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Supplement of

Emission of nitrous acid from soil and biological soil crusts represents an important source of HONO in the remote atmosphere in Cyprus

Hannah Meusel et al.

Correspondence to: Hang Su (h.su@mpic.de) and Bettina Weber (b.weber@mpic.de)

Calculations of fluxes derived by dynamic chamber measurements:

$$[HONO] \cdot \frac{f}{A} \cdot \frac{p}{R \cdot T} \cdot M_N = F_{HONO-N} \quad \text{(eq. S1)}$$

$$[NO] \cdot \frac{fr}{A} \cdot \frac{p}{R \cdot T} \cdot M_N = F_{NO-N} \quad \text{(eq. S2)}$$

[HONO], [NO] measured mixing ratios in ppb
f = flow rate in m^3 s^{-1} (8 L min^{-1} = 1.33 x 10^{-4} m^3 s^{-1})
A = surface of sample in m^2 (0.00238 m^2)
p = pressure in Pa
R = ideal gas constant (8.31 J mol^{-1} K^{-1})
T = temperature in K (298 K)
M_N = molar weight of N (14 g mol^{-1})
F_{HONO-N}, F_{NO-N} = fluxes of HONO-N and NO-N in ng m^{-2} s^{-1}

Table S1: Overview over soil and biocrust samples including nutrient and chlorophyll analyses and HONO and NO emission fluxes. (<LOD = below limits of detection)

sample type		NO_2^--N	NO_3^--N	NH_4^+-N	chl_{a-b}	chl_a	$HONO_{max}$	NO_{max}	$HONO_{int}$	NO_{int}	HONO/NO	
		mg kg^{-1}			mg m^{-2}		ng (N) m^{-2} s^{-1}		µg (N) m^{-2}		(max)	(int)
Bare soil	1	0.126	0.723	2.017	17.45	8.61	89.12	53.70	465.49	341.45	1.66	1.36
Bare soil	2	0.574	2.450	1.325	18.66	6.84	263.80	120.99	1899.9	1544.8	2.18	1.23
Bare soil	3	0.501	6.478	6.509	31.71	13.93	173.32	101.83	1510.4	1621.3	1.70	0.93
Dark BSC	1	<LOD	<LOD	1.906	40.80	27.48	1.29	1.73	9.45	17.1	0.74	0.55
Dark BSC	2	<LOD	<LOD	1.873	32.13	18.61	3.08	2.90	16.42	25.49	1.06	0.64
Dark BSC	3	<LOD	0.050	1.365	30.42	15.52	4.69	6.64	36.28	63.53	0.71	0.57
Dark BSC	4	0.265	3.549	3.159	95.66	66.01	43.15	35.86	337.45	359.56	1.20	0.94
Dark BSC	5	0.113	0.582	2.061	21.65	11.26	83.43	85.1	443.86	712.1	0.98	0.62
Light BSC	1	<LOD	<LOD	0.626	12.71	6.05	1.28	1.74	8.61	14.84	0.73	0.58
Light BSC	2	<LOD	<LOD	0.587	16.34	7.72	12.35	11.44	61.48	66.07	1.08	0.93
Light BSC	3	0.267	4.015	22.209	24.60	11.00	96.53	95.22	540.77	592.28	1.01	0.91
Light BSC	4	0.119	0.819	1.478	18.09	8.31	83.89	67.5	475.72	481.0	1.24	0.99
Chlorolichen BSC I	1	<LOD	<LOD	0.085	61.39	37.48	0.63	0.83	3.73	6.03	0.76	0.62
Chlorolichen BSC I	2	<LOD	<LOD	<LOD	84.12	58.64	2.45	2.62	12.02	15.73	0.93	0.76
Chlorolichen BSC I	3	<LOD	<LOD	0.829	107.59	74.85	1.24	2.03	10.50	24.54	0.61	0.43
Chlorolichen BSC II	1	<LOD	<LOD	0.187	24.75	14.18	1.69	1.88	15.23	15.32	0.90	0.99
Chlorolichen BSC II	2	0.011	0.116	2.460	10.58	10.58	7.98	8.40	54.53	63.25	0.95	0.86
Chlorolichen BSC II	3	0.074	0.916	0.982	21.73	12.29	9.65	9.88	94.72	103.62	0.98	0.91
Chlorolichen BSC II	4	0.017	0.128	2.062	17.97	9.50	19.97	15.83	110.68	95.15	1.26	1.16
Chlorolichen BSC II	5	<LOD	0.513	3.894	37.46	22.65	4.27	4.43	35.14	49.83	0.96	0.71
Chlorolichen BSC II	6	<LOD	<LOD	0.585	17.43	9.71	1.52	1.54	7.87	11.60	0.98	0.68
Moss BSC	1	0.071	<LOD	2.048	48.93	27.82	12.68	13.44	104.08	148.62	0.94	0.70
Moss BSC	2	<LOD	<LOD	0.306	83.63	54.53	4.34	5.79	40.07	57.66	0.75	0.69
Moss BSC	3	0.030	<LOD	0.763	211.31	144.21	6.78	8.87	62.54	89.10	0.77	0.70
Moss BSC	4	<LOD	0.029	5.164	169.64	123.26	3.49	3.65	16.61	19.58	0.96	0.85

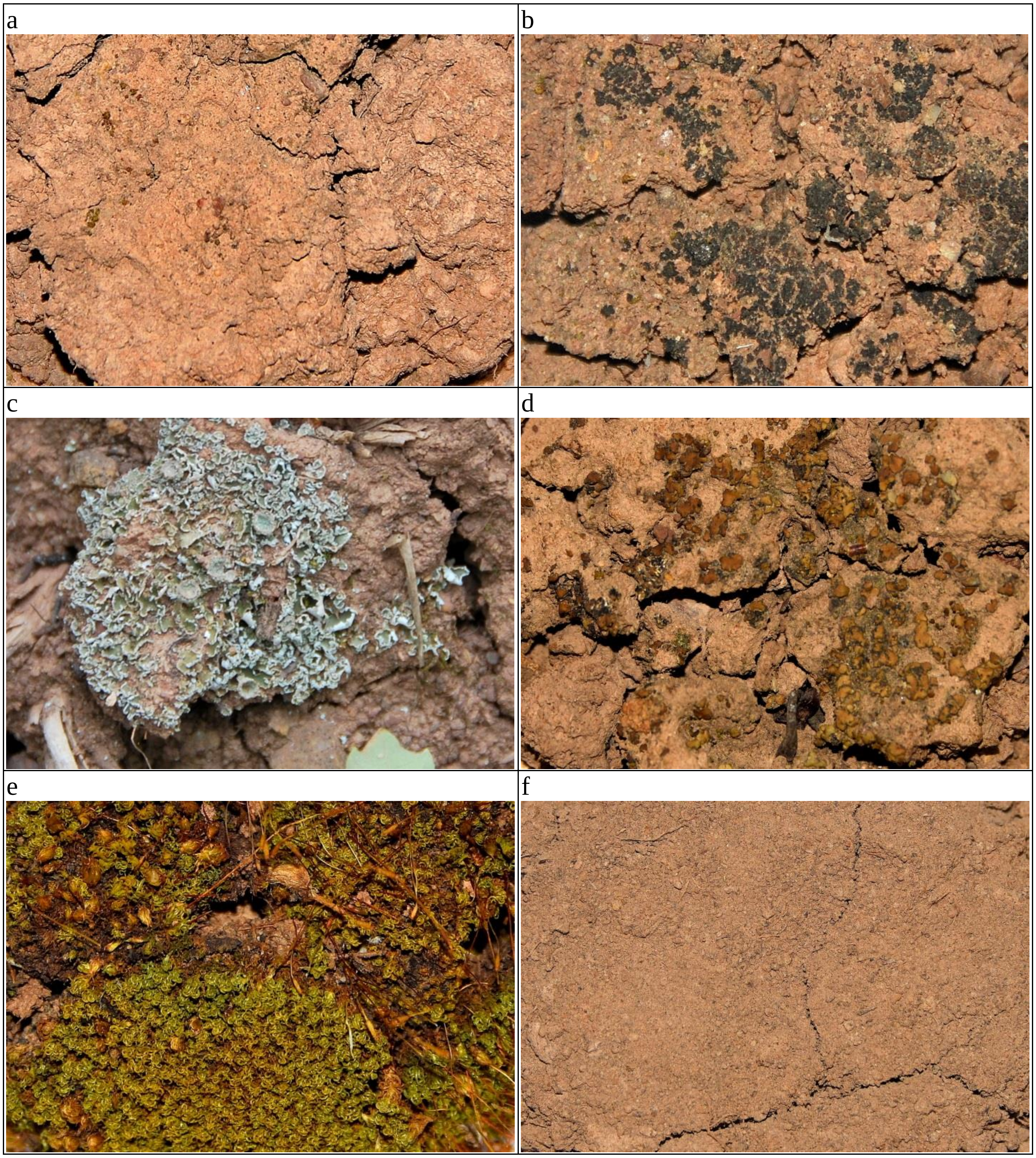

Fig. S1: Pictures of local biocrusts: a) light cyanobacteria-dominated biocrust, b) dark cyanobacteria-dominated biocrust with *Collema* sp. as dominating cyanolichen species, c) chlorolichen-dominated biocrust with *Cladonia* sp. as dominating lichen species, type I, d) chlorolichen-dominated biocrust with *Placidium* sp. as dominating lichen species, type II, e) moss-dominated biocrust with *Trichostomum crispulum* as dominating moss species, and f) bare soil.

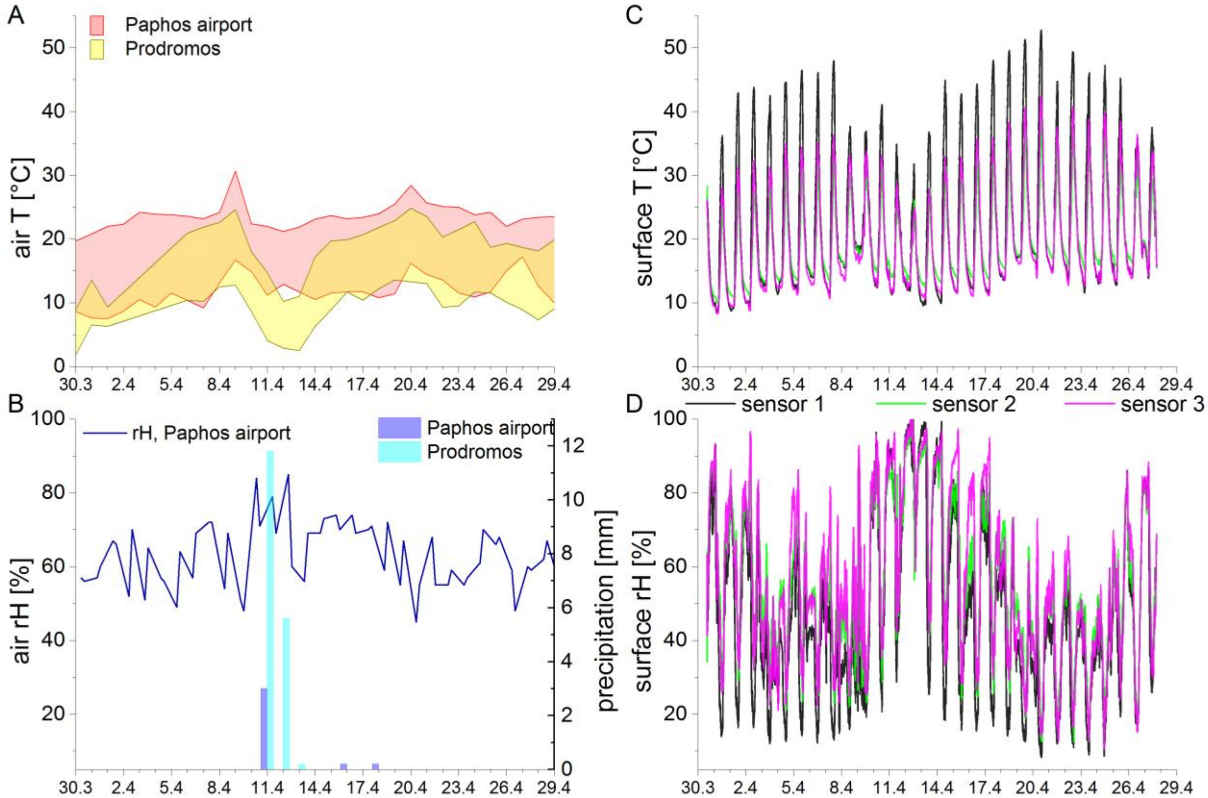

Fig. S2: Climatic conditions of air and soil during April 2016, about one month before samples were taken. Atmospheric data was adopted from the Department of Meteorology, Cyprus. Minimum and maximum air temperatures (A) of one day at both sites are presented by red and yellow shaded areas. Air-rH data (B; dark blue line, left axis) were only available for Paphos airport, representing values at 8:00 and 13:00 local time. Precipitation data at Paphos airport and Prodromos (B; blue bars, right axis) show the daily rainfall. Surface temperature and rH are shown on the right side (C, D). The time resolution is 5 min. The variations between sensors arise from 3 different locations/surface (bare soil, next to rock, under shrubs). (http://www.moa.gov.cy/moa/ms/ms.nsf/DMLmeteo_reports_en/DMLmeteo_reports_en?OpenDocument)

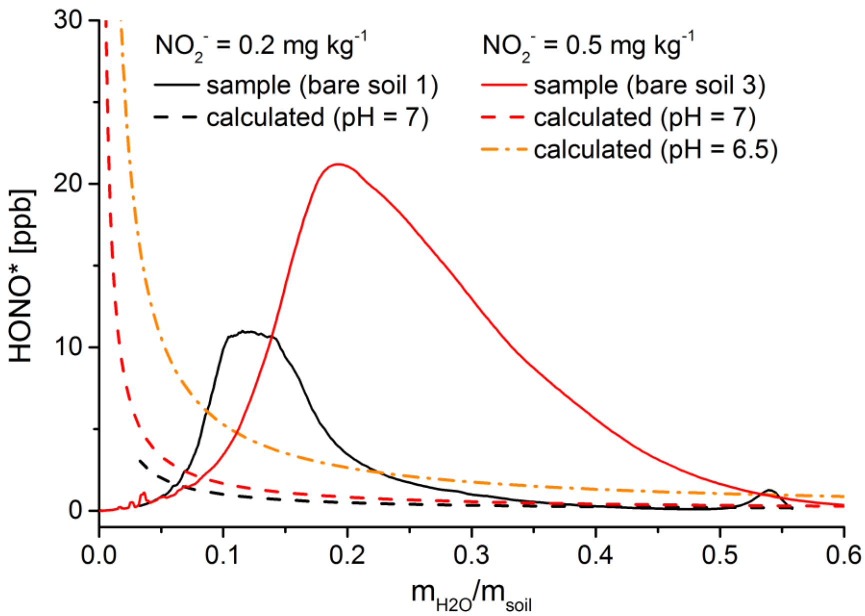

Fig. S3: Calculated [HONO]* for two different NO_2^- concentrations at pH 7 and pH 6.5 (dashed lines) in comparison with measured [HONO]* for two samples with similar NO_2^- content (solid lines) vs the gravimetric soil water content.