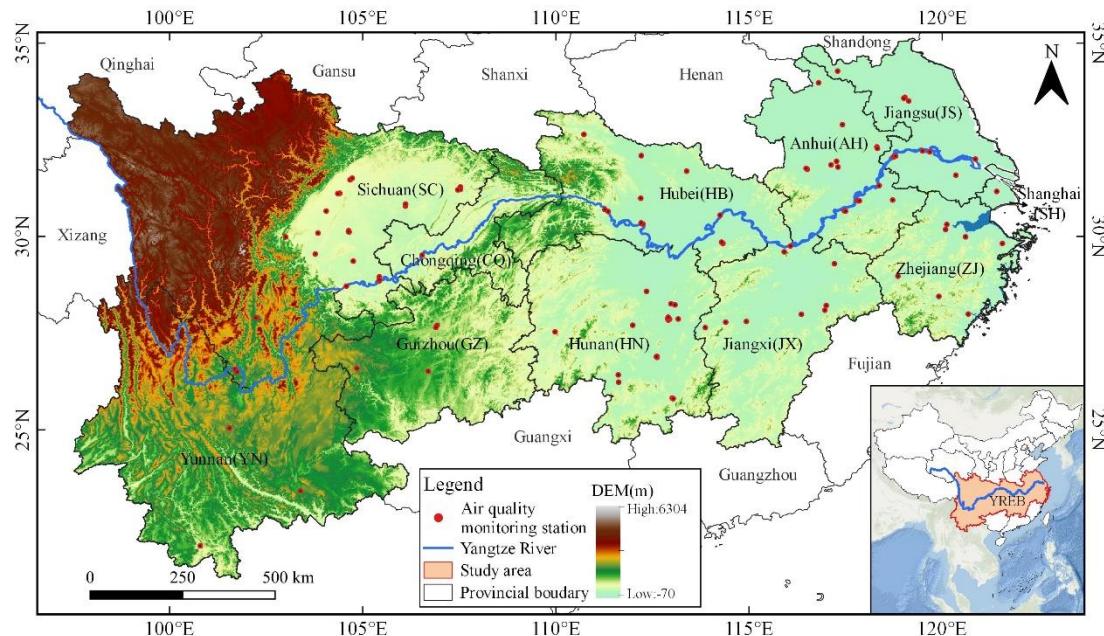
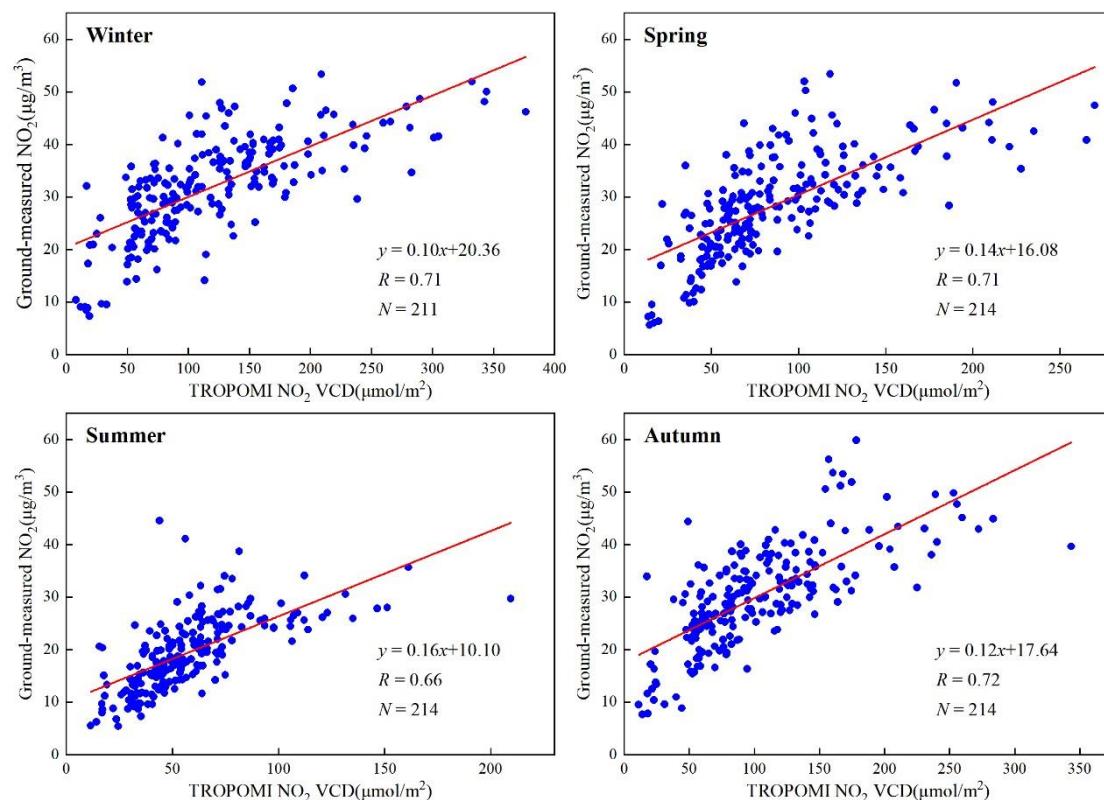




## Supplementary Material



**Figure S1.** Spatial distribution of surface air quality monitoring stations in YREB.



**Figure S2.** Scatter plots of the TROPOMI NO<sub>2</sub> VCD and NO<sub>2</sub> concentrations measured in situ for all seasons.

**Table S1.** Descriptions of 17 potential influencing factors on NO<sub>2</sub> VCD.

Variable Name	Abbreviation	Data Sources	Resolution
NPP/VIIRS Nighttime Light	NTL	National Oceanic and Atmospheric Administration [48]	500 m
Carbon dioxide emissions from fuel combustion, cement production, and gas flaring	CO <sub>2</sub>	the Open-source Data Inventory for Anthropogenic Carbon Dioxide, version 2020 (ODI-AC2020 CO <sub>2</sub> ) [49,50]	1000 m
Normalized Difference Vegetation Index	NDVI	MYD13A2.006 Aqua Vegetation Indices 16-Day Global 1km [51]	1000 m
Digital Elevation Model	DEM	SRTM DEM [52]	90 m
Total Column Ozone	TCO <sub>3</sub>		
Total Cloud Cover	TCC		
2m temperature	T2m		
Total Precipitation	TPrec	The Total Column Ozone data and related meteorological data of ERA5 at 14:00 local time	
10m u-component of wind	U10	(within half an hour of the overpass time of the	
10m v-component of wind	V10	S5P satellite) are obtained from the monthly	
Boundary Layer Height	BLH	average ERA5 reanalysis dataset, which are	0.25
875 hPa Relative Humidity	RH_875	provided by European Centre for Medium-range Weather Forecasts (ECMWF). [53]	
10 m wind speed	WS10		
surface net solar radiation	SNSR		
surface pressure	SP		
surface solar radiation downward	SSRD		
surface thermal radiation downward	STRD		

**Table S2.** The seasonal average of the NO<sub>2</sub> VCD in 11 provinces and cities in the the YREB.

Province	2019WI	2019SP	2019SU	2019AU	2020WI	2020SP	2020SU	2020AU
CJ	53.51	39.17	27.53	40.33	42.10	34.80	25.63	41.53
SH	242.63	200.65	95.20	158.68	197.04	161.48	87.38	124.94
JS	194.96	116.41	62.70	115.91	130.61	95.60	59.24	110.73
ZJ	80.73	59.57	35.13	67.70	76.62	56.62	33.29	65.34
AH	128.42	65.57	42.65	78.18	83.34	56.48	36.83	84.20
JX	42.83	36.79	26.13	41.74	45.43	35.18	24.62	42.27
HB	75.27	43.30	32.17	47.50	45.87	33.10	28.17	49.99
HN	42.38	35.49	26.78	38.41	38.53	31.80	24.06	41.13
CQ	46.85	38.15	30.22	39.91	39.42	35.27	27.97	46.24
SC	27.53	24.53	19.75	23.82	22.17	22.46	19.73	23.42
GZ	32.64	32.61	24.14	27.36	32.50	30.18	22.69	31.89
YN	17.17	21.07	17.83	18.28	17.52	20.64	16.73	19.44

**Table S3.** The 10 cities with the highest NO<sub>2</sub> VCD in the YREB in each season from 2019 to 2020 ( $\mu\text{mol}/\text{m}^2$ ).

	2019WI	2019SP	2019SU	2019AU	2020WI	2020SP	2020SU	2020AU
1	Suzhou (273.97)	Suzhou (201.35)	Suzhou (99.7)	Wuxi (183.15)	Shanghai (196.67)	Suzhou (165.72)	Suzhou (91.69)	Wuxi (170.99)
2	Wuxi (258.95)	Shanghai (200.30)	Shanghai (95.00)	Suzhou (181.44)	Suzhou (186.38)	Shanghai (161.24)	Shanghai (87.23)	Suzhou (164.85)
3	Shanghai (242.27)	Wuxi (188.10)	Wuxi (87.76)	Shanghai (158.32)	Jiaxing (179.61)	Wuxi (156.41)	Wuxi (82.61)	Changzhou (153.23)
4	Xuzhou (238.01)	Changzhou (154.45)	Taizhou (76.19)	Jiaxing (156.47)	Wuxi (174.09)	Changzhou (126.58)	Taizhou (76.63)	Zhenjiang (144.27)
5	Zhenjiang (222.10)	Zhenjiang (144.32)	Zhenjiang (74.64)	Changzhou (150.60)	Zhenjiang (155.70)	Zhenjiang (124.81)	Nantong (70.54)	Nanjing (139.41)
6	Huaibei (220.03)	Jiaxing (137.68)	Changzhou (73.64)	Nanjing (138.97)	Nanjing (150.03)	Jiaxing (123.00)	Changzhou (69.88)	Maanshan (137.66)
7	Changzhou (214.62)	Taizhou (135.59)	Nanjing (69.44)	Zhenjiang (137.20)	Changzhou (145.62)	Nanjing (114.08)	Zhenjiang (64.65)	Jiaxing (136.34)
8	Jiaxing (212.62)	Nanjing (130.89)	Nantong (67.02)	Maanshan (131.41)	Maanshan (139.75)	Taizhou (103.47)	Nanjing (64.02)	Xuzhou (131.45)
9	Nanjing (208.43)	Nantong (123.83)	Maanshan (64.93)	Xuzhou (119.74)	Taizhou (138.45)	Nantong (103.17)	Jiaxing (63.25)	Huaibei (128.17)
10	Lianyungang (206.44)	Huzhou (115.82)	Wuhan (61.86)	Huzhou (118.77)	Yangzhou (134.12)	Huzhou (96.75)	Maanshan (62.50)	Huzhou (128.04)

**Table S4.** The optimal classification method of NO<sub>2</sub> VCD potential impact factors and the highest value range of NO<sub>2</sub> VCD for each impact factor in 2019.

Factors	Optimal Classification Method and Category		TNO <sub>2</sub> VCD of the Entire Yangtze River Economic Belt		
	Method	Category	Variation Pattern	The Highest Value Range	Average Value ( $\mu\text{mol}/\text{m}^2$ )
NTL	quantile	8	↗	(0.83, 96]	92.23
CO <sub>2</sub>	quantile	8	↗	(68.4, 2.56 × 10 <sup>5</sup> ]	115.33
NDVI	natural	8	↗↘	(0.28, 0.48]	89.01
DEM	quantile	7	↘	[0, 45]	99.44
TCO <sub>3</sub>	sd	8	↘↗	(6.18 × 10 <sup>-3</sup> , 6.55 × 10 <sup>-3</sup> ]	102.81
TCC	quantile	8	↗↘↗	(0.59, 0.60]	72.34
T2m	quantile	8	↗↘	(11.7, 12.4]	61.31
TPrec	sd	8	↘↗↘	[5.47 × 10 <sup>-4</sup> , 8.09 × 10 <sup>-4</sup> ]	109.40
U10	sd	6	↘	[-1.69, -1.43]	202.82
V10	natural	8	↘↗↘↗	(-0.65, -0.29]	58.32
BLH	natural	6	↗↘	(256, 340]	54.74
RH_875	equal	8	↗↘	(49.6, 56.3]	78.51
WS10	sd	8	↘↗	(2.78, 6.9]	92.14
SNSR	quantile	8	↗↘	(1.01 × 10 <sup>7</sup> , 1.11 × 10 <sup>7</sup> ]	69.59
SP	quantile	8	↗	(1.01 × 10 <sup>5</sup> , 1.02 × 10 <sup>5</sup> ]	103.14
SSRD	sd	8	↘↗↘	[3.17 × 10 <sup>6</sup> , 7.51 × 10 <sup>6</sup> ]	72.13
STRD	quantile	5	↗↘	(1.54 × 10 <sup>7</sup> , 1.61 × 10 <sup>7</sup> ]	55.34