Electronic Supplementary Material (ESI) for Environmental Science: Atmospheres.

SUPPLEMENTARY DATA

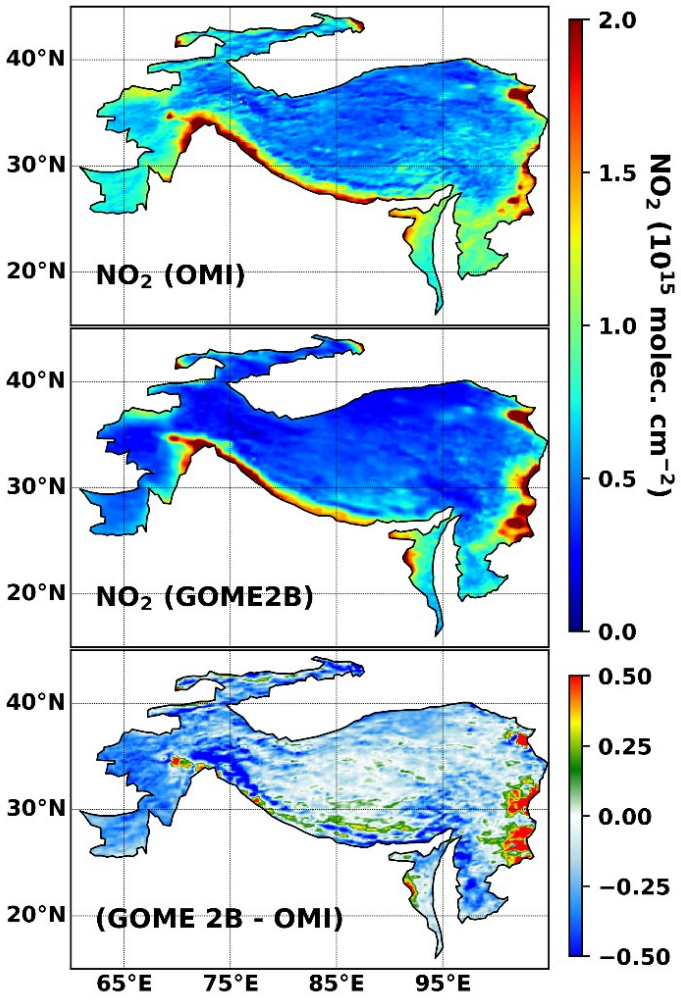

Figure S1. Top. Mean tropospheric NO_2 column for the satellite overlapping period (from May 2013 to December 2014) of OMI and GOME-2B. **Middle.** Mean tropospheric NO_2 column for the same period derived from GOME-2B. **Bottom.** The difference between these satellite measurements. All entities are shown in 10^{15} molecule cm^{-2}.

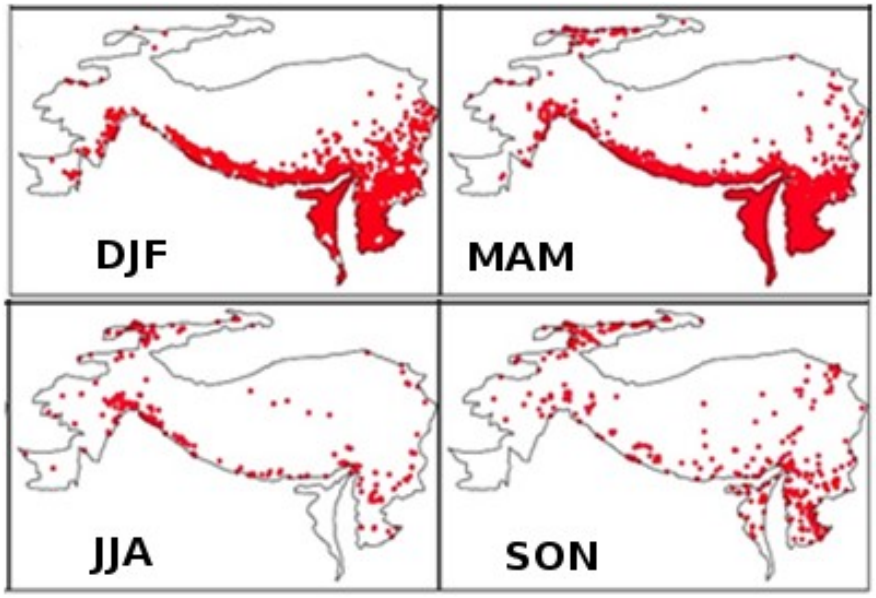

Figure S2. Seasonal changes in Fire Count derived from MODIS Terra in TP. The seasons are defined as winter (December–January–February, DJF), spring (March–April–May, MAM), summer (June–July–August, JJA) and autumn (September–October–November, SON).

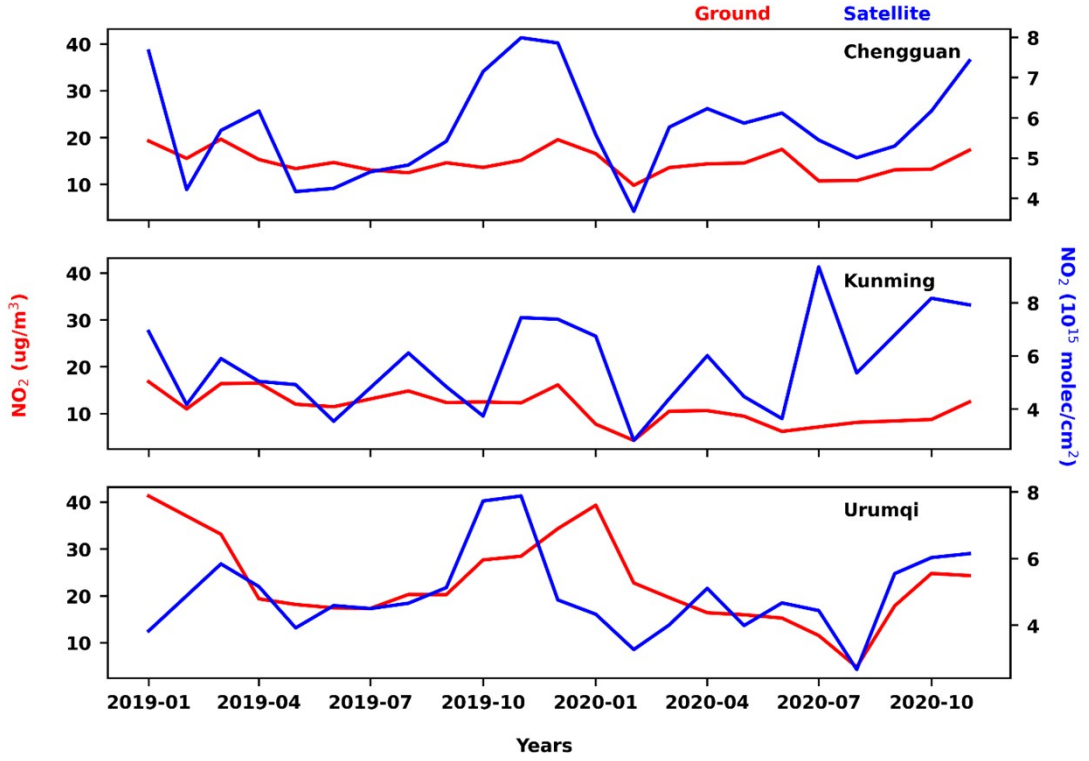

Figure S3. Time evolution of monthly averaged tropospheric NO_2 from space (GOME-2B) and ground-based data in Chengguan, Kunming and Urumqi for the period from January 2019 to October 2020. These data are available on https://aqicn.org/data-platform/register/.

Table S1: Tropospheric NO_2 trends (10^{15} molec cm^{-2} $year^{-1}$) estimated from the merged OMI and GOME-2 data over three distinct NO_2 concentration regions R_1, R_2 and R_3 and two sub-regions (a and b) for the period from November 2004 to March 2021. Details of the regions are provided in the main text.

Regions	Annual	MAM	JJA	SON	DJF
R_1	0.05 ± 0.01	0.04 ± 0.02	0.04 ± 0.02	0.06 ± 0.01	0.07 ± 0.01
R_2	0.02 ± 0.01	0.02 ± 0.01	0.03 ± 0.01	0.03 ± 0.01	0.02 ± 0.01
R_3	0.01 ± 0.01	0.01 ± 0.01	0.03 ± 0.01	0.01 ± 0.01	0.003 ± 0.003
a	0.14 ± 0.02	0.13 ± 0.03	0.23 ± 0.02	0.17 ± 0.03	0.05 ± 0.05
b	0.06 ± 0.01	0.05 ± 0.01	0.02 ± 0.02	0.08 ± 0.01	0.10 ± 0.01

Table S2: Tropospheric NO_2 trends (10^{15} molec cm^{-2} $year^{-1}$) estimated from the merged OMI and GOME-2B data for 20 major cities in and around TP. The trend analysis is performed for the period from November 2004 to March 2021.

CITY	ANNUAL	MAM	JJA	SON	DJF
Kabul	0.09 ± 0.01	0.10 ± 0.02	0.08 ± 0.01	0.06 ± 0.02	0.11 ± 0.03
Peshawar	0.12 ± 0.01	0.10 ± 0.01	0.05 ± 0.03	0.13 ± 0.02	0.19 ± 0.02
Srinagar	0.11 ± 0.02	0.13 ± 0.03	0.05 ± 0.03	0.12 ± 0.02	0.13 ± 0.02
Deharadun	0.04 ± 0.01	-0.01 ± 0.02	0.01 ± 0.03	0.10 ± 0.02	0.06 ± 0.02
Kathmandu	0.06 ± 0.02	0.06 ± 0.03	0.07 ± 0.03	0.04 ± 0.02	0.07 ± 0.02
Xining	0.03 ± 0.04	0.03 ± 0.05	0.10 ± 0.03	-0.01 ± 0.04	0.02 ± 0.06
Lhasa	0.04 ± 0.01	0.05 ± 0.02	0.05 ± 0.01	0.06 ± 0.01	0.02 ± 0.01
Kunming	0.32 ± 0.07	0.29 ± 0.11	0.57 ± 0.10	0.17 ± 0.13	0.25 ± 0.07
Shilong	0.04 ± 0.01	0.01 ± 0.02	0.04 ± 0.02	0.09 ± 0.02	0.02 ± 0.02
Silchar	0.04 ± 0.02	0.05 ± 0.02	0.06 ± 0.03	0.03 ± 0.02	0.02 ± 0.01
Agartala	0.23 ± 0.02	0.26 ± 0.02	0.21 ± 0.04	0.35 ± 0.04	0.08 ± 0.02
Chittagong	0.16 ± 0.02	0.19 ± 0.04	0.13 ± 0.02	0.24 ± 0.03	0.08 ± 0.03
Urumqi	-0.42 ± 0.08	-0.51 ± 0.09	-0.42 ± 0.09	-0.23 ± 0.10	-0.87 ± 0.84
Almaty	-0.01 ± 0.03	0.04 ± 0.05	0.10 ± 0.02	-0.04 ± 0.03	-0.23 ± 0.11
Bishkek	0.04 ± 0.02	0.08 ± 0.02	0.04 ± 0.01	0.05 ± 0.02	-0.06 ± 0.07
Tashkent	0.20 ± 0.08	0.29 ± 0.04	0.37 ± 0.04	0.28 ± 0.06	-0.13 ± 0.32
Dushanbe	0.02 ± 0.02	0.01 ± 0.02	0.01 ± 0.02	0.06 ± 0.01	-0.01 ± 0.03
Khuzdar	0.02 ± 0.01	0.02 ± 0.02	0.04 ± 0.02	0.02 ± 0.01	0.01 ± 0.01
Thimphu	0.04 ± 0.02	0.03 ± 0.02	0.02 ± 0.02	0.05 ± 0.01	0.08 ± 0.02
Naypyidaw	0.03 ± 0.01	0.06 ± 0.03	0.01 ± 0.02	0.01 ± 0.01	0.04 ± 0.01

Table S3: Details about the selected stations in and around TP. The population data are taken from the last census of each country (e.g. 2011 for India, 2017 for Pakistan and projected data for the year 2011 in the case of Afghanistan).

City	Latitude (degree)	Longitude (degree)	Elevation (m)	Area (Km^2)	Population (Million)
Kabul	34.5553	69.2075	1798	1028.24	4.6
Peshawar	34.0151	71.5749	340	1257	1.97
Srinagar	34.0837	74.7973	1589	766	1.27
Deharadun	30.3165	78.0322	652	196.48	0.71
Kathmandu	27.7172	85.324	1296	933.73	2.52
Xining	36.6171	101.7782	2244	2892.7	1.17
Lhasa	29.6548	91.1406	3650	525	0.46
Kunming	24.8801	102.8329	1895	2622	3.56
Shilong	25.5788	91.8933	1507	10.36	0.14
Silchar	24.8333	92.9989	24	26.88	0.17
Agartala	23.8315	91.2868	16	58.84	0.4
Chittagong	22.3419	91.8155	29	2054	2.79
Uramqi	43.8255	87.61	862	583	2.85
Almaty	43.222	76.8512	787	324.4	1.42
Bishkek	42.882	74.5827	767	169.6	0.86
Tashkent	41.2995	69.2401	424	334.8	2.3
Dushanbe	38.5598	68.787	767	126.6	0.73
Khuzdar	27.8165	66.657	1220	360	0.8
Thimphu	27.4712	89.6339	2307	26.1	0.11
Naypyidaw	19.7633	96.0785	122	1036	1.16