Supplementary materials to "Global fire emissions and the contribution of deforestation, savanna, forest, agricultural, and peat fires (1997-2009)"

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Table S1a. Tropical deforestation and forest degradation fire emissions (Tg C year^{-1}) for 1997-2009.

Region	Year													Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
BONA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TENA	0	0	0	0	0	0	0	0	0	1	0	0	0	0
CEAM	8	37	5	15	2	6	16	2	11	11	7	7	10	11
NHSA	8	33	2	4	4	2	31	7	2	2	10	3	3	9
SHSA	93	162	102	53	46	99	118	200	315	161	349	109	49	143
EURO	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NHAF	56	53	48	53	34	47	48	32	50	47	38	40	31	44
SHAF	26	35	27	28	26	24	41	31	41	29	32	39	37	32
BOAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CEAS	2	1	3	2	0	1	2	3	3	2	3	5	5	3
SEAS	42	134	108	35	19	52	39	112	56	56	119	36	80	68
EQAS	290	95	17	15	26	110	34	51	69	143	12	18	40	71
AUST	4	1	2	2	4	4	3	2	6	2	1	2	6	3
Globe	530	550	316	207	161	346	332	441	552	454	574	258	260	383

Table S1b. Grassland and savanna fire emissions (Tg C year^{-1}) for 1997-2009.

Region							Year							Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
BONA	3	18	4	3	0	2	2	2	2	1	1	1	1	3
TENA	1	1	2	2	1	1	1	0	2	2	2	1	2	1
CEAM	2	4	2	3	2	2	2	1	2	2	2	2	2	2
NHSA	8	14	11	13	11	6	17	17	9	8	13	9	9	11
SHSA	69	179	122	60	67	75	58	61	76	36	104	40	21	74
EURO	1	1	1	1	0	0	1	0	0	0	1	0	0	0
MIDE	0	1	1	1	0	0	1	1	0	1	1	0	1	1
NHAF	337	384	343	341	293	338	334	299	370	294	310	315	271	325
SHAF	217	327	253	255	266	269	316	315	315	295	291	303	294	286
BOAS	8	74	9	15	9	7	27	1	4	6	5	8	6	14
CEAS	21	13	5	13	8	23	13	11	12	14	14	9	7	12
SEAS	7	12	17	8	7	16	12	22	10	11	18	12	10	13
EQAS	10	2	1	1	2	3	1	2	1	2	1	0	1	2
AUST	94	97	164	129	161	123	80	140	73	112	107	70	104	112
All	779	1127	934	844	829	866	864	873	876	784	868	770	728	857

Table S1c. Woodland fire emissions (Tg C year^{-1}) for 1997-2009.

Region	Year													Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
BONA	1	4	2	0	0	1	1	2	1	1	1	1	1	1
TENA	0	3	2	4	2	1	2	2	2	2	5	2	2	2
CEAM	1	5	2	2	2	2	3	2	6	3	1	2	2	2
NHSA	1	1	0	0	0	0	1	0	0	0	0	0	0	0
SHSA	12	20	26	6	14	32	15	29	32	23	70	23	9	24
EURO	1	3	1	3	1	1	2	1	3	1	3	1	1	2
MIDE	0	0	0	0	0	0	0	0	0	0	1	0	0	0
NHAF	143	112	86	104	73	63	97	48	81	73	66	64	36	80
SHAF	209	247	193	174	173	142	185	175	204	166	160	181	159	182
BOAS	4	12	6	5	4	10	22	2	3	5	6	17	4	8
CEAS	5	3	2	3	5	5	4	3	3	4	4	7	4	4
SEAS	5	7	7	3	4	5	5	6	3	4	5	3	2	5
EQAS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AUST	9	6	10	7	9	6	8	7	6	9	3	3	13	7
Globe	392	423	339	312	288	269	344	278	342	291	326	304	233	319

Table S1d. Forest fire emissions (Tg C year^{-1}) for 1997-2009.

Region	Year													Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
BONA	15	94	30	11	4	65	57	135	63	47	39	47	42	50
TENA	0	3	5	5	2	7	5	1	2	5	12	8	3	5
CEAM	2	10	4	5	2	2	4	1	6	3	2	2	2	3
NHSA	2	3	1	1	1	1	5	1	1	1	2	1	1	2
SHSA	19	35	34	12	8	19	18	32	31	16	39	17	8	22
EURO	1	2	0	2	1	0	2	0	2	2	1	0	0	1
MIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NHAF	35	30	25	26	18	22	20	19	23	20	19	18	17	22
SHAF	56	64	55	50	46	43	49	54	57	54	45	51	51	52
BOAS	24	243	64	116	86	167	269	11	38	80	29	126	51	100
CEAS	18	6	3	10	2	7	17	1	2	6	4	5	6	7
SEAS	7	20	21	5	3	7	6	13	7	5	12	5	6	9
EQAS	45	11	2	1	2	9	2	5	3	9	1	1	4	7
AUST	11	8	6	8	12	20	36	5	4	24	10	3	14	12
Globe	234	529	250	253	187	370	490	279	238	274	215	285	205	293

Table 1e. Agricultural waste burning emissions (Tg C year^{-1}) for 1997-2009.

Region	Year													Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
BONA	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TENA	0	1	1	1	1	1	1	1	1	1	1	1	1	1
CEAM	1	5	1	2	1	1	3	2	2	2	2	1	2	2
NHSA	1	0	0	0	0	0	0	0	0	0	0	0	0	0
SHSA	8	17	14	6	7	6	5	5	5	5	9	5	3	7
EURO	0	1	1	2	3	1	1	1	0	1	2	1	1	1
MIDE	1	1	1	0	2	1	1	1	1	1	1	0	1	1
NHAF	10	8	9	9	9	8	8	8	9	8	7	7	7	8
SHAF	5	8	5	5	4	4	5	5	5	4	5	4	4	5
BOAS	6	9	5	5	5	6	16	2	3	5	6	14	5	7
CEAS	11	7	5	9	18	13	7	7	8	9	10	15	9	10
SEAS	4	13	7	4	7	11	7	13	11	6	11	8	8	8
EQAS	25	5	1	1	1	4	1	1	1	4	1	0	2	4
AUST	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Globe	72	75	51	46	57	56	55	46	47	46	55	59	44	55

Table 1f. Tropical peatland fire emissions (Tg C year^{-1}) for 1997-2009.

Region							Year							Mean
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	
EQAS	699	71	11	2	39	159	33	50	49	209	6	5	53	107
Globe	699	71	11	2	39	159	33	50	49	209	6	5	53	107

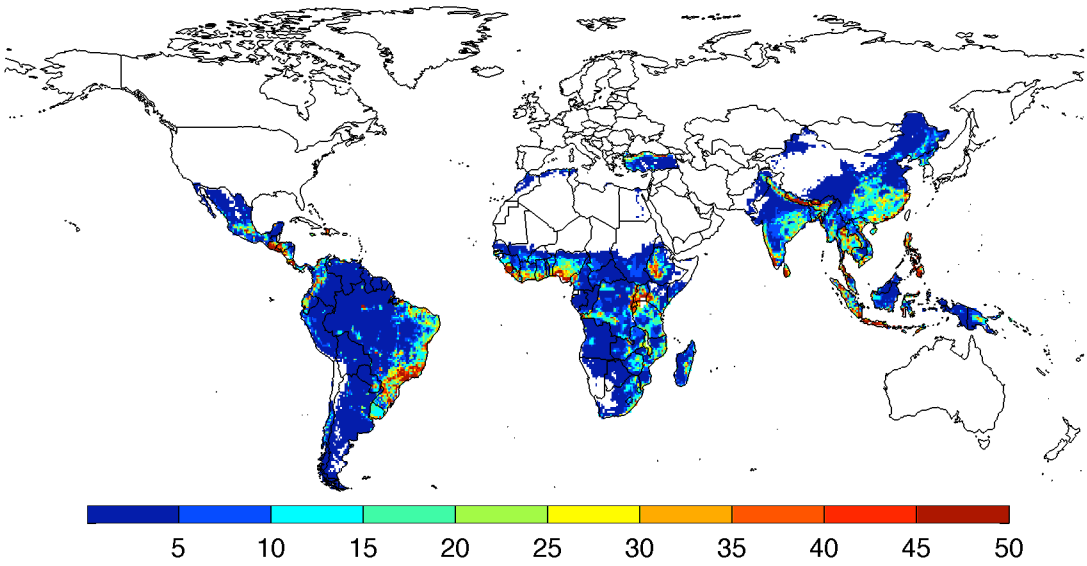

Fig. S1. Fuel wood collection (g C m^{-2} $year^{-1}$) based on population density and country-level fuel wood collection statistics (as in van der Werf et al., 2003).

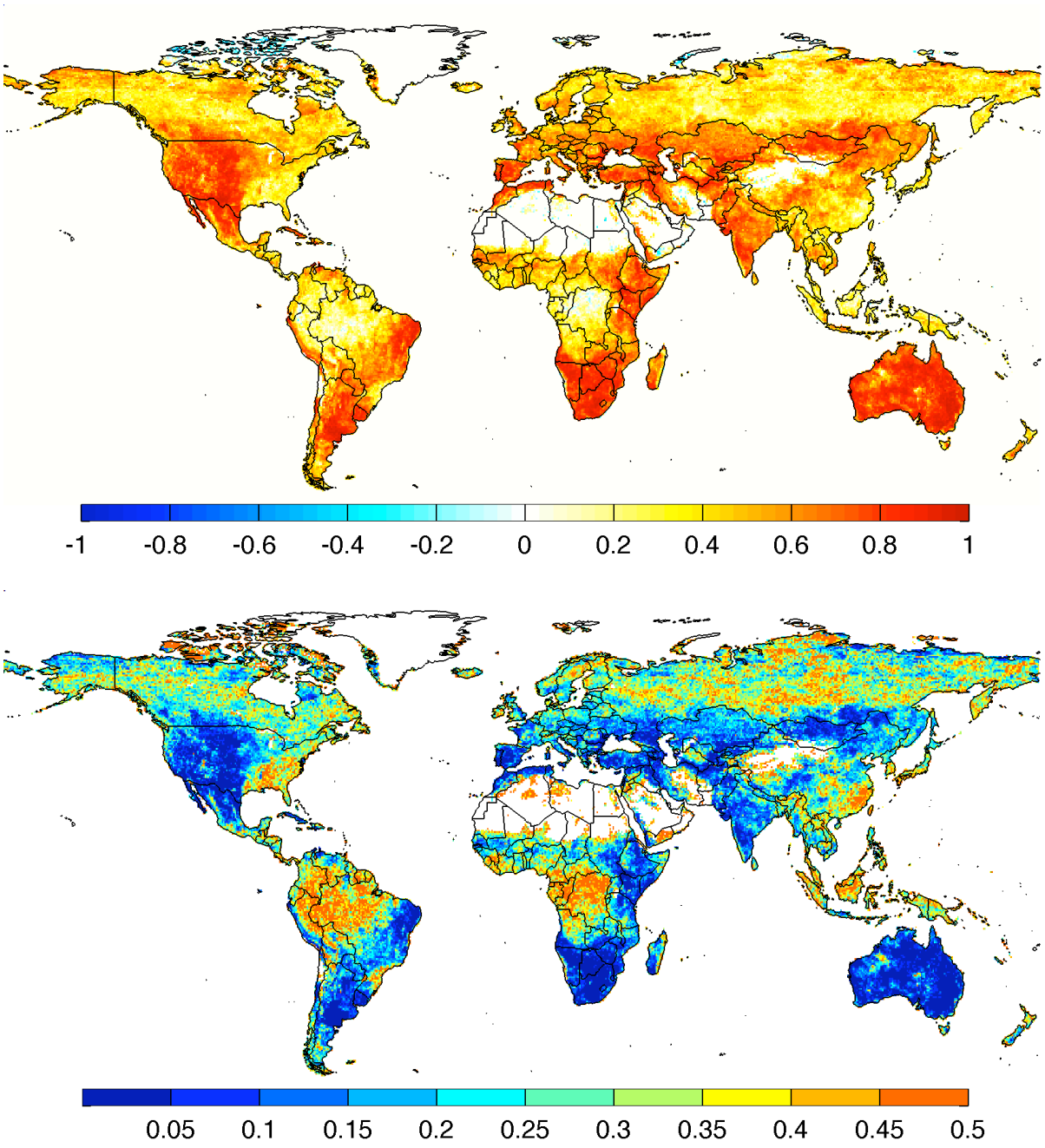

Fig. S2. Regression coefficient (top panel) and *p*-value (bottom panel) of linear regression between MODIS *f*APAR and AVHRR GIMMS NDVI anomalies over 2001-2008 (n = 8). Values were the mean of the 12 monthly regressions.

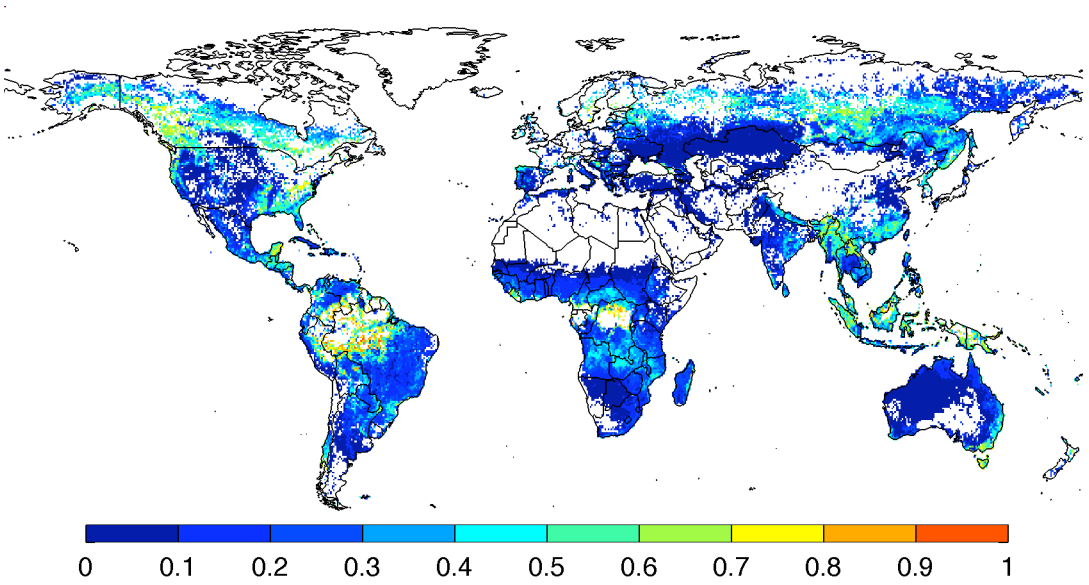

Fig. S3. Contribution of area burned in the wooded fraction to total burned area in each 0.5° grid cell during 2001-2009. This calculation was based on the 500 meter burned area, 500 meter fractional tree cover maps, and eq. 3.

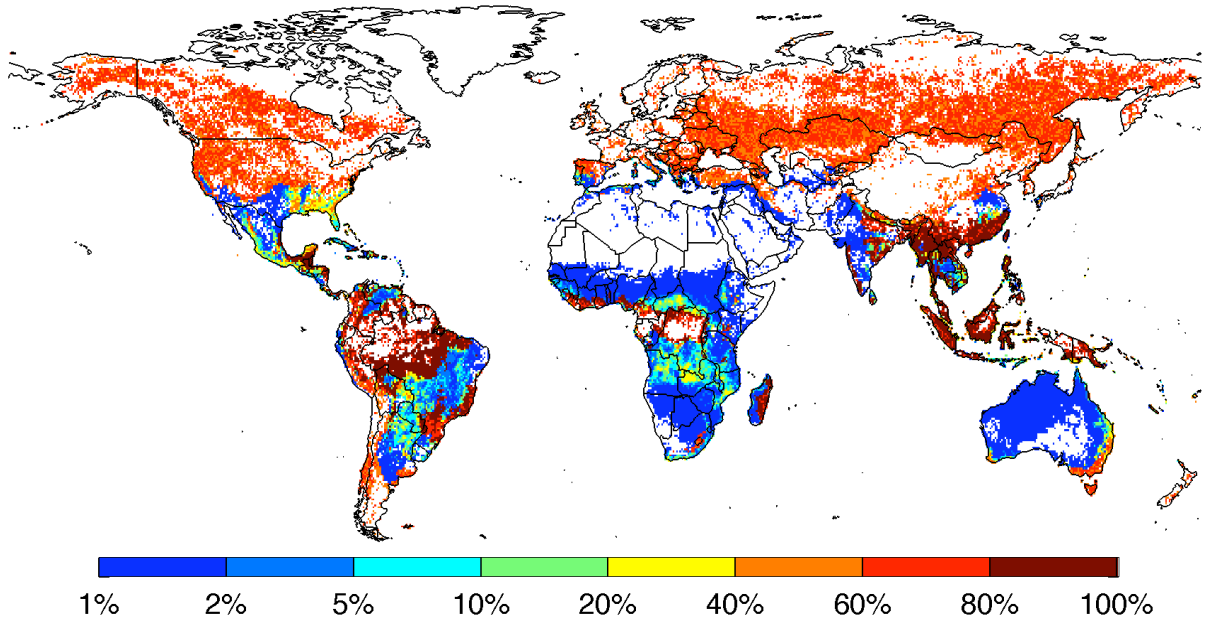

Fig. S4. Fire induced tree mortality as a function of burned area and fractional tree cover (eq. 4). Tree mortality was constant (60%) in temperate and boreal ecosystems (Mean annual temperature < 15°C) and varied between 80-100% in deforestation zones based on fire persistence.

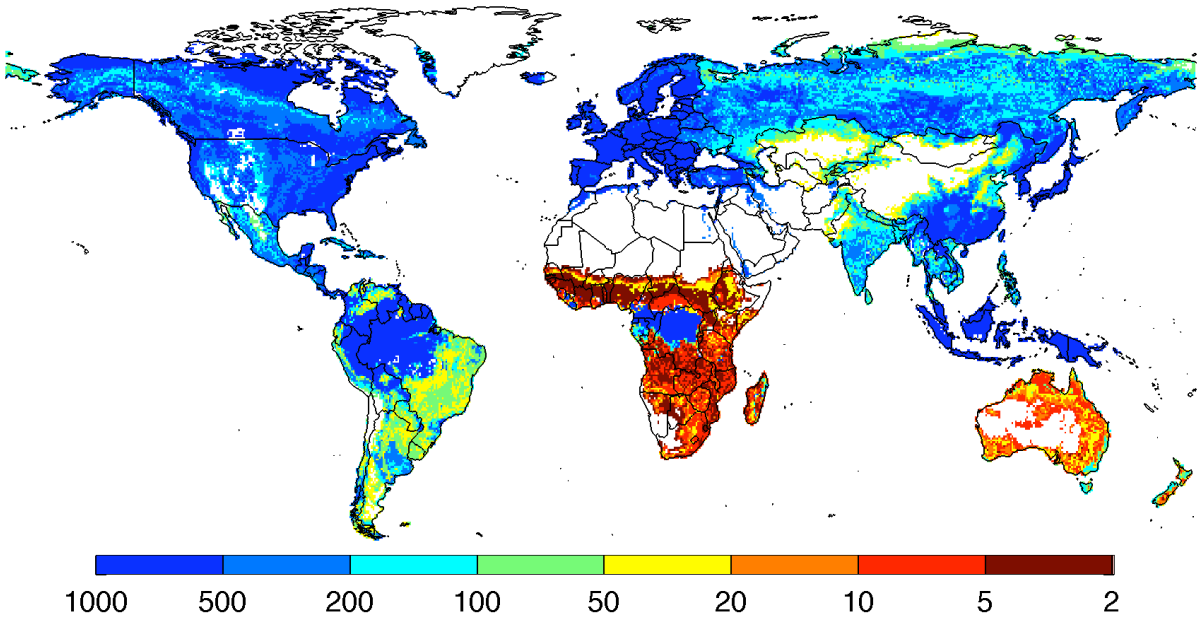

Fig. S5. Average fire return time (years) used in the spin-up, based on burned area during 1997-2009, averaged per region by 10% fractional tree cover bins. Note that the high fire return times observed in African savanna areas do not necessarily limit tree growth; modeled tree mortality is relatively low in these regions (Fig. S4).

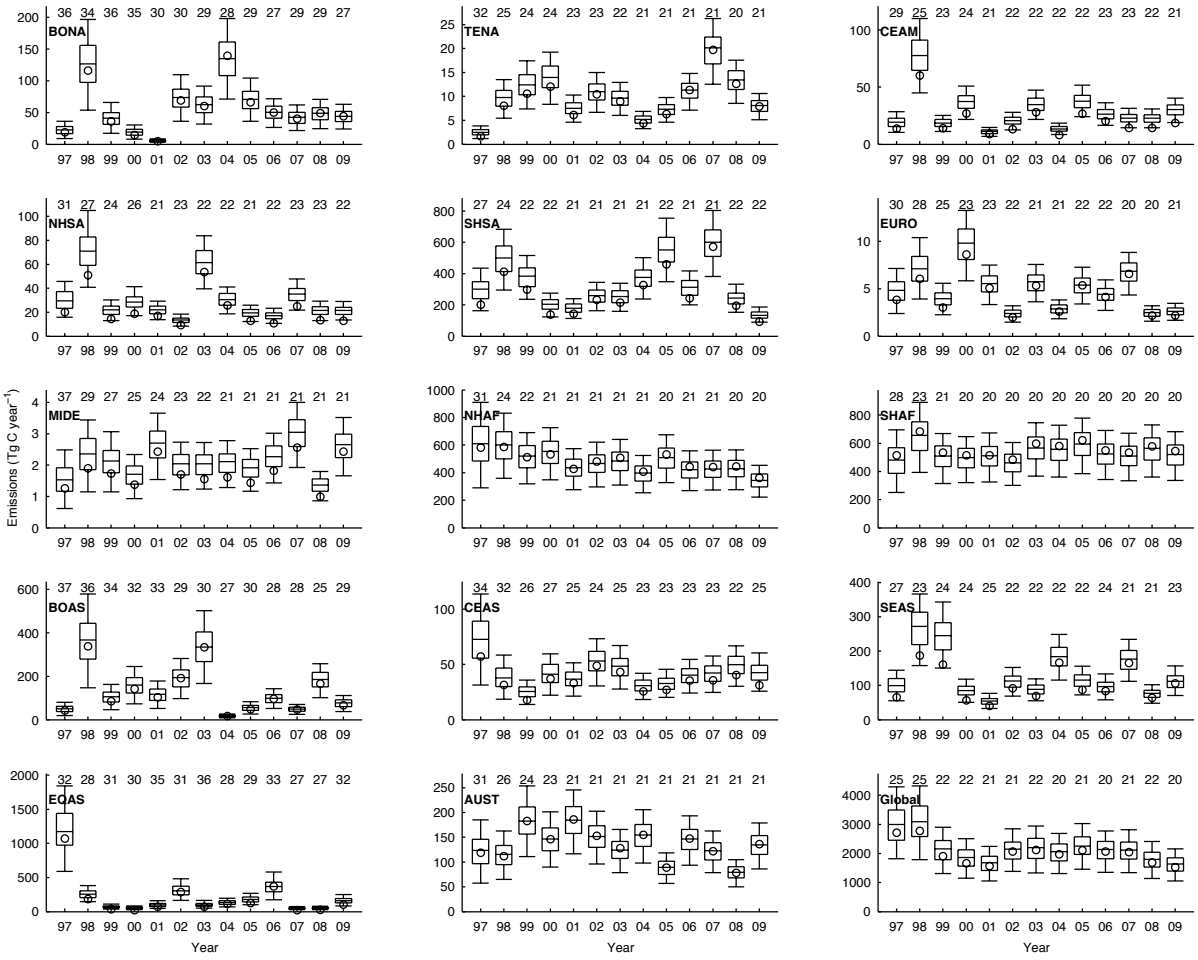

Fig. S6. Annual uncertainties for different regions (Fig. 7) expressed as the 5th, 25th, 50th, 75th, and 95th percentiles of 2000 runs in a Monte Carlo set-up. Circles denote the estimates reported throughout the paper, which do not necessarily align with the 50th percentiles due to truncation of several parameters in the Monte Carlo simulations. Numbers on top give an indication of 1σ uncertainties (expressed as percentage of the 50th percentile) assuming a Gaussian distribution.

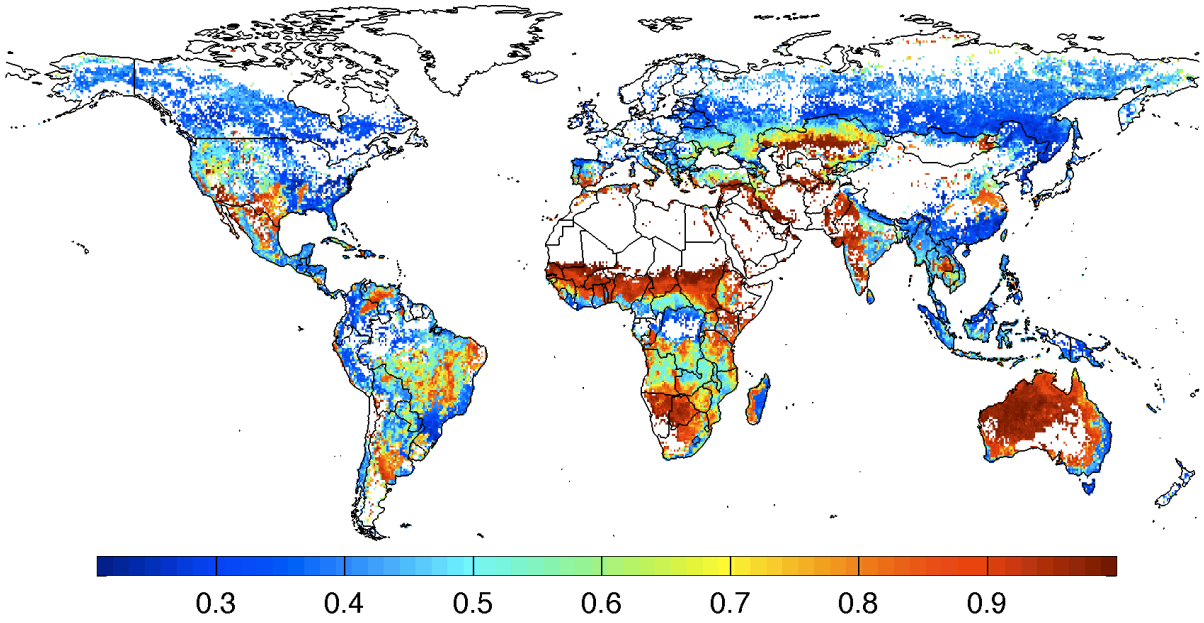

Fig. S7. Combustion completeness of aboveground live biomass (trees, leaves, grass), averaged over 1997-2009. Only trees killed by fire are taken into account, combustion completeness decreases when taking all trees into account (see Table 4).

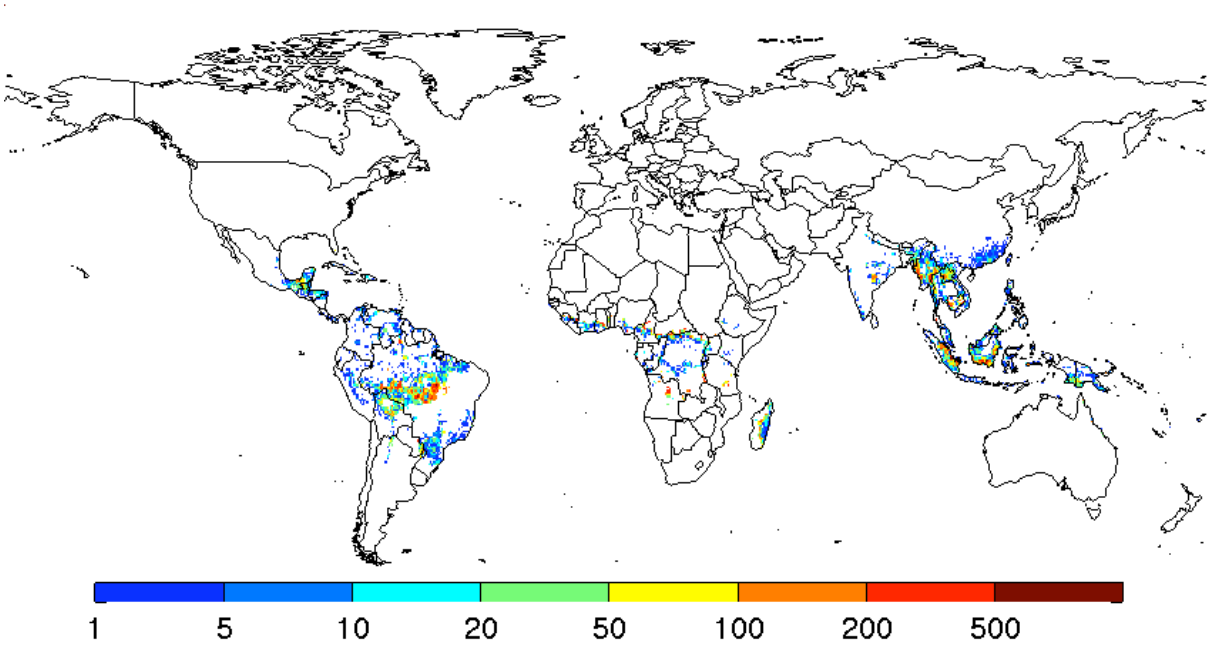

Fig. S8a. Annual emissions from deforestation and degradation fires (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

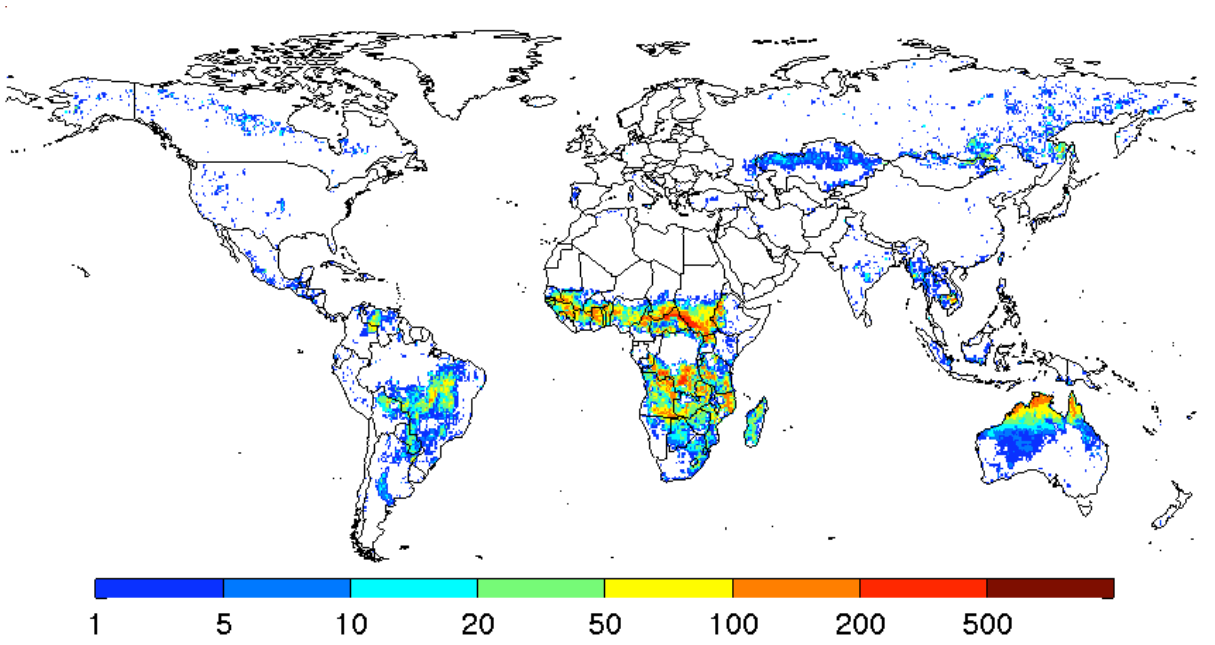

Fig. S8b. Annual emissions from savanna and grassland fires (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

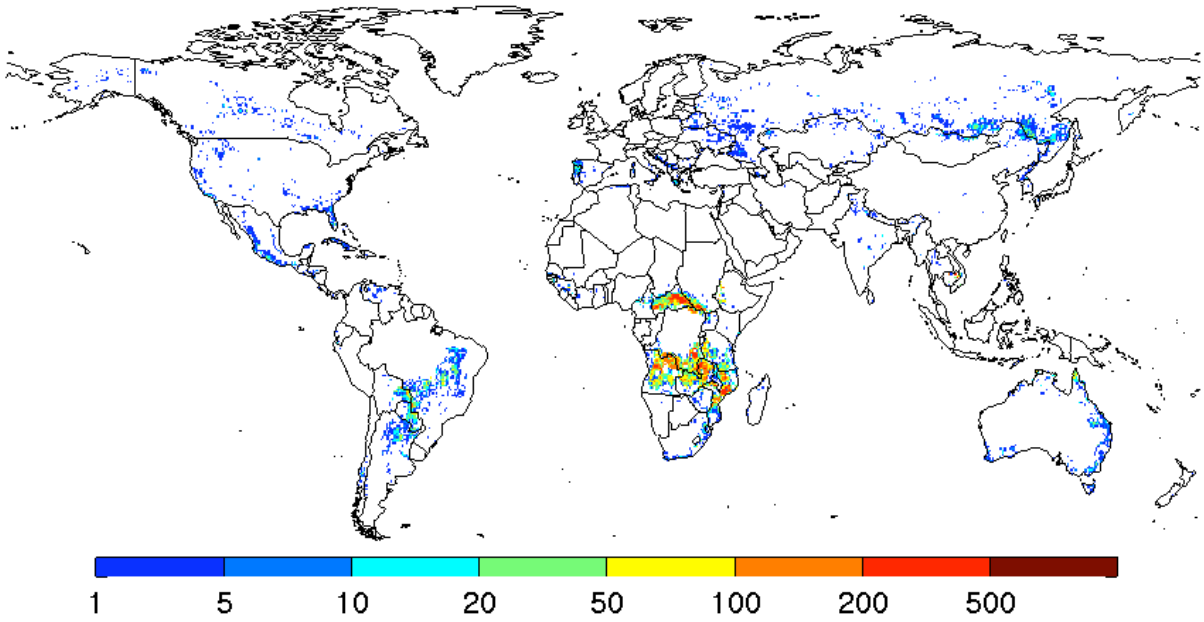

Fig. S8c. Annual emissions from woodland fires (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

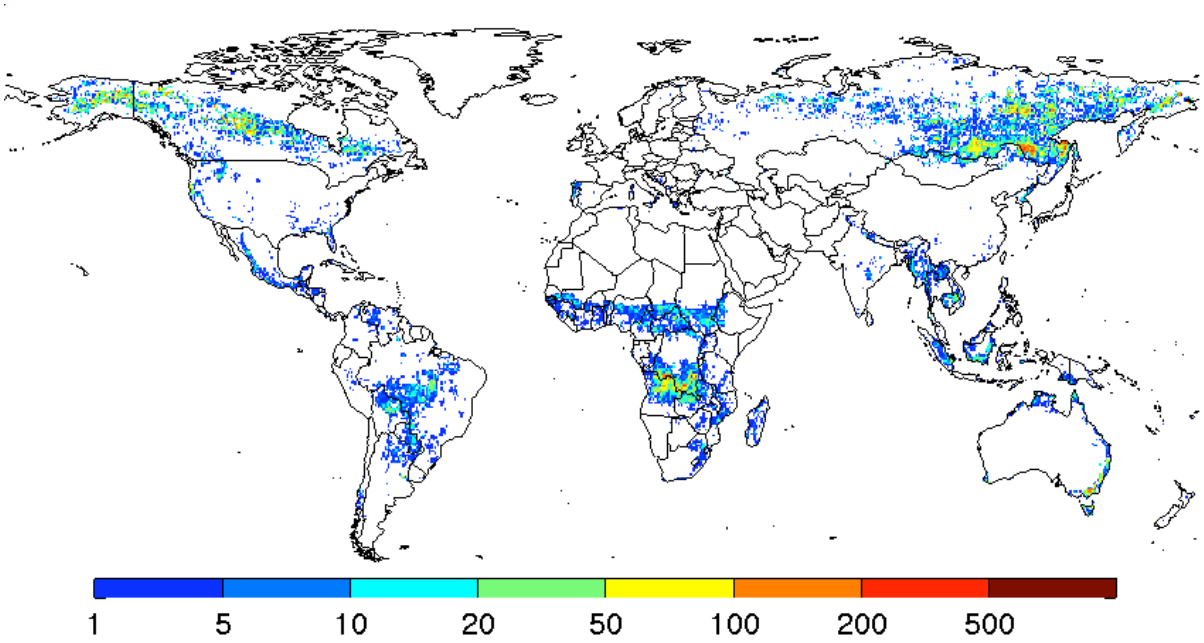

Fig. S8d. Annual emissions from forest fires (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

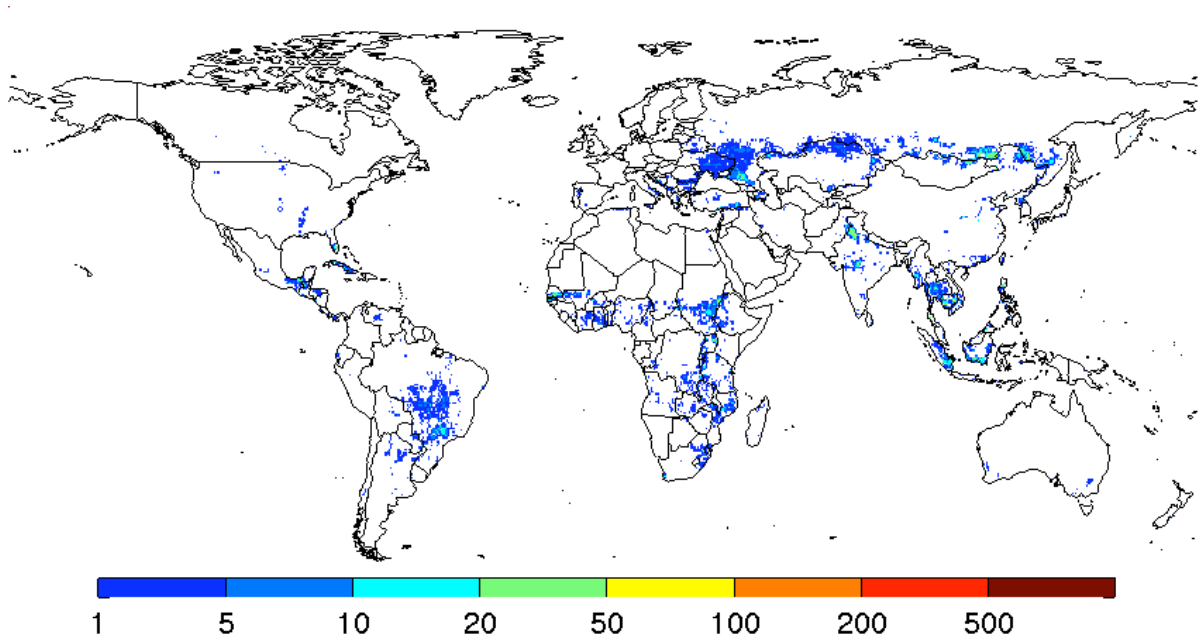

Fig. S8e. Annual emissions from agricultural waste burning (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

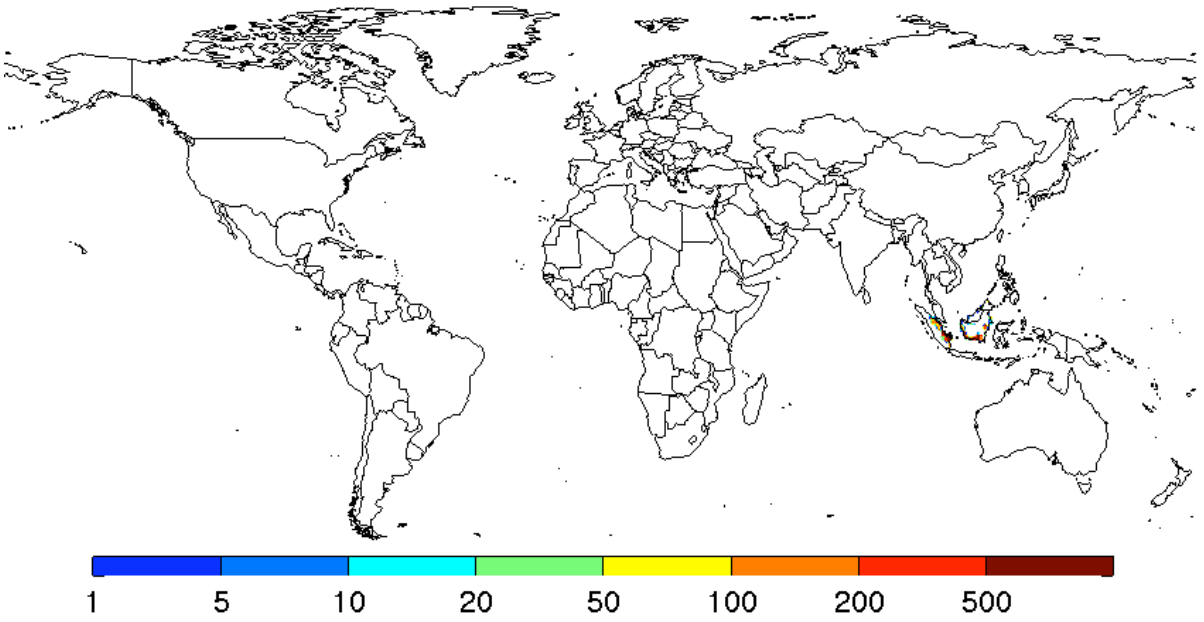

Fig. S8f. Annual emissions from tropical peatland fires (g C m^{-2} $year^{-1}$), averaged over 1997-2009.

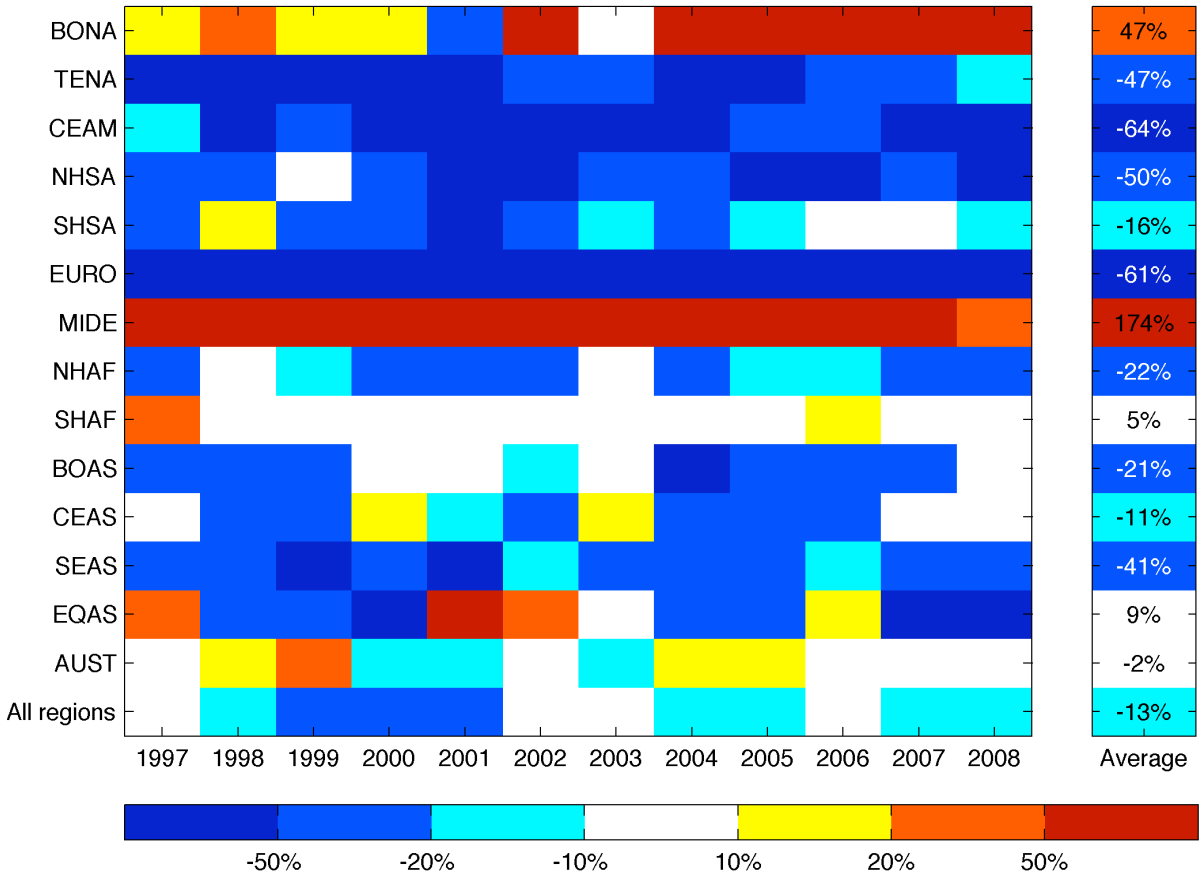

Fig. S9. Differences in fire CO emissions estimates between GFED3 and GFED2, as a percent of GFED2 estimates. Positive numbers indicate GFED3 is higher than GFED2 and vice versa.

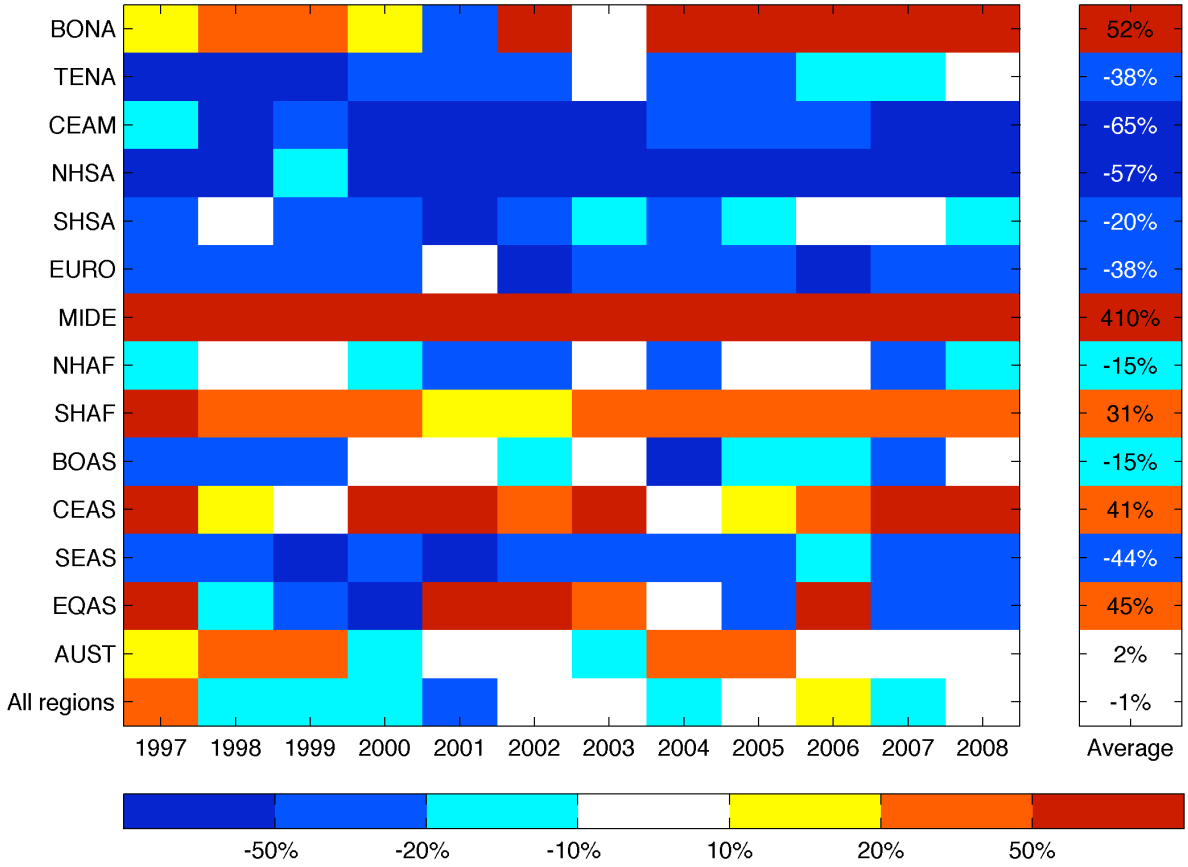

Fig. S10. Differences in fire CH_4 emissions estimates between GFED3 and GFED2, as a percent of GFED2 estimates. Positive numbers indicate GFED3 is higher than GFED2 and vice versa.