



*Supplement of*

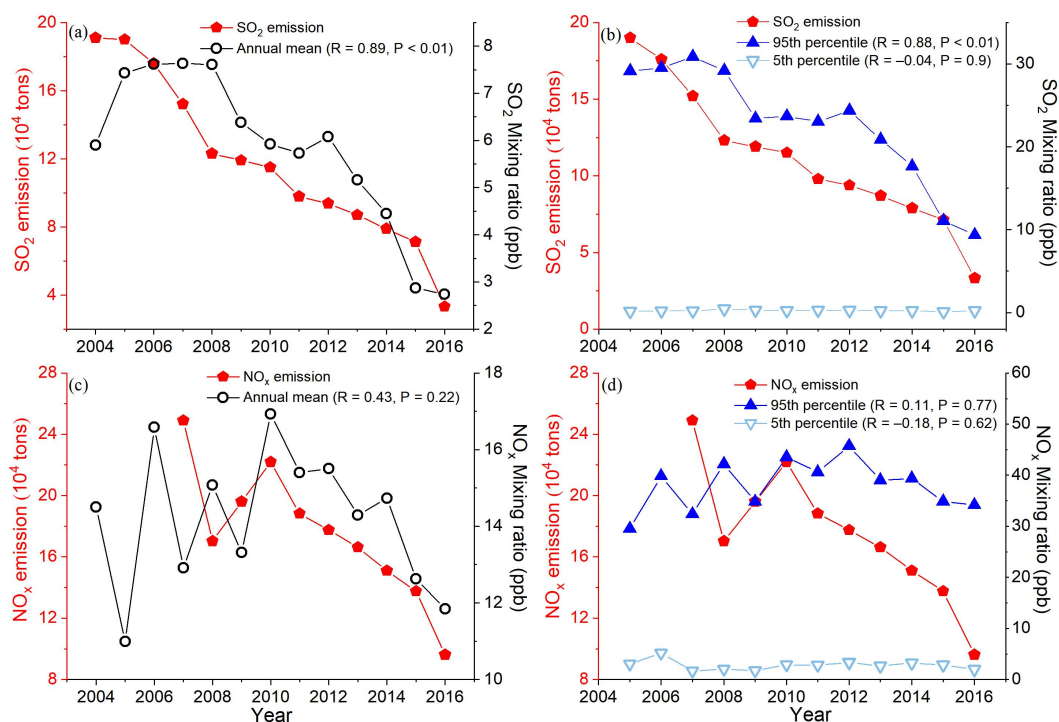
**Measurement report: Variations in surface SO<sub>2</sub> and NO<sub>x</sub> mixing ratios from 2004 to 2016 at a background site in the North China Plain**

**Xueli Liu et al.**

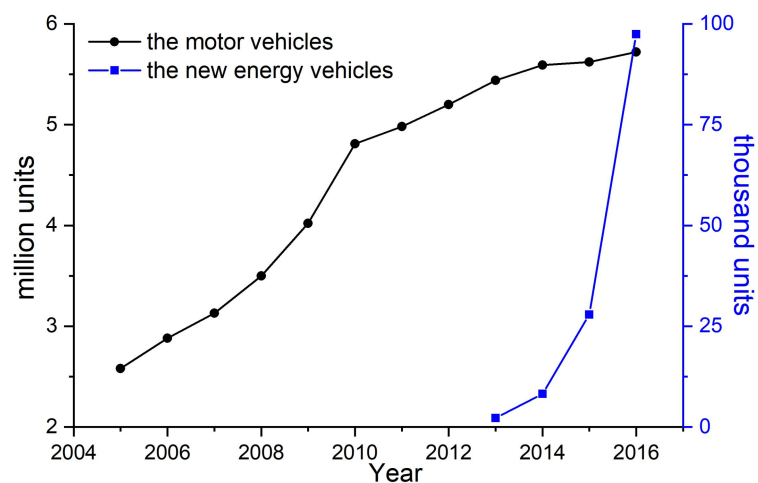
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## Supplementary Materials

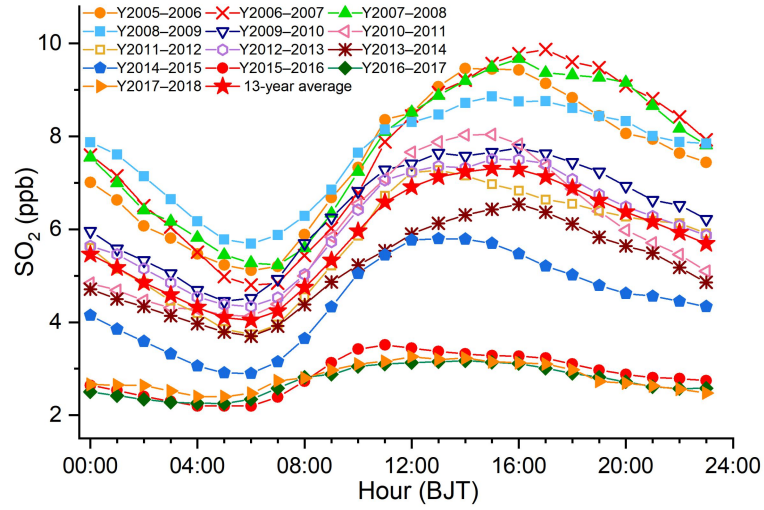


**Figure S1.** Annually variations in (a) SO<sub>2</sub> mixing ratios at SDZ and total SO<sub>2</sub> emissions in Beijing; (b) the 5th and 95th percentile of the hourly mean of SO<sub>2</sub> and SO<sub>2</sub> emissions in Beijing; (c) NO<sub>x</sub> mixing ratios at SDZ and total NO<sub>x</sub> emissions in Beijing; (d) the 5th and 95th percentile of the hourly mean of NO<sub>x</sub> and NO<sub>x</sub> emissions in Beijing.

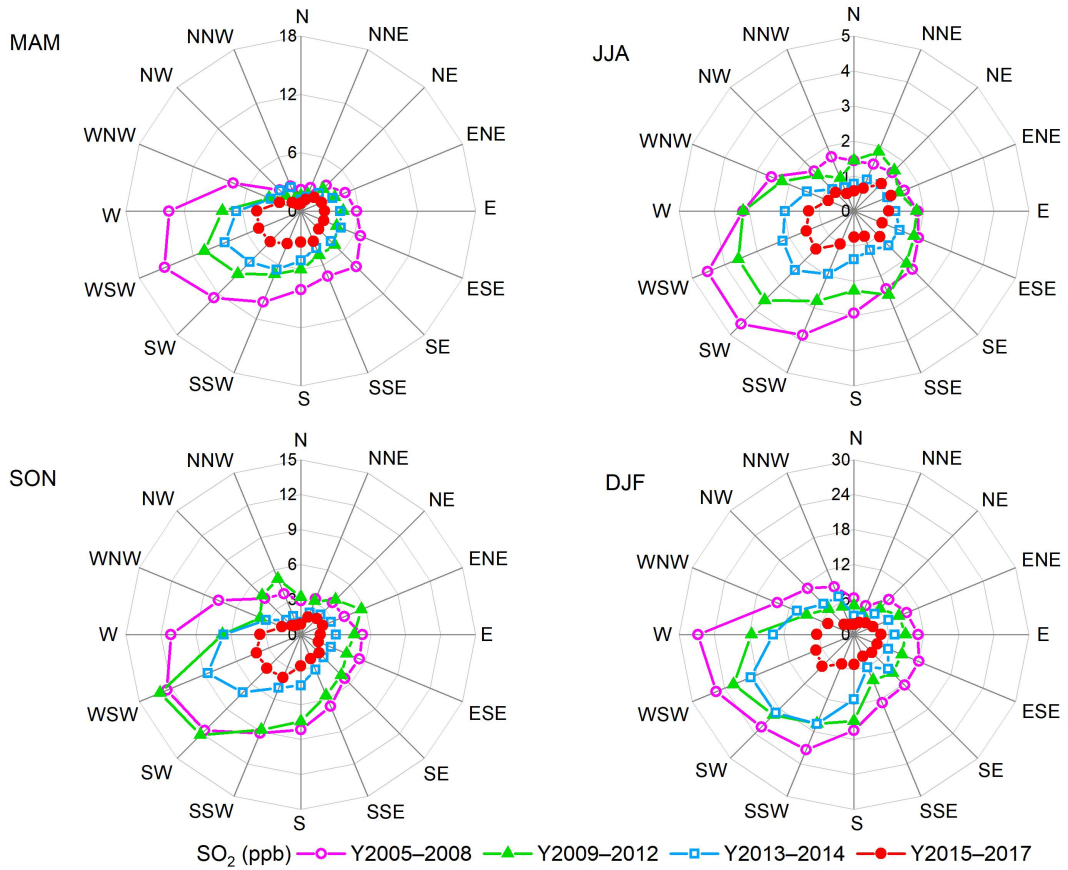


**Figure S2.** The motor vehicle and new energy vehicle population in Beijing in recent years.

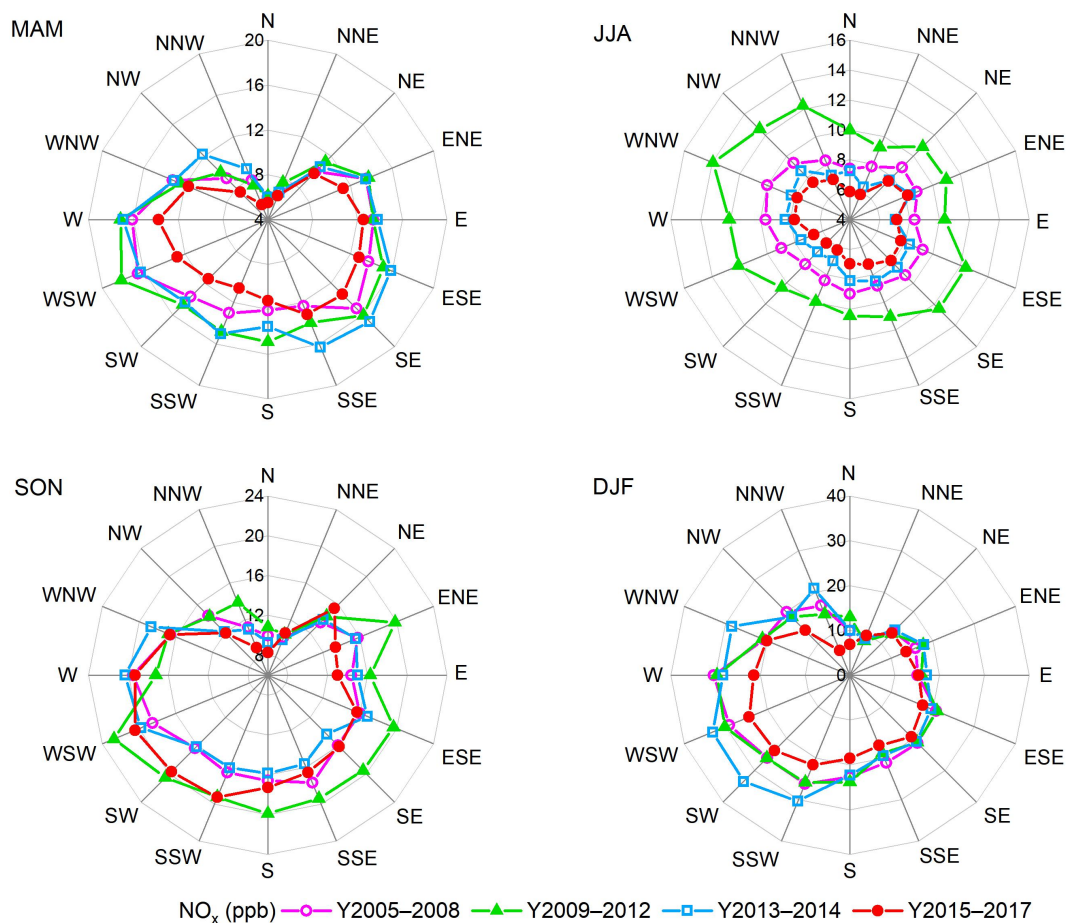
(The data are provided by Beijing Traffic Management Bureau and Beijing Transportation Development Research Institute.)



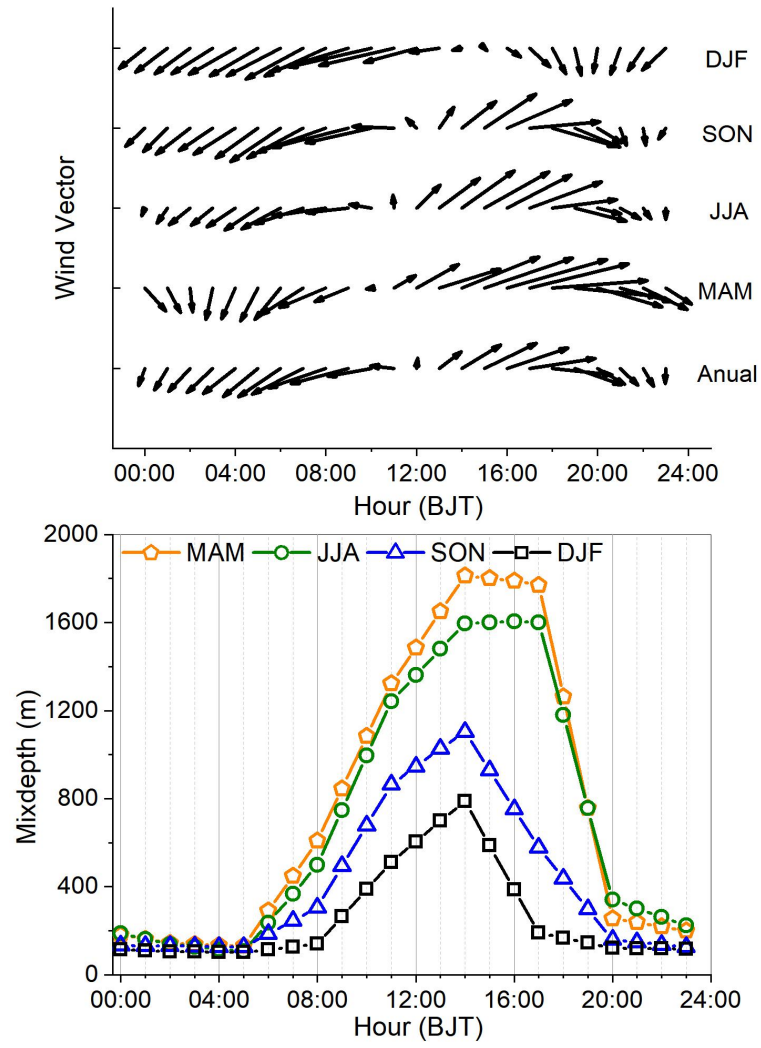
**Figure S3.** The average diurnal variations in  $\text{SO}_2$  mixing ratios in different years at SDZ.



**Figure S4.** Mixing ratios of  $\text{SO}_2$  in four seasons during different stages as a function of wind direction at SDZ.



**Figure S5.** Mixing ratios of NO<sub>x</sub> in four seasons during different stages as a function of wind direction at SDZ.



**Figure S6.** The average diurnal variations in wind vectors and mixing depth in different seasons at SDZ.

**Table S1.** The frequency distributions (%) of wind directions in different stages.

WD	Y2005–2008	Y2009–2012	Y2013–2014	Y2015–2017
N	3.4	3.4	2.9	3.8
NNE	5.4	6.1	5.4	8.0
NE	12.6	13.9	12.1	15.3
ENE	18.1	16.9	16.8	16.2
E	11.3	9.5	10.8	8.6
ESE	3.1	3.0	3.9	3.4
SE	2.2	2.2	2.6	2.4
SSE	1.6	1.9	2.2	2.0
S	1.8	2.1	2.3	2.1
SSW	3.4	4.0	3.5	4.5
SW	9.8	11.1	10.5	10.0
WSW	13.8	14.7	14.6	11.8
W	8.1	6.2	7.4	6.4
WNW	2.1	1.8	2.1	2.1
NW	1.4	1.4	1.3	1.5
NNW	1.8	1.9	1.6	1.9