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Measurement report: Exchange fluxes of HONO over agricultural fields in the North China Plain

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Table S1. Statistical parameters for HONO fluxes at 12h intervals. PFP: pre-fertilization period (before June 18); HEP: high HONO emission period (from June 18 to July 10); LEP: low HONO emission period (after July 10).

Flux	PFP		HEP		LEP	
(ng N m^{-2} s^{-1})	NP	CK	NP	CK	NP	CK
AVG	0.55	-0.51	97.7	-0.36	1.03	-2.88
SD[a]	0.35	0.13	8.6	0.04	3.17	2.41
MAX[b]	0.92	0.44	319	1.78	8.15	1.68
MIN[c]	-0.05	-1.65	-1.14	-3.29	-5.52	-8.55

a: SD represents the standard deviation between the three duplicates in parallel.

[b, c]: MAX and MIN represent the maximum and minimum values of the observed HONO flux at 12h intervals.

Table S2. Summary of regional fertilizer-induced soil HONO emissions and related parameters in each province in China mainland in 2021.

Province	TN[a] (1E4 t)	Crop area (kha)	FAR[b] (kg N ha^{-1})	$F_{max\text{-}SF}$[c] (ng N m^{-2} s^{-1})	$F_{max\text{-}DF}$[d] (ng N m^{-2} s^{-1})	EF (%)	E_{HONO}[e] (Gg N yr^{-1})
Beijing	2.9	118	245.5	341.2	208.1	0.46	0.1
Tianjin	6.5	437	149.6	115.7	70.6	0.26	0.2
Hebei	126.6	8,097	156.4	125.5	76.5	0.27	3.4
Shanxi	35.0	3,588	97.5	59.7	36.4	0.20	0.7
Neimenggu	106.9	8,743	122.3	82.6	50.4	0.23	2.4
Liaoning	59.6	4,329	137.8	100.3	61.1	0.24	1.5
Jilin	78.9	6,187	127.5	88.2	53.8	0.23	1.8
Heilongjiang	94.2	15,065	62.5	35.7	21.8	0.19	1.8
Shanghai	3.3	264	124.6	85.1	51.9	0.23	0.1
Jiangsu	153.8	7,514	204.7	218.1	133.0	0.36	5.5
Zhejiang	31.5	2,015	156.4	125.5	76.5	0.27	0.8
Anhui	114.8	8,887	129.2	90.2	55.0	0.23	2.7
Fujian	41.1	1,652	248.9	353.9	215.8	0.48	2.0
Jiangxi	39.5	5,673	69.7	40.0	24.4	0.19	0.8
Shandong	149.5	10,949	136.5	98.8	60.2	0.24	3.6
Henan	243.1	14,705	165.3	139.3	85.0	0.28	6.9
Hubei	118.4	8,109	146.0	110.9	67.6	0.25	3.0
Hunan	91.8	8,504	107.9	68.6	41.9	0.21	2.0
Guangdong	94.6	4,498	210.3	232.3	141.7	0.37	3.5
Guangxi	91.1	6,178	147.5	112.8	68.8	0.26	2.3
Hainan	15.2	685	222.5	265.5	161.9	0.40	0.6
Chongqing	48.3	3,409	141.7	105.1	64.1	0.25	1.2
Sichuan	98.4	10,000	98.4	60.4	36.9	0.21	2.0

Guizhou	37.5	5,423	69.1	39.6	24.1	0.19	0.7
Yunnan	98.6	7,057	139.7	102.6	62.6	0.25	2.4
Xizang	1.7	274	62.2	35.5	21.7	0.19	0.0
Shaanxi	96.2	4,189	229.6	287.3	175.2	0.42	4.0
Gansu	35.6	3,998	89.1	53.1	32.4	0.20	0.7
Qinghai	2.4	584	41.2	24.8	15.1	0.20	0.0
Ningxia	17.6	1,176	149.5	115.5	70.4	0.26	0.5
Xinjiang	115.4	6,387	180.7	166.4	101.5	0.31	3.6

[a]: total applied nitrogen amounts (nitrogen fertilizer amount+0.22×compound fertilizer amount). Data source: China Statistical Yearbooks 2022.

[b]: fertilizer application rate. FAR = TN/Crop area

[c]: the maximum HONO flux under surface fertilization condition. $F_{max\text{-}SF} = 29.54 \times \exp(FAR/98.04) - 20.17$.

[d]: the maximum HONO flux under deep fertilization condition. $F_{max\text{-}DF} = F_{max\text{-}SF} / 1.64$.

[e]: emission factor of HONO relative to TN. $EF = F_{max\text{-}DF} \times 0.68/372 \times 300/FAR$.

[f]: the regional fertilizer-induced soil HONO emissions. $E_{HONO} = EF \times FAR$.

Figures

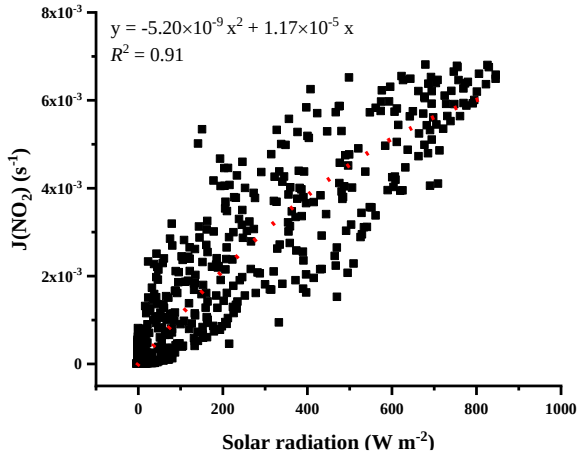

Figure S1. Correlation between the measured J(NO_2) and solar radiation (August 28–September 30, 2021).

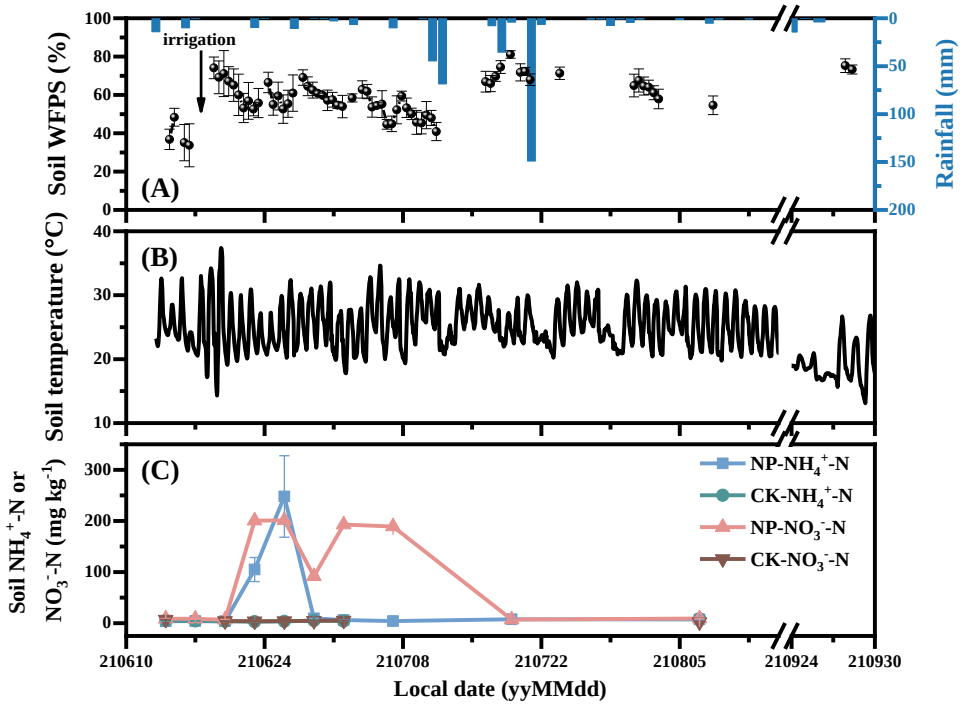

Figure S2. Variations of soil water-filled pore space (WFPS) and rainfall (A), surface soil (5 cm) temperature (B), and concentrations of soil NH_4^+-N and NO_3^--N from the NP (chemical N fertilizer and normal irrigation), and CK (no fertilization but with normal irrigation) plots (C) during the maize growing season. Error bars represent the standard deviations (n=5 for soil WPFS and 3 for soil NH_4^+-N and NO_3^--N concentrations).

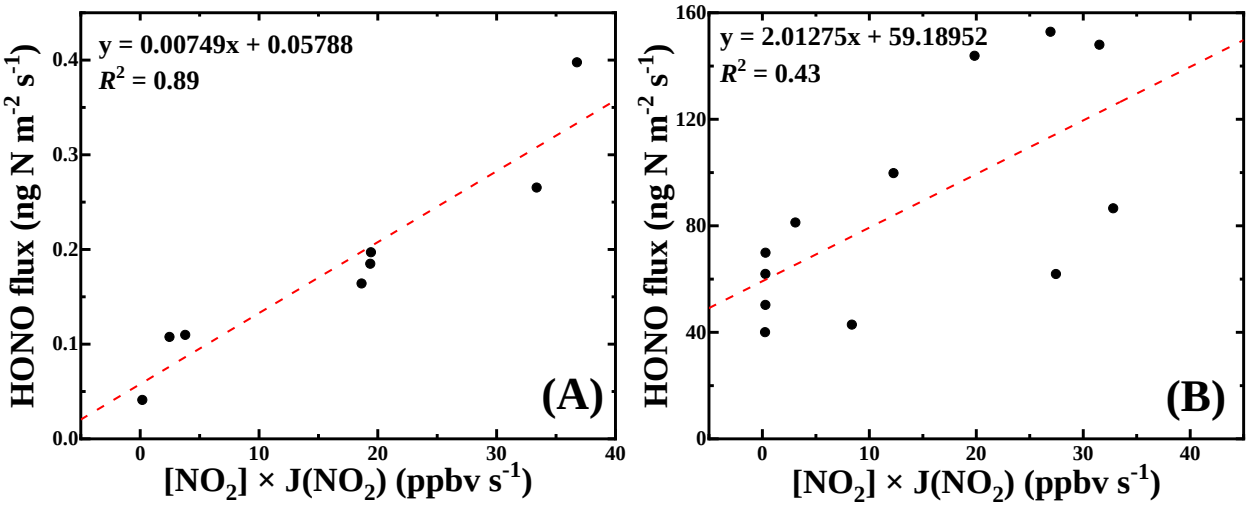

Figure S3. Correlation of the HONO flux with the product [NO₂] × J(NO₂) during 07:00 to 23:00 UTC, June 16, 2021 (A) and HEP (B). HEP: high HONO emission period.

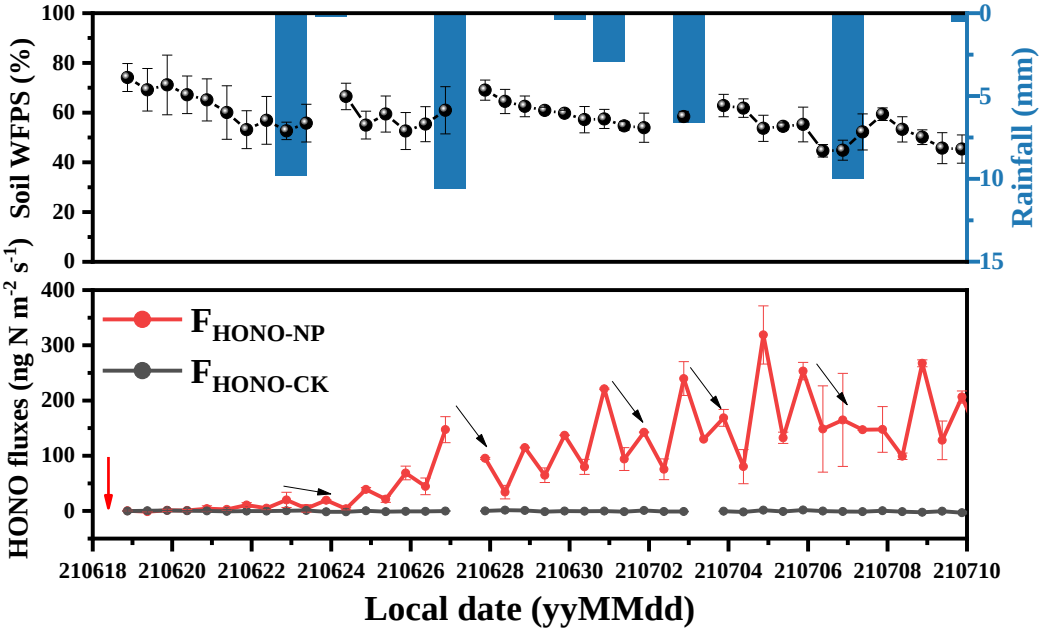

Figure S4. Influence of rainfall on soil HONO emissions and soil water-filled pore space (WFPS). The red arrow represents the fertilization and irrigation. The black arrows indicate reduced HONO fluxes after rain events.

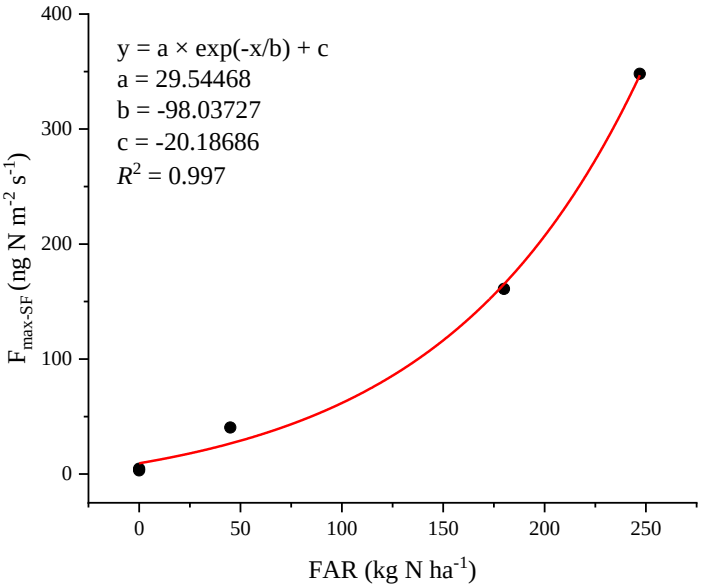

Figure S5. Correlations of fertilization application rates (FAR) and maximum HONO flux under surface fertilization (F_{max-SF}).

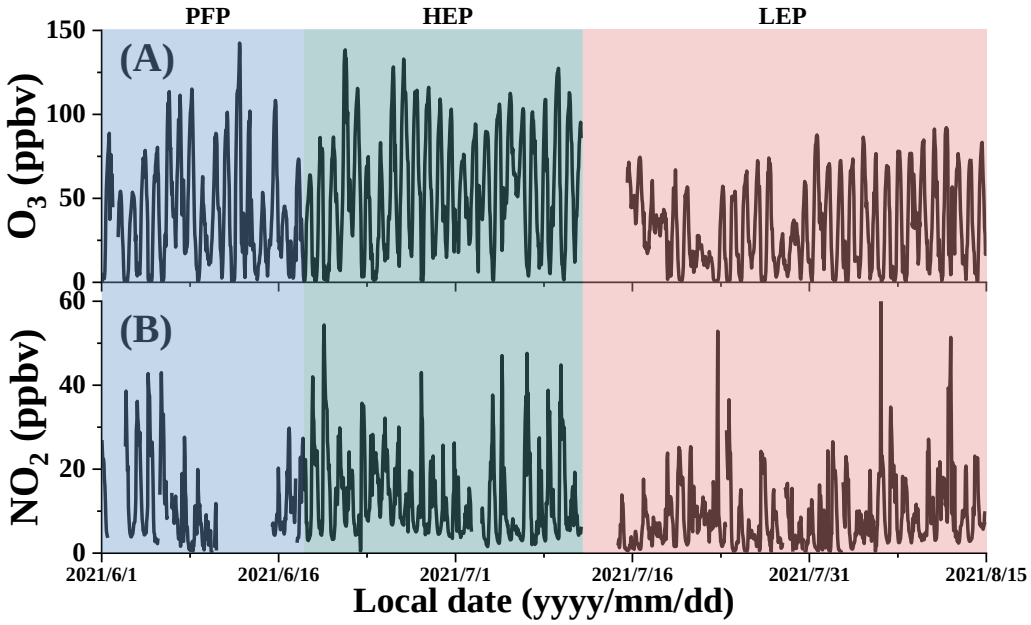

Figure S6. Time series of atmospheric O_3 (A) and NO_2 (B) concentrations at the observation site from June 1 to August 15, 2021. PFP: pre-fertilization period, before June 18; HEP: high HONO emission period, from June 18 to July 10; LEP: low HONO emission period, after July 10.