

Supplement of

**OMI measured increasing SO₂ emissions due to energy industry
expansion and relocation in Northwestern China**

Authors:

Zaili Ling¹, Tao Huang^{1,*}, Yuan Zhao¹, Jixiang Li¹, Xiaodong Zhang¹, Jinxiang Wang¹,
Lulu Lian¹, Xiaoxuan Mao¹, Hong Gao¹, Jianmin Ma^{2,1,3,*}

Affiliation:

¹Key Laboratory for Environmental Pollution Prediction and Control, Gansu Province
College of Earth and Environmental Sciences, Lanzhou University, Lanzhou 730000,
P. R. China

² Laboratory for Earth Surface Processes, College of Urban and Environmental
Sciences, Peking University, Beijing, 100871, China

³CAS Center for Excellence in Tibetan Plateau Earth Sciences, Chinese Academy of
Sciences, Beijing, 100101, China

Corresponding authors: Jianmin Ma, Tao Huang

College of Earth and Environmental Sciences, Lanzhou University, 222, Tianshui
South Road, Lanzhou 730000, China

Email: jianminma@lzu.edu.cn; huangt@lzu.edu.cn

Uncertainty analysis for SO₂ emission derived by OMI measurements

Table S1. Coefficients of variation (*CV*, %) of input parameters for the uncertainty analysis (McLinden et al., 2014, 2016; Fioletto et al; 2016) in estimations of SO₂ emission derived from OMI measurements.

Parameter	Air mass factor (AMF)	Mass	Σ	τ
<i>CV</i> (%)	18	5	35	35

Mass: total SO₂ mass as determined from a linear regression.

σ : standard deviation of the width or spread of SO₂.

τ : decay time of SO₂.

Comparisons between measured ambient concentration data and SO₂ VCD

The OMI retrieved SO₂ PBL VCD were further evaluated by comparing with ambient air concentration data of SO₂ from routine measurements by local official air quality monitoring stations (<http://www.aqistudy.cn/historydata/>). These measured data include daily averaged air concentrations of SO₂ from 2014 to 2015, covering 188 major cities in China. We compared monthly averaged SO₂ VCD over all grid points (0.25×0.25 latitude/longitude resolution) with the monthly averaged monitored concentrations of SO₂ in 188 cities. Result is shown in **Figure S1**. The OMI retrieved SO₂ VCD match well with the measured SO₂ concentrations at a correlation coefficient of $r=0.85$ ($p<0.001$).

Table S2 Statistics between satellite derived SO₂ VCD and monitored SO₂ annually averaged air concentrations during 2014-2015 at 188 operational air quality monitoring stations across China. In the table, r is the correlation coefficient, RE is the relative error, FB is the fractional bias, NMB is the normalized mean bias, and RMSE is the root mean square error, respectively.

r	RE	FB	NMB	RMSE
0.85 ($p<0.05$)	0.25	0.0003	0.119	9.65

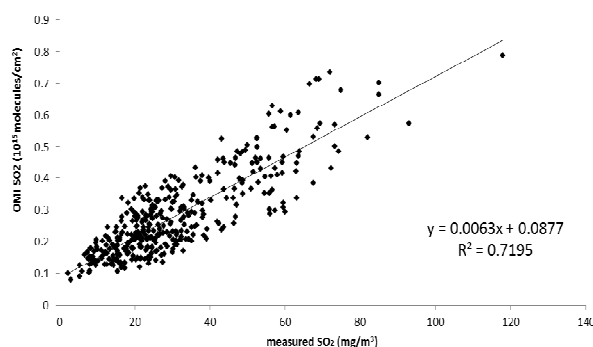


Figure S1 Comparisons between monthly averaged concentration of SO₂ and OMI retrieved SO₂ VCD from 2014 to 2015. n is the number of data points used in correlation analysis, r is the correlation coefficient, and p is the significance level.

Reference

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