Supplemental Information

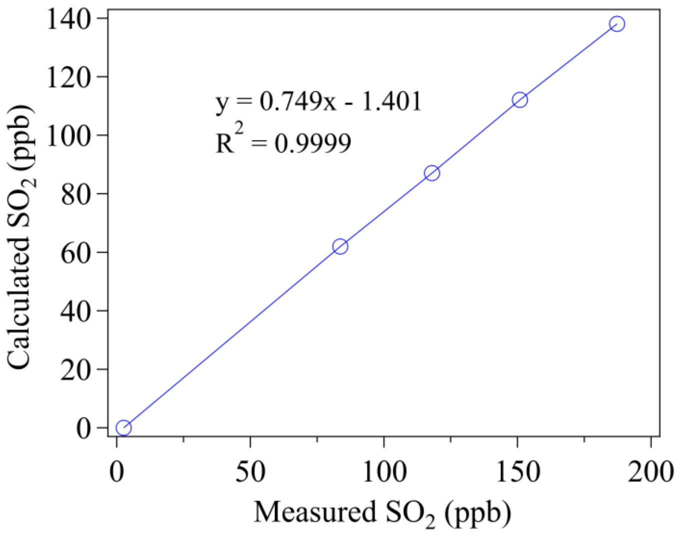

Figure S.1. Calibration curve of the SO_2 analyzer. Measured SO_2 means the measured mixing ratios of SO_2 by the instrument and the calculated SO_2 shows the calculated mixing ratios based on the gas standard and the flow rate. The symbols represent measured data and the solid line shows the linear least square fit.

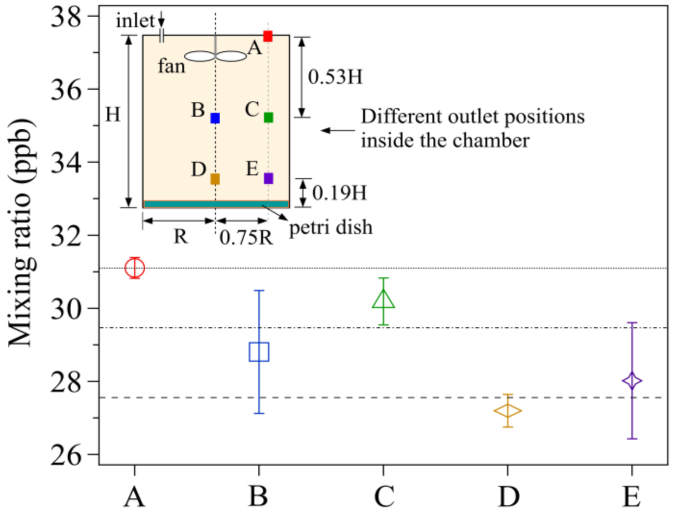

Figure S.2. The effects of different chamber outlet positons on detected C_{sam}. The sample petri dish I.D. is 116 mm and the background O_3 mixing ratio is ~ 105 ppb. The labels (A - E) of the X axis represent the different outlet positions shown in the chamber sketch, and the lines mean the averaged mixing ratios at the three different vertical outlet heights. The error bars represent the standard deviation of three replicate experiments.

Table S.1. Results of *t*-test on the detected mixing ratios at different chamber outlet positions

Samples		*t*-test results					
		t	*sd*	*df*	*ci*	*h*	*p*
Fig.4	B vs C	0.369	0.675	4	(-1.326, 1.733)	0	0.731
	D vs E	-0.920	0.435	4	(-1.312, 0.659)	0	0.410
	A vs B+C	1.118	NA	6	(-0.353, 0.936)	0	0.308
	B+C vs D+E	3.072	0.529	10	(0.258, 1.619)	1	0.012
Fig.S.2	B vs C	-1.328	1.272	4	(-4.264, 1.504)	0	0.255
	D vs E	-0.856	1.168	4	(-3.465, 1.832)	0	0.440
	A vs B+C	2.764	NA	6	(0.172, 3.042)	1	0.034
	B+C vs D+E	2.603	1.257	10	(0.272, 3.505)	1	0.026

t: value of the test statistic; *sd*: pooled estimate of the population standard deviation; *df*: degree of freedom; *ci*: confidence interval (95%); *h*: hypothesis test result; *p*: probability (p-) value; NA: no available data. The listed results are from two-sample *t*-test using a Matlab software. For the *t*-test, the null hypothesis is set as the tested two samples have equal means. The hypothesis test result *h* returns as 0 or 1: $h = 0$ indicates the *t*-test doesn't reject the null hypothesis and $h = 1$ otherwise. The p-values of over 0.1 suggest there is no evidence that the null hypothesis doesn't hold, and the p-values between 0.01 and 0.05 indicate there is moderately strong evidence that the null hypothesis doesn't hold (see http://www-ist.massey.ac.nz/dstirlin/cast/cast/htestpvalue/testpvalue4.html).

Comparison between R_a and R_b

Approximations of R_a and R_b can be achieved using the methodology developed by Seinfeld and Pandis (2016), i.e., R_a and R_b can be derived based on Eqs. (1) and (2), respectively.

$$R_a = \frac{1}{\kappa u_*} ln(\frac{z}{z_0}) \quad \text{(S1)}$$

$$R_b = \frac{5\ \mathrm{Sc}^{2/3}}{u_*} \quad \text{(S2)}$$

where κ is the von Karman constant (κ = 0.41), u_* is the friction velocity, z is the outlet height above the chamber bottom (for our chamber configuration, z = 62 mm), z_0 is the roughness length and *Sc* is the dimensionless Schmidt number. z_0 can be viewed as a length-scale representation of the roughness of the sample surface. For the prepared oxide coatings, their corresponded z_0 are assumed as ~ 100 µm based on our previously reported coating surface roughness range (Li et al., 2018). *Sc* can be calculated according to the equation $Sc = \nu/D$, where ν is the kinematic viscosity of air and D is the diffusion coefficient of SO_2 (at 296K, $\nu = 1.53\times10^{-5}\ m^2\ s^{-1}$ and $D = 1.26\times10^{-5}\ m^2\ s^{-1}$).

References:

Li, G., Su, H., Kuhn, U., Meusel, H., Ammann, M., Shao, M., Pöschl, U., and Cheng, Y.: Technical note: Influence of surface roughness and local turbulence on coated-wall flow tube experiments for gas uptake and kinetic studies, Atmos. Chem. Phys., 18, 2669-2686, 10.5194/acp-18-2669-2018, 2018.

Seinfeld, J. H., and Pandis, S. N.: Dry Deposition, in: Atmospheric Chemistry and Physics: from Air Pollution to Climate Change, 3rd ed., John Wiley & Sons, Inc., Hoboken, New Jersey, 2016.