Supplementary materials

Table S1 The settings of combustion completeness in different land cover types.

$frac_{forest}$	**>60%**	**40%-60%**	**<40%**
cropland	0.93	0	0
grassland	0.9	$e^{-0.13\times FB}$	0.98
forest	0.3	0.05	0

Note: $frac_{forest}$ indicates the fraction of percentage of forest cover. FB stands for the fraction of burned within an individual grid cell.

Table S2 The emission factors of wildfire-induced emissions for various GHG types (unit: g kg^{-1} dry matter).

GHG	Grassland	Trop. F	Temp. F	Bor. F	Cropland	Wheat	Rice	Maize	Sugarcane
CO_2	1666.3±81.2	1632.1±65.0	1583.7±123.3	1519.2±136.5	1452.8±222.7	1454.4±50.0	1474.0±221	1336.0±36.6	1270.0±170.0
CH_4	2.63±2.12	6.10±1.82	5.05±2.79	5.59±2.65	5.72±5.60	2.46±1.19	3.51±3.12	3.72±1.72	0.40±0.20
N_2O	0.17±0.09	0.20±0.1	0.19±0.18	0.27±0.12	0.09±0.04	0.07±0.02	0.07±0.02	0.14±0.03	0.09±0.04

Note: Grassland represents all short vegetation dominated areas including grassland, shrubland and other herbaceous areas. Trop. F, Temp. F and Bor. F are the abbreviations for tropical, temperate and boreal forest. The different types of crop residues including wheat, rice, maize and sugarcane were contained within the extent of cropland pixels, using the ratio between planting area and grid area for calculation. The references are listed at the end of the text [1–14].

Table S3 Average burned area and wildfire-induced GHG emissions at regional and provincial level from 2012 to 2022.

Region/Province	Burned area (Mha yr^{-1})	CO_2 (Tg yr^{-1})	CH_4 (Gg yr^{-1})	N_2O (Gg yr^{-1})	Major fuel type[ǂ]	Peak month[#]
Northeast China	3.29 ± 1.49	43.07 ± 19.22	159.34 ± 73.01	3.33 ± 1.31	Crop	April
Nei Mongol	0.48 ± 0.16	4.98 ± 2.16	16.48 ± 7.53	0.54 ± 0.30	Crop	March
Liaoning	0.09 ± 0.04	1.28 ± 0.57	4.85 ± 2.22	0.10 ± 0.04	Crop	April
Jilin	0.65 ± 0.50	9.10 ± 6.80	34.28 ± 25.09	0.58 ± 0.41	Crop	April
Heilongjiang	2.06 ± 1.18	27.71 ± 15.22	103.73 ± 57.72	2.12 ± 1.03	Crop	April
East China	0.73 ± 0.95	10.51 ± 10.75	38.20 ± 38.60	0.73 ± 0.69	Crop	June
Shanghai	0.00 ± 0.00	0.01 ± 0.01	0.03 ± 0.03	0.00 ± 0.00	Crop	November
Jiangsu	0.13 ± 0.21	1.43 ± 2.12	5.22 ± 7.64	0.09 ± 0.13	Crop	June
Zhejiang	0.01 ± 0.01	0.40 ± 0.21	1.44 ± 0.73	0.03 ± 0.02	Crop	March
Anhui	0.41 ± 0.67	4.26 ± 6.75	15.29 ± 24.10	0.26 ± 0.41	Crop	June
Jiangxi	0.04 ± 0.03	1.32 ± 0.98	4.76 ± 3.52	0.11 ± 0.08	Crop	January
Hubei	0.08 ± 0.05	1.27 ± 0.96	4.72 ± 3.53	0.09 ± 0.07	Crop	February
Hunan	0.06 ± 0.03	1.82 ± 1.20	6.74 ± 4.35	0.14 ± 0.10	Crop	January
North China	0.74 ± 0.58	6.14 ± 4.64	21.57 ± 16.34	0.41 ± 0.29	Crop	June
Beijing	0.00 ± 0.00	0.03 ± 0.03	0.13 ± 0.11	0.00 ± 0.00	Crop	October
Tianjin	0.01 ± 0.01	0.11 ± 0.06	0.41 ± 0.22	0.01 ± 0.00	Crop	January
Hebei	0.11 ± 0.07	0.83 ± 0.46	2.83 ± 1.58	0.06 ± 0.03	Crop	June
Shanxi	0.08 ± 0.03	0.70 ± 0.33	2.29 ± 1.05	0.06 ± 0.03	Crop	March
Shandong	0.17 ± 0.03	1.54 ± 1.14	5.57 ± 4.08	0.10 ± 0.07	Crop	June
Henan	0.37 ± 0.43	2.93 ± 3.26	10.35 ± 11.39	0.18 ± 0.20	Crop	May

Region/Province	Burned area (Mha yr^{-1})	CO_2 (Tg yr^{-1})	CH_4 (Gg yr^{-1})	N_2O (Gg yr^{-1})	Major fuel typeᵻ	Peak month#
South China	0.16 ± 0.05	5.93 ± 1.97	20.49 ± 6.83	0.53 ± 0.17	Crop	January
Fujian	0.02 ± 0.01	0.66 ± 0.21	2.24 ± 0.74	0.06 ± 0.02	Forest	January
Guangdong	0.05 ± 0.03	1.92 ± 1.19	6.72 ± 4.15	0.16 ± 0.10	Crop	January
Guangxi	0.08 ± 0.01	3.02 ± 0.63	10.32 ± 2.17	0.27 ± 0.06	Crop	January
Hainan	0.01 ± 0.01	0.25 ± 0.14	0.91 ± 0.51	0.02 ± 0.01	Crop	February
Taiwan	0.00 ± 0.00	0.07 ± 0.02	0.27 ± 0.09	0.00 ± 0.00	Crop	March
Hong Kong	0.00 ± 0.00	0.01 ± 0.01	0.03 ± 0.04	0.00 ± 0.00	Forest	March
Macau	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	Grass	January
Northwest China	0.12 ± 0.06	1.36 ± 0.77	4.84 ± 2.76	0.10 ± 0.06	Crop	April
Shaanxi	0.03 ± 0.02	0.29 ± 0.18	1.02 ± 0.64	0.03 ± 0.02	Crop	March
Gansu	0.02 ± 0.01	0.14 ± 0.04	0.48 ± 0.13	0.01 ± 0.00	Crop	March
Qinghai	0.00 ± 0.00	0.03 ± 0.01	0.08 ± 0.03	0.00 ± 0.00	Crop	October
Ningxia	0.01 ± 0.01	0.09 ± 0.06	0.29 ± 0.20	0.01 ± 0.00	Crop	October
Xinjiang	0.06 ± 0.04	0.82 ± 0.58	2.97 ± 2.05	0.06 ± 0.04	Crop	April
Southwest China	0.26 ± 0.09	11.11 ± 4.45	35.02 ± 13.47	1.17 ± 0.50	Forest	February
Chongqing	0.00 ± 0.00	0.19 ± 0.10	0.72 ± 0.36	0.01 ± 0.01	Crop	August
Sichuan	0.05 ± 0.03	2.11 ± 1.23	6.80 ± 3.88	0.23 ± 0.16	Forest	January
Guizhou	0.04 ± 0.02	1.18 ± 0.58	4.17 ± 2.10	0.10 ± 0.05	Crop	March
Yunnan	0.16 ± 0.07	7.57 ± 3.71	23.13 ± 11.08	0.81 ± 0.41	Forest	February
Xizang	0.00 ± 0.00	0.06 ± 0.05	0.19 ± 0.15	0.01 ± 0.01	Forest	March

ᵻ The land cover types (Cropland, Grassland, Forests) with the most wildfire-induced CO_2 emission.

The single month with the most wildfire-induced CO_2 emission.

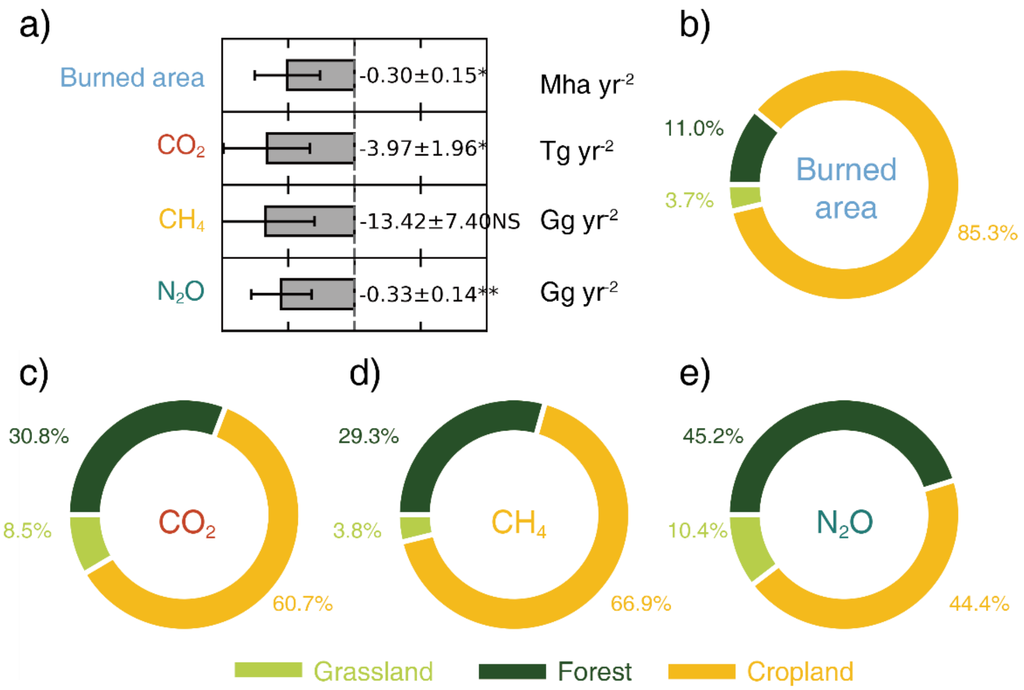

Fig. S1 The national trends of burned area and three wildfire-induced GHGs. Subplots b) to e) demonstrates the relative proportions of different types of fuels contributing the overall trends.

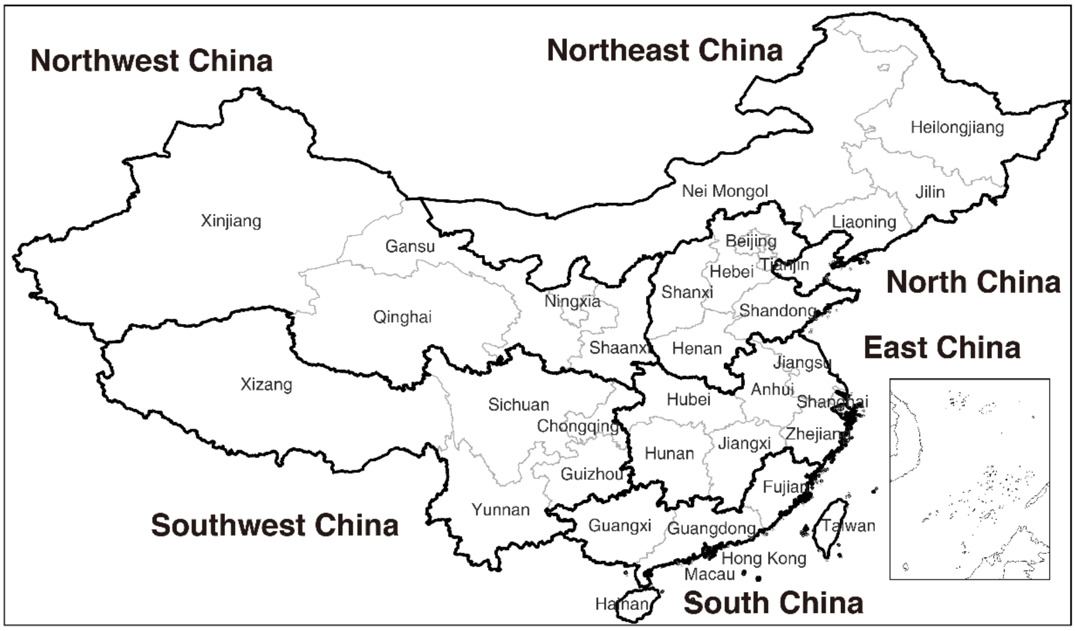

Fig. S2 The classification of six major regions discussed. All of the provincial administrative units are marked in lower font within the regional scope.

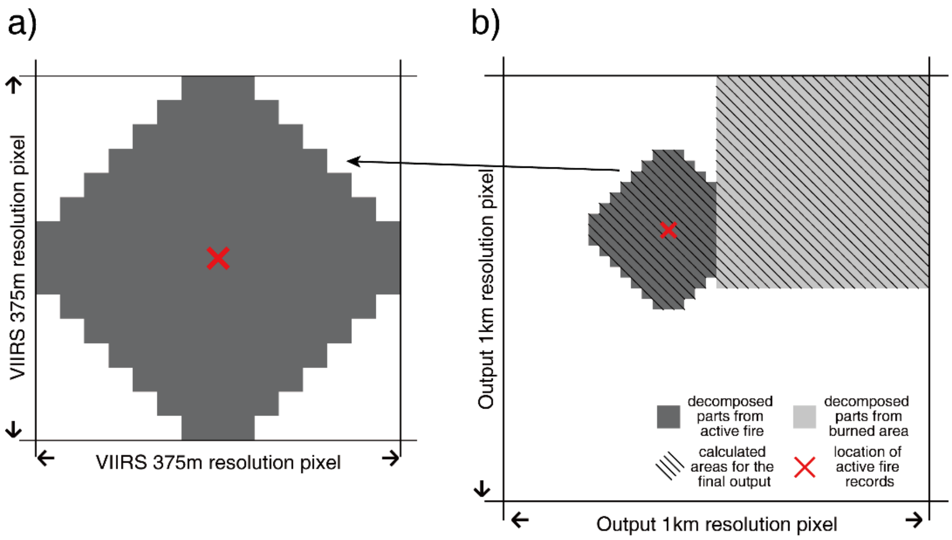

Fig. S3 Samples of processing active fire and burned area products. The subplot a) and b) represent the scope of 375m resolution VIIRS pixel and 1km resolution output pixel with small pixels decomposed. The details are listed as the legend shows.

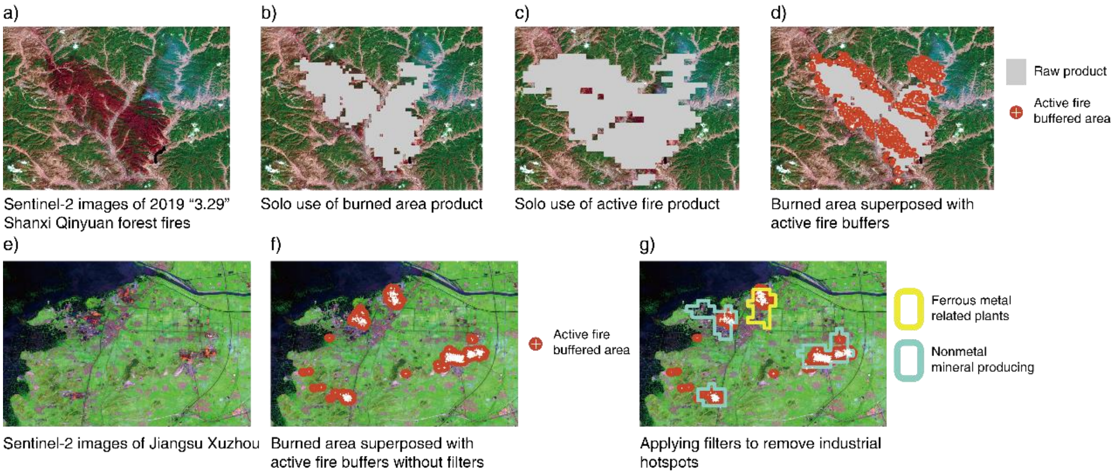

Fig. S4 Two samples of the recalculated burned area estimate with the first row demonstrating the burned area superposed by active fire buffering areas and the second row showing the filters of fixed location industrial hotspots [15]. The background images are composite of Sentinel-2 images.

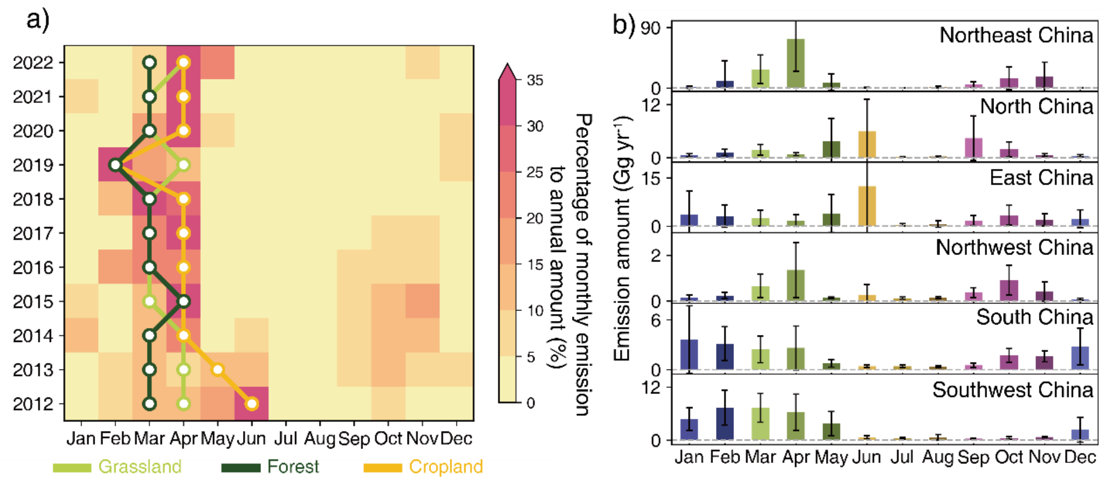

Fig. S5 Seasonal cycle of national and regional wildfire-induced CH_4 emissions with the same meaning of vertical lines and bars with that in Fig. 2. Emissions from six regions are depicted on distinct Y-axes to accurately capture the seasonal variations in emissions patterns. Four sets of colors indicate four seasons.

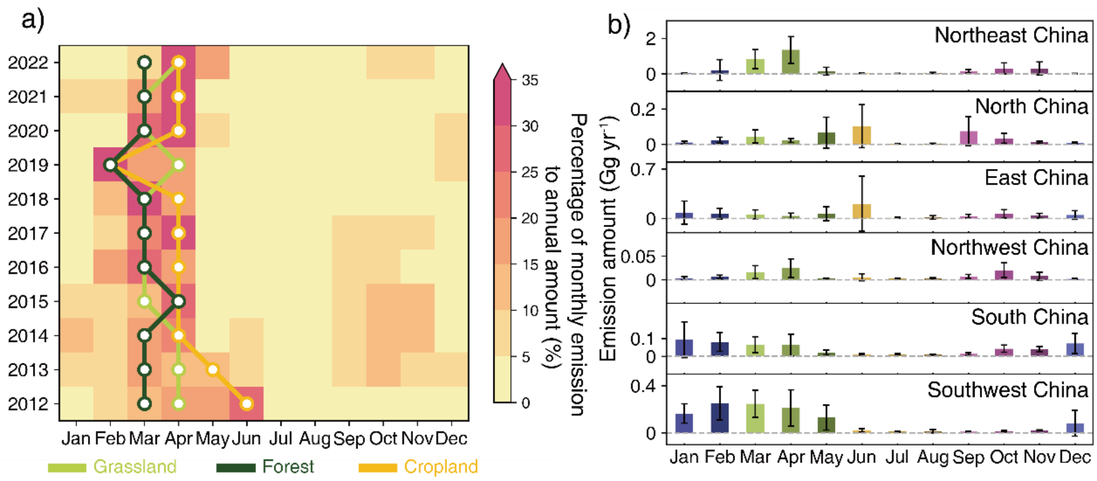

Fig. S6 Seasonal cycle of national and regional wildfire-induced N_2O emissions with the same meaning of vertical lines and bars with that in Fig. 2. Emissions from six regions are depicted on distinct Y-axes to accurately capture the seasonal variations in emissions patterns. Four sets of colors indicate four seasons.

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