Supplementary Materials for **Global gridded NO$_x$ emissions using TROPOMI observations**

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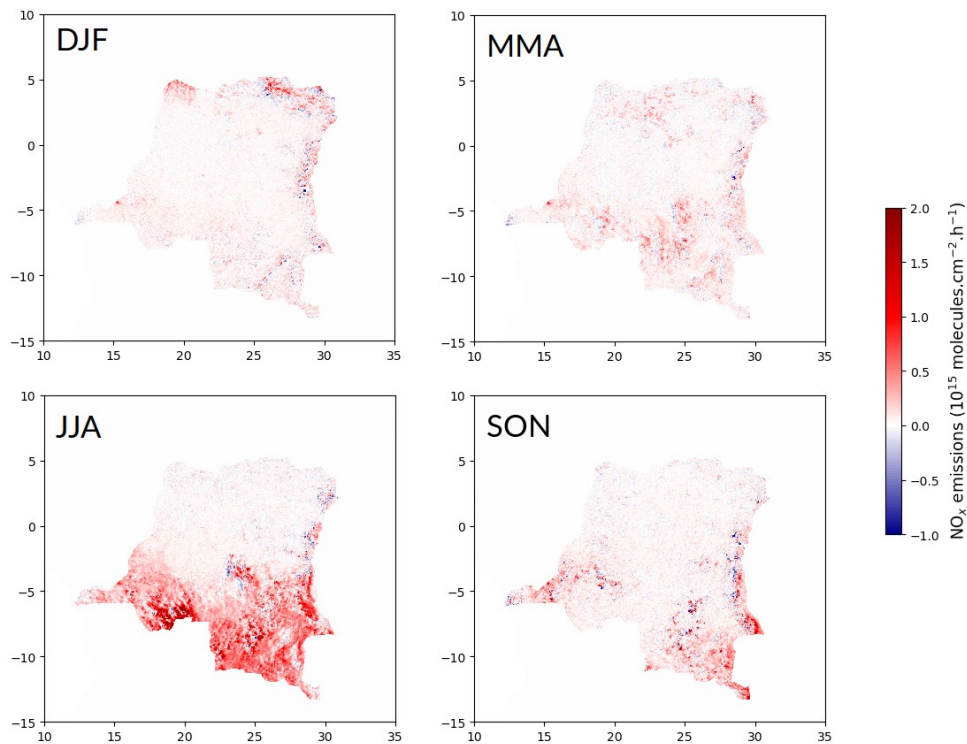
Fig. S1: TROPOMI-derived mean daytime NO$_x$ emission rates by period in 2022 for Congo (DRC) estimated with the flux-divergence method, showing high wildfire emissions in summer period.
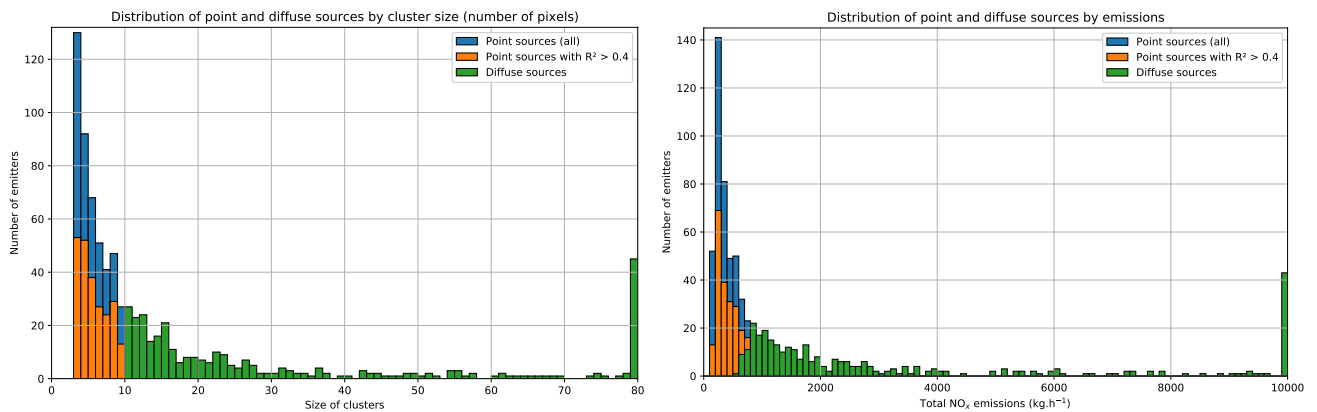
Fig. S2: Distribution of emitters by emissions (left) and cluster size (right), with a disinction between diffuse sources (more than 10 pixels, green) and point sources (between 3 and 9 pixels, blue). Point sources with a Gaussian behaviour (2D Gaussian fit with $R^2 > 0.4$) are diplayed in orange.
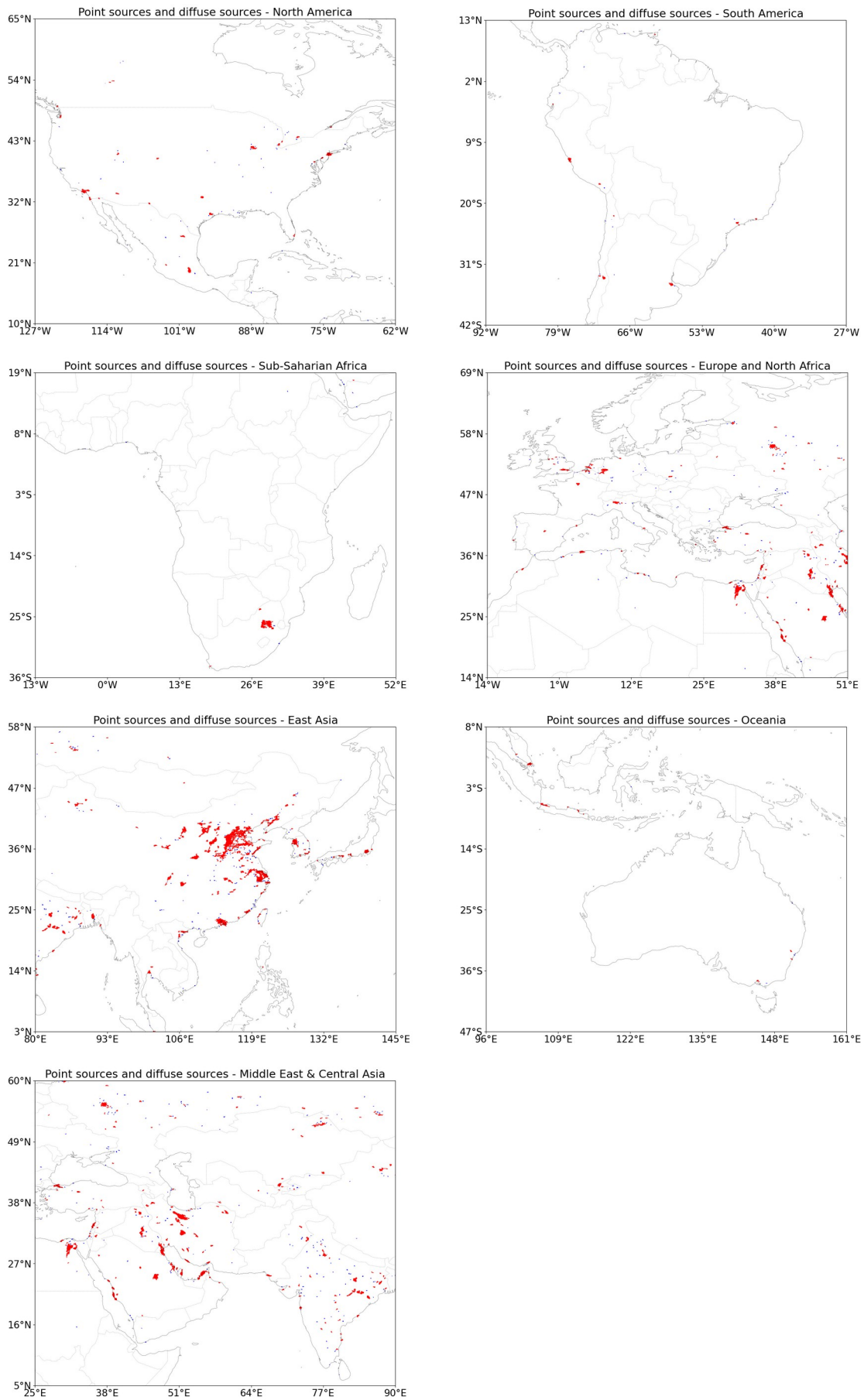
Fig. S3: Distribution of detcted point sources (blue) and diffuse sources (red) in North America, South America, Sub-Saharan Africa, Europe and North Africa, East Asia, Oceania, Middle East and Central Asia.
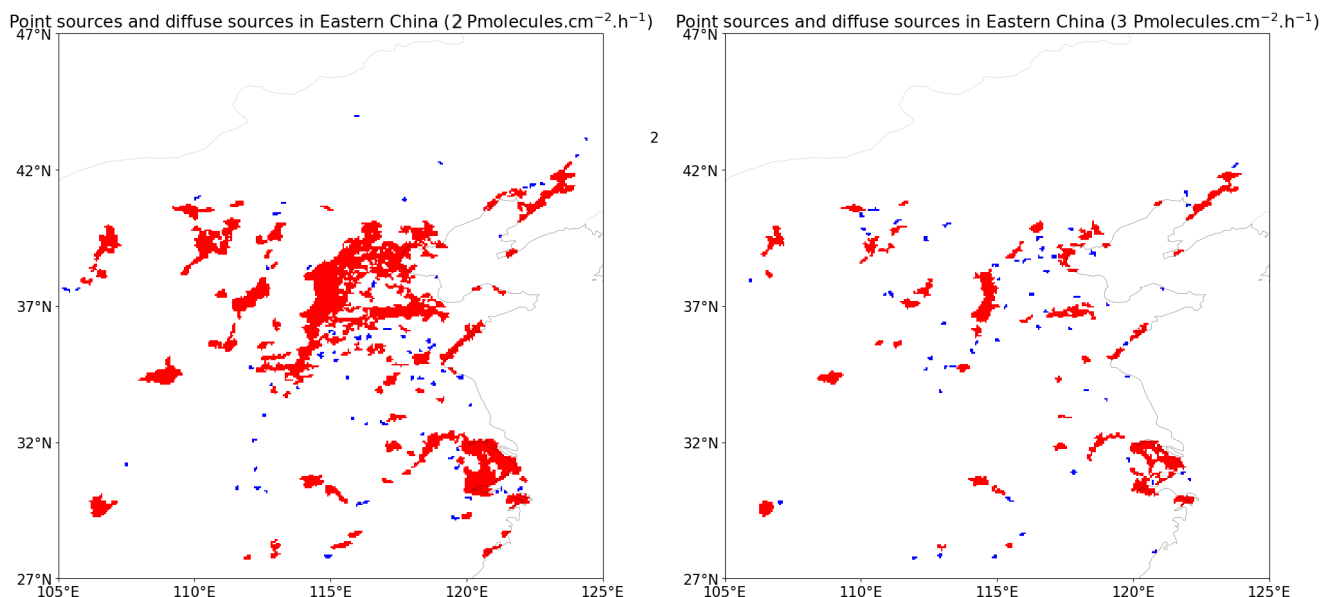
Fig. S4: Distribution of detcted point sources (blue) and diffuse sources (red) in Eastern China (around Bejing) with cluster detection thresholds of 2×10¹⁵ molecules.cm⁻².h⁻¹ and (left) and 3×10¹⁵ molecules.cm⁻².h⁻¹ (right).

Cluster size	Approx. latitude (°N)	Approx. longitude (°E)	Mean emission density (Pmolecules.cm⁻².h⁻¹)	Total emissions (kg.h⁻¹)	Corresponding emitter	Type
2818	37.527	116.010	2.83	235026.7	Bejing, China	URB
837	31.283	120.352	3.83	102011.4	Shangai, China	URB
439	35.549	51.329	7.09	94188.2	Tehran, Iran	URB
552	-26.406	28.739	4.27	78452.7	Gauteng mining sites, South Africa	MIN
425	22.798	113.630	3.72	54223.3	Shenzen & Hong-Kong, China	URB
361	29.653	31.126	4.13	48158.0	Cairo & Beni Suef, Egypt	URB
303	29.582	47.874	4.55	44642.6	Kuwait City, Kuwait	URB
172	24.649	46.797	5.70	33116.2	Riyadh, Saudi Arabia	URB
198	32.771	44.298	5.32	32939.2	Baghdad, Iraq	URB
274	41.174	123.033	4.29	32876.9	Anshan, China	URB
353	39.338	110.656	2.99	30320.2	Ordos mining sites, China	MIN
224	37.162	126.874	4.31	28632.8	Seoul, South Korea	URB
171	25.316	55.342	4.81	27652.5	Dubai, United Arab Emirates	URB
157	32.577	51.610	4.86	23917.2	Ispahan, Iran	URB
127	21.115	39.309	4.92	21661.7	Jeddah, Saudi Arabia	URB
219	37.317	112.087	3.17	20559.1	Shanxi, China	URB
180	55.715	37.501	5.39	20346.3	Moscow, Russia	URB
102	24.118	82.747	5.53	19149.7	Uttar Pradesh & Madhya Pradesh mining sites, India	MIN
154	39.329	106.809	4.26	18867.6	Wuhai & Hainan industrial zones, China	IND
83	-12.183	-76.853	6.19	18677.9	Lima, Peru	URB
135	26.436	49.845	4.01	18013.8	Damman industrial zone, Saudi Arabia	IND
177	34.486	108.865	3.24	17574.4	Xi'an, China	URB
111	19.653	-99.161	4.48	17427.2	Mexico City, Mexico	URB
105	23.822	90.385	4.73	16917.6	Dacca, Bangladesh	URB
154	35.700	119.831	3.56	16566.7	Zhuhai, China	URB
159	33.924	-117.997	3.37	16559.9	Los Angeles, United States	URB
132	41.011	29.146	4.39	16250.9	Istanbul, Türkiye	URB
126	21.813	83.655	3.58	15577.4	Odisha mining sites & MSP steel, India	MIN
121	29.652	106.560	3.61	14135.3	Chongqing, China	URB

178	51.261	6.994	3.40	14106.7	Ruhr, Germany (and correspnding coal mining region)	URB
102	35.545	139.754	4.57	14099.5	Tokyo, Japan	URB
125	40.566	-73.946	3.85	13592.8	New-York City, United States	URB
85	25.334	51.462	4.33	12376.3	Doha, Qatar	URB
102	30.091	32.267	3.65	11990.0	Steel plant (unknown name) & Suez, Egypt	STI
94	33.924	35.527	4.11	11933.5	Beyrouth, Lebanon	URB
78	1.276	103.864	4.07	11803.3	Singapore, Singapore	URB
91	30.746	104.162	4.01	11672.7	Chengdu, China	URB
78	21.023	106.815	4.24	11492.0	Haïphong, Vietnam	URB
101	28.748	77.165	3.42	11263.6	Delhi, India	URB
95	40.505	109.925	4.11	11037.2	Baotou, China	URB
92	-6.075	106.528	3.15	10734.3	Jakarta, Indonesia	URB
77	29.888	121.862	4.19	10408.7	Ningbo, China	URB
100	52.150	76.740	4.52	10308.2	Aluminium plants, Kazakhstan	OTH
90	24.650	118.251	3.38	10282.1	Xiamen, China	URB
75	41.222	69.107	4.62	9693.8	Tachkent, Uzbekistan	URB
74	22.127	82.554	3.74	9533.0	Atal Bihari Vajpayee Thermal Power Station, India	TPP
65	-34.617	-58.551	4.76	9478.2	Bueno Aires, Argentina	URB
74	30.578	114.323	3.94	9344.3	Wuhan, China	URB
104	41.743	-87.636	3.23	9329.9	Chicago, United States	URB
113	36.308	103.666	2.73	9254.9	Lanzhou, China	URB
57	27.503	52.463	4.88	9180.5	Asaluyeh petrochemical complex, Iran	OTH
73	36.671	3.084	4.18	9096.2	Algiers, Algeria	URB
92	34.783	50.737	3.13	8809.4	Qom, Iran	URB
54	24.858	67.189	4.71	8575.4	Karachi, Pakistan	URB
56	20.948	85.135	4.25	8276.6	Anatapur mining sites & Kalikata Plant & JSPL, India	MIN
55	20.321	105.959	4.10	7869.2	Ninh Bình industrial zone, Vietnam	IND
93	35.675	111.135	2.78	7808.8	Unidentified, China	UNK
61	-33.464	-70.698	4.06	7680.6	Santiago, Chile	URB
63	36.282	59.518	4.06	7676.7	Mechhed, Iran	URB
68	31.410	74.115	3.41	7359.9	Lahore, Pakistan	URB
55	23.576	87.274	3.90	7313.3	Durgapur steel plant, India	STI
42	22.560	39.082	5.02	7246.7	NOMAC AL Mourjan Electricit Company & Arabian Cement, Saudi Arabia	TPP
61	24.463	54.591	3.50	7235.1	Abu Dhabi, United Arab Emirates	URB
64	35.238	129.030	3.61	7013.0	Busan, South Korea	URB
90	44.022	87.608	2.90	6970.7	Urumqi, China	URB
92	51.487	-0.031	3.10	6614.4	London, United Kingdom	URB
60	32.090	54.068	3.47	6551.8	Yazd, Iran	URB
49	37.930	46.212	4.26	6129.9	Tabriz, Iran	URB
55	13.771	100.529	3.06	6072.0	Bangkok, Thailand	URB
88	45.563	9.234	2.64	6051.0	Milan, Italy	URB
57	30.137	115.169	3.28	6009.0	Huangshi, China	URB
44	27.200	56.253	4.09	5960.8	Bandar Abbas, Iran	URB
67	51.897	75.605	3.84	5901.6	Ekibastuz mining sites, Kazakhstan	MIN
54	21.436	81.789	3.10	5792.1	Raipur Energen Ltd, India	TPP
54	34.684	135.216	3.43	5665.6	Osaka, Japan	URB
47	29.495	52.550	3.72	5663.8	Shiraz, Iran	URB
45	25.784	-100.337	3.64	5482.2	Monterrey, Mexico	URB
52	36.121	43.918	3.49	5452.3	Erbil, Iraq	URB
62	35.078	118.343	2.82	5325.5	Linyi, China	URB
66	51.911	4.262	3.51	5316.9	Rotterdam, Netherlands	URB
51	29.779	-95.270	3.14	5165.8	Houston, United States	URB

44	31.976	36.001	3.70	5141.3	Amman, Jordan	URB
69	39.699	113.025	2.60	5136.5	Unidentified, China	UNK
46	31.851	117.291	3.43	4991.1	Hefei, China	URB
51	34.937	136.770	3.17	4925.7	Nagoya, Japan	URB
31	23.924	38.297	4.20	4429.8	Yanbu 3 power plant, Saudi Arabia	TPP
48	48.896	2.396	3.55	4161.5	Paris, France	URB
27	32.795	13.156	4.88	4119.2	Tripoli, Libya	URB
36	19.049	72.936	3.23	4092.8	Mumbai, India	URB
24	-23.659	27.508	4.94	4042.7	Grootegeluk mining sites, South Africa	MIN
35	24.013	120.365	3.34	3970.6	Changua, Taiwan/China	URB
50	51.268	4.070	3.41	3969.4	Antwerp, Belgium	URB
23	26.121	50.583	5.11	3923.3	Manama, Bahrain	URB
39	28.083	112.969	3.05	3898.2	Changsha, China	URB
34	-23.568	-46.636	3.28	3806.0	Sao Paulo, Brazil	URB
37	32.568	-117.067	3.16	3663.8	San Diego, United States & Tijuana, Mexico	URB
37	43.367	76.964	3.64	3644.4	Almaty, Kazakhstan	URB
49	35.429	116.686	2.45	3636.5	Jining, China	URB
36	39.934	32.835	3.51	3607.3	Ankara, Türkiye	URB
42	34.301	117.237	2.76	3563.5	Gulou district, China	URB
29	17.583	83.247	3.40	3499.7	Visakhapatnam steel area, India	STI
34	31.131	29.849	3.21	3478.4	Alexandria, Egypt	URB
42	59.906	30.335	4.39	3442.4	Saint Petersburg, Russia	URB
43	43.665	-79.565	2.97	3437.2	Toronto, Canada	URB
43	32.818	-96.851	2.47	3321.1	Dallas, United States	URB
26	30.216	56.882	3.88	3244.8	Cement plant (unknown name) & Kerman, Iran	CEM
32	28.225	115.420	3.08	3230.5	Unidentified, China	UNK
36	43.842	125.325	3.34	3222.3	Changchun, China	URB
21	22.204	91.751	4.37	3159.1	Chittagong, Bangladesh	URB
25	34.044	49.679	4.08	3146.0	Arak, Iran	URB
32	37.477	45.244	3.25	3072.8	Ourmia, Iran	URB
48	53.842	87.250	2.82	2971.5	Novokouznetsk industrial zone, Russia	IND
25	34.809	127.746	3.85	2936.6	Gwangyang port, China	POR
36	57.094	61.856	3.96	2880.0	Mining sites (unknown name), Russia	MIN
40	41.141	121.864	2.56	2870.4	Panjin, China	URB
33	28.020	120.865	2.65	2868.0	Wenzhou, China	URB
24	29.500	51.719	3.68	2859.8	Unidentified, Iran	UNK
32	32.910	117.412	2.78	2781.7	Bengbu, China	URB
26	33.550	-7.596	3.41	2750.6	Casablanca, Morocco	URB
18	22.319	69.771	4.44	2750.3	Industrial area (unknown name), India	IND
23	13.208	80.330	3.28	2735.0	Chennai, India	URB
24	-16.529	-71.469	3.18	2723.8	Arequipa & Mining sites, Peru	MIN
26	38.168	106.599	3.55	2700.3	Ningdongzhen industrial zone, China	IND
27	25.082	121.365	2.95	2682.3	Taipei, Taiwan/China	URB
28	33.638	72.942	3.05	2644.7	Islamabad, Pakistan	URB
23	26.279	43.980	3.41	2618.5	Buraydah, Saudi Arabia	URB
26	39.248	119.002	3.48	2608.0	Jingtang port, China	POR
18	18.774	79.458	4.00	2535.6	Mining sites & Power plant (unknown name), India	MIN
22	14.662	101.000	3.20	2531.8	Siam Cement, Thailand	CEM
33	37.421	116.365	2.59	2528.4	Dezhou, China	URB
26	55.026	83.014	4.54	2515.3	Novossibirsk, Russia	URB
22	-7.151	112.616	3.08	2497.1	Surabaya, Indonesia	URB
30	40.719	120.898	2.94	2484.1	Huludao, China	URB

27	33.450	-112.131	2.94	2465.6	Phoenix, United States	URB
19	21.423	39.834	3.73	2451.9	Mecca, Saudi Arabia	URB
22	23.696	86.781	3.26	2445.9	IISCO Steel Plant, India	STI
16	15.195	76.680	4.19	2405.0	KPCL Ozonisation plant & JSW cement plant, India	TPP
22	23.094	72.616	3.17	2384.7	Ahmedabad, India	URB
28	45.679	126.710	3.27	2382.8	Harbin, China	URB
23	31.330	48.765	3.25	2376.2	Ahwaz, Iran	URB
22	32.551	14.361	3.35	2308.0	Leptis Cement & Zliten Cement, Libya	CEM
31	42.338	-83.019	2.71	2306.4	Detroit, United States	URB
22	37.253	49.722	3.53	2301.5	Rasht, Iran	URB
21	24.713	74.665	3.24	2295.6	Nuvoco Vistas Chittorgarh & JK Cement Works, India	CEM
20	21.222	79.200	3.31	2292.5	Nagpur, India	URB
31	36.572	101.644	2.46	2277.2	Xining, China	URB
18	19.983	79.212	3.60	2262.7	Maharashtra State Power Generation & Dhariwal Power Station, India	TPP
23	38.944	121.637	3.40	2262.2	Dalian, China	URB
21	21.153	72.781	3.08	2246.2	Surat, India	URB
25	37.441	110.996	3.01	2221.0	Lüliang, China	URB
16	11.555	79.484	3.76	2194.9	Neyveli lignite mining sites, India	MIN
27	39.406	112.434	2.73	2120.0	Shuozhou, China	URB
16	30.469	49.109	4.08	2092.8	Mahshahr industrial zone, Iran	IND
30	47.406	-122.348	2.75	2074.6	Seattle, United States	URB
23	28.629	115.898	2.67	2008.5	Nanchang, China	URB
26	40.649	-112.022	2.73	2004.5	Salt Lake City, United States	URB
15	29.102	55.323	4.09	1992.5	Golgohar Sirjan mining sites, Iran	MIN
19	31.676	-106.387	3.29	1980.0	El Paso, Mexico	URB
29	52.389	4.749	2.99	1970.8	Amsterdam, The Netherlands	URB
24	44.794	89.115	3.11	1969.3	Gu'Erban Tonggute Shamo mining sites, China	MIN
23	40.746	111.583	3.04	1968.6	Hohhot, China	URB
27	55.020	73.446	3.35	1926.2	Omsk & CHP-5, Russia	TPP
14	24.518	56.571	4.06	1923.0	Sohar power plant, Oman	TPP
24	-37.813	145.003	2.71	1911.0	Melbourne, Australia	URB
25	35.569	112.566	2.49	1884.3	Yangcheng power station, China	TPP
15	28.456	36.552	3.84	1882.3	Tabuk, Saudi Arabia	URB
23	40.401	-3.637	2.88	1877.3	Madrid, Spain	URB
26	51.663	39.327	3.10	1857.2	Voronej, Russia	URB
31	50.259	19.051	2.51	1851.4	Katowice, Poland	URB
23	36.314	113.012	2.67	1837.4	Power plant (unknown name), China	TPP
20	36.241	58.866	3.00	1797.6	Nishapur, Iran	URB
21	25.930	-80.249	2.53	1775.4	Miami, United States	URB
22	39.892	-75.207	2.82	1770.0	Philadelphia, United States	URB
22	38.065	58.327	2.71	1748.4	Ashgabat, Turkmenistan	URB
17	22.531	88.259	2.98	1742.4	Kolkatta, India	URB
22	44.455	86.028	2.97	1735.5	Shihezi, China	URB
13	32.118	20.084	4.23	1734.0	Benghazi, Libya	URB
17	34.494	133.825	3.32	1730.9	Okayama, Japan	URB
14	31.982	44.946	3.92	1729.8	Diwaniya, Iraq	URB
21	23.552	116.674	2.40	1720.1	Chaozhou, China	URB
14	27.121	30.996	3.69	1711.8	Asyut & Cemex Egypt, Egypt	CEM
15	22.790	86.215	3.33	1711.2	Jamshedpur urban and industrial region, India	IND
19	31.988	34.863	2.84	1704.5	Tel Aviv, Israel	URB
12	30.401	48.276	4.35	1675.1	Khorramchahr & Abadan, Iran	URB
17	-32.439	150.991	3.12	1666.4	Muswellbrook to Brok coal mining sites, Australia	MIN

19	36.788	43.143	2.93	1660.8	Unidentified, Iraq	UNK
15	36.806	10.223	3.70	1654.9	Tunis, Tunisia	URB
17	-22.855	-43.267	2.80	1629.3	Rio de Janeiro, Brazil	URB
19	34.347	47.222	2.78	1622.2	Kermanshah, Iran	URB
20	29.303	120.006	2.47	1605.5	Beiyuan, China	URB
18	25.375	56.354	2.62	1582.4	Fujairah Power Plant, United Arab Emirates	TPP
15	3.040	101.456	2.83	1578.2	Kuala Lumpur, Malaysia	URB
18	21.059	105.917	2.52	1572.8	Hanoi, Vietnam	URB
15	40.423	49.885	3.68	1564.5	Baku, Azerbaijan	URB
12	17.635	44.354	3.65	1554.2	Unidentified, Saudi Arabia	UNK
16	-33.098	-71.453	3.10	1545.9	Valparaíso & Viña del Mar & Quilpué, Chile	URB
20	29.622	103.572	2.37	1534.8	Unidentified, China	UNK
15	25.431	85.881	3.04	1530.8	Barauni thermal power station, India	TPP
22	39.790	-104.886	2.43	1527.6	Denver, United States	URB
18	37.563	121.198	2.87	1525.6	Yantai, China	URB
13	24.733	87.897	3.46	1521.3	NTPC Farakka, India	TPP
20	49.978	73.156	3.13	1495.4	ArcelorMittal Temirtau JSC, Kazakhstan	STI
16	39.828	98.313	3.27	1495.2	Mining sites (unknown name), China	MIN
19	40.896	14.304	2.80	1493.9	Naples, Italy	URB
17	33.983	51.520	2.84	1489.0	Kashan, Iran	URB
20	37.913	106.025	2.52	1477.1	Qingtongxia industrial zone & Wuzhong, China	IND
13	22.550	120.329	3.31	1476.5	Kaohsiung, Taiwan/China	URB
14	25.246	87.268	3.12	1471.4	Kahalgaon power station, India	TPP
20	36.884	115.800	2.46	1466.6	Power plant (unknown name), China	TPP
15	37.356	57.969	3.24	1438.1	Shirvan & Shirvan Combine Cycle Power Plant, Iran	TPP
15	16.806	79.923	2.63	1407.0	Maha Cement Mellacheruvu & Rain Cements & Sagar Cements, India	CEM
15	35.860	128.602	3.11	1406.8	Daegu, South Korea	URB
16	31.477	104.742	2.76	1402.9	Mianyang, China	URB
19	41.410	2.117	2.63	1393.7	Barcelone, Spain	URB
11	16.327	77.361	3.54	1389.3	ARV Cement society office & KPCL & Yermarus station, India	CEM
13	20.632	-103.353	3.04	1374.2	Guadalajara, Mexico	URB
14	38.022	23.634	3.29	1349.4	Athens, Greece	URB
16	31.332	119.785	2.65	1346.8	Yixing & Dingshuzhen, China	URB
16	53.563	49.438	3.80	1342.0	Togliatti, Russia	URB
17	55.193	61.447	3.70	1336.9	Tcheliabinsk, Russia	URB
16	39.215	-76.605	2.88	1327.2	Baltimore, United States	URB
14	33.862	130.888	3.07	1326.3	Kitakyūshū, Japan	URB
12	14.318	80.182	3.05	1318.7	Sri Damodaram Sanjeevaiah power plant, India	TPP
13	35.906	140.656	3.27	1280.2	Kashima port, Japan	POR
13	33.478	36.281	3.14	1264.7	Damascus, Syria	URB
11	24.378	88.116	3.37	1255.0	Sagardighi Thermal Power Project & Sonar Bangla Cement, India	TPP
15	-33.960	18.560	2.70	1251.3	Cape Town, South Africa	URB
15	52.602	39.631	3.62	1227.9	Lipetsk urban and industrial zone, Russia	IND
15	28.648	121.423	2.50	1226.0	Taizhou, China	URB
14	35.777	-0.290	2.90	1224.6	Oran industrial zone, Algeria	IND
12	32.609	-115.432	3.23	1214.4	Mexicali, Mexico	URB
12	39.599	126.318	3.51	1207.0	Beichanghua Power Station, North Korea	TPP
14	42.978	90.121	3.17	1206.9	Power plant (unknown name), China	TPP
12	30.896	117.807	3.15	1205.4	Xian de Tongling industrial zone, China	IND
13	36.320	43.180	3.09	1202.5	Mosul, Iraq	URB
14	54.607	39.817	3.98	1200.1	Riazan, Russia	URB
14	53.223	76.629	3.85	1198.8	Unidentified, Russia	UNK

15	30.581	117.069	2.48	1189.8	Anqing, China	URB
10	14.650	121.081	3.28	1181.0	Manilla, Philippines	URB
21	56.272	44.001	2.72	1178.5	Nijni Novgorod, Russia	URB
18	59.135	38.000	3.42	1175.9	Tcherepovets industrial zone, Russia	IND
13	51.565	46.046	3.87	1162.4	Saratov, Russia	URB
12	23.552	58.281	2.82	1154.4	Muscat, Oman	URB
10	14.688	78.481	3.20	1151.0	Zuari Cement Rayalasema & Zuari Thermal Plant, India	CEM
16	45.500	-73.609	2.74	1143.7	Montreal, Canada	URB
15	42.348	69.635	2.77	1143.5	Chimkent, Kazakhstan	URB
10	27.769	111.950	3.47	1141.6	Loudi, China	URB
15	36.556	52.719	2.55	1140.7	Babol, Iran	URB
11	37.469	129.128	3.50	1135.7	Ssangyong C&E Cement Donghae & Eastern Metal Donghae, South Korea	CEM
19	55.308	38.488	2.77	1113.3	Unidentified, Russia	UNK
12	40.188	44.542	3.26	1112.8	Yerevan, Armenia	URB
18	53.792	-112.920	2.78	1098.7	Edmonton & Nutrien Redwater Fertilizer, Canada	OTH
13	36.156	117.704	2.81	1095.6	Gangsheng & Laiwu, China	URB
10	-2.156	-79.894	2.94	1092.2	Guayaquil, Equator	URB
13	-33.892	151.103	2.71	1089.7	Sydney, Australia	URB
11	-6.446	110.764	2.67	1084.7	PLTU Tanjungjati, Indonesia	TPP
15	33.910	116.798	2.33	1080.0	Huaibei, China	URB
11	38.486	27.162	3.31	1061.3	Izmir, Türkiye	URB
15	41.065	121.256	2.51	1057.8	Jinzhou, China	URB
14	40.433	71.746	2.66	1053.8	Marguilan & Ferghana, Uzbekistan	URB
12	40.141	65.302	3.08	1052.1	Navoi & mining sites, Uzbekistan	MIN
14	42.853	-82.411	2.72	1039.5	Point Edward, Canada & Port Huron, United States	URB
10	33.063	-8.656	3.33	1038.3	Chemical and coal complex, Morocco	OTH
10	10.463	-61.519	2.82	1032.0	Chaguanas, Trinidad and Tobago	URB
14	30.763	30.830	2.30	1031.4	Unidentified, Egypt	UNK
10	-7.719	113.563	2.79	1029.6	PLTU Paiton, Indonesia	TPP
11	36.736	36.168	3.14	1028.1	Industrial zone (unknown name), Türkiye	IND
10	24.450	39.613	3.01	1020.7	Medina, Saudi Arabia	URB
10	38.369	36.981	3.46	1009.7	Afşin Elbistan Termik Santrali & mining sites, Türkiye	TPP
15	53.535	9.965	3.04	1007.2	Hamburg, Germany	URB
12	36.844	53.234	2.75	984.0	Neka power plant, Iran	TPP
10	32.456	34.938	3.12	977.8	Orot Rabin Power Plant, Israel	TPP
14	38.406	106.308	2.39	976.9	Yinchuan, China	URB
12	31.594	117.958	2.56	972.4	Woniu, China	URB
11	30.634	122.094	2.72	958.1	Xiaoyang island port, China	POR
12	33.906	112.932	2.59	958.1	Shilong industrial zone, China	IND
13	37.642	120.373	2.47	947.0	Longkou, China	URB
15	49.244	-122.965	2.59	943.9	Vancouver, Canada	URB
12	38.745	26.896	2.64	920.6	Çakmaklı & Izmir, Türkiye	URB
12	45.083	39.052	2.89	911.8	Krasnodar, Russia	URB
11	36.895	34.787	2.78	909.7	Mersin & Tarse, Türkiye	URB
10	-22.294	-68.888	2.64	908.7	Chuquicamata mining sites, Chile	MIN
16	53.387	-2.855	2.56	907.5	Liverpool, United Kingdom	URB
14	54.388	86.326	2.99	906.8	Bachatsky mining sites, Russia	MIN
11	33.565	119.060	2.66	906.3	Huai'an, China	URB
12	35.052	117.172	2.48	906.0	Tengzhou, China	URB
10	22.825	70.894	2.64	905.5	Lakhdhirpur industrial zone, India	IND
10	27.988	78.138	2.71	891.4	Power mech project & UltraTech Limited Aligarh Cement Works, India	TPP
12	53.250	77.573	3.33	888.8	Unidentified, Russia	UNK

11	33.895	118.287	2.61	888.1	Suqian, China	URB
11	35.412	44.310	2.66	885.7	Kirkouk, Iraq	URB
14	38.906	112.701	2.17	878.1	Power plant (unknown name), China	TPP
13	40.599	114.877	2.36	867.1	Xian de Xuanhua industrial zone, China	IND
10	47.888	106.838	3.45	861.6	Oulan-Bator, Mongolia	URB
12	51.193	71.563	3.08	861.2	Astana & AO Astana Tets-2, Kazakhstan	TPP
10	35.375	47.031	2.83	859.1	Sanandaj & Qolyan Iran Power Plant, Iran	TPP
10	30.356	30.556	2.67	858.5	Steel area (unknown name), Egypt	STI
10	-23.925	-46.363	2.52	858.1	Cubatão industrial zone & Santos, Brazil	IND
12	37.391	118.510	2.40	851.1	Dongying, China	URB
10	34.631	119.481	2.75	843.2	Lianyun industrial zone, China	IND
11	35.276	115.571	2.52	841.6	Heze, China	URB
12	40.901	69.625	2.48	837.1	Ohangaran & Almalyk mining and metallurgical combine, Uzbekistan	MIN
12	35.495	116.005	2.29	833.7	Unidentified, China	UNK
12	34.844	117.552	2.27	833.3	Shizhong, China	URB
11	30.452	76.634	2.35	830.0	Rajpura & Ambala, India	URB
11	38.770	-9.253	2.60	828.0	Lisbon, Portugal	URB
15	54.056	86.590	2.50	817.1	Krasnobrodsky to Kisseliovsk mining sites, Russia	MIN
11	33.753	113.401	2.38	810.5	Weidong, China	URB
11	40.253	29.003	2.57	803.0	Bursa, Türkiye	URB
12	54.135	37.568	3.06	800.0	Tula industrial zone, Russia	IND
13	55.656	51.930	2.88	784.5	Nijnekamsk industrial zone, Russia	IND
12	53.276	50.313	2.92	778.7	Samara, Russia	URB
13	51.373	3.291	2.54	767.4	Anvers port, Belgium	POR
11	40.281	68.969	2.42	756.3	Syrdarinskaya & Bekobodtsement AJ, Uzbekistan	TPP
10	51.269	37.750	3.18	739.4	Mining sites (unknown name), Russia	MIN
11	53.372	83.673	2.95	719.2	Barnaoul, Russia	URB
10	52.488	103.938	3.17	717.4	Angarsk industrial zone, Russia	IND
10	37.219	37.250	2.39	708.5	Gaziantep, Türkiye	URB
11	53.810	27.457	2.91	703.2	Minsk, Belarus	URB
12	53.443	-2.229	2.64	702.5	Manchester, United Kingdom	URB
11	43.957	126.497	2.32	682.3	Changyi & Longtan, China	URB
10	38.500	112.938	2.34	681.5	Xian de Dingxiang, China	URB
11	53.514	-113.474	2.75	668.8	Edmonton, Canada	URB
11	45.480	10.264	2.29	657.3	Brescia, Italy	URB
10	55.175	38.081	3.03	644.5	Unidentified, Russia	UNK
10	61.294	73.500	3.61	644.3	Surgut, Russia	URB
11	52.486	-1.923	2.55	635.3	Birmingham, United Kingdom	URB
10	52.206	21.000	2.73	622.3	Warsaw, Poland	URB
10	56.000	93.000	2.98	618.9	Krasnoïarsk, Russia	URB
10	53.744	-1.600	2.40	527.8	Leeds, United Kingdom	URB

Table S1: List of diffuse sources with number of pixels within the corresponding cluster, mean latitude and longitude, mean emission density within cluster and total daily NO_x emissions using the flux-divergence method. The corresponding emitter is identified, as well the sector probably accounting for the majority of the emissions within the emitter (nine categories are considered: urban (URB), mining (MIN), iron and steel (STI), cement (CEM), power generation (TPP), port (POR), mixed (IND), other (OTH) and unknown sector (UNK)).

Latitude (°N)	Longitude (°E)	R^2	Total cluster emissions (kg.h⁻¹)	Total emissions – Gaussian fit (kg.h⁻¹)	Cluster size	Country	Name of most possible emitters	Main sector
31.9688	11.1406	0.946	1193	867	8	Libya	Hawamid Gas Power Plant	TPP
31.7063	6.0563	0.930	864	369	5	Algeria	Hassi Messaoud Oil field	OTH
27.1875	60.5000	0.927	1072	455	4	Iran	Iranshahr	TPP
29.1641	74.0234	0.906	1107	974	8	India	Suratgarh Super Critical Unit-7&8	TPP
23.2917	81.0417	0.903	1021	631	6	India	Sanjay Gandhi	TPP
24.7109	84.1016	0.901	1388	819	8	India	Nabi Nagar	TPP
26.5729	12.6771	0.899	583	271	3	Libya	Ubari	TPP
32.3438	15.1094	0.896	1198	703	8	Libya	Libyan Iron Steel Company	STI
25.1484	75.8359	0.894	1201	948	8	India	Kota Super Thermal Power Station	TPP
28.6771	-106.0729	0.894	747	222	3	Mexico	Chihuaha	URB
12.9766	77.6016	0.893	1532	817	8	India	Bangalore	URB
16.5000	75.8438	0.891	972	640	6	India	NTPC Kudgi	TPP
12.8616	44.9777	0.890	1506	882	7	Yemen	President PP (Petromasila) & Shaykh Uthman urban area	TPP
27.4688	41.7188	0.885	1314	857	7	Saudi Arabia	GCB Hail PP-2 & Hail urban area	TPP
-17.3854	-151.9896	0.883	1303	1290	3	NO COUNTRY	Outlier - Empty area	OUT
17.4479	78.4479	0.883	1145	240	3	India	Hyperabad	URB
29.5000	60.8125	0.878	821	403	4	Iran	Zahedan power station & Zahedan urban area	TPP
15.6063	32.5063	0.877	1240	475	5	Sudan	Khartoum	URB
24.3854	109.3785	0.866	1537	1017	9	China	Liuzhu industrial zone	IND
15.3563	44.2313	0.866	1064	469	5	Yemen	Sanaa	URB
24.3750	85.5625	0.861	759	409	4	India	Koderma	TPP
30.6938	33.7938	0.860	894	490	5	Egypt	Al-Aarish & Sinai White Cement	CEM
25.5000	78.7500	0.858	605	337	4	India	Parichha	TPP
44.4330	26.1116	0.857	1299	548	7	Romania	Bucarest	URB
21.0469	75.8438	0.853	785	382	4	India	Bhusawal	TPP
37.9375	32.5000	0.848	895	367	4	Turkey	Konya Cement Factory + Konya urban area	CEM
26.5547	101.7031	0.846	1571	712	8	China	Panzhihua industrial zone	IND
32.3021	70.7604	0.846	496	241	3	Pakistan	Lucky Cement Limited Pezu Plant	CEM
22.0781	76.5469	0.845	824	345	4	India	Shree Singaji	TPP
26.2545	74.2009	0.842	1034	815	7	India	Shree Cement Limited	CEM
6.9479	79.8854	0.834	767	229	3	Sri Lanka	Kelanitissa Power Station & Colombo	TPP
43.9688	115.9688	0.834	652	202	3	China	Xilinhot mining site	MIN
25.5781	-103.4297	0.831	1612	740	8	Mexico	Torréon & Met-Mex Peñoles	OTH
31.1875	107.5000	0.830	788	354	4	China	Dazhou	URB
22.1354	-100.9271	0.826	1023	274	3	Mexico	San Luis Potosí	URB
40.1146	31.6979	0.826	750	221	3	Turkey	Çayırhan	TPP
36.1354	-115.1354	0.820	1528	451	6	United States	Las Vegas	URB
38.6920	35.5134	0.817	1033	535	7	Turkey	Kayseri	URB
39.2188	-111.0313	0.814	1250	629	8	United States	PacifiCorp Hunter	TPP
41.8750	12.4688	0.812	1200	366	6	Italy	Rome	URB
25.8984	81.3359	0.812	850	814	8	India	Feroze Gandhi Unchahar	TPP
31.2396	37.4271	0.808	640	233	3	Saudi Arabia	Al Qurayyat	TPP
42.8854	74.5625	0.806	1100	419	6	Kyrgyzstan	Bichkek	URB
31.0188	46.1938	0.794	1057	538	5	Iraq	Nassiriya	URB
47.4609	19.0859	0.790	1093	488	8	Hungary	Budapest	URB
21.5491	109.5223	0.785	1103	740	7	China	Tieshangang industrial zone	IND
24.6979	73.0104	0.784	816	212	3	India	JK Ceemnt Sirohi	CEM
34.4375	60.3438	0.783	849	314	4	Iran	Sangan industrial zone	IND
27.5313	-99.5313	0.780	761	212	3	Mexico	Laredo	URB
11.7688	77.8188	0.778	974	590	5	India	Mettur 1&2	TPP

37.5188	61.8188	0.775	983	409	5	Turkmenistan	Mary-3	TPP
39.5104	-112.5729	0.773	630	222	3	United States	Intermountain Power Service Corporation	TPP
53.4618	59.1146	0.772	1114	655	9	Russia	Sinter plant (unknown name)	STI
8.7455	78.2098	0.770	1354	868	7	India	Tuticorin	TPP
36.1313	1.2688	0.763	829	384	5	Algeria	Cimenterie Chlef ECDE	CEM
21.3958	79.9583	0.762	970	668	6	India	Adani	TPP
41.2031	-95.8906	0.762	886	244	4	United States	Mid American Energy - Walter Scott Jr. Energy Center	TPP
19.0859	-98.1641	0.761	1423	788	8	Mexico	Central Ciclo Combinado San Lorenzo & Puebla urban area	TPP
-29.8507	30.9618	0.758	1483	757	9	South Africa	Durban	URB
29.3125	75.8750	0.758	569	338	4	India	Rajiv Gandhi - Residential Colony	TPP
24.1063	52.6813	0.757	1274	563	5	United Arab Emirates	Al Ruways Industrial City	IND
36.5156	-89.5469	0.756	693	311	4	United States	New Madrid Steam	TPP
-20.2563	-40.2688	0.753	926	491	5	Brazil	Harsco Environmental (ArcelorMittal)	STI
51.2188	58.3438	0.750	837	171	3	Russia	Novotroïtsk industrial zone	IND
5.2604	-3.9896	0.747	895	274	3	Côte d'Ivoire	Abidjan	URB
11.3188	108.7688	0.746	932	431	5	Vietnam	Nhà Máy Nhiêt Điện Vĩnh Tân 2	TPP
11.0000	-74.8125	0.744	620	338	4	Colombia	Baranquilla	URB
39.0938	-94.5938	0.742	1096	233	3	United States	Kansas City	URB
59.7083	-158.3542	0.742	367	294	6	United States	Outlier - Empty area	OUT
-20.1188	57.4813	0.740	1133	560	5	Mauritius	Fort George Thermal Power Station & Port Louis	TPP
28.5000	-100.6875	0.739	985	488	4	Mexico	José López Portillo	TPP
23.8438	53.6250	0.738	667	375	4	United Arab Emirates	GASCO Habshan industrial zone	IND
27.8125	79.9063	0.736	755	582	6	India	Roza	TPP
18.5438	-69.8563	0.733	1070	434	5	Dominican Republic	Saint Domingue	URB
-28.4479	-49.0104	0.733	581	287	3	Brazil	Jorge Lacerda	TPP
36.1979	37.1354	0.730	413	241	3	Syria	Alep	URB
14.7031	-17.3984	0.729	1395	782	8	Senegal	Dakar	URB
19.3368	105.8021	0.727	1616	1089	9	Vietnam	Nhà Máy Xi Măng Nghi Sơn	TPP
56.8125	60.5938	0.720	1187	426	8	Russia	Iekaterinbourg	URB
-32.8854	-68.8229	0.719	1050	215	3	Argentina	Mendoza	URB
38.1771	-85.7604	0.719	973	191	3	United States	Louisville	URB
22.3750	73.1250	0.716	829	679	6	India	Petro Chemical Complex INA	IND
24.7500	89.3750	0.715	692	360	4	Bangladesh	Outlier - Inconsistent emissions	OUT
22.8750	73.3750	0.711	1243	1023	8	India	Wanakbori	TPP
39.6938	66.9188	0.711	1146	348	5	Uzbekistan	Samarcande	URB
39.8854	48.9479	0.710	476	223	3	Azerbaijan	Cənub Elektrik Stansiyası	TPP
28.4598	76.3884	0.709	745	702	7	India	Jhajjar	TPP
53.7438	91.3563	0.705	1104	267	5	Russia	Abakanskiy Filial Sibirskaya Generiruyushchaya Kompaniya	TPP
33.4271	52.5521	0.703	924	282	3	Iran	Zaverh Admin bulding PP	TPP
26.5759	82.6205	0.696	786	694	7	India	L&T Power Batching Plant	TPP
6.4688	3.4063	0.694	1653	743	7	Nigeria	Lagos	URB
53.2188	45.0000	0.693	696	232	4	Russia	Penza	URB
42.1563	25.9688	0.691	1020	196	3	Bulgaria	Central Contour Global Maritsa East 3	TPP
18.0469	106.4531	0.691	722	385	4	Vietnam	Xưởng Luyện Cốc	TPP
-23.1813	-70.3938	0.689	941	621	5	Chile	Thermal Complex Mejillones Engie	TPP
35.7604	43.2708	0.688	677	512	6	Iraq	Qayyarah Power station	TPP
41.1875	-8.6250	0.687	847	263	4	Portugal	Porto	URB
42.2500	26.1250	0.685	1034	288	4	Bulgaria	TPP Marista East 2	TPP
24.6188	77.0438	0.684	962	529	5	India	Chhabra	TPP
40.9063	117.7188	0.684	942	366	5	China	Chengde industrial zone	IND
16.8993	42.6354	0.683	1310	1129	9	Saudi Arabia	Jizan	URB
4.1354	100.6354	0.683	739	302	3	Malaysia	Manjung	TPP

-23.8125	151.2188	0.682	1148	560	6	Australia	RG Tanna Coal Terminal	OTH
24.1771	-110.3021	0.678	524	240	3	Mexico	La Paz	URB
51.8188	55.1438	0.675	1134	288	5	Russia	Orenburg	URB
53.3646	-114.3229	0.674	605	157	3	Canada	Capital Power - Genesee	TPP
10.6146	-66.9479	0.672	1195	577	6	Venezuela	Caracas	URB
39.1830	27.5759	0.672	942	608	7	Turkey	Soma	TPP
39.7438	-86.2063	0.670	1055	326	5	United States	Indianapolis	URB
49.5000	8.4688	0.669	915	409	6	Germany	Manheim	URB
39.4531	-0.3906	0.668	1107	309	4	Spain	Valencia	URB
21.6406	108.3984	0.667	1594	1001	8	China	Fangchenggang Port	OTH
16.5938	80.5491	0.664	947	781	7	India	Vijayawada	TPP
45.5625	-122.6250	0.663	1108	345	6	United States	Portland	URB
42.3507	-71.0729	0.663	977	640	9	United States	Boston	URB
36.3333	6.5833	0.663	839	430	6	Algeria	Constantine	URB
-24.2656	-69.0938	0.661	1306	384	4	Chile	Estación Zaldivar mining site	MIN
33.6250	-84.4375	0.659	1047	293	4	United States	Atlanta	URB
24.9479	34.6771	0.659	468	270	3	Egypt	Sukari Gold mining site	MIN
-2.7938	122.1813	0.658	1047	559	5	Indonesia	Dexin Steel Indonesia	STI
53.3438	-6.3125	0.658	907	319	6	Ireland	Dublin	URB
30.1979	-93.3229	0.658	608	294	3	United States	Prien Lake industrial zone	IND
22.1875	84.8438	0.657	906	601	6	India	Rourkela Steel Plant Area	STI
30.4509	70.9777	0.657	572	586	7	Pakistan	Kot Adu	URB
35.0104	26.1146	0.655	667	217	3	Greece	D. R. H. Atherinolakkos	TPP
36.8854	7.6771	0.655	501	220	3	Algeria	El-Hadjar Steel Complex	STI
12.7049	101.1771	0.650	1384	1059	9	Thailand	Maptaphut industrial zone	IND
21.2031	73.5469	0.650	894	411	4	India	Ukai	TPP
24.2500	113.4063	0.648	763	585	6	China	Yingde industrial zone	IND
41.8229	81.8021	0.648	701	194	3	China	Industrial facility (unknown name)	OTH
27.1250	78.3750	0.647	480	356	4	India	Firozabad	URB
45.1016	7.7344	0.644	1243	557	8	Italy	Turin	URB
37.0625	27.8750	0.641	697	303	4	Turkey	Teknokon Industry Kemerköy	TPP
50.0313	19.9688	0.637	804	164	3	Poland	Cracovie	URB
50.4219	30.5469	0.633	1157	249	4	Ukraine	Kiev	URB
23.3646	111.0104	0.631	673	264	3	China	Guangxi Hongjun Ceramics	OTH
55.3750	86.0625	0.629	927	583	8	Russia	Kemerovskaya GRES	TPP
57.1146	65.6250	0.627	790	348	6	Russia	Tuymen urban and industral zone	IND
10.8281	106.6563	0.622	1126	322	4	Vietnam	Ho Chi Minh Ville	URB
52.1146	47.4271	0.622	440	225	3	Russia	Heidelberg Cement Volga	CEM
24.2604	37.5521	0.620	516	242	3	Saudi Arabia	Yanbu Cement Company	CEM
48.4313	135.1063	0.612	1209	291	5	Russia	Khabarovsk & Khabarovskaya Tets-1	URB
-17.2500	-70.5938	0.610	1422	543	6	Peru	Toquepala mining site	MIN
56.2455	90.4509	0.610	779	464	7	Russia	Achinskiy Tsement & Achinsk Alumina Refinery	CEM
22.8281	108.3281	0.609	1197	699	8	China	Nanning	URB
45.4479	12.2500	0.608	817	420	6	Italy	Edison Marghera Levante CCGT Power Plant	TPP
43.3438	45.7500	0.606	1082	251	4	Russia	Power station (unknown name) & Groznyï urban area	TPP
41.5000	31.9063	0.603	965	519	8	Turkey	Catalagzi	TPP
23.7188	86.1146	0.602	1112	1068	9	India	Chandrapura	TPP
59.8750	29.9688	0.600	2968	190	4	Russia	Outlier - Inconsistent emissions	OUT
15.6063	-88.0063	0.600	634	499	5	Honduras	San Pedro Sula	URB
31.5313	83.0313	0.594	800	237	3	China	Outlier - Empty area	OUT
20.9479	86.0729	0.594	670	314	3	India	MBF Plant (Visa Special Steel Unlimited)	STI
23.1313	-82.3938	0.590	823	518	5	Cuba	La Havane	URB

21.7396	108.6146	0.589	1646	253	3	China	Qinzhou Port	OTH
32.0781	112.2031	0.588	930	294	4	China	Xiangyang	URB
-22.8854	-69.3229	0.587	1288	283	3	Chile	Sierra Gorda mining site & Planta Molibdeno	MIN
43.6920	95.0134	0.587	911	639	7	China	Power station (unknown name)	TPP
51.2813	19.3438	0.580	821	714	9	Poland	Bełchatów	TPP
37.8203	-122.3281	0.577	1211	596	8	United States	San Francisco/Oakland	URB
35.3750	-119.0625	0.568	1003	268	4	United States	Bakersfield	URB
51.3021	19.5521	0.568	828	151	3	Poland	Outlier - Inconsistent emissions	OUT
55.5938	65.1250	0.568	359	318	4	Russia	Outlier - Empty area	OUT
31.8563	47.1313	0.565	876	444	5	Iraq	Maysan power station & Al-Amara urban area	TPP
28.6875	53.5625	0.565	841	331	4	Iran	Jahrom	TPP
48.1719	16.4063	0.562	697	221	4	Austria	Vienna	URB
37.0188	128.3188	0.557	1555	592	5	South Korea	Sungshin Yanghoe Danyang Factories	CEM
31.6641	73.2109	0.557	1124	648	8	Pakistan	PACHEM Global Pvt. Ltd	STI
31.4509	73.0938	0.556	1206	555	7	Pakistan	Faisalabad	URB
35.5670	45.3884	0.555	1281	701	7	Iraq	Sulaymaniyah	URB
-38.2455	146.6027	0.555	1083	637	7	Australia	Loy Yang A & B	TPP
54.7188	20.5000	0.555	778	197	4	Russia	Kaliningrad	URB
-33.1250	151.5859	0.550	1299	704	8	Australia	Vales Point	TPP
17.6667	42.1667	0.543	950	641	6	Saudi Arabia	Shuqaiq Steam Power Plant	TPP
34.0625	131.8125	0.537	604	321	4	Japan	Tokuyama Higashi	TPP
43.4375	4.8750	0.536	522	251	4	France	ArcelorMittal PCD4 FOS SUR MER	STI
44.7563	37.7688	0.535	1296	366	5	Russia	Novorossiisk	URB
54.7396	56.0104	0.535	1179	146	3	Russia	Truba	TPP
50.0938	8.6076	0.535	987	570	9	Germany	Frankfurt	URB
57.9330	56.2009	0.530	691	334	7	Russia	CHPP 9	TPP
24.8854	89.9896	0.530	487	247	3	Bangladesh	United Jamalpur	TPP
35.1875	126.8125	0.528	970	294	4	South Korea	Gwangju	URB
30.8750	75.8750	0.526	520	345	4	India	Ludhiana	URB
36.9955	35.3616	0.524	764	492	7	Turkey	Adana	URB
52.5000	13.3750	0.523	1227	233	4	Germany	Berlin	URB
17.1313	77.2063	0.523	860	402	5	India	Thermal Power Plant Unit 4 Ultratech Cement	CEM
40.5563	70.9563	0.523	823	313	5	Uzbekistan	Kokand Thermal Power Station & Kokand	TPP
25.1641	81.6641	0.518	849	786	8	India	Bara Thermal Power Station + Ultratech grinding unit	TPP
38.6250	-90.1875	0.512	954	263	4	United States	Saint Louis	URB
29.9375	-90.1250	0.507	866	285	4	United States	New Orleans	URB
42.2500	119.0313	0.497	784	269	4	China	Honghan industrial zone	IND
54.3688	18.6688	0.497	701	271	5	Poland	Wybrzeze (Gdansk/Gdynia) CHP Power Plant & Gdansk port	TPP
57.4340	41.2118	0.494	840	656	9	Russia	Kostroma	TPP
-6.8021	111.9271	0.493	770	246	3	Indonesia	Indonesia Semen Tuban	CEM
26.6146	106.6771	0.492	1040	208	3	China	Guiyang industrial zone	IND
33.2708	131.6458	0.492	710	677	6	Japan	Nippon Steel Corporation Oita Works	STI
-22.8594	-47.1406	0.491	752	284	4	Brazil	Campinas	URB
50.0313	8.3125	0.490	912	210	4	Germany	Mainz	URB
24.1354	81.9271	0.490	742	289	3	India	Jaypee Nigrie	TPP
17.6146	80.6979	0.489	498	260	3	India	Kothagudem Thermal Power Station VII stage	TPP
21.0729	110.4896	0.488	473	272	3	China	Industrial zone (unknown name)	IND
30.4896	-91.1979	0.484	713	216	3	United States	Bâton Rouge	URB
34.7734	48.5391	0.480	1037	779	8	Iran	Hamadan	URB
31.4063	31.7031	0.480	1002	842	8	Egypt	Damietta	URB
53.7902	74.0670	0.473	856	455	7	Russia	Outlier - Empty area	OUT
32.0625	74.8125	0.473	427	296	4	Pakistan	Hubco Narowal	TPP

51.4375	14.5938	0.472	446	424	6	Germany	Boxberg	TPP
44.8063	20.4563	0.470	967	314	5	Serbia	Belgrade	URB
31.8125	34.6875	0.469	1522	274	4	Israel	Eshkol	TPP
27.8203	114.9063	0.468	1071	907	8	China	Xinyu urban area and industrial zone	IND
39.0000	125.7188	0.466	713	564	6	North Korea	Pyongyang	TPP
26.7991	119.7902	0.465	901	857	7	China	Power station (unknown name)	TPP
51.1979	12.3646	0.465	352	163	3	Germany	Lippendorf	TPP
36.9598	54.8259	0.462	1075	593	7	Iran	Ali Abad Gas Turbine Power Plant	TPP
53.6116	-0.1830	0.460	836	409	7	United Kingdom	VPI Immingham Power Station	TPP
43.3125	5.3750	0.459	469	267	4	France	Marseille	URB
32.8750	115.8125	0.458	730	290	4	China	Fuyang	URB
48.4271	35.0521	0.456	581	180	3	Ukraine	Dnipro	URB
31.6875	47.2500	0.455	902	282	4	Iraq	Al-Amarah	TPP
25.1188	81.9188	0.450	1186	458	5	India	TPSC NPTC	TPP
30.3313	111.5688	0.450	1144	352	5	China	Outlier - Inconsistent emissions	OUT
37.6094	105.2891	0.445	1208	596	8	China	Ningxia Iron and Steel Group No.3 Men	STI
40.7396	72.3021	0.445	999	642	9	Uzbekistan	Reco Sement Zavodi	CEM
57.6063	39.8688	0.445	688	358	5	Russia	Yaroslavl CHP-2	TPP
40.5729	49.6146	0.442	2224	231	3	Azerbaijan	Sumgait	URB
29.9063	75.2500	0.442	531	523	6	India	Talwandi Sabo (Super Critical)	TPP
51.0223	2.2902	0.438	570	461	7	France	AcelorMittal Dunkerque	STI
44.6771	20.1771	0.434	1043	224	3	Serbia	Nikola Tesla	TPP
55.8063	49.1688	0.430	1259	312	5	Russia	Kazan 3	TPP
41.0547	71.5547	0.429	733	514	8	Uzbekistan	Namangan	URB
41.4479	-81.6771	0.421	572	194	3	United States	Cleveland	URB
53.5688	49.8938	0.417	1105	278	5	Russia	Outlier - Empty area	OUT
24.2938	121.7063	0.417	744	469	5	Taiwan	Hoping power station & Taiwan Cement Company	TPP
30.3229	112.3125	0.415	707	541	6	China	Jingzhou	URB
36.1563	-5.4063	0.405	602	421	5	Spain	Campo de Gibraltar CCGT & Algesiras/Gibraltar urban area	TPP
30.0000	-90.4375	0.404	747	285	4	United States	Norco North Entergy Power Station & Dow Chemical Plant	IND
35.6771	-0.6215	0.400	1607	791	9	Algeria	Oran	URB
50.9063	-1.3884	0.395	516	373	7	United Kingdom	Southampton	URB
34.3750	115.6250	0.393	555	282	4	China	Shangqiu	URB
32.7500	45.0938	0.389	996	882	8	Iraq	Wassit	TPP
33.0000	112.5625	0.387	590	295	4	China	Tongi	URB
47.2118	39.7326	0.380	909	615	9	Russia	Rostov-on-Don	URB
22.0580	88.1116	0.377	723	769	7	India	Haldia industrial zone	IND
29.8125	116.3125	0.376	879	528	6	China	Indusrial zone (unknown name)	IND
56.3125	44.5313	0.371	1488	365	6	Russia	Outlier - Empty area	OUT
29.7500	104.5000	0.370	509	300	4	China	Cheng Yu Fan Tai Technology Co.Ltd. Manufacturing Factory	OTH
24.8854	102.5000	0.369	1406	556	6	China	Yunnan industrial zone	IND
42.2396	-83.3021	0.368	1579	178	3	United States	Cliffs Steel	STI
42.7500	88.6563	0.367	1108	255	4	China	Xingjiang Sunye Energy Chemical Engineering	OTH
30.1979	71.4896	0.367	356	211	3	Pakistan	Multan	URB
37.9063	102.6458	0.365	1016	363	6	China	Wuwei	URB
29.2266	119.5703	0.363	904	692	8	China	Xishansi mining site	MIN
45.0469	-83.2656	0.357	683	346	4	United States	Holcim Alpena Cement Plant	CEM
62.7438	81.1813	0.355	886	276	5	Russia	Outlier - Empty area	OUT
30.0813	77.3313	0.354	409	395	5	India	Haryana Yamunanagar	TPP
34.1146	112.8229	0.353	901	220	3	China	Ruzhou industrial zone	IND
25.3785	49.5451	0.350	1248	815	9	Saudi Arabia	Al Hufuf	URB
36.0104	129.3993	0.344	1126	984	9	South Korea	Pohang Coal Port	IND

62.7396	80.8854	0.338	786	121	3	Russia	Outlier - Empty area	OUT
35.6146	44.8854	0.337	1045	254	3	Iraq	Sulaymanya	TPP
52.0729	78.3646	0.333	237	193	3	Kazakhstan	Outlier - Empty area	OUT
50.5625	13.7813	0.332	731	225	4	Czechia	Ele Chladící Věž	TPP
41.3438	122.1563	0.331	1455	187	3	China	Power station (unknown name)	TPP
42.8646	87.9479	0.331	1048	217	3	China	Industrial facility (unknown name)	OTH
29.7277	116.0491	0.327	883	572	7	China	Jinjipo industrial zone	IND
57.3646	-111.1354	0.323	986	157	3	Canada	Kearl mining site	MIN
24.9826	102.7674	0.320	1107	765	9	China	Kunming	URB
47.2813	39.2188	0.317	555	231	3	Russia	Outlier - Inconsistent emissions	OUT
52.2634	104.1920	0.316	1233	391	7	Russia	Novo-Irkutskaya Tets	TPP
35.1295	48.8884	0.313	819	636	7	Iran	Mofatteh Power Plant & Vian Steel Complex	STI
55.5469	35.5781	0.304	1096	196	4	Russia	Outlier - Inconsistent emissions	OUT
51.0729	1.6771	0.300	823	162	3	France	Channel (shipping)	OTH
36.7266	49.4609	0.300	706	668	8	Iran	Khazar Cement Factory	CEM
33.3646	120.1354	0.299	682	194	3	China	Yancheng	URB
45.4896	126.9896	0.298	1813	180	3	China	Acheng	URB
-32.8854	151.7396	0.297	1393	208	3	Australia	Newcaste	URB
49.7813	18.3438	0.297	1000	167	3	Czechia	Ostrava industrial zone	IND
57.0521	-111.5833	0.297	961	263	6	Canada	Syncrude ID station (oilsand)	OTH
41.5000	-83.3438	0.296	981	253	4	United States	Martin Marietta - Lime and Stone	CEM
35.7188	118.6116	0.290	1087	507	7	China	Xian de Yishui industrial zone	IND
57.0938	84.3854	0.289	466	584	9	Russia	Outlier - Empty area	OUT
36.5156	52.3438	0.288	1026	283	4	Iran	Amol	URB
39.5729	121.2396	0.288	740	187	3	China	Changxing Island Hengli	TPP
31.4896	34.4479	0.287	807	208	3	Palestine	Gaza	URB
43.1354	124.3854	0.282	789	182	3	China	Siping urban and industrial zone	IND
25.6250	32.5313	0.279	518	304	4	Egypt	Impossible to characterize	OTH
60.1563	30.5938	0.278	2338	473	7	Russia	Outlier - Inconsistent emissions	OUT
34.4766	133.4531	0.277	1469	801	8	Japan	Setouchi Joint - LTD Fukuyama Joint Power	TPP
43.2708	87.5417	0.276	816	360	6	China	Aketashi mining site	MIN
21.6938	72.6063	0.276	478	472	5	India	Lakhigam industrial zone	IND
36.8646	54.4271	0.273	859	203	3	Iran	Gorgan	URB
45.4896	-85.6146	0.272	506	261	3	United States	Outlier - Empty area	OUT
43.8854	94.6979	0.270	1137	198	3	China	Yireng Leke mining site	MIN
31.0313	112.2500	0.269	611	303	4	China	Jigmen	URB
40.2366	49.5759	0.268	1668	459	7	Azerbaijan	Holcim Azerbaijan	CEM
34.3906	119.7734	0.266	598	708	8	China	Guanhe river mouth industrial zone	IND
41.6563	-83.4688	0.264	917	199	3	United States	Cleveland-Cliffs HBI	STI
40.8125	30.3750	0.263	806	242	4	Türkiye	Enka Natural Gas Combined Cycle Power Plant	TPP
25.0000	103.1875	0.261	892	316	4	China	Yiliang Jinzhu Cement	CEM
50.8854	6.0104	0.260	805	158	3	Netherlands	Sibelco Benelux	CEM
59.7813	29.3125	0.257	1048	158	4	Russia	Industrial facility (unknown name)	OTH
25.1563	121.7813	0.253	1226	239	3	Taiwan	Concord Power	TPP
31.8125	44.1250	0.246	2225	273	4	Iraq	KAR Cement Plant	CEM
55.6813	52.6063	0.246	660	267	5	Russia	Tem-Po, Naberezhnochelninskiy Zavod Metallokonstruktsiy	STI
30.6771	76.7396	0.244	914	213	3	India	Mohali/Panchkula/Chandigarh	URB
34.7438	112.0813	0.243	894	343	5	China	Power station (unknown name)	TPP
31.3125	76.9063	0.241	625	431	6	India	Ultratech Cement Baga	CEM
51.8281	14.4688	0.237	299	247	4	Germany	Jänschwalde	TPP
56.2031	51.3984	0.236	677	486	8	Russia	Outlier - Inconsistent emissions	OUT
40.7813	113.2813	0.230	1217	231	3	China	Power station (unknown name)	TPP

30.2500	75.1875	0.227	297	322	4	India	Guru Hargobind	TPP
45.4063	10.9688	0.225	798	165	3	Italy	Verona	URB
33.0670	131.8527	0.224	820	530	7	Japan	Tsukumi mining site & Tsukumi plant	MIN
2.5521	101.7396	0.224	768	257	3	Malaysia	Jimah	TPP
56.7604	36.7396	0.221	228	130	3	Russia	Konakovo	TPP
52.9479	-1.1979	0.220	658	157	3	United Kingdom	Nottingham	URB
60.2688	25.5063	0.216	618	268	5	Finland	Kilpilahti industrial zone	IND
38.8750	-77.0313	0.215	769	405	6	United States	Washington DC	URB
47.6979	38.2604	0.215	725	169	3	Ukraine	Outlier - Empty area	OUT
56.8688	62.0563	0.214	2060	257	5	Russia	Slk Tsement	CEM
25.6667	49.4792	0.213	576	686	6	Saudi Arabia	Saudi Cement Company	CEM
52.8438	-1.3125	0.211	600	213	4	United Kingdom	Ratcliffe-on-Soar	TPP
32.6771	116.3229	0.207	278	228	3	China	Outlier - Inconsistent emissions	OUT
21.7009	73.0491	0.206	760	551	7	India	Gujarat Narmada Valley Fertilizers & Chemicals Limited	IND
47.4375	40.1563	0.198	405	392	6	Russia	Rosatov AO Metallotorg	STI
53.7455	77.8527	0.197	963	506	7	Russia	Outlier - Empty area	OUT
25.9757	56.0451	0.197	616	927	9	United Arab Emirates	Union Cement Company	CEM
25.2188	118.9688	0.193	765	788	9	China	Meizhou Bay	OTH
32.6953	116.9453	0.190	580	604	8	China	Power station (unknown name)	TPP
41.2063	-112.0563	0.188	505	332	5	United States	Outlier - Inconsistent emissions	OUT
35.3646	118.3021	0.186	1255	186	3	China	Outlier - Inconsistent emissions	OUT
11.3854	79.2396	0.183	1408	252	3	India	The Ramco Cements Ltd., PP	CEM
47.8125	38.0000	0.183	612	408	6	Ukraine	Starobesheve	TPP
53.7188	-0.9688	0.183	558	170	3	United Kingdom	Drax	TPP
26.0243	119.4549	0.182	844	727	9	China	Fuzhou	URB
55.3958	52.1146	0.182	698	362	6	Russia	Outlier - Empty area	OUT
36.5938	53.0313	0.179	998	259	3	Iran	Sari	URB
55.9271	51.4479	0.178	674	255	3	Russia	Outlier - Empty area	OUT
31.0313	76.5781	0.173	383	304	4	India	Guru Gobind Singh	TPP
25.7396	119.5174	0.167	502	688	9	China	Industrial zone (unknown name)	IND
55.8229	41.7396	0.167	296	143	3	Russia	Outlier - Inconsistent emissions	OUT
13.1094	100.9063	0.166	497	385	4	Thailand	Thung Sukhla industrial zone	IND
44.4688	-81.5000	0.165	455	374	4	Canada	Outlier - Empty area	OUT
32.7674	12.6771	0.163	938	890	9	Libya	Az Zawiyah Power Plant	TPP
53.9271	39.1979	0.162	528	150	3	Russia	Outlier - Empty area	OUT
54.0469	38.1563	0.162	464	219	4	Russia	Novomoskovskaya Gres	TPP
40.3828	113.0078	0.159	682	621	8	China	Fengzhen, Ulaan Chab industrial zone	IND
38.0521	118.8854	0.158	189	200	3	China	Dongying Haikerui Lin & Shandong Deyang Chemical Industries	IND
58.4063	-60.3594	0.156	315	278	4	NO COUNTRY	Outlier - Empty area	OUT
53.9271	79.5104	0.153	985	191	3	Russia	Outlier - Empty area	OUT
23.7604	86.3854	0.151	978	234	3	India	Kustore mining site	MIN
39.4271	126.0000	0.150	812	509	6	North Korea	Sunchon Cement Complex & South Pyongan Ore Processing Plant	CEM
48.0625	38.2604	0.149	425	419	6	Ukraine	Zuivska	TPP
44.1146	-81.8646	0.145	313	282	3	Canada	Outlier - Empty area	OUT
52.3958	77.5938	0.142	581	614	6	Kazakhstan	Outlier - Empty area	OUT
56.7604	62.6771	0.141	260	126	3	Russia	Outlier - Inconsistent emissions	OUT
41.4583	-88.1146	0.139	1035	442	6	United States	Joliet 9	TPP
18.6813	72.9813	0.137	1380	571	5	India	JSW Cement + JSW Steel	CEM
19.8438	105.7813	0.136	1645	237	3	Vietnam	Than Hoa	URB
54.2396	38.8854	0.136	256	179	3	Russia	Serebryanskiy Tsementnyy Zavod	CEM
34.3563	117.9938	0.134	277	360	5	China	Power station (unknown name)	TPP
30.0625	103.7813	0.133	636	293	4	China	Sichuan Guangxin Aluminium Industry	OTH

55.7188	52.4063	0.132	561	172	3	Russia	Naberezhnochelninskaya Tets & Naberejnye Tchelny urban area	TPP
34.1458	118.7917	0.130	238	406	6	China	Mengxi	URB
54.4813	87.6438	0.128	474	234	5	Russia	Outlier - Empty area	OUT
38.3938	112.6813	0.127	859	330	5	China	Xinzhou	URB
35.6250	53.4688	0.127	420	280	4	Iran	Qods	TPP
34.3563	118.3063	0.127	306	351	5	China	Xinyi	URB
17.2604	42.3854	0.126	426	335	3	Saudi Arabia	Jazan City for Primary and Downstream Industries	IND
38.4188	114.2063	0.123	1511	368	5	China	Hebei industrial zone	IND
30.1979	112.6354	0.123	255	259	3	China	Power station (unknown name)	TPP
50.6563	5.5313	0.118	305	156	3	Belgium	Liège	URB
22.8047	69.5703	0.116	851	759	8	India	Adani Power Limited	TPP
43.2455	-79.8259	0.116	478	510	7	Canada	Hamilton indutrial zone	IND
42.5104	124.0521	0.115	570	208	3	China	Kaiyuan	URB
31.0156	31.3125	0.113	285	626	8	Egypt	Mansourah	URB
22.9453	120.1953	0.111	626	646	8	Taiwan	Tainan	URB
22.4063	87.8750	0.111	349	382	4	India	Kolaghat	TPP
53.0729	80.3229	0.110	636	141	3	Russia	Outlier - Empty area	OUT
45.3563	9.9188	0.110	564	278	5	Italy	Outlier - Inconsistent emissions	OUT
35.9896	115.1354	0.110	430	204	3	China	Outlier - Inconsistent emissions	OUT
52.6354	-1.1771	0.108	428	157	3	United Kingdom	Leicester	URB
51.8229	5.2396	0.106	184	150	3	Netherlands	Outlier - Inconsistent emissions	OUT
22.0000	113.1875	0.103	512	356	4	China	Power station (unknown name)	TPP
54.3313	38.2938	0.101	293	246	5	Russia	Outlier - Inconsistent emissions	OUT
44.6354	-81.3021	0.100	361	242	3	Canada	Outlier - Empty area	OUT
46.0938	127.3125	0.098	365	222	4	China	Outlier - Inconsistent emissions	OUT
-32.7813	-71.4063	0.095	607	274	3	Chile	AES Gener - Termoeléctrica Ventanas	TPP
53.4063	-1.3438	0.093	416	179	3	United Kingdom	Shefield/Rotterdam	URB
35.8813	117.6688	0.090	486	326	5	China	Qingyun industrial zone	IND
35.0063	115.2063	0.089	158	349	5	China	Zhuangzhaizhen industrial zone	IND
55.0688	38.8313	0.088	344	265	5	Russia	Holcim Cement	CEM
-26.6424	30.1076	0.087	731	1030	9	South Africa	Eskom - Camden	TPP
32.8021	35.0521	0.083	323	219	3	Israel	Haifa	URB
58.2604	-60.4271	0.083	234	173	3	NO COUNTRY	Outlier - Empty area	OUT
37.6250	105.7188	0.080	373	277	4	China	Ningxia Huaxia Spec. Steel Co.	STI
37.2563	127.3938	0.075	2582	330	5	South Korea	Icheon	URB
31.4313	119.4438	0.068	391	383	5	China	Lichengzhen	URB
34.6188	119.1438	0.068	205	349	5	China	Lianyingang	URB
11.1813	79.0813	0.067	430	455	5	India	Dalmia Cement	CEM
26.5104	119.6979	0.067	246	266	3	China	Baogang Desheng Company	STI
20.2813	78.9688	0.066	384	298	3	India	Sai Wardha	TPP
50.8750	4.4063	0.063	337	538	8	Belgium	Bruxelles	URB
36.1563	117.0938	0.060	264	364	5	China	Tai'an	URB
41.9688	-87.2656	0.059	915	241	4	United States	Outlier - Empty area	OUT
31.9563	44.6938	0.059	801	401	5	Iraq	Diwaniyah	TPP
20.4896	106.5104	0.057	424	754	9	Vietnam	Nhà Máy Nhiệt Diện Thái Bình 2	TPP
35.8281	116.0234	0.057	155	543	8	China	Outlier - Inconsistent emissions	OUT
31.0833	119.6563	0.049	841	464	6	China	Huzhou Xinhuai S Cement Co.	CEM
18.3854	79.8021	0.049	345	260	3	India	Kakatiya	TPP
45.9152	127.1473	0.049	337	472	7	China	Outlier - Inconsistent emissions	OUT
31.8021	35.1979	0.048	199	219	3	Israel	Jerusalem	URB
25.6563	50.7188	0.047	548	242	3	Qatar	Outlier - Empty area	OUT
29.4271	55.6979	0.045	461	217	3	Iran	Sirjian	URB

-34.8958	-57.9688	0.044	429	538	6	Argentina	La Plata	URB
52.6250	76.5781	0.042	811	563	8	Kazakhstan	Outlier - Empty area	OUT
35.5104	118.7326	0.041	511	613	9	China	Cement plant (unknown name)	CEM
42.3750	-88.0000	0.038	251	266	4	United States	Waukegan/Gurnee	URB
56.4167	37.3646	0.038	215	316	6	Russia	Outlier - Inconsistent emissions	OUT
24.0625	91.0000	0.036	355	379	4	Bangladesh	Midland PP & Ashuganj Fertilizer & Chemical Company Limited	TPP
54.2708	39.5104	0.036	264	301	6	Russia	Outlier - Empty area	OUT
33.9896	113.8021	0.036	199	198	3	China	Xuchang	URB
23.5848	113.1027	0.035	1017	547	7	China	Outlier - Inconsistent emissions	OUT
52.4375	75.9375	0.035	406	410	6	Kazakhstan	Impossible to characterize	OTH
29.5000	-95.6250	0.035	234	299	4	United States	NRG Texas Power LLC	TPP
59.8021	30.9896	0.034	184	121	3	Russia	Outlier - Inconsistent emissions	OUT
31.7396	119.6771	0.033	695	237	3	China	Industrial zone (unknown name)	IND
41.4297	122.4141	0.031	339	510	8	China	Anshan Shunda Compound Fertilizer Chang	OTH
29.8594	52.7656	0.030	395	347	4	Iran	Ammonia plant & Shiraz Methanol Plant	OTH
54.3359	86.7891	0.028	207	396	8	Russia	Karakan mining site	MIN
52.0521	7.0521	0.025	122	153	3	Germany	Outlier - Inconsistent emissions	OUT
35.1979	114.6424	0.024	137	608	9	China	Chengguan	URB
29.9563	120.0813	0.020	695	347	5	China	Outlier - Inconsistent emissions	OUT
27.1563	49.1438	0.020	381	401	5	Saudi Arabia	Eastern Province Cement Company	CEM
23.2188	90.6563	0.020	339	589	7	Bangladesh	Desh Energy Chandpur	TPP
26.8813	55.9563	0.020	299	450	5	Iran	Qeshm Cement Factory	CEM
35.8750	116.3984	0.020	138	551	8	China	Rising Chemical Group	OTH
54.1920	87.1384	0.019	158	359	7	Russia	Taldinskiy mining site	MIN
32.3021	118.3854	0.018	197	249	3	China	Chuzhou	URB
56.0469	36.7344	0.018	127	222	4	Russia	Outlier - Inconsistent emissions	OUT
30.2917	121.9688	0.016	219	587	6	China	Dayushan island	OTH
35.3021	115.1354	0.012	114	195	3	China	Dongzhuang industrial zone	IND
36.9479	127.4271	0.010	210	272	3	South Korea	Urban area (unknown name)	URB
35.3125	117.9063	0.010	119	269	4	China	Power station (unknown name)	TPP
30.2188	30.7188	0.008	1811	210	3	Egypt	Outlier - Inconsistent emissions	OUT
30.1875	121.1250	0.007	150	302	4	China	Outlier - Inconsistent emissions	OUT
40.9792	110.1146	0.006	301	433	6	China	Baotou	TPP
30.2813	121.2813	0.006	137	214	3	China	Cixi Ningbo industrial zone	IND
55.3229	37.1771	0.005	1167	166	3	Russia	Outlier - Inconsistent emissions	OUT
30.1771	121.4271	0.003	117	227	3	China	Guanhaiweizhen	URB
41.4938	122.7688	0.002	117	332	5	China	Industrial zone (unknown name)	IND
52.2188	4.4375	0.002	82	227	4	Netherlands	Noordwijk	URB
33.7500	44.6250	0.000	116	288	4	Iraq	Bakouba	URB
37.8047	116.5781	-0.001	137	509	8	China	Outlier - Inconsistent emissions	OUT
36.0781	115.0156	-0.012	184	252	4	China	Outlier - Inconsistent emissions	OUT
30.5688	31.4563	-0.082	975	369	5	Egypt	Zagazig	URB

Table S2: List of point sources with number of pixels within the corresponding cluster, mean latitude and longitude, total daily NO_x emissions using the flux-divergence method, correponding emissions using a Gaussian fit and value of the correlation coefficient for the fit. The corresponding emitter is identified, as well the sector probably accounting for the majority of the emissions within the emitter (seven categories are considered: urban (URB), mining (MIN), iron and steel (STI), cement (CEM), power generation (TPP), other (OTH) and differen types of outliers (OUT)). The list is ordered by decreasing values of R^2.