Supplement of

Analysis of atmospheric ammonia over South and East Asia based on the MOZART-4 model and its comparison with satellite and surface observations

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Supplementary material

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Table S1. Location of NH$_3$ measurement sites from the air quality monitoring network operated by the Central Pollution Control Board, India (see also Figure 3)

Site No.	Location name	Latitude	Longitude	Elevation (m)	Area
1	Adarsh Nagar	26.8754	75.8167	433	Rural
2	Devas	22.9688	76.0636	563	Rural
3	Ajmer	26.4727	74.6415	494	Urban
4	Nashik	20.0073	73.7762	580	Urban
5	Visakhapatnam	17.72	83.3	26	Urban
6	Ujjain	23.1793	75.7849	497	Urban
7	Patiala	30.3448	76.3708	256	Urban
8	Aurangabad	19.8406	75.2466	521	Urban
9	Alwar	27.5591	76.6021	276	Urban
10	Howrah	22.5707	88.3008	8	Coastal
11	Kerela	8.5141	76.9477	23	Urban
12	Vijaywada	16.5064	80.632	25	Urban
13	Udaipur	24.589	73.7022	575	Urban
14	Ratnapura	31.029	76.5734	274	Rural
15	Bhiwadi	28.207	76.8577	268	Industrial
16	Amravati	16.5151	80.5182	14	Rural
17	Pithampur	22.6248	75.6752	616	Rural
18	Mandideep	23.099	77.505	445	Industrial
19	Kota	25.136	75.8247	297	Urban
20	Lucknow	26.834	80.8917	126	Urban
21	Kolkata	22.5449	88.3425	18	Urban
22	Singrauli	24.0886	82.6478	287	Rural
23	Delhi1	28.8229	77.102	212	Urban
24	Delhi2	28.6508	77.3152	224	Urban

25	Delhi3	28.6687	77.23	218	Urban
26	Delhi4	28.7762	77.0511	218	Industrial
27	Delhi5	28.4997	77.2671	257	Rural
28	Delhi6	28.7501	77.1177	214	Urban
29	Delhi7	28.5713	77.0644	220	Urban
30	Delhi8	28.6803	77.2012	226	Urban
31	Delhi9	28.6317	77.2494	230	Urban
32	Delhi10	28.7255	77.1587	225	Urban
33	Delhi11	28.6687	77.1599	217	Urban
34	Delhi12	28.6124	77.2351	204	Urban
35	Delhi13	28.6338	77.198	219	Urban
36	Delhi14	28.6823	77.0349	217	Urban
37	Delhi15	28.6072	76.9459	218	Urban
38	Delhi16	28.6072	76.8408	212	Urban
39	Delhi17	28.6644	77.1704	238	Urban
40	Delhi18	28.5393	77.2687	233	Urban
41	Delhi19	28.6287	77.2946	220	Urban
42	Delhi20	28.6637	77.1196	22	Urban
43	Delhi21	28.632	77.1555	219	Urban
44	Delhi22	28.5646	77.167	225	Urban
45	Delhi23	28.7406	77.0577	212	Urban
46	Delhi24	28.5438	77.331	201	Urban
47	Delhi25	28.5504	77.2116	222	Urban
48	Delhi26	28.7373	77.2274	203	Urban
49	Delhi27	28.5062	77.2492	243	Urban
50	Delhi28	28.6688	77.3131	207	Urban
51	Delhi29	28.6981	77.1517	215	Urban

52	Delhi30	28.9575	77.2723	211	Urban
53	Delhi31	28.407	77.8498	197	Urban
54	Delhi32	28.694	77.455	226	Urban
55	Delhi33	28.6679	77.4498	208	Urban
56	Delhi34	28.8253	78.7213	193	Urban
57	Delhi35	29.4677	77.7116	245	Urban
58	Hyderabad1	17.4567	78.3264	580	Rural
59	Hyderabad2	17.5111	78.2752	544	Rural
60	Hyderabad3	17.5325	78.1849	545	Industrial
61	Hyderabad4	17.3507	78.4513	505	Urban
62	Bengaluru1	12.9568	77.5397	851	Urban
63	Bengaluru2	12.9135	77.5951	917	Urban
64	Bengaluru3	12.9756	77.6035	923	Urban
65	Bengaluru4	12.9172	77.5834	921	Urban
66	Bengaluru5	13.029	77.5197	909	Urban
67	Bengaluru6	12.9177	77.6238	882	Urban
68	Jaipur1	26.916	75.8017	435	Urban
69	Jaipur2	26.9503	75.801	470	Urban

Table S2. Location of NH$_3$ measurement sites from the Nationwide Nitrogen Deposition Monitoring Network (NNDMN) operated by China Agricultural University, China (see also Figure 3)

Site No.	Location name	Latitude	Longitude	Elevation (m)	Area
1	China Agricultural University	40.02	116.28	50	Urban
2	Zhengzhou	34.75	113.37	167	Urban
3	Dalian	38.92	121.58	18	Urban
4	Nanjing	31.84	118.85	9	Urban
5	Baiyun	23.16	113.27	16	Urban
6	Wenjiang	30.55	103.84	477	Urban
7	Shangzhuang	40.11	116.20	44	Rural
8	Baoding	38.85	115.48	15	Rural
9	Quzhou	36.78	114.94	44	Rural
10	Yangqu	38.05	112.89	1276	Rural
11	Zhumadian	33.02	114.05	69	Rural
12	Yangling	34.31	108.01	554	Rural
13	Yucheng	36.94	116.63	24	Rural
14	Gongzhuling	43.53	124.83	201	Rural
15	Lishu	43.36	124.17	129	Rural
16	Wuwei	38.07	102.60	1493	Rural
17	Wuxue	30.01	115.79	16	Rural
18	Taojiang	28.61	111.97	130	Rural
19	Fengyang	32.88	117.56	66	Rural
20	Zhanjiang	21.26	110.33	24	Rural
21	Fuzhou	26.17	119.36	432	Rural

22	Fenghua	29.61	121.53	34	Rural
23	Ziyang	30.13	104.63	360	Rural
24	Yanting	31.28	105.47	506	Rural
25	Jiangjin	29.06	106.18	292	Rural
26	Lingshadao	35.77	120.18	0	Coastal
27	Changdao	37.93	120.75	59	Coastal
28	Duolun	42.20	116.49	1239	Grassland
29	Bayingbuluke	42.88	83.71	2468	Grassland
30	Feiyue	28.56	113.34	77	Forest
31	Huinong	28.52	113.41	96	Forest
32	Xishan	28.61	113.31	230	Forest
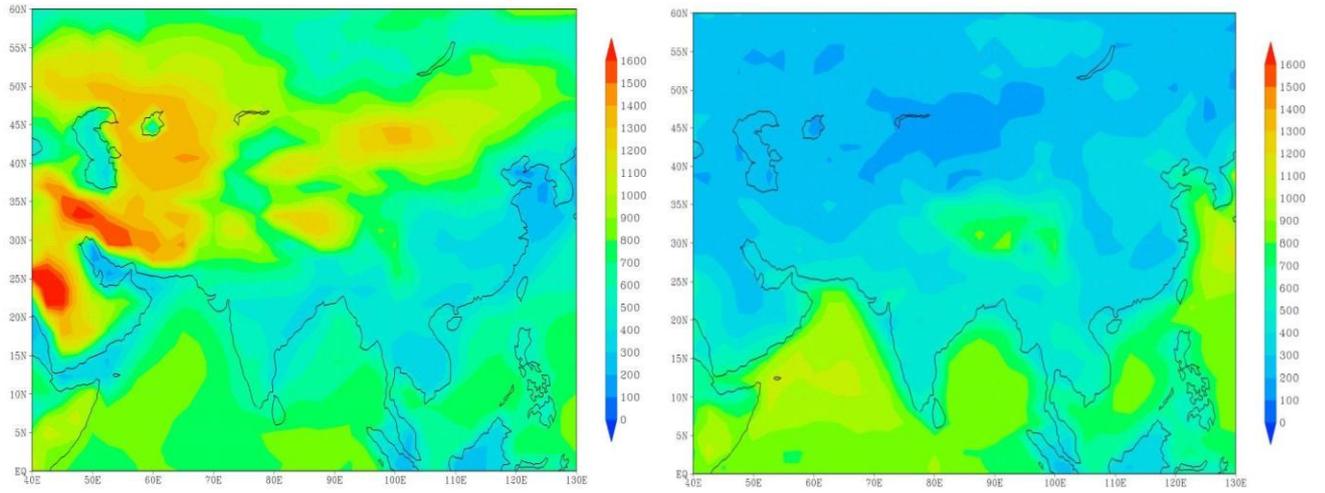
Figure S1. MOZART-4 model estimate of Planetary boundary layer height (PBLH) (m) during summer (JJA) season (left) and during winter (DJF) season (right).
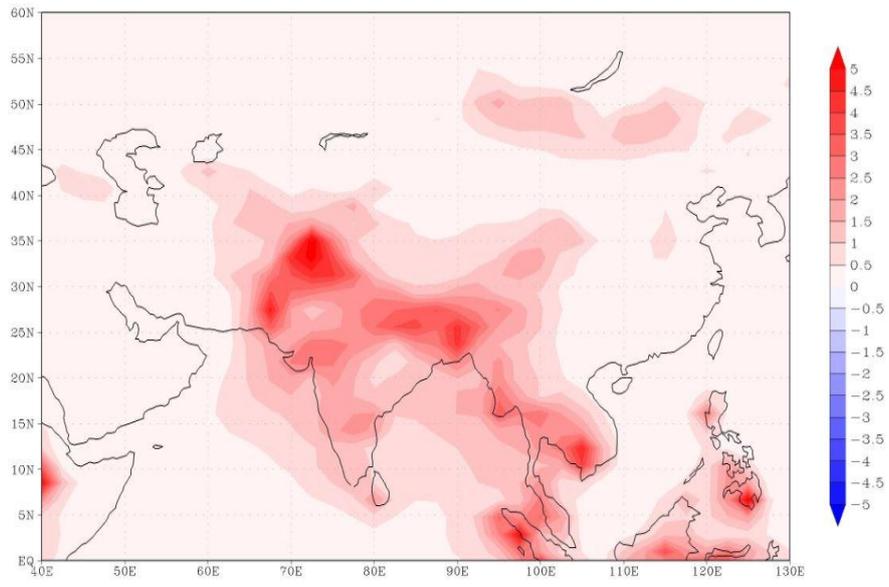
Figure S2. MOZART-4 model estimate of annual averaged NH$_3$/NH$_4$ ratio ($\times 10^9$ ppb) over Asia.
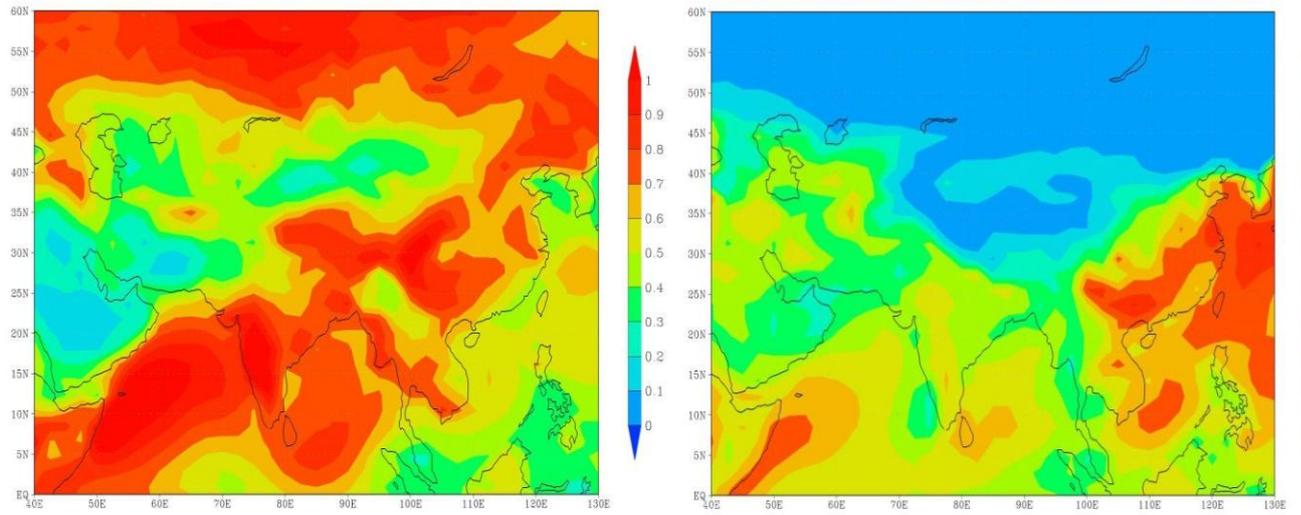
Figure S3. MOZART-4 model estimate of dry deposition velocity (cm/s) during summer (JJA) season (left) and during winter (DJF) season (right).
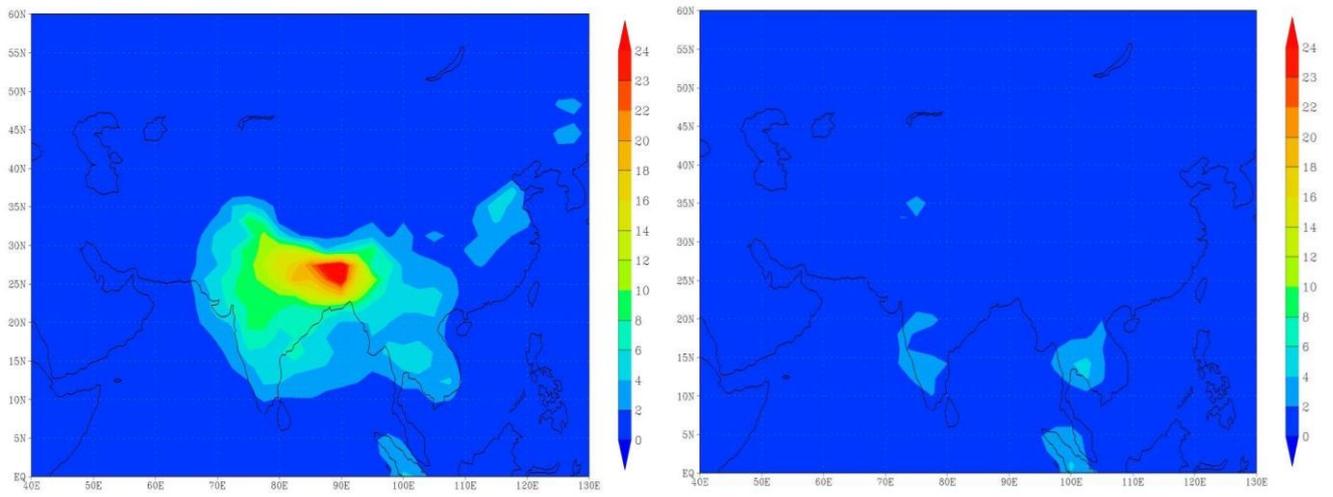
Figure S4. MOZART-4 model estimate of NH₃ wet deposition flux ($\times 10^{-9}$ kg m^{-2} s^{-1}) during summer (JJA) season (left) and during winter (DJF) season (right).
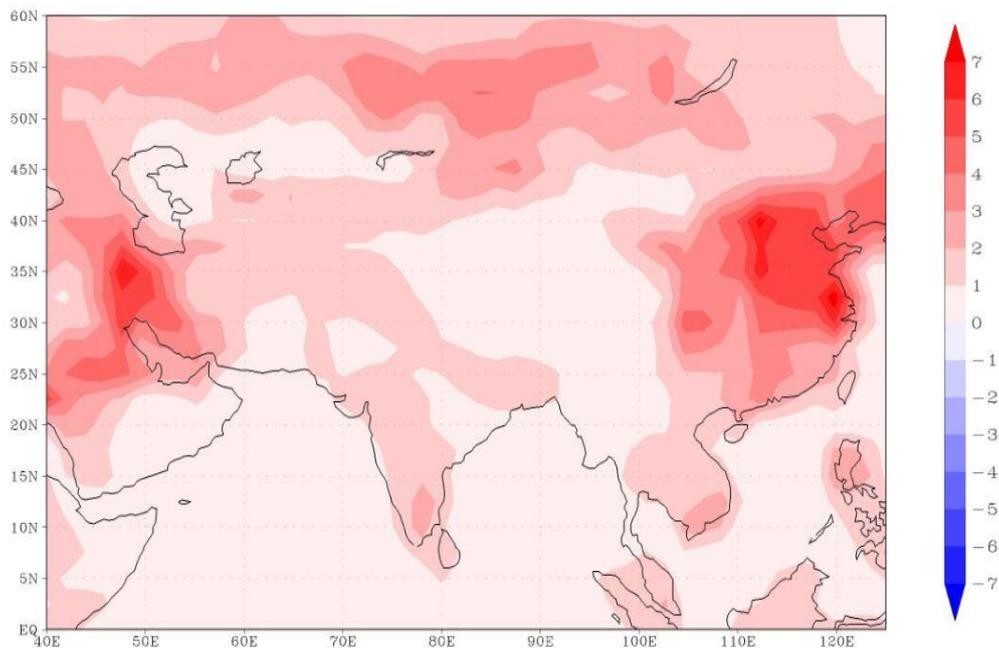
Figure S5. MOZART-4 model estimate of annual averaged NH$_3$ total emissions/NH$_3$ total column ratio ($\times 10^{-5}$ S^{-1}) over Asia.