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Global Emissions Inventory from Open Biomass Burning (GEIOBB): utilizing Fengyun-3D global fire spot monitoring data

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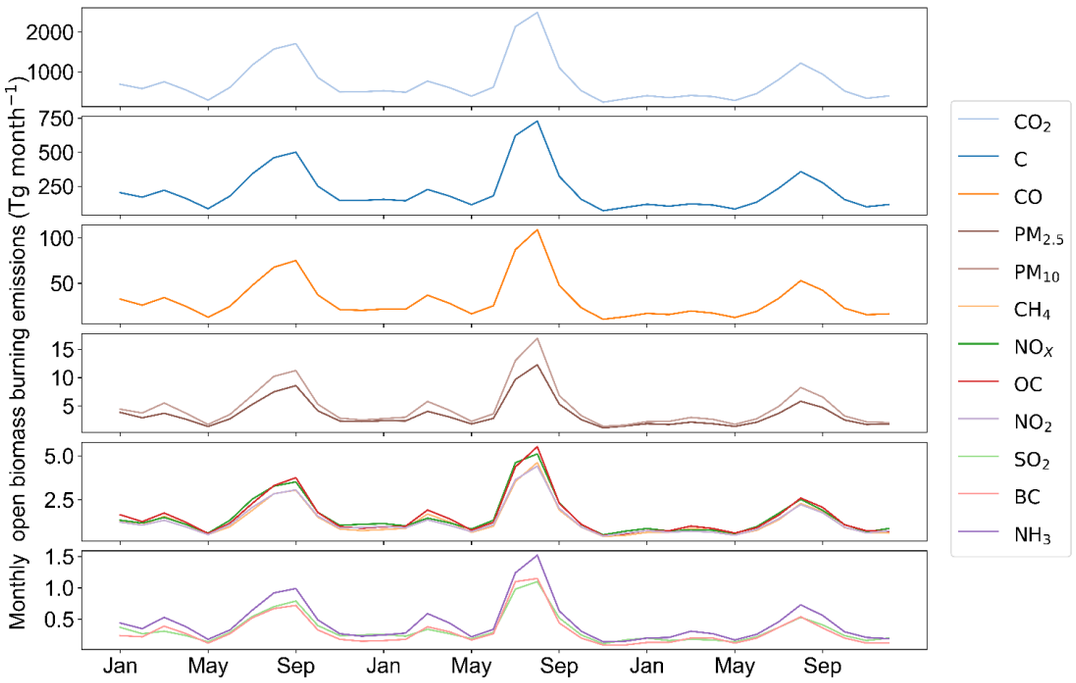

Figure S1: Global monthly variations of OBB emissions from 2020 to 2022.

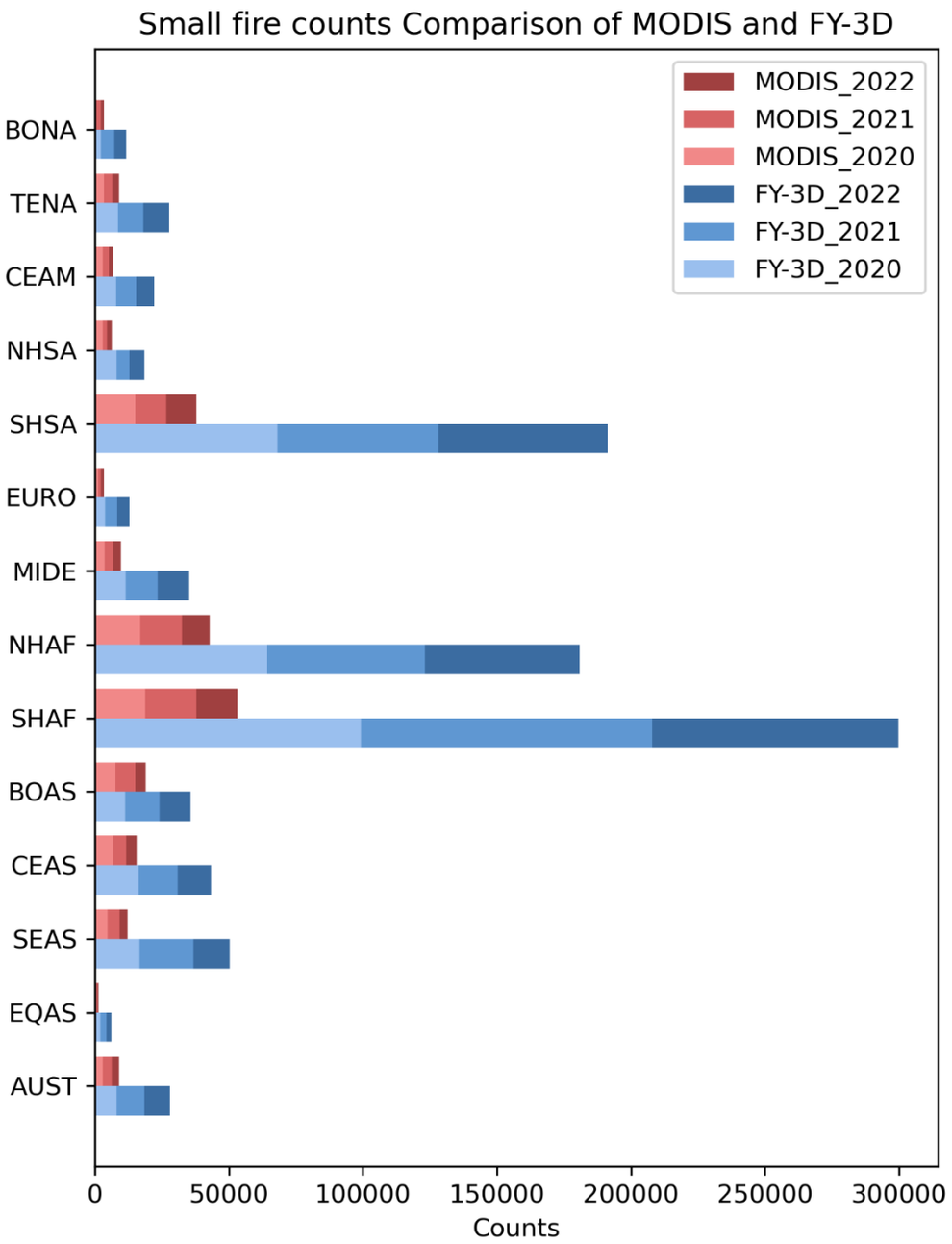

Figure S2. Small fire count in 2020-2022 between MODIS active fire and FY-3D GFR

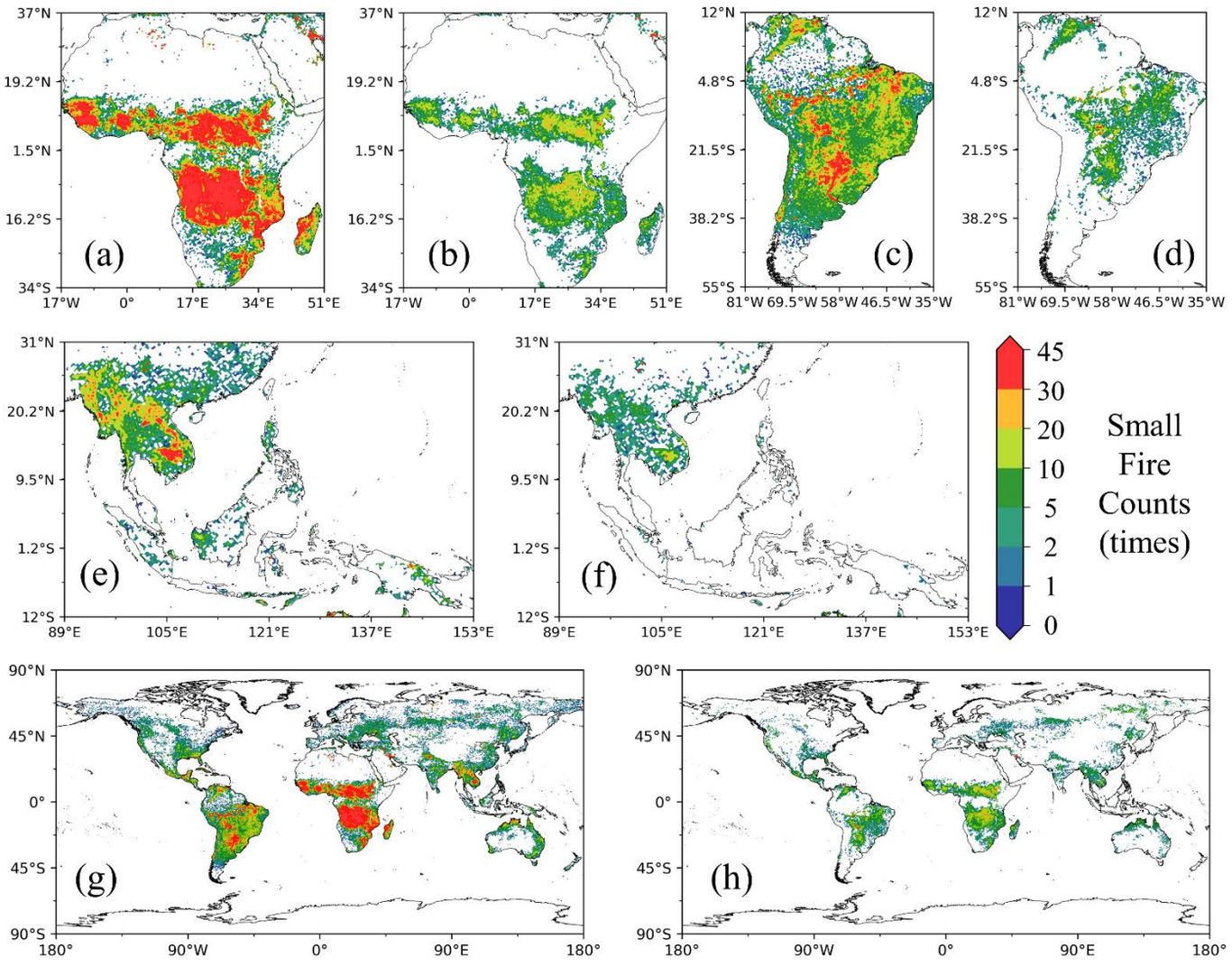

Figure S3. Small fire counts in 2020-2022. (a) FY-3D GFR in Africa. (b) MODIS GFR in Africa. (c) FY-3D GFR in South America. (d) MODIS active fire in South America. (e) FY-3D GFR in Southeast Asia. (f) MODIS active fire in Southeast Asia. (g) FY-3D GFR in Global. (h) MODIS active fire in Global.

Table S1. Comparison of parameters related to MERSI-2, MODIS, and VIIRS.

	MERSI-2 (FY-3D)	**MODIS (AQUA)**	**VIIRS (NOAA-20)**
Orbit altitude (km)	836	705	824
Equator Crossing time	14:00 LT	13:30 LT	14:20 LT
Swath (km)	2900	2330	3060
Pixel resolution at nadir (km)	1	1	0.75/0.375
Pixel resolution at the edge (km)	>6	4	1.5/0.75
ID MIR Band (s)	21	21/22	M-13/I-4
Spectral range (μm)	3.973–4.128	3.929–3.989 3.940–4.001	3.973–4.128 3.550–3.930
TMAX (SNR–NEΔT on orbit)	380 K (0.25)	500 K (0.183) 331 K (0.019)	634 K (0.04)
ID TIR Band (s)	24	31	M-15/I-5
Spectral range (μm)	10.300–11.300	10.780–11.280	10.263–11.263 10.500–12.400
TMAX (SNR–NEΔT on orbit)	330 K (0.4)	400 K (0.017)	343 K (0.03)

TMAX means maximum temperature, SNR means signal-to-noise ratio, and NEΔT means noise equivalent differential temperature.

Table S2. **Reclassification method.**

IGBP LCT Description	LCT Value	Method and Value
Evergreen Needleleaf Forests	1	If latitude>50, then V5; else V6
Evergreen Broadleaf Forests	2	If latitude>-23.5 and <23.5, then V3; else V4
Deciduous Needleleaf Forests	3	If latitude >50, then V5; else V4
Deciduous Broadleaf Forests	4	V4
Mixed Forests	5	If latitude >50, then V5; if latitude>-23.5 and <23.5, then V3; else V4
Closed Shrublands	6	V2
Open Shrublands	7	V2
Woody Savannas	8	V2
Savannas	9	V1
Grasslands	10	V1
Permanent Wetlands	11	V1
Croplands	12	V7
Urban and Built-up Lands	13	If tree cover < 40, then V1; if tree cover >40 and <60, then V2; if tree cover >60 then assign to Mixed Forests.
Cropland/Natural Vegetation Mosaics	14	V1
Permanent Snow and Ice	15	-
Barren	16	V1
Water Bodies	17	-

A major influence on fire discharge in the framework is the condition of the subsurface at the location of the fire event. Different types of subsurface have different biological qualities and correlates. In GEIOBB we used IGBP categorized data from MODIS LCT (Friedl and Sulla-Menashe, 2022) and we reclassified the original 17 classifications and reclassified the results to reorganize the subsurface types into seven categories (Table 1, reclassification approach), including grasslands and savannas (V1), woody savannas or shrubs (V2), tropical forests (V3), temperate forests (V4), boreal forests (V5), temperate evergreen forests (V6), and crops (V7), to allow for better matching in subsequent assignments of biomass and related factors.

Table S3. Annual global fire CO_2 emission from different regions between GEIOBB and FINN during 2020 to 2021 (Unit: Tg).

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
BONA	3.85	1.40	1.96	2.25	10.21	8.46	174.01	60.47	2.01	11.99	10.55	6.64
	0.95	0.40	0.35	0.80	3.58	6.99	74.71	33.03	2.03	9.13	5.21	1.91
TENA	15.89	11.61	21.38	14.33	5.61	15.33	106.21	217.38	203.59	55.53	30.45	12.86
	5.50	7.53	22.27	16.94	5.27	5.18	25.24	78.38	99.47	22.87	18.23	6.77
CEAM	2.40	5.20	20.66	63.71	25.69	5.75	1.40	1.69	1.51	1.49	1.31	2.82
	3.70	7.52	30.58	141.69	86.03	9.22	1.98	1.36	1.76	1.33	1.78	3.03
NHSA	12.85	36.13	52.55	18.95	4.97	1.81	3.34	3.87	5.22	5.37	7.58	3.83
	24.35	75.47	94.84	36.39	13.55	1.70	2.27	2.87	5.80	13.36	5.95	7.18
SHSA	19.95	24.41	28.90	28.00	36.51	48.94	160.29	632.45	503.07	341.86	89.81	33.15
	19.17	14.27	20.49	21.02	29.00	53.80	139.46	630.35	658.28	437.38	131.72	41.66
EURO	1.60	2.84	4.00	4.49	2.13	1.72	4.02	14.79	3.19	1.35	0.95	0.56
	0.54	2.44	5.60	7.03	0.84	1.08	4.26	8.65	4.24	2.41	0.83	0.22
MIDE	0.77	0.54	0.54	0.43	1.03	1.81	9.59	14.65	2.70	2.67	0.97	0.77
	0.51	0.52	0.48	0.36	1.21	2.17	2.23	2.86	1.49	1.88	1.35	0.75
NHAF	391.64	317.22	161.86	99.89	25.47	3.34	3.63	7.48	4.16	15.37	119.84	314.86
	323.62	481.45	328.99	104.57	21.13	8.52	4.71	3.90	3.71	20.30	109.00	229.80
SHAF	13.17	18.31	18.06	10.11	128.30	444.23	894.25	782.83	582.74	198.81	62.61	14.08
	9.79	20.37	23.25	23.03	105.28	348.06	669.50	533.22	447.17	146.53	79.21	19.38
BOAS	0.55	0.71	7.88	56.70	31.79	60.78	260.32	254.43	63.36	13.17	3.15	0.33
	0.01	0.12	9.04	82.38	39.74	73.64	244.67	198.78	41.65	11.78	2.00	0.06
CEAS	5.89	5.16	17.84	26.60	5.09	2.76	5.56	7.22	4.85	10.96	4.76	8.83
	13.09	15.24	43.69	70.69	12.56	9.96	13.81	15.37	12.52	19.20	7.83	11.24
SEAS	27.58	80.90	411.98	228.48	30.86	3.43	1.38	1.32	0.74	2.39	5.77	5.29
	98.13	197.47	660.16	422.14	51.68	9.12	5.61	5.16	4.97	14.36	32.36	27.96
EQAS	1.15	3.87	6.46	1.96	1.23	1.36	3.87	10.26	11.12	5.80	2.15	0.47
	3.90	7.39	10.63	8.60	6.01	8.29	18.86	21.04	29.51	22.06	9.79	2.54
AUST	111.35	26.62	6.81	19.57	32.34	16.00	22.51	22.66	19.86	27.23	28.51	8.38
	51.09	9.21	4.19	11.68	23.70	13.99	18.87	14.02	12.07	20.42	22.73	9.16

The upper values are from GEIOBB, and the lower values are from FINN.