3.2	4.2	2.6	2.5	3.0
1750–2000	1.5	0.7	1.9	1.4	0.8	0.7	2.4	2.9	1.9	1.4	2.4	1.8	1.9	1.4	1.9	1.4
2000–2050	0.4	0.3	1.3	1.0	0.6	0.5	1.7	2.5	0.7	0.9	1.7	1.2	1.0	1.0	0.9	0.8
2250–2500	0.3	0.2	1.0	0.3	0.4	0.3	1.5	1.0	0.5	0.6	1.4	0.7	0.4	0.6	0.4	0.7
2500-2750	0.2	0.2	0.7	0.2	0.3	0.2	1.3	0.5	0.3	0.4	0.8	0.3	0.2	0.3	0.2	0.1
2750–3000	0.1	0.1	0.4	0.1	0.2	0.1	0.7	0.6	0.2	0.2	0.7	0.3	0.1	0.2	0.2	0.1
3000–3250	0.1	0.0	0.4	0.2	0.1	0.1	0.4	0.3	0.1	0.1	0.5	0.1	0.1	0.1	0.2	0.4
3250–3500	0.0	0.0	0.3	0.1	0.0	0.0	0.4	0.2	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.0
3500–3749	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
3750–4000	0.0	0.0	0.2	0.0	0.0	0.0	0.3	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
4000–4250	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
4250–4500	0.0	0.0	0.1	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.1	0.0	0.0	0.0	1.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S4b. Same as Table S4a, for Africa and Europe.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Africa							
0–250	16.1	17.6	6.3	12.5	16.7	10.7	7.2	11.5	7.4	12.0	6.9	9.4	7.4	12.0	13.4	13.0
250–500	29.5	37.3	9.6	14.0	22.8	22.3	16.5	24.6	14.2	23.1	17.5	20.1	14.2	23.1	20.2	25.9
500–750	24.0	19.4	11.7	14.6	18.9	22.4	19.7	22.3	17.4	19.2	17.9	19.5	17.4	19.2	18.3	24.9
750–1000	16.4	12.4	16.7	19.9	14.5	18.3	18.9	16.0	17.7	17.3	16.0	16.0	17.7	17.3	13.7	17.1
1000–1250	7.2	4.7	21.1	15.6	10.5	11.9	15.0	11.1	12.5	12.7	12.4	11.7	12.5	12.7	10.3	9.3
1250–1500	3.1	5.4	16.2	10.0	6.6	6.7	9.4	6.8	10.5	7.5	8.6	8.1	10.5	7.5	8.1	4.3
1500–1750	2.4	1.9	9.6	8.2	3.9	3.6	5.2	3.3	7.8	3.9	5.7	5.4	7.8	3.9	5.2	2.3
1750–2000	0.7	1.0	4.9	3.0	2.7	1.9	2.9	1.7	5.1	2.1	3.8	3.6	5.1	2.1	3.3	1.5
2000–2050	0.6	0.1	2.2	1.3	1.5	1.0	1.8	1.0	3.0	1.0	2.5	2.3	3.0	1.0	2.4	0.7
2250–2500	0.0	0.1	0.7	0.6	0.9	0.7	1.1	0.6	1.9	0.6	1.8	1.5	1.9	0.6	1.8	0.4
2500-2750	0.0	0.1	0.6	0.3	0.4	0.3	0.7	0.4	1.0	0.3	1.3	0.9	1.0	0.3	1.1	0.2
2750–3000	0.0	0.0	0.4	0.0	0.3	0.1	0.5	0.3	0.6	0.2	1.1	0.6	0.6	0.2	1.0	0.1
3000–3250	0.0	0.0	0.0	0.0	0.2	0.1	0.4	0.2	0.4	0.1	1.0	0.3	0.4	0.1	0.6	0.1
3250–3500	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.1	0.3	0.0	0.8	0.2	0.2	0.0	0.3	0.1
3500–3749	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.7	0.2	0.1	0.0	0.2	0.1
3750–4000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.1	0.1	0.0	0.1	0.0
4000–4250	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.7	0.1	0.1	0.0	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
									Europe							
0–250	10.4	30.8	28.2	29.2	11.2	11.4	40.5	38.5	33.3	20.6	7.8	8.8	33.3	20.6	18.0	31.5
250–500	14.3	26.4	23.9	23.5	6.0	7.4	34.0	35.1	31.1	24.7	12.9	12.8	31.1	24.7	20.4	27.2
500–750	14.3	19.6	14.3	14.1	9.6	8.9	25.5	26.4	18.6	15.6	18.0	17.8	18.6	15.6	16.8	22.1
750–1000	12.1	9.3	8.0	7.9	20.7	15.7	0.0	0.0	7.2	6.8	14.4	14.2	7.2	6.8	13.4	9.9
1000–1250	14.4	2.8	7.6	7.5	24.0	22.2	0.0	0.0	5.7	6.3	16.0	15.9	5.7	6.3	9.3	4.0
1250–1500	11.7	3.7	9.7	9.5	13.5	13.7	0.0	0.0	2.0	4.8	12.2	12.0	2.0	4.8	6.9	2.7
1500–1750	10.1	1.8	5.3	5.2	9.6	9.0	0.0	0.0	0.9	5.8	7.9	7.8	0.9	5.8	6.1	1.0
1750–2000	3.9	1.6	1.8	1.8	3.3	3.6	0.0	0.0	0.5	3.7	4.1	4.1	0.5	3.7	3.5	0.6
2000–2050	3.5	1.0	0.1	0.1	1.3	3.0	0.0	0.0	0.0	3.0	3.5	3.5	0.0	3.0	2.3	0.4
2250–2500	1.7	1.0	0.5	0.5	0.4	2.9	0.0	0.0	0.4	3.8	2.0	1.9	0.4	3.8	1.6	0.3
2500-2750	1.4	1.1	0.2	0.2	0.2	1.1	0.0	0.0	0.2	1.3	0.7	0.7	0.2	1.3	0.8	0.2
2750–3000	1.0	0.4	0.2	0.2	0.1	0.5	0.0	0.0	0.1	1.3	0.3	0.3	0.1	1.3	0.4	0.1
3000–3250	0.6	0.1	0.1	0.2	0.1	0.3	0.0	0.0	0.0	0.9	0.2	0.2	0.0	0.9	0.3	0.0
3250–3500	0.3	0.2	0.1	0.1	0.0	0.2	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.9	0.2	0.0
3500–3749	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0
3750–4000	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4000–4250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S4c. Same as Table S4a, for Boreal Eurasia and South Asia.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Boreal Eurasia							
0–250	5.3	7.3	42.5	45.0	2.8	6.5	22.6	20.9	5.6	8.6	41.6	30.0	5.6	8.6	27.4	20.3
250–500	12.0	16.2	32.8	31.4	5.0	11.8	40.9	41.7	8.6	18.2	33.4	40.0	8.6	18.2	28.0	30.8
500–750	17.8	23.0	24.7	23.6	8.0	14.1	28.9	29.4	16.2	19.4	25.0	30.0	16.2	19.4	21.1	23.2
750–1000	20.4	19.9	0.0	0.0	18.7	14.5	3.6	3.9	18.1	19.7	0.0	0.0	18.1	19.7	10.7	11.7
1000–1250	15.6	13.3	0.0	0.0	19.0	14.7	1.5	1.5	13.7	15.6	0.0	0.0	13.7	15.6	6.2	6.9
1250–1500	11.2	8.1	0.0	0.0	9.2	12.8	1.4	1.4	12.2	8.3	0.0	0.0	12.2	8.3	2.7	3.0
1500–1750	7.6	5.2	0.0	0.0	7.6	10.4	0.7	0.8	9.1	4.5	0.0	0.0	9.1	4.5	2.3	2.5
1750–2000	4.0	3.2	0.0	0.0	6.2	6.8	0.2	0.2	6.1	2.4	0.0	0.0	6.1	2.4	0.9	1.0
2000–2050	2.5	1.8	0.0	0.0	4.8	4.0	0.2	0.2	4.1	1.6	0.0	0.0	4.1	1.6	0.6	0.6
2250–2500	1.6	1.0	0.0	0.0	6.9	2.1	0.0	0.0	2.8	0.9	0.0	0.0	2.8	0.7	0.1	0.0
2500-2750	0.9	0.5	0.0	0.0	4.8	1.1	0.0	0.0	1.6	0.3	0.0	0.0	1.6	0.5	0.0	0.0
2750–3000	0.5	0.3	0.0	0.0	3.3	0.6	0.0	0.0	0.9	0.2	0.0	0.0	1.1	0.2	0.0	0.0
3000–3250	0.3	0.1	0.0	0.0	2.2	0.3	0.0	0.0	0.7	0.1	0.0	0.0	0.6	0.1	0.0	0.0
3250–3500	0.2	0.1	0.0	0.0	1.2	0.2	0.0	0.0	0.3	0.1	0.0	0.0	0.2	0.1	0.0	0.0
3500–3749	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3750–4000	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000–4250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
									South Asia							
0–250	19.3	3.8	15.0	26.1	17.9	17.5	8.2	15.0	7.0	4.5	10.2	5.9	7.0	4.5	21.3	23.0
250–500	19.2	8.8	18.7	25.5	18.7	18.4	23.6	22.7	11.0	9.5	19.8	37.8	11.0	9.5	34.5	28.6
500–750	16.5	16.9	14.2	19.1	16.8	18.9	21.2	26.4	14.0	9.9	18.5	21.8	14.0	9.9	21.7	20.1
750–1000	14.6	16.0	20.7	12.1	13.7	14.7	15.1	18.6	13.4	10.7	15.7	16.0	13.4	10.7	11.4	12.7
1000–1250	10.7	15.2	13.0	8.9	11.3	8.9	8.9	7.4	13.8	11.1	11.7	8.7	13.8	11.1	5.2	6.3
1250–1500	7.9	14.6	8.2	4.3	7.6	5.2	8.1	4.8	13.2	11.8	7.2	5.1	13.2	11.8	2.8	3.6
1500–1750	5.5	12.4	5.4	2.0	4.4	4.5	8.5	2.3	10.5	12.6	6.9	2.6	10.5	12.6	1.6	2.0
1750–2000	2.9	7.9	4.0	1.0	3.2	2.2	3.1	0.9	7.3	11.0	4.6	0.2	7.3	11.0	0.5	1.5
2000–2050	1.5	2.7	0.3	0.5	2.1	2.2	1.3	0.5	4.1	6.9	2.1	1.1	4.1	6.9	0.5	1.0
2250–2500	0.7	0.8	0.2	0.2	1.6	1.4	1.2	0.5	2.3	4.8	1.3	0.4	2.3	4.8	0.3	0.4
2500-2750	0.5	0.3	0.1	0.1	1.3	1.2	0.1	0.2	1.3	2.5	0.6	0.3	1.2	2.6	0.1	0.3
2750–3000	0.4	0.3	0.1	0.1	0.6	1.1	0.1	0.1	0.8	1.4	0.5	0.1	0.8	1.4	0.1	0.2
3000–3250	0.2	0.2	0.1	0.1	0.3	1.2	0.0	0.2	0.5	0.9	0.3	0.0	0.5	0.9	0.0	0.2
3250–3500	0.1	0.1	0.0	0.0	0.2	0.9	0.0	0.2	0.3	0.5	0.1	0.0	0.4	0.5	0.0	0.1
3500–3749	0.0	0.0	0.0	0.0	0.1	0.7	0.3	0.1	0.2	0.3	0.1	0.0	0.2	0.4	0.0	0.0
3750–4000	0.0	0.0	0.0	0.0	0.1	0.5	0.2	0.1	0.1	0.3	0.1	0.0	0.1	0.3	0.0	0.0
4000–4250	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.3	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.3	0.1	0.0	0.1	0.3	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S4d. Same as Table S4a for Australia.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Australia							
0–250	15.7	18.5	24.3	17.5	14.1	18.2	12.9	5.8	25.9	15.8	6.5	18.6	25.9	15.8	43.9	43.3
250–500	24.2	23.4	23.8	26.6	26.5	30.7	17.8	9.2	24.6	28.4	13.0	22.7	24.6	28.4	32.1	32.4
500–750	19.4	18.7	22.7	34.4	20.2	25.3	17.3	8.5	18.8	22.0	14.6	16.3	18.8	22.0	24.0	24.3
750–1000	19.1	18.4	11.7	9.2	12.9	13.6	15.0	9.7	12.6	14.6	18.3	11.8	12.6	14.6	0.0	0.0
1000–1250	12.8	12.4	7.4	5.7	7.9	6.0	11.9	11.3	7.5	10.2	18.1	7.3	7.5	10.2	0.0	0.0
1250–1500	4.6	4.5	5.5	3.7	5.8	2.8	7.1	12.5	4.5	5.1	12.1	6.6	4.5	5.1	0.0	0.0
1500–1750	2.1	2.0	2.4	1.6	4.1	1.4	4.6	11.6	2.3	2.0	7.4	5.0	2.3	2.0	0.0	0.0
1750–2000	0.9	0.8	1.3	0.7	2.6	0.8	3.5	10.0	1.5	0.9	4.6	4.1	1.5	0.9	0.0	0.0
2000–2050	0.7	0.7	0.6	0.4	2.0	0.6	2.7	6.3	1.0	0.4	2.5	2.8	0.9	0.4	0.0	0.0
2250–2500	0.3	0.4	0.2	0.2	1.1	0.2	2.0	4.9	0.6	0.2	1.4	2.2	0.6	0.2	0.0	0.0
2500-2750	0.2	0.2	0.1	0.0	0.8	0.2	1.3	3.4	0.3	0.2	0.8	1.8	0.4	0.2	0.0	0.0
2750–3000	0.0	0.0	0.0	0.0	0.6	0.1	0.8	2.7	0.2	0.1	0.4	0.5	0.2	0.1	0.0	0.0
3000–3250	0.0	0.0	0.0	0.0	0.5	0.1	1.1	1.5	0.1	0.1	0.2	0.1	0.1	0.1	0.0	0.0
3250–3500	0.0	0.0	0.0	0.0	0.4	0.0	0.6	1.0	0.1	0.0	0.1	0.2	0.1	0.0	0.0	0.0
3500–3749	0.0	0.0	0.0	0.0	0.2	0.0	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3750–4000	0.0	0.0	0.0	0.0	0.1	0.0	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000–4250	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S5a. Pixel-weighted percentages of fire smoke injection heights per fire region, broad biomes and seasons, for North and South America. Note that percentages are above ground level.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
North America																
0–250	15.6	7.6	9.2	12.9	15.9	8.0	23.5	19.3	20.2	3.4	14.8	12.6	20.2	3.4	15.1	6.4
250–500	17.2	11.5	13.7	34.6	18.8	13.1	21.9	30.2	29.7	9.8	29.1	19.6	29.7	9.8	35.5	31.3
500–750	17.2	13.1	10.8	25.3	19.0	14.3	16.2	20.1	21.7	15.5	19.0	29.5	21.7	15.5	14.7	21.2
750–1000	14.0	11.7	8.3	11.1	14.6	15.2	10.6	11.6	12.1	16.9	11.2	13.9	12.1	16.9	9.8	15.6
1000–1250	8.4	10.9	7.0	4.0	11.4	13.7	8.8	7.8	7.2	15.0	8.7	12.9	7.2	15.0	12.5	8.6
1250–1500	6.2	9.1	5.7	2.5	8.4	9.4	6.3	3.9	3.9	11.3	6.3	7.1	3.9	11.3	6.5	6.8
1500–1750	3.9	6.5	4.6	2.5	5.0	6.3	4.1	2.6	2.3	9.0	4.3	1.7	2.3	9.0	3.3	3.8
1750–2000	2.5	4.9	4.1	1.9	3.1	5.2	3.0	1.9	1.3	6.2	2.8	1.7	1.3	6.2	1.6	1.5
2000–2050	1.6	3.8	3.3	1.9	1.8	5.3	1.6	1.3	0.6	4.0	1.9	0.2	0.6	4.0	0.5	1.4
2250–2500	1.3	3.3	2.7	0.7	0.8	4.2	1.2	0.7	0.4	2.8	1.0	0.2	0.5	2.8	0.3	1.0
2500-2750	1.2	2.9	2.4	0.4	0.4	2.4	1.1	0.5	0.3	1.8	0.4	0.2	0.4	1.8	0.2	0.6
2750–3000	1.5	2.4	1.7	0.7	0.3	1.0	0.9	0.0	0.2	1.6	0.3	0.2	0.1	1.6	0.0	0.4
3000–3250	1.5	2.0	1.9	0.2	0.2	0.8	0.4	0.0	0.1	1.0	0.1	0.2	0.0	1.0	0.0	0.6
3250–3500	1.6	1.6	2.0	0.4	0.1	0.7	0.2	0.0	0.0	0.7	0.1	0.0	0.0	0.7	0.0	0.1
3500–3749	1.5	1.4	2.2	0.9	0.1	0.2	0.1	0.0	0.0	0.3	0.0	0.0	0.0	0.3	0.0	0.1
3750–4000	1.4	1.2	2.6	0.0	0.1	0.1	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.1
4000–4250	1.2	1.2	3.6	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.3
4250–4500	0.8	1.2	5.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.1
4500–4750	0.6	1.1	3.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
4750–5000	0.4	1.0	2.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
5000–5250	0.2	0.7	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.1	0.4	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.1	0.3	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
South America																
0–250	24.1	21.8	18.9	20.2	24.2	21.9	12.6	13.1	22.3	19.9	19.4	16.9	22.3	19.9	16.1	15.0
250–500	30.2	31.5	24.7	25.9	31.6	35.5	19.9	20.3	27.0	27.3	22.6	27.4	27.0	27.3	21.6	19.2
500–750	18.5	20.8	19.4	19.6	20.9	18.8	19.6	18.6	18.7	18.3	18.6	21.3	18.7	18.3	18.8	22.7
750–1000	10.3	12.6	13.6	14.3	9.3	10.6	16.1	15.0	12.7	12.2	13.0	14.1	12.7	12.2	19.0	21.4
1000–1250	4.5	6.5	8.5	9.3	6.5	5.6	10.8	11.7	7.7	8.4	8.7	7.8	7.7	8.4	11.9	9.3
1250–1500	4.0	3.1	5.2	4.8	3.8	3.2	6.9	7.4	5.1	5.2	5.5	5.1	5.1	5.2	5.8	5.7
1500–1750	2.3	1.6	3.1	2.5	1.8	1.9	4.0	5.7	3.4	3.2	3.9	3.0	3.4	3.2	3.2	3.2
1750–2000	1.4	0.9	2.2	1.3	0.8	0.9	2.6	3.1	1.6	2.0	2.5	1.8	1.6	2.0	1.8	1.5
2000–2050	0.7	0.5	1.4	1.0	0.6	0.6	1.6	2.1	0.7	1.5	1.7	1.2	0.7	1.5	0.6	0.8
2250–2500	1.0	0.3	0.9	0.4	0.3	0.4	1.2	1.1	0.4	0.8	1.3	0.6	0.4	0.8	0.5	0.6
2500-2750	0.8	0.2	0.6	0.2	0.2	0.2	1.1	0.5	0.2	0.5	0.8	0.3	0.2	0.5	0.2	0.3
2750–3000	0.7	0.1	0.4	0.1	0.0	0.1	0.6	0.4	0.1	0.3	0.7	0.3	0.1	0.3	0.1	0.2
3000–3250	0.6	0.1	0.3	0.3	0.0	0.1	0.4	0.4	0.1	0.2	0.5	0.1	0.1	0.2	0.2	0.1
3250–3500	0.3	0.0	0.2	0.1	0.0	0.1	0.4	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.2	0.0
3500–3749	0.4	0.0	0.2	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.2	0.0	0.0	0.1	0.0	0.0
3750–4000	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
4000–4250	0.1	0.0	0.1	0.0	0.0	0.0	0.3	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
4250–4500	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.1	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S5b. Same as Table S5a for Africa and Europe.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Africa							
0–250	15.9	15.2	8.5	13.9	17.5	10.9	7.8	12.1	9.4	12.4	8.5	10.0	9.4	12.4	14.6	13.7
250–500	28.3	29.8	14.2	17.7	25.1	22.9	17.7	25.3	16.2	22.5	20.3	20.8	16.2	22.5	23.0	24.8
500–750	25.5	24.7	16.5	17.9	20.2	22.5	19.6	21.8	18.0	19.2	19.0	19.7	18.0	19.2	18.2	23.8
750–1000	17.8	15.0	17.0	18.5	13.8	18.1	18.5	15.4	17.1	17.3	16.7	15.8	17.1	17.3	13.3	17.0
1000–1250	6.5	6.0	17.9	13.4	9.3	11.5	14.5	10.8	11.6	12.7	12.5	11.6	11.6	12.7	9.6	9.7
1250–1500	3.0	5.8	12.3	8.3	5.8	6.7	9.2	6.7	9.5	7.4	8.4	7.8	9.5	7.4	7.6	4.6
1500–1750	1.9	2.0	7.1	5.9	3.5	3.5	5.1	3.4	7.0	3.9	5.1	5.1	7.0	3.9	4.6	2.7
1750–2000	0.6	0.8	3.4	2.3	2.1	1.9	2.8	1.9	4.5	2.2	3.2	3.3	4.5	2.2	2.8	1.8
2000–2050	0.5	0.3	1.5	1.2	1.1	1.0	1.7	1.0	2.7	1.1	2.0	2.1	2.7	1.1	2.0	0.9
2250–2500	0.0	0.2	0.6	0.6	0.7	0.6	1.0	0.6	1.7	0.6	1.3	1.4	1.7	0.6	1.5	0.5
2500-2750	0.0	0.1	0.7	0.3	0.4	0.2	0.7	0.4	0.9	0.3	0.8	0.9	0.9	0.3	0.9	0.2
2750–3000	0.0	0.1	0.3	0.0	0.3	0.1	0.5	0.2	0.5	0.2	0.6	0.6	0.5	0.2	0.7	0.2
3000–3250	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.2	0.4	0.1	0.4	0.3	0.4	0.1	0.6	0.1
3250–3500	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.1	0.3	0.2	0.2	0.1	0.3	0.0
3500–3749	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.0	0.3	0.2	0.1	0.0	0.2	0.0
3750–4000	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.1	0.1	0.0	0.1	0.0
4000–4250	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
									Europe							
0–250	12.9	25.1	20.6	21.9	11.0	11.6	40.5	38.5	40.3	24.9	8.3	9.3	40.3	24.9	20.6	36.2
250–500	15.8	22.0	18.0	18.0	12.9	12.6	34.0	35.1	27.9	23.0	12.8	12.7	27.9	23.0	21.3	25.6
500–750	16.6	15.2	12.7	12.8	20.4	18.5	25.5	26.4	15.8	13.7	17.7	17.3	15.8	13.7	16.4	20.3
750–1000	12.9	7.5	13.2	13.5	18.2	16.9	0.0	0.0	6.7	6.4	14.9	14.7	6.7	6.4	12.7	9.8
1000–1250	13.0	3.0	10.4	11.3	13.6	14.4	0.0	0.0	5.2	5.9	16.2	16.1	5.2	5.9	8.7	3.2
1250–1500	10.2	4.2	12.1	10.2	8.9	9.5	0.0	0.0	1.8	4.3	12.0	11.9	1.8	4.3	6.4	2.5
1500–1750	8.5	3.2	7.1	6.6	5.5	5.8	0.0	0.0	1.1	5.5	7.7	7.6	1.1	5.5	5.5	0.7
1750–2000	3.7	3.8	3.0	2.8	3.1	3.2	0.0	0.0	0.5	3.6	4.0	4.0	0.5	3.6	3.2	0.4
2000–2050	2.8	2.6	0.7	0.9	2.8	3.0	0.0	0.0	0.3	3.4	3.3	3.3	0.3	3.4	2.2	0.4
2250–2500	1.1	4.6	1.0	1.0	1.3	1.9	0.0	0.0	0.2	4.1	1.9	1.9	0.2	4.1	1.4	0.4
2500-2750	1.0	4.4	0.5	0.4	0.6	0.7	0.0	0.0	0.1	1.5	0.6	0.6	0.1	1.5	0.7	0.2
2750–3000	0.8	1.6	0.3	0.3	0.4	0.4	0.0	0.0	0.1	1.5	0.3	0.3	0.1	1.3	0.4	0.2
3000–3250	0.4	1.0	0.2	0.1	0.3	0.4	0.0	0.0	0.0	1.0	0.2	0.2	0.0	1.0	0.3	0.1
3250–3500	0.2	0.6	0.2	0.1	0.3	0.2	0.0	0.0	0.0	0.8	0.1	0.1	0.0	1.0	0.2	0.0
3500–3749	0.1	0.4	0.0	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
3750–4000	0.0	0.6	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4000–4250	0.0	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S5c. Same as Table S5a, for Boreal Eurasia and South Asia.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Boreal Eurasia							
0–250	6.3	7.0	42.5	45.0	6.2	8.6	22.2	20.6	5.9	8.4	41.6	30.0	5.9	8.4	30.6	22.7
250–500	12.1	15.8	32.9	31.4	8.8	13.7	44.5	45.3	9.5	17.0	33.4	40.0	9.5	17.0	29.8	33.3
500–750	15.6	22.8	24.6	23.6	11.7	15.7	23.4	23.9	13.6	19.0	25.0	30.0	13.6	19.0	20.4	22.8
750–1000	18.2	19.6	0.0	0.0	19.1	15.5	4.7	5.0	17.8	20.0	0.0	0.0	17.8	20.0	9.7	10.8
1000–1250	15.6	13.3	0.0	0.0	17.2	13.8	2.1	2.1	15.5	15.6	0.0	0.0	15.5	15.6	4.9	5.5
1250–1500	11.8	8.8	0.0	0.0	11.2	10.9	1.8	1.8	12.4	8.3	0.0	0.0	12.4	8.3	2.0	2.2
1500–1750	7.9	5.5	0.0	0.0	7.7	8.2	0.7	0.8	9.7	4.9	0.0	0.0	9.7	4.9	1.4	1.5
1750–2000	4.7	3.3	0.0	0.0	5.2	5.5	0.2	0.2	5.8	2.9	0.0	0.0	5.8	2.9	0.6	0.6
2000–2050	2.7	1.8	0.0	0.0	3.2	3.5	0.2	0.2	3.4	1.8	0.0	0.0	3.4	1.8	0.4	0.5
2250–2500	1.9	1.1	0.0	0.0	3.5	2.0	0.1	0.1	2.5	0.8	0.0	0.0	2.5	0.8	0.1	0.1
2500-2750	1.2	0.5	0.0	0.0	2.6	1.2	0.1	0.0	1.4	0.5	0.0	0.0	1.4	0.5	0.1	0.0
2750–3000	0.8	0.3	0.0	0.0	1.8	0.7	0.0	0.0	1.1	0.3	0.0	0.0	1.1	0.3	0.0	0.0
3000–3250	0.6	0.1	0.0	0.0	1.1	0.4	0.0	0.0	0.5	0.2	0.0	0.0	0.5	0.2	0.0	0.0
3250–3500	0.3	0.1	0.0	0.0	0.6	0.2	0.0	0.0	0.4	0.1	0.0	0.0	0.4	0.1	0.0	0.0
3500–3749	0.1	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0
3750–4000	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	0.0	0.2	0.1	0.0	0.0
4000–4250	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
									South Asia							
0–250	16.1	5.1	18.7	28.8	15.6	10.9	19.3	17.4	6.6	4.8	11.8	7.9	6.6	4.8	20.8	23.1
250–500	17.7	9.3	21.8	25.7	17.5	13.9	24.8	23.9	10.4	10.1	20.5	38.5	10.4	10.1	32.0	29.6
500–750	16.7	17.2	18.3	20.4	16.0	15.8	19.7	25.0	13.1	10.5	18.4	20.1	13.1	10.5	22.8	19.1
750–1000	15.4	18.0	17.1	11.6	13.6	13.0	12.7	17.2	14.5	11.1	15.5	15.7	14.5	11.1	13.3	11.6
1000–1250	11.9	15.3	10.7	6.4	11.4	8.4	7.0	7.4	15.1	11.6	12.0	8.2	15.1	11.6	5.6	6.1
1250–1500	8.7	13.5	5.9	3.3	8.2	5.5	6.6	4.7	13.0	11.9	7.5	4.2	13.0	11.9	2.8	3.9
1500–1750	5.8	10.2	3.6	1.8	5.5	5.6	4.9	2.0	9.7	11.4	5.9	2.5	9.7	11.4	1.5	2.4
1750–2000	3.4	6.3	2.6	0.9	4.0	5.9	2.1	0.9	6.7	9.9	3.6	0.6	6.7	9.9	0.5	1.8
2000–2050	1.9	2.7	0.5	0.4	2.7	4.9	1.1	0.5	4.1	6.6	1.9	1.3	4.1	6.6	0.4	1.2
2250–2500	1.1	1.3	0.3	0.2	2.1	2.8	0.8	0.3	2.4	4.7	1.1	0.4	2.4	4.7	0.1	0.5
2500-2750	0.6	0.6	0.2	0.1	1.5	2.4	0.1	0.2	1.5	2.6	0.6	0.2	1.5	2.6	0.1	0.3
2750–3000	0.3	0.3	0.1	0.1	0.8	2.4	0.2	0.1	0.9	1.6	0.4	0.2	0.9	1.6	0.1	0.1
3000–3250	0.2	0.1	0.1	0.1	0.4	2.3	0.1	0.1	0.6	1.0	0.3	0.2	0.6	1.0	0.0	0.2
3250–3500	0.1	0.1	0.1	0.1	0.3	2.2	0.0	0.1	0.5	0.6	0.1	0.0	0.5	0.6	0.0	0.1
3500–3749	0.1	0.0	0.0	0.1	0.2	1.8	0.2	0.1	0.3	0.3	0.1	0.0	0.3	0.3	0.0	0.0
3750–4000	0.0	0.0	0.0	0.0	0.1	1.1	0.1	0.1	0.2	0.3	0.1	0.0	0.2	0.3	0.0	0.0
4000–4250	0.0	0.0	0.0	0.0	0.1	0.5	0.1	0.0	0.2	0.3	0.1	0.0	0.2	0.3	0.0	0.0
4250–4500	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.1	0.3	0.1	0.0	0.1	0.3	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S5d. Same as Table S5a for Australia.

	Forest				Shrubland				Grassland				Cropland			
	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF	MAM	JJA	SON	DJF
									Australia							
0–250	11.9	13.6	20.6	15.5	15.0	15.9	12.4	6.1	25.7	18.4	7.6	15.7	25.7	18.4	43.9	43.3
250–500	17.2	16.9	21.6	26.4	27.5	28.6	18.5	9.7	24.6	28.9	14.4	18.9	24.6	28.9	32.1	32.4
500–750	16.5	16.8	21.8	34.8	20.6	26.3	18.2	9.5	18.7	22.7	15.6	15.7	18.7	22.7	24.0	24.3
750–1000	17.4	17.6	13.5	9.6	12.7	15.8	15.7	10.6	12.7	13.8	17.1	12.0	12.7	13.8	0.0	0.0
1000–1250	13.0	12.4	9.3	6.3	7.5	6.9	11.3	11.1	7.6	8.5	16.7	8.5	7.6	8.5	0.0	0.0
1250–1500	7.3	6.9	7.0	4.1	5.2	3.1	6.9	11.6	4.4	4.1	11.3	8.0	4.4	4.1	0.0	0.0
1500–1750	3.0	2.8	3.1	1.8	3.6	1.5	4.6	10.4	2.4	1.7	7.2	6.5	2.4	1.7	0.0	0.0
1750–2000	1.6	1.5	1.6	0.8	2.4	0.8	3.2	9.3	1.6	0.8	4.3	5.5	1.6	0.8	0.0	0.0
2000–2050	2.8	2.5	0.7	0.4	1.9	0.5	2.5	6.3	0.9	0.4	2.5	3.4	0.9	0.4	0.0	0.0
2250–2500	1.5	1.4	0.5	0.3	1.0	0.3	1.7	5.1	0.5	0.3	1.5	2.8	0.5	0.3	0.0	0.0
2500-2750	1.6	1.5	0.1	0.0	0.7	0.2	1.2	3.4	0.4	0.2	0.8	2.2	0.4	0.2	0.0	0.0
2750–3000	2.3	2.1	0.1	0.0	0.5	0.1	0.9	2.6	0.2	0.1	0.5	0.6	0.3	0.1	0.0	0.0
3000–3250	1.6	1.5	0.1	0.0	0.4	0.0	1.2	1.5	0.1	0.1	0.3	0.1	0.1	0.1	0.0	0.0
3250–3500	1.0	1.0	0.0	0.0	0.3	0.0	0.6	1.1	0.1	0.0	0.2	0.1	0.1	0.0	0.0	0.0
3500–3749	0.6	0.6	0.0	0.0	0.1	0.0	0.4	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3750–4000	0.4	0.6	0.0	0.0	0.1	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4000–4250	0.2	0.2	0.0	0.0	0.1	0.0	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4250–4500	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4500–4750	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table S6. AOD- and pixel-weighted percentages of fire smoke injection heights per biome.

	Forest					Shurbland			Grassland			
	EvgrNdl	EvgrBrl	DecNdl	Dec Brl	Mixed	Closed	Open	Woody Sav	Savanna	Grass	Wetland	Cropland
						AOD-Weighted						
0–250	5.0	12.5	5.4	14.8	8.4	5.4	7.0	9.2	8.0	11.2	11.5	7.0
250–500	7.8	25.1	15.7	25.0	16.2	15.3	14.2	20.5	18.8	18.5	30.0	19.8
500–750	9.0	21.0	22.8	19.3	17.8	19.2	15.1	20.7	18.8	16.5	22.5	19.5
750–1000	9.4	16.1	19.3	14.2	17.1	26.4	14.1	17.2	16.5	13.5	16.0	16.5
1000–1250	10.1	10.7	13.2	9.3	12.5	10.6	13.5	12.7	12.6	11.5	8.8	13.0
1250–1500	8.1	6.6	8.7	5.7	9.6	13.3	11.5	7.8	8.7	8.7	4.7	9.8
1500–1750	6.6	3.8	6.0	3.4	6.5	5.5	9.1	4.4	5.7	6.9	2.7	6.3
1750–2000	5.6	1.8	3.9	2.3	3.8	2.0	6.1	2.6	3.6	5.1	1.5	3.4
2000–2050	4.7	1.0	2.3	1.5	2.2	1.4	3.7	1.8	2.2	3.1	0.9	1.9
2250–2500	4.0	0.6	1.4	1.0	1.4	0.5	2.3	1.2	1.5	2.0	0.6	1.1
2500-2750	3.1	0.3	0.6	0.9	1.1	0.0	1.4	0.7	0.9	1.1	0.4	0.7
2750–3000	2.3	0.2	0.3	0.7	0.8	0.2	0.9	0.3	0.7	0.7	0.1	0.4
3000–3250	2.0	0.1	0.2	0.6	0.7	0.2	0.5	0.2	0.5	0.4	0.0	0.3
3250–3500	1.9	0.1	0.1	0.3	0.5	0.0	0.3	0.2	0.4	0.3	0.1	0.2
3500–3749	2.3	0.1	0.1	0.3	0.3	0.0	0.1	0.1	0.3	0.2	0.1	0.1
3750–4000	2.6	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.3	0.1	0.0	0.0
4000–4250	3.1	0.0	0.0	0.2	0.2	0.0	0.1	0.1	0.3	0.1	0.1	0.0
4250–4500	3.4	0.0	0.0	0.1	0.2	0.0	0.0	0.1	0.1	0.1	0.0	0.0
4500–4750	3.0	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0
4750–5000	2.5	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	1.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	1.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.6	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
						Pixel-Weighted						
0–250	7.1	13.6	5.2	14.8	9.6	7.4	8.2	10.0	9.6	10.8	13.3	7.8
250–500	10.9	26.6	14.7	25.6	17.7	20.1	17.1	22.1	20.5	19.3	31.4	20.7
500–750	11.9	21.7	21.7	19.6	17.9	25.7	16.5	21.0	19.3	16.5	22.7	18.7
750–1000	10.9	15.4	19.0	13.8	16.8	23.5	14.6	16.8	16.2	13.8	15.1	15.9
1000–1250	9.9	9.5	13.7	8.9	12.8	10.1	12.1	11.9	12.0	11.8	7.8	12.8
1250–1500	8.0	5.8	9.6	5.8	9.5	7.3	9.6	7.3	8.1	8.8	4.2	9.8
1500–1750	5.9	3.2	6.4	3.5	6.4	2.9	7.0	4.2	5.2	6.6	2.3	6.2
1750–2000	4.7	1.8	4.1	2.5	3.7	1.5	5.0	2.5	3.3	4.6	1.2	3.4
2000–2050	3.7	1.0	2.4	1.6	2.0	0.7	3.3	1.6	2.0	2.9	0.8	1.9
2250–2500	3.4	0.6	1.5	1.1	1.2	0.3	2.2	1.0	1.3	1.9	0.5	1.1
2500-2750	3.0	0.3	0.8	0.8	0.8	0.1	1.5	0.6	0.8	1.1	0.3	0.7
2750–3000	2.5	0.2	0.5	0.5	0.5	0.3	1.0	0.3	0.6	0.7	0.1	0.4
3000–3250	2.3	0.1	0.2	0.4	0.4	0.1	0.8	0.2	0.4	0.4	0.1	0.3
3250–3500	2.1	0.1	0.1	0.3	0.2	0.0	0.5	0.2	0.2	0.3	0.1	0.2
3500–3749	2.0	0.1	0.1	0.2	0.2	0.0	0.2	0.1	0.2	0.2	0.1	0.1
3750–4000	2.0	0.0	0.0	0.2	0.1	0.0	0.2	0.1	0.1	0.1	0.0	0.0
4000–4250	2.1	0.0	0.0	0.2	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.0
4250–4500	2.3	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.1	0.1	0.0	0.0
4500–4750	1.8	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4750–5000	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5000–5250	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5250–5500	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5500–5750	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5750–6000	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

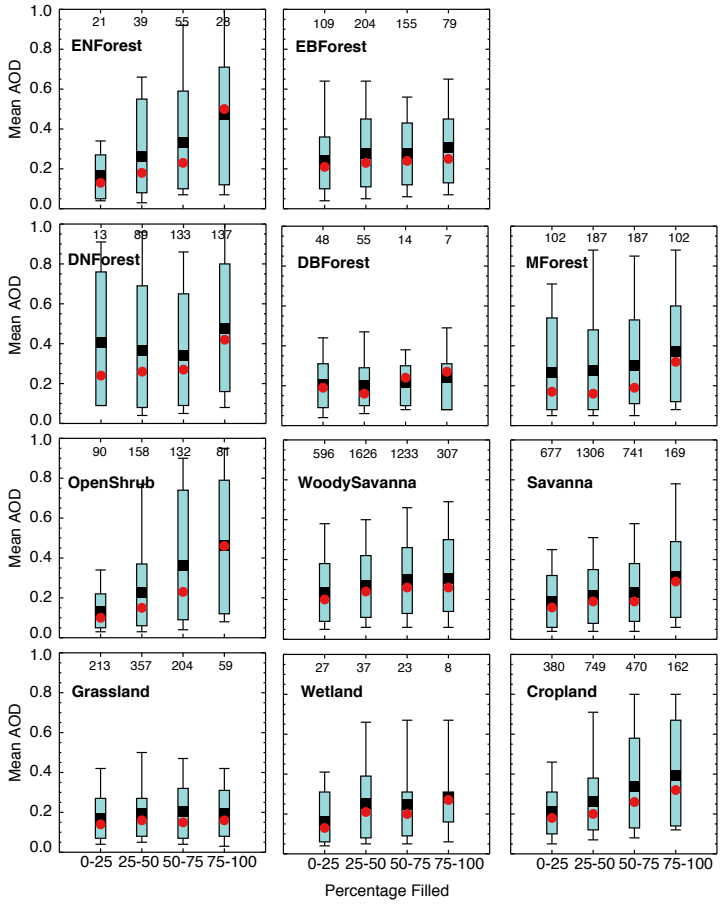

Figure S1. Distributions of mean AOD558 with respect to percentage of the DAR filled with successful retrievals (PcntHtsFilled) over 12 biomes for this study. The medians (red circles) and the means (black squares) are shown along with the central 67% (light blue box) and the central 90% (black whiskers). Only biomes with more than 10 plumes are plotted. The number of cases is indicated at the top of each boxplot.

To determine the effect of including the ±500 m plume-height measurement uncertainty in the fitting technique, we compare in Figure S2 the histograms of (1) the originally retrieved MISR plume heights for the whole dataset, with those derived by adding statistically generated heights (2) without and (3) with the ±500 m measurement uncertainty. To determine the impact of the fitting technique on the results, we also include histograms of the MISR plume heights derived by considering, for each plume, normal distributions having the same mean as the retrieved data and standard deviations equal to (4) 1xSD and (5) 2xSD. This comparison shows that the five distributions are very similar, with medians of 811, 792, 754, 768 and 757 m respectively. Similar results are found with the means of the distributions. The vertical distributions of the stereo-height retrievals with uncertainty added are slightly spread out towards the tails of the original distributions when the stereo-height retrievals within the DAR are included in the analysis. The spread of each plume is increased by including the effect of retrieval variability. Including the 500 m measurement uncertainty to determine the variability of the plume yields similar results as the distribution without including this factor (median of 754 m versus 792 m). Similar results are found if all the plumes are considered having a normal distribution.

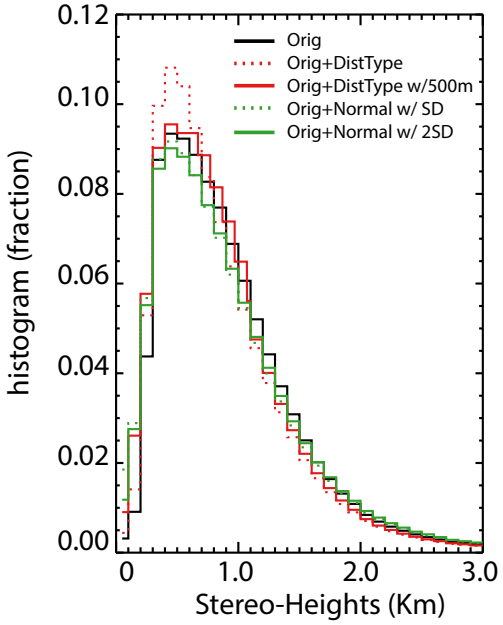

Figure S2. Histogram of originally retrieved MISR plume heights (black), originally retrieved and fitted depending on distribution type without ±500 m factor (dotted red) and with ±500 m factor (solid red), and originally retrieved and fitted to a normal distribution with 1xSD (dotted green) and 2xSD (solid green). Data points having more than 3000 m altitude are not shown to better illustrate the distribution of data values.

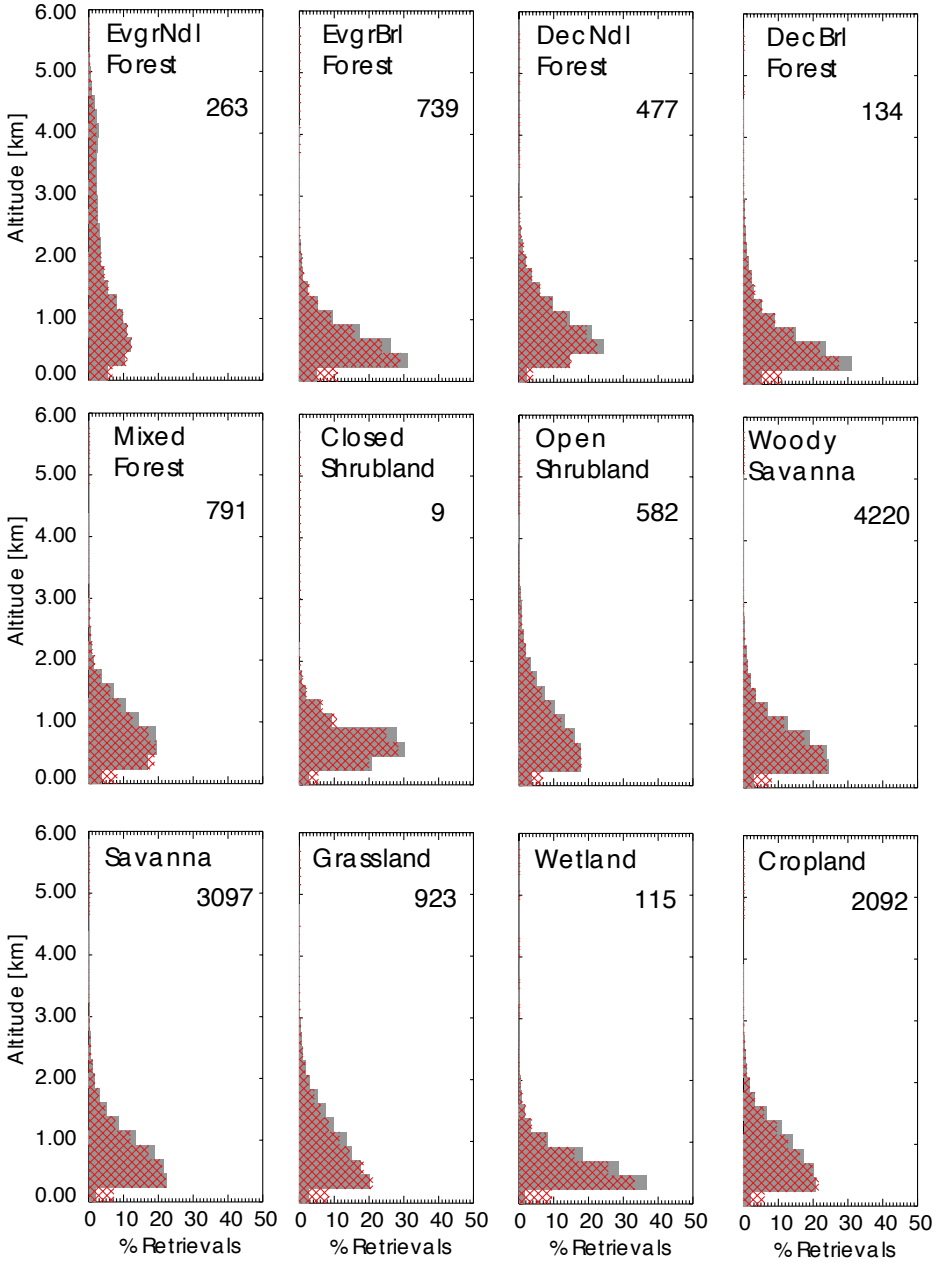

Figure S3. Pixel-weighted results. Vertical distribution of number of stereo-height retrievals in 250-meter bins for successful retrievals (gray) and successful + filled retrievals (hatched red), over our 12 biomes. Numeric annotations indicate the number of plumes in each classification.

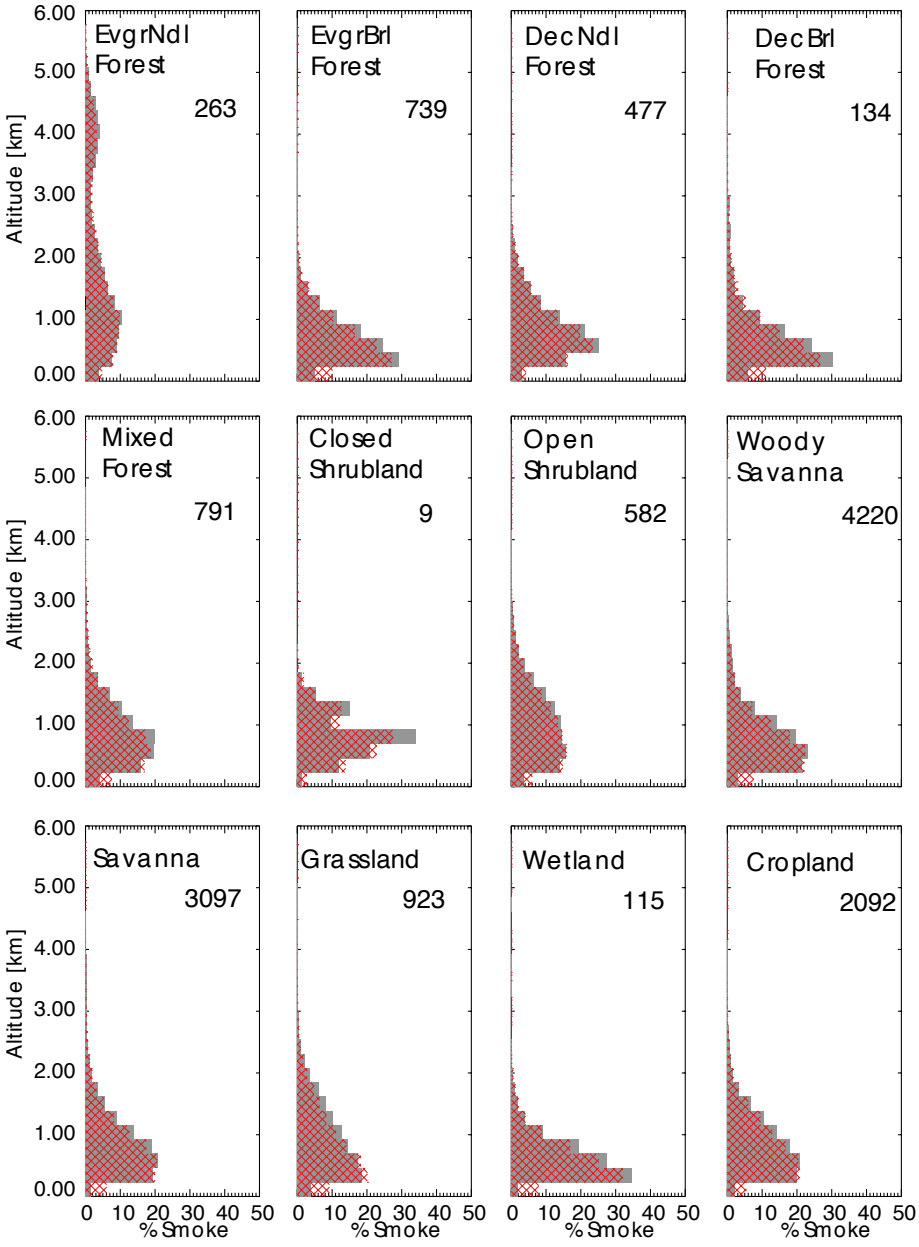

Figure S4. AOD-weighted results. Vertical distribution of percentage of smoke in 250-meter bins for original AOD retrievals (gray) and final AOD retrievals (hatched red), over our 12 biomes. Numeric annotations indicate the number of plumes in each classification.

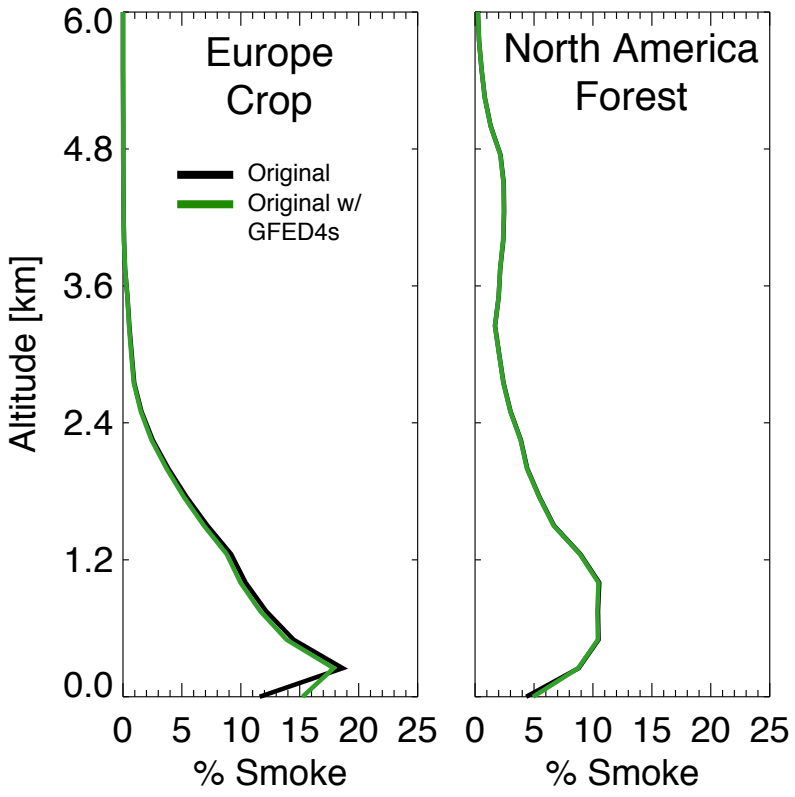

Figure S5. Vertical distribution of percentage of smoke calculated with the original+AOD-filled retrievals (black) and original+AOD-filled retrievals adjusted with the GFED4s fraction to account for small fires (green), over cropland fire in Europe and forest fires in North America.

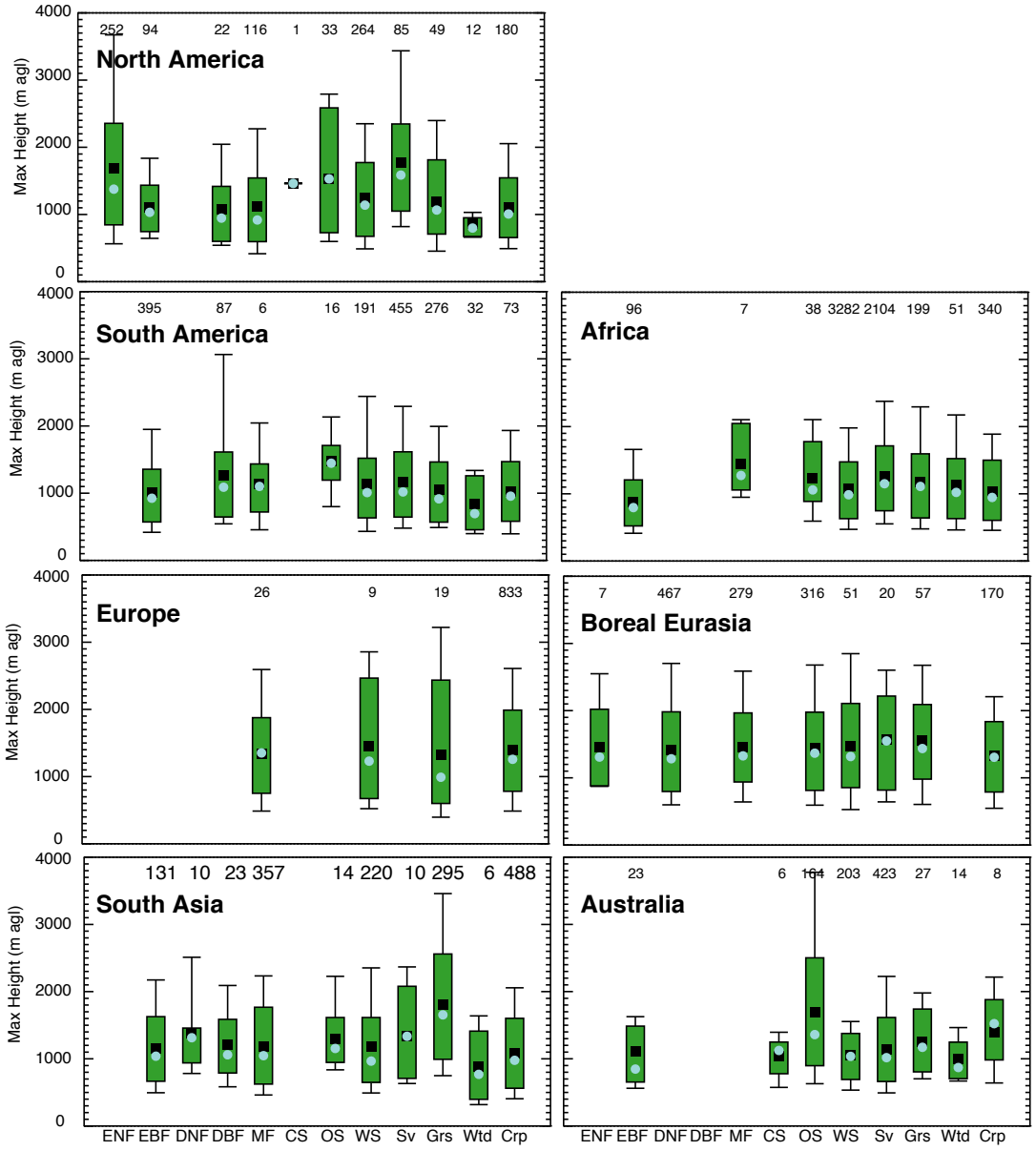

Figure S6. MISR maximum plume height summaries by region and biome. The medians (blue circles) and the means (black squares) are shown along with the central 67% (green boxes) and the central 90% (black whiskers). The number of observations included in each distribution are given in the annotation above each bar plot. Only distributions with more than 5 plumes are plotted.

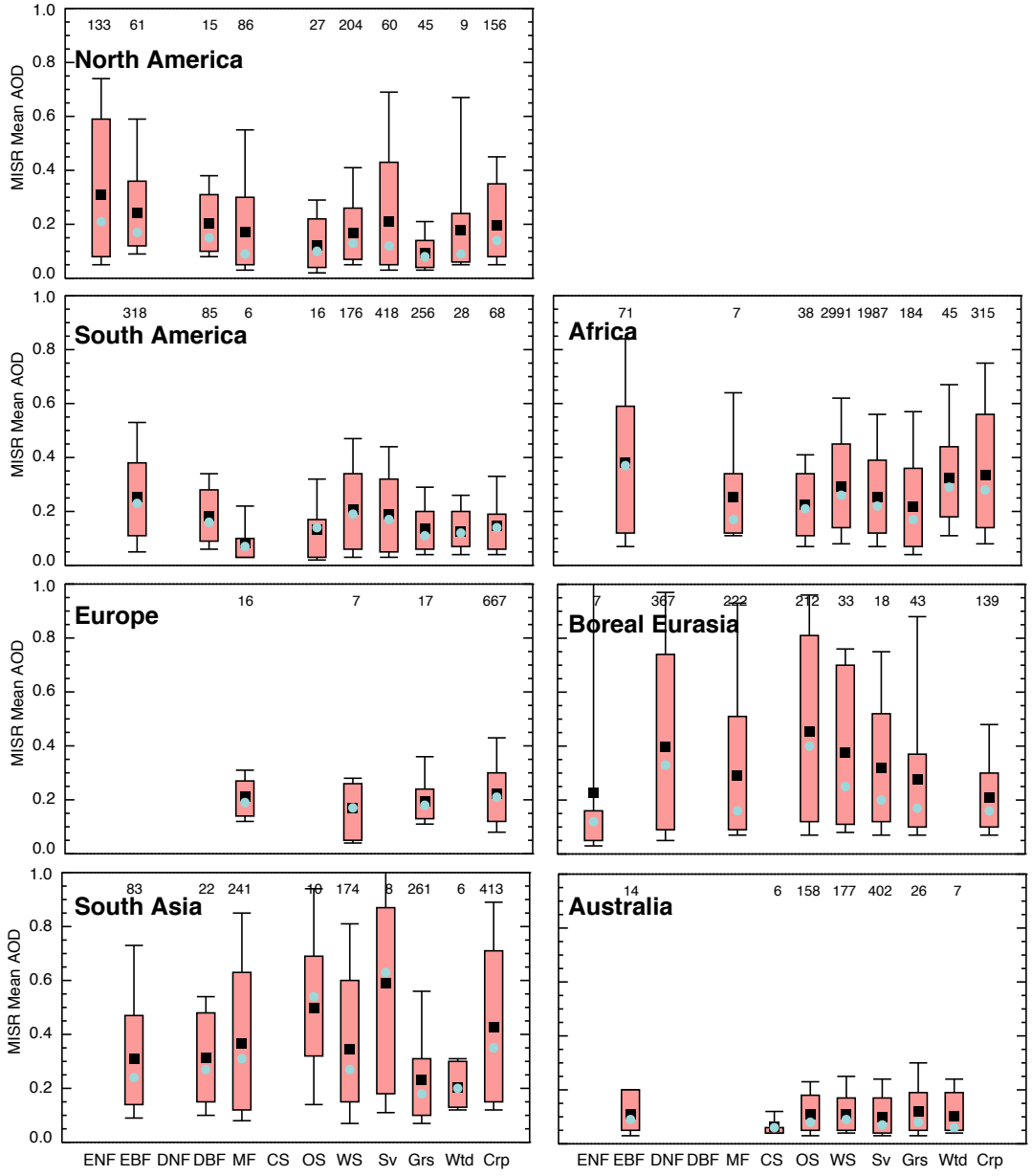

Figure S7. MISR mean AOD by region and biome. The medians (blue circles) and the means (black squares) are shown along with the central 67% (light red boxes) and the central 90% (black whiskers). The number of observations included in each distribution are given in the annotation above each bar plot. Only distributions with more than 5 plumes are plotted.

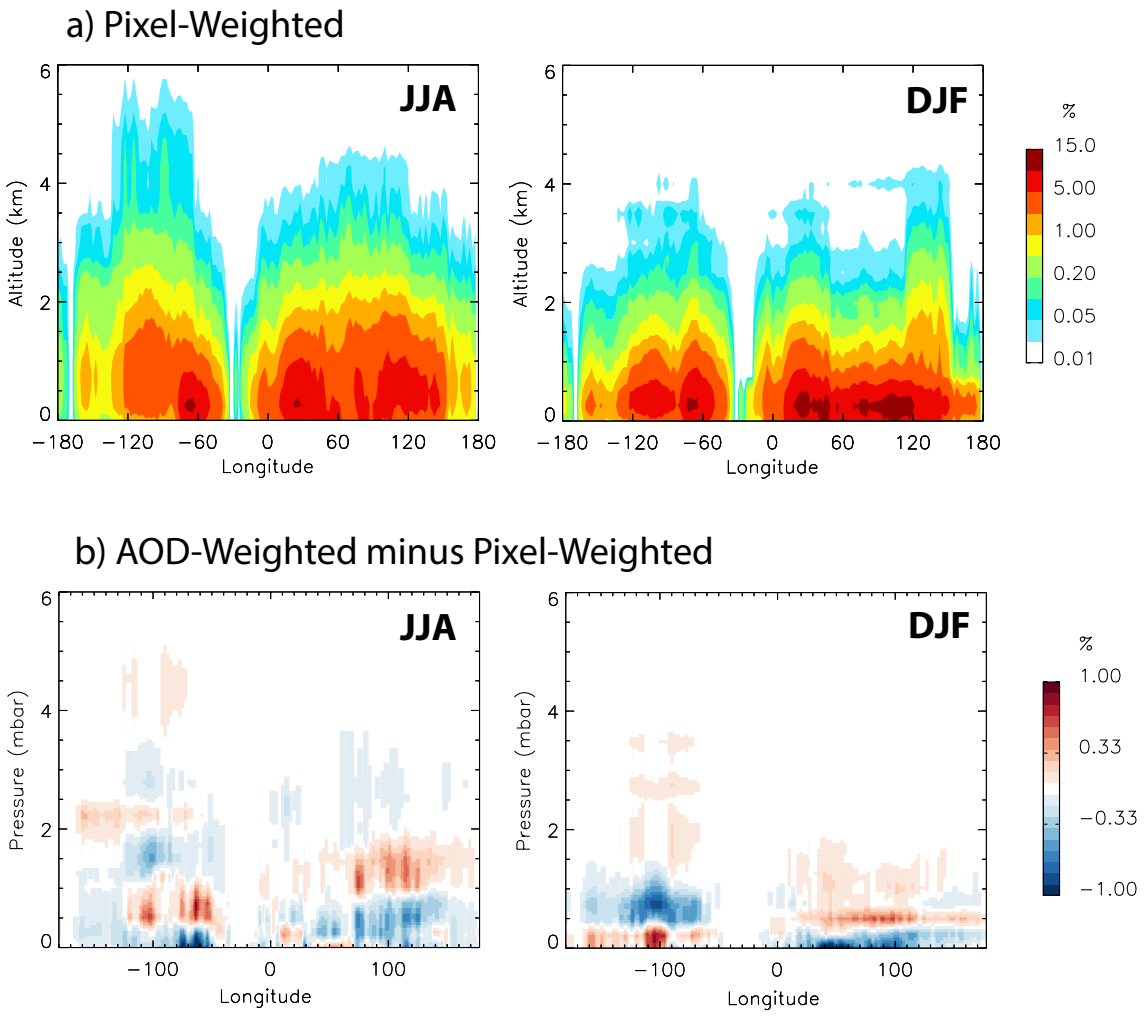

Figure S8. Zonal (80S-80N) averages of vertical distribution of biomass burning injection heights with the pixel-weighted method (%) for northern summer (JJA) and winter (DJF) (a). The difference between the AOD-weighted and pixel-weighted methods for JJA and DJF is also shown for comparison (b). The 2008 data were used for these plots.

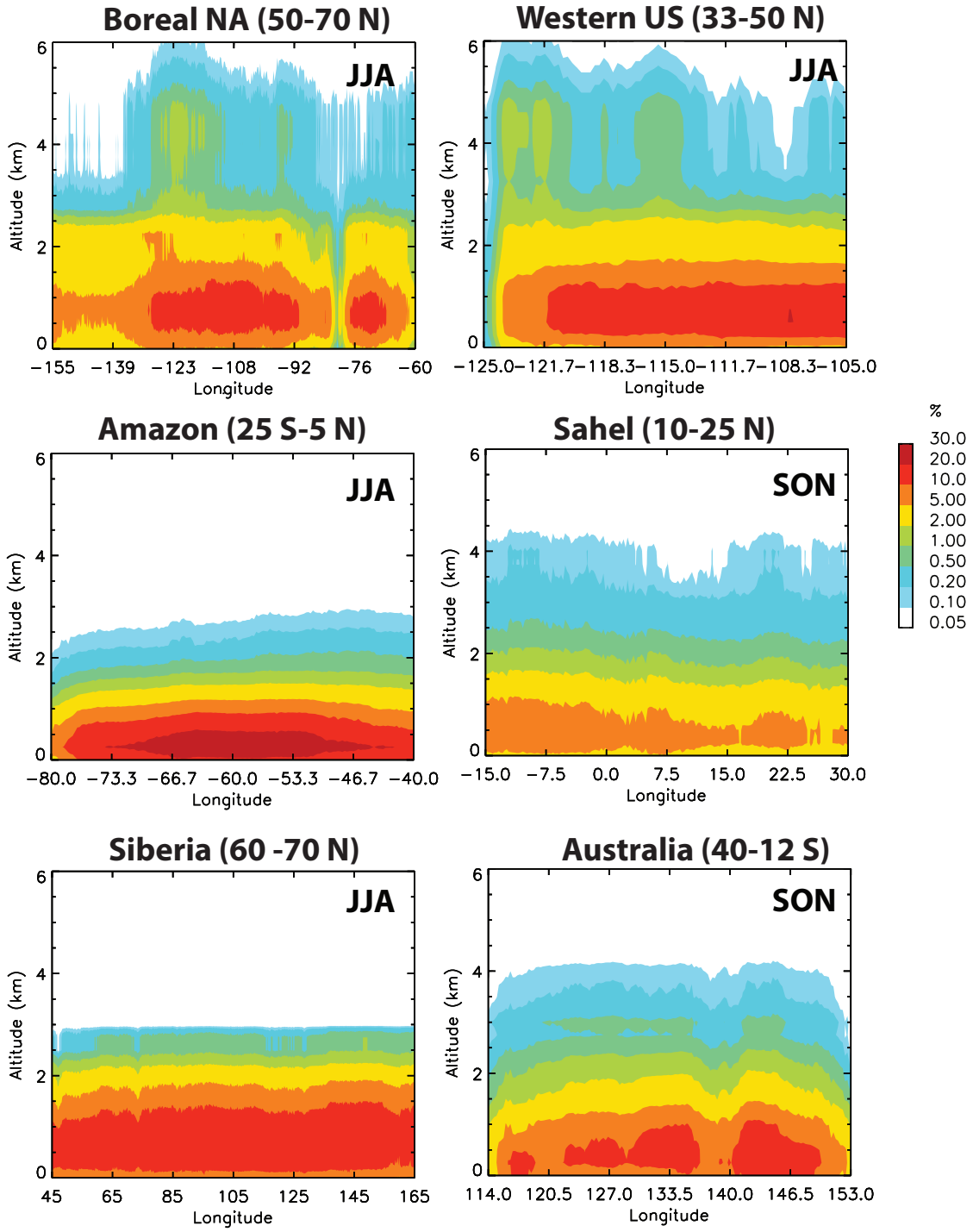

Figure S9. Regional zonal averages of vertical distribution of biomass burning injection heights with the AOD-weighted method (%) in 6 fire regions for their primary active fire season.

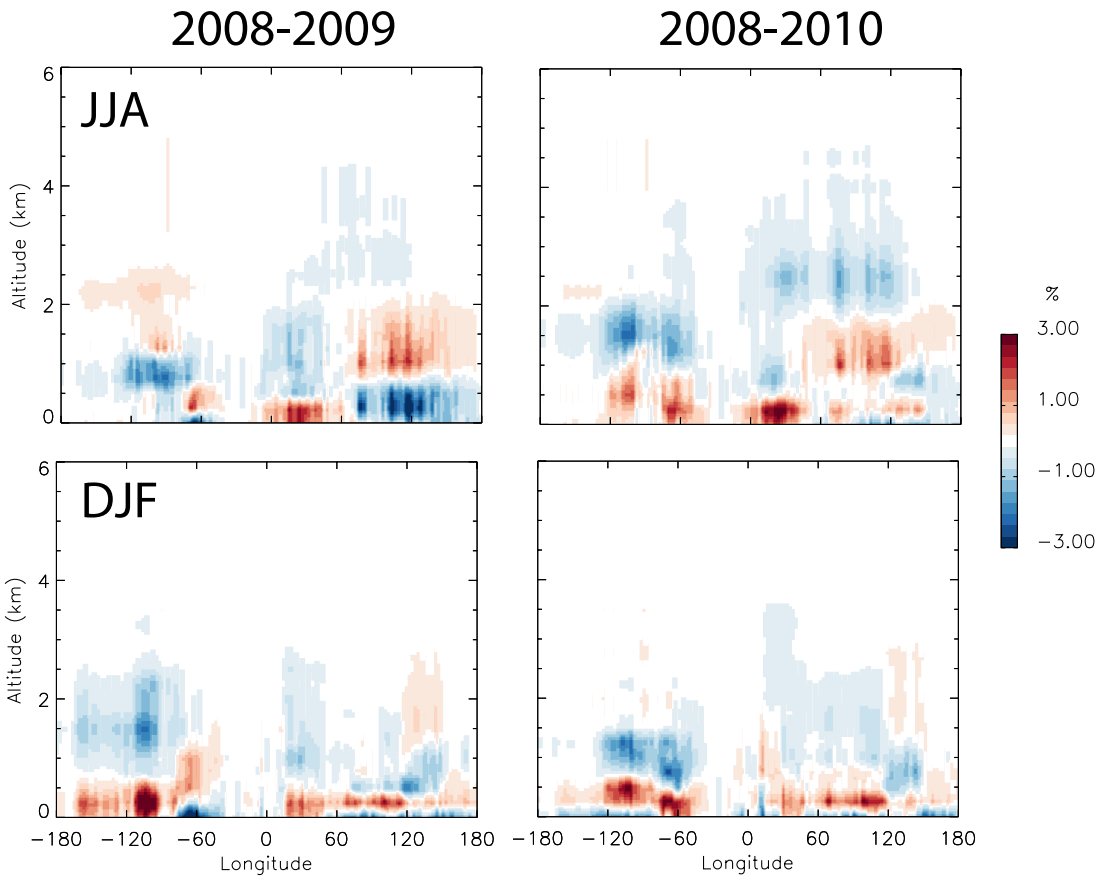

Figure S10. Differences in the zonal (80S-80N) annual average vertical distribution of biomass burning injection heights with the AOD-weighted method (%) for 2008-2009 and 2008-2010 for northern summer (JJA) and winter (DJF).