Supplementary Information

Unravelling ammonium and nitrate dynamics in soils: effects of soil type, moisture content, and temperature revealed by diffusive gradients in thin-films

Krishantha Kodithuwakku[a], Jianyin Huang[a], Casey L. Doolette[a], Sean Mason[b], Orlando Lam-Gordillo[cd], Enzo Lombi[e], Niklas J. Lehto[f]*

[a] UniSA STEM, University of South Australia, Mawson Lakes Campus, Mawson Lakes, South Australia, 5095, Australia

[b] Agronomy Solutions Pty. Ltd., 3/11, Ridley Street, Hindmarsh, South Australia, 5007, Australia

[c] The New Zealand Institute for Earth Science, Hamilton, New Zealand.

[d] College of Science and Engineering, Flinders University, Adelaide, Australia.

[e] Future Industries Institute, University of South Australia, Mawson Lakes Campus, Mawson Lakes, South Australia, 5095, Australia

[f] Department of Soil and Physical Science, Faculty of Agriculture and Life Science, Lincoln University, New Zealand

*Corresponding Author – niklas.lehto@lincoln.ac.nz

Table S1. Comparison of DGT measured NH_4-N at different temperatures (Te), deployment times (Dt) and soil moisture (SM) contents over the urea hydrolysis period.

PERMANOVA table of results						
Source	**df**	**SS**	**MS**	**Pseudo-F**	**P(perm)**	**Unique perms**
Dt	6	6.27E+07	1.04E+07	131.23	**0.0001**	9947
Te	1	1.47E+07	1.47E+07	185.12	**0.0001**	9830
SM	2	1.13E+07	5.65E+06	71.031	**0.0001**	9945
Dt × Te	6	4.45E+06	7.41E+05	9.3073	**0.0001**	9937
Dt × SM	12	6.91E+06	5.76E+05	7.2339	**0.0001**	9932
Te × SM	2	1.21E+06	6.06E+05	7.6169	**0.0006**	9964
Dt × Te × SM	12	5.22E+06	4.35E+05	5.4636	**0.0001**	9926
Res	84	6.69E+06	79610			
Total	125	1.13E+08				

Table S2. Comparison of DGT measured NO_3-N in different temperature (Te), deployment times (Dt) and soil moisture (SM) contents over the urea hydrolysis period

PERMANOVA table of results						
Source	**df**	**SS**	**MS**	**Pseudo-F**	**P(perm)**	**Unique perms**
Dt	6	2.12E+08	3.53E+07	49.262	**0.0001**	9943
Te	1	3162	3162	0.004419	0.9487	9847
SM	2	1.42E+08	7.11E+07	99.422	**0.0001**	9962
Dt × Te	6	2.82E+06	4.69E+05	0.65601	0.7047	9943
Dt × SM	12	1.18E+08	9.85E+06	13.769	**0.0001**	9920
Te × SM	2	1.77E+06	8.83E+05	1.2344	0.305	9955
Dt × Te × SM	12	2.72E+07	2.27E+06	3.1688	**0.001**	9951
Res	84	6.01E+07	7.16E+05			
Total	125	5.64E+08				

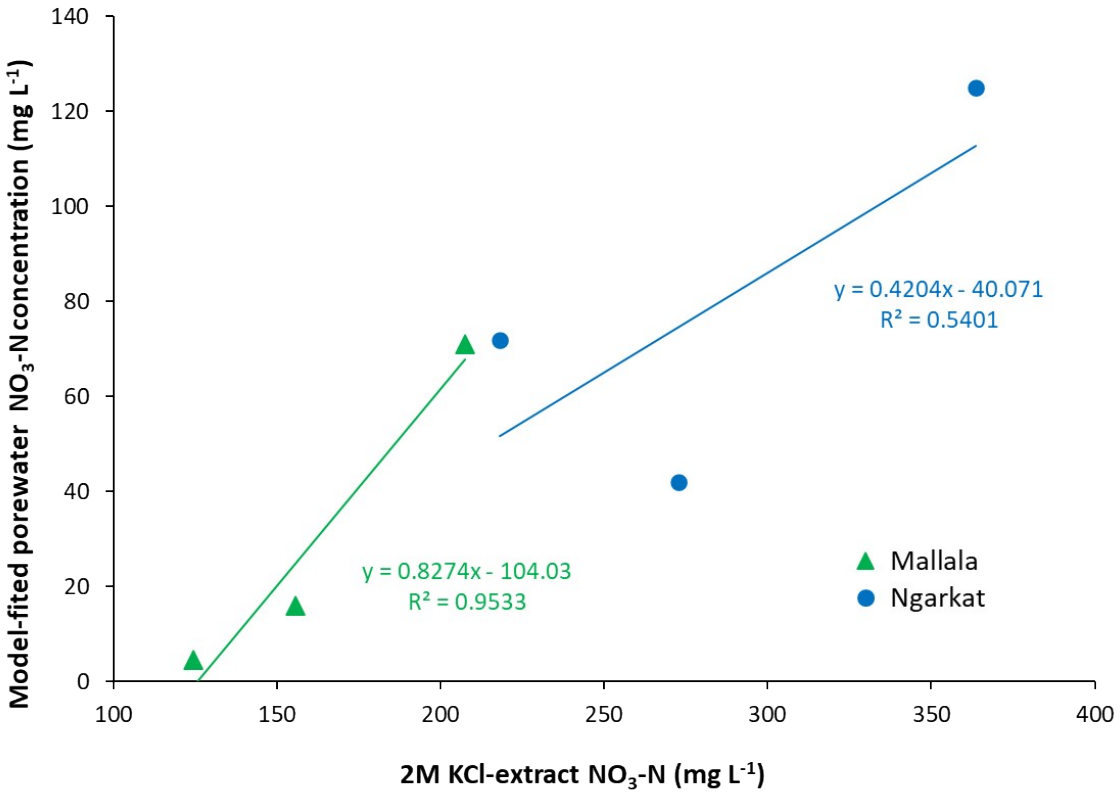

Figure S1. KCl-extracted vs. 3D-DIFS model fitted porewater concentrations in the Mallala and Ngarkat soils.

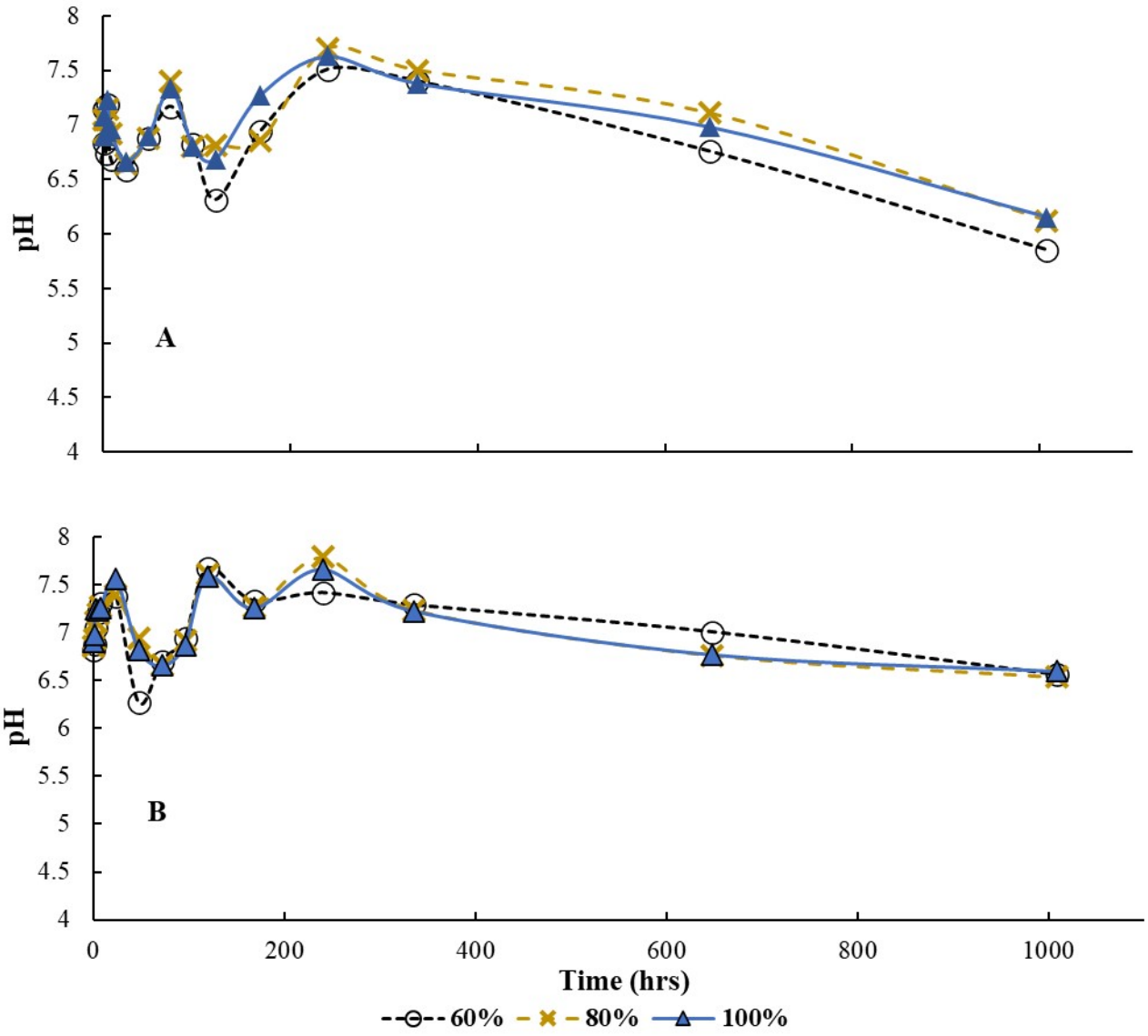

Figure S2. Soil pH variation over time after introduction of urea to Mallal soil at different soil moisture contents at (A) 24 ℃ and (B) at 15 ℃.