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Supplement of

Fast particulate nitrate formation via N_2O_5 uptake aloft in winter in Beijing

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1 **Lists of support information:**

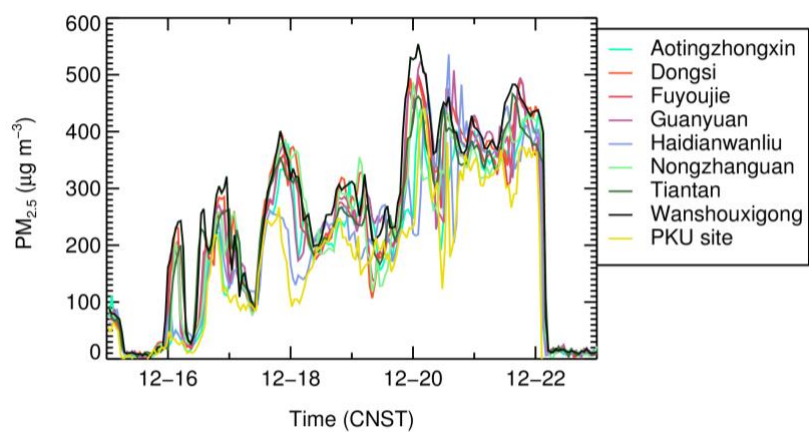
2 **Figure S1.** The time series of PM_{2.5} from December 16 to 22, 2016 observed by PKU
3 and a number of national monitoring sites in Beijing.

4 **Figure S2.** Intercomparison of NO_x and O₃ at PKU and IAP site.

5 **Figure S3.** The vertical profiles of NO_x and O₃ in the noon on December 18, 2016 at
6 IAP site.

7 **Table S1.** The instrumentation and parameter details at PKU site.

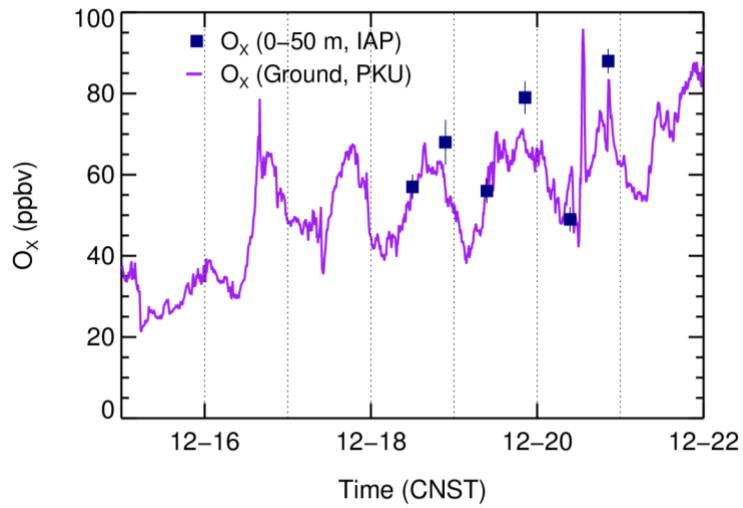
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10 **Figure S1.** The similarity of the PM_{2.5} concentrations at different sites throughout
11 urban Beijing demonstrated that the observed PM pollution was a regional event.

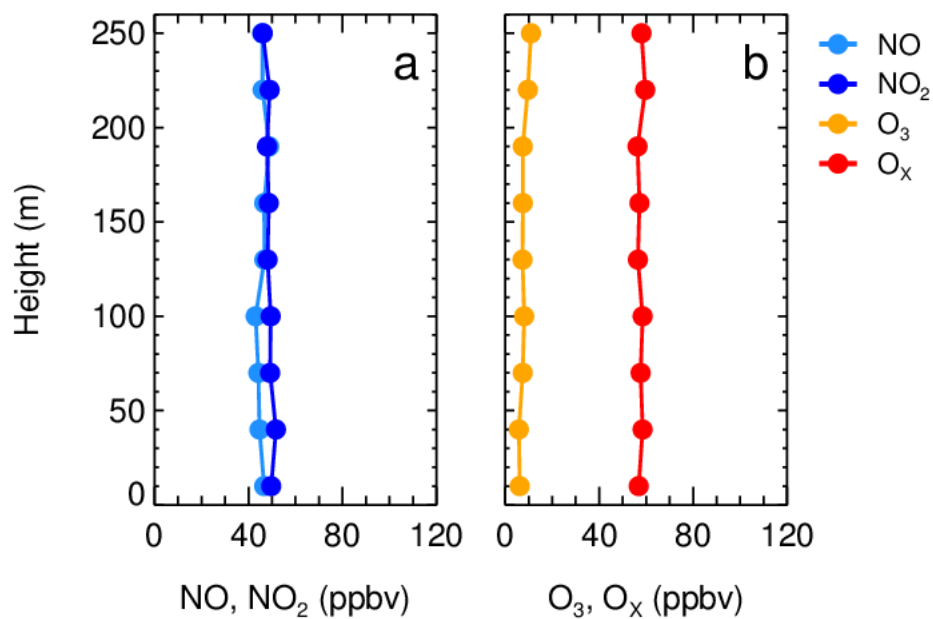
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14 **Figure S2.** The intercomparison of the O_x concentrations at PKU (purple line) and IAP
 15 site (navy square), the navy line shows the standard deviation at IAP site, the
 16 consistency in the two sites demonstrated that the observed O_x pollution was also a
 17 regional event.

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21 **Figure S3.** Vertical profiles of NO₂, NO, O₃, and O_x at 11:31-12:00 in the morning of
22 December 18, 2016. Suggesting the trace gases was well mixed in the noon.

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24 **Table S1.** Measured parameters and the corresponding measurement instruments from
25 PKU site.

Species	Detection of limit	Method	Accuracy
NO	60 pptv (2σ , 1min)	Chemiluminescence (CL)	$\pm 20\%$
NO ₂	0.3 ppbv (2σ , 1min)	Photolytic converter + CL	$\pm 20\%$
O ₃	0.5 ppbv (2σ , 1min)	UV photometry	$\pm 5\%$
PM _{2.5}	0.1 $\mu\text{g m}^{-3}$ (1 min)	TEOM 1400A analyzer	$\pm 5\%$
PNSD	14 nm -697 nm (4 min)	SMPS	$\pm 20\%$

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