



## Supplement of

## Atmospheric amines and ammonia measured with a chemical ionization mass spectrometer (CIMS)

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SOAS	1 s	5 s	30 s	60 s
NH <sub>3</sub> (pptv)	53.6	43.3	40.1	35.1
C1-amine (pptv)	1.18	0.37	0.21	0.13
C2-amines (pptv)	4.75	1.51	0.86	0.52
C3-amines (pptv)	5.55	1.89	1.19	0.77
C4-amines (pptv)	23.1	8.09	5.15	3.24
C5-amines (pptv)	17.3	5.44	3.05	1.88
C6-amines (pptv)	13.0	4.05	2.27	1.40

**Table S1.** Detection limits (3 sigma of background signals) for different integration times (1, 5, 10, and 60 s) derived from SOAS.

Kent	1 s	5 s	30 s	60 s
NH <sub>3</sub> (pptv)	54.3	44.0	42.7	42.2
C1-amine (pptv)	1.13	0.50	0.20	0.12
C2-amines (pptv)	4.44	1.98	0.78	0.45
C3-amines (pptv)	4.98	2.21	0.88	0.51
C4-amines (pptv)	19.1	8.49	3.37	2.01
C5-amines (pptv)	14.4	6.40	2.54	1.51
C6-amines (pptv)	13.1	5.85	2.32	1.44

**Table S2.** Detection limits (3 sigma of background signals) for different integration times (1, 5, 10, and 60 s) derived from Kent, Ohio.

**Table S3.** Mean background signals obtained during SOAS and in Kent, Ohio, shown in ion signals per million Hz of reagent ion signals (Hz MHz<sup>-1</sup>) and in mixing ratios (pptv or ppbv).

Mean Background Signal	SOAS	Kent	SOAS	Kent
$(Hz MHz^{-1})$	(Hz MHz <sup>-1</sup> )	(Hz MHz <sup>-1</sup> )	(pptv)	(pptv)
NH <sub>3</sub>	23240	10817	1785.9	831.3
C1-amine	38	11	3.1	0.9
C2-amines	272	161	23.0	13.6
C3-amines	309	38	37.4	4.6
C4-amines	280	348	77.3	96.0
C5-amines	45	25	23.5	13.2
C6-amines	18	17	10.8	10.5



**Figure S1.** Schematic diagram of the sampling inlet for amines and NH<sub>3</sub> (upper) and the calibration gas-line system (lower). CIMS, chemical ionization mass spectrometer; PFA, perfluoroalkoxy Teflon; PTFE, Polytetrafluoroethylene Teflon.



**Figure S2.** The *in-situ* calibration curves of  $NH_3$  and amines obtained during the SOAS campaign. The slopes of the linear fitting (green solid lines) correspond to the normalized sensitivities. Dashed blue lines indicate the 95% confidence level of the linear fitting. C5-amine permeation tubes are not available from Kin-Tech, so no calibrations were made for C5-amines. The sensitivity of C5-amines was instead predicted based on those of other amines (Table 1), as there was a decreasing trend in sensitivities with the increasing number of carbon atoms in the amine molecule.



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Figure S3. Wind rose plots of ammines and  $NH_3$  on June 4, 2013. The trash buring event took place at the east side of the measurement site.



Figure S4. Diurnal variation of C3-amines,  $NH_3$ , temperature,  $SO_2$ , CO, wind speed (WS) and wind direction (WD) for June 17, 2013 in the Alabama forest.



**Figure S5.** Temperature dependences of amines and  $NH_3$  measured in Kent from August 31 to September 2, 2013. Gray dots show the measurement data and blue lines show exponential fitting of the data. Red circles and vertical lines show the mean and one standard deviation of concentrations of these chemical species, with each bin representing 20 percentile of temperature values.



**Figure S6.** EPA-reported annual emission rates of NH<sub>3</sub> from various sectors in Alabama (blue) and Ohio (red) in 2011. Data were adopted from the 2011 National Emissions Inventory website: <u>http://www.epa.gov/ttn/chief/net/2011inventory.html</u>.