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Long-term additions of ammonium nitrate to montane forest ecosystems may cause limited soil acidification, even in the presence of soil carbonate

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Table S1: Outputs of linear models for cation and anion concentrations in the precipitation measured at the study site in the Alptal. Explanatory variables are time (1 timestep = 2 weeks), cos and sin of day of year (test for seasonality with sinusoidal regression). The units for SO_4^{2-}, NO_3^- - N and NH_4^+ - N is mg/l

Dependant variable	Fixed effect	Estimate	SE	t-value	p-value	df	Adjusted R^2
pH	(Intercept)	5.0072	0.0495	101.241	< 0.001	654	0.420
	Time	0.0026	0.0001	20.623	< 0.001		
	cos	-0.2642	0.0348	-7.5591	< 0.001		
	sin	-0.0021	0.0349	-0.059	0.9572		
SO_4^{2-}	(Intercept)	1.0191	0.0510	19.9959	< 0.001	645	0.118
	Time	-0.0011	0.0001	-8.0492	< 0.001		
	cos	-0.1563	0.0358	-4.3590	< 0.001		
	sin	0.0691	0.0359	1.9245	0.0547		
NO_3^- - N	(Intercept)	0.3291	0.0150	21.9536	< 0.001	654	0.085
	Time	-0.0002	0.0000	-4.3150	< 0.001		
	cos	-0.0097	0.0105	-0.9243	0.3556		
	sin	0.0695	0.0106	6.5648	< 0.001		
NH_4^+ - N	(Intercept)	0.3261	0.0215	15.1577	< 0.001	654	0.116
	Time	<0.0001	0.0001	0.6922	0.4890		
	cos	-0.1128	0.0151	-7.4518	< 0.001		
	sin	0.0864	0.0152	5.6874	< 0.001		

Table S2: Output of linear mixed effects models for pH and total acidity. Calculated with treatment (control or N treated), year (scaled and centred around 0; midpoint at 2011), and interaction (year:treatment). (note: the log of total acidity was used as dependant variable) For total acidity an extra fixed effect, year squared, was added to account for the nonlinearity. The random effect was replication (location of sampling) allowing for random slopes for treatment. Calculations were done for both the O horizon and A horizon separately. The unit for acidity is mmolc/kg.

Dependant variable	Soil horizon	Fixed effect	Estimate	SE	df	t-value	p-value
pH	O horizon	(Intercept)	4.554	0.336	52	13.564	<0.001
		Treatment	-0.203	0.192	52	-1.055	0.296
		Year	-0.032	0.007	52	-4.502	<0.001
		Year:treatment	0.007	0.010	52	0.656	0.515
pH	A horizon	(Intercept)	4.837	0.288	51	16.790	<0.001
		Treatment	-0.292	0.256	51	-1.137	0.261
		Year	-0.030	0.010	51	-3.064	0.004
		Year:treatment	0.016	0.013	51	1.184	0.242
Total acidity	O horizon	(Intercept)	1.455	0.162	40	8.991	<0.001
		Treatment	0.094	0.078	40	1.199	0.237
		Year	0.0004	0.003	40	-0.114	0.910
		$Year^2$	-0.001	0.000	40	-4.910	<0.001
		Year:treatment	0.004	0.004	40	0.897	0.375
Total acidity	A horizon	(Intercept)	1.106	0.173	40	6.383	<0.001
		Treatment	0.193	0.123	40	1.567	0.125
		Year	0.002	0.005	40	0.337	0.738
		$Year^2$	-0.001	0.000	40	-3.360	0.002
		Year:treatment	0.001	0.007	40	0.093	0.927

Table S3: Output of linear mixed effects models for total acidity (note: the log of total acidity was used as dependant variable), calculated with treatment (control or N treated), topography (depression and mound), and interaction (topography:treatment). The random effect was replication (location of sampling). Allowing for random slopes for treatment did not converge, for which reason only random intercepts was tested. Calculations were done for both the O horizon and A horizon separately. The unit for acidity is mmolc/kg.

Dependant variable	Soil horizon	Fixed effect	Estimate	SE	df	t-value	p-value
Total acidity	O horizon	(Intercept)	1.090	0.058	42	18.878	<0.001
		Treatment	0.004	0.069	42	0.058	0.954
		Topography (Mound)	0.666	0.094	3	7.124	0.006
		Topography:treatment	0.205	0.110	42	1.859	0.070
Total acidity	A horizon	(Intercept)	0.722	0.079	42	9.140	<0.001
		Treatment	0.042	0.092	42	0.461	0.647
		Topography (Mound)	0.709	0.128	3	5.555	0.012
		Topography:treatment	0.348	0.147	42	2.365	0.023

Table S4: Outputs of linear models for cation and anion concentrations in the runoff water from the control and N treated catchment areas. Explanatory variables are treatment (Control and N treatment), time (1 timestep = 2 weeks), cos and sin of day of year (test for seasonality with sinusoidal regression) and interaction (between treatments over time). The unit for the ions is mg/l.

Dependant variable	Fixed effect	Estimate	SE	t-value	p-value	df	Adjusted R^2
pH	(Intercept)	7.5543	0.0147	512.731	<0.0001	1369	0.1149
	Treatment	-0.0064	0.0132	-0.4840	0.6285		
	Time	-0.0004	0.0000	-12.270	<0.0001		
	cos	0.0520	0.0094	5.5630	<0.0001		
	sin	0.0015	0.0094	0.1640	0.8698		
	Interaction	-0.0074	0.0044	-1.670	0.0952		
Al_3^+	(Intercept)	0.0887	0.0036	24.5510	<0.0001	1379	0.2760
	Treatment	-0.0050	0.0032	-1.5495	0.1215		
	Time	0.0001	0.0000	11.2725	<0.0001		
	cos	-0.0419	0.0023	-18.2824	<0.0001		
	sin	-0.0201	0.0023	-8.7601	<0.0001		
	Interaction	0.0019	0.0011	1.7974	0.0725		
NO_3^-	(Intercept)	1.0861	0.0885	12.2742	<0.0001	1379	0.2683
	Treatment	-0.0002	0.0002	-1.1844	0.2364		
	Time	0.2604	0.0561	4.6428	<0.0001		
	cos	0.2743	0.0561	4.8862	<0.0001		
	sin	1.7090	0.0793	21.5460	<0.0001		
	Interaction	0.0332	0.0265	1.2518	0.2109		
Fe_2^+	(Intercept)	0.1830	0.0035	52.5869	<0.0001	1379	0.2251
	Treatment	-0.0329	0.0031	-10.5425	<0.0001		
	Time	0.0000	0.0000	1.3106	0.1902		
	cos	-0.0254	0.0022	-11.5101	<0.0001		
	sin	-0.0267	0.0022	-12.0927	<0.0001		
	Interaction	0.0046	0.0010	4.4096	<0.0001		
SO_4^{2-}	(Intercept)	1.8209	0.0710	25.6504	<0.0001	1379	0.3398
	Treatment	1.0668	0.0636	16.7653	<0.0001		
	Time	-0.0011	0.0002	-6.8783	<0.0001		
	cos	0.8073	0.0450	17.9398	<0.0001		
	sin	-0.2076	0.0450	-4.6111	<0.0001		
	Interaction	0.1374	0.0213	6.4616	<0.0001		
Ca_2^+	(Intercept)	12.6412	0.2374	53.2498	<0.0001	1379	0.2455
	Treatment	2.8603	0.2128	13.4415	<0.0001		
	Time	-0.0060	0.0005	-11.5920	<0.0001		
	cos	1.3925	0.1505	9.2537	<0.0001		
	sin	-0.8514	0.1506	-5.6540	<0.0001		
	Interaction	0.3147	0.0711	4.4245	<0.0001		