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# The simulated N deposition accelerates net N mineralization and nitrification in a tropical forest soil

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**Table S1** Primer information of selected soil functional genes.

| Gene | Primers | Primer sequence (5'--3') | Location | Length | References |
|---|---|---|---|---|---|
| AOB-*amoA* | *amo*A 1F | 5' GGGGTTTCTACTGGTGGT 3' | 322-249 | 500bp | (Rich et al., 2003; Levy-Booth et al., 2014) |
| | *amo*A 2R | 5' CCCCTCKGSAAAGCCTTCTTC 3' | 802-822 | | |
| AOA-*amoA* | *Crenamo*A 23F | 5' ATGGTCTGGCTWAGACG 3' | 7-24 | 620bp | (Levy-Booth et al., 2014) |
| | *Crenamo*A 616R | 5' GCCATCCATCTGTATGTCCA 3' | 611-631 | | |
| *nirK* | *nir*K F560-589 | 5'- GGGCATGAACGGCGCGCTCATGGTGCTGCC -3' | 560-589 | 376bp | (Levy-Booth et al., 2014) |
| | *nir*K R906-935 | 5'-CGGGTTGGCGAACTTGCCGGTGGTCCAGAC -3' | 906-935 | | |
| *nosZ* | *nos*Z-F | 5'- CGCTGTTCITCGACAGYCAG -3' | 1181-1201 | 700bp | (Rich et al., 2003) |
| | *nos*Z-R | 5'- ATGTGCAKIGCRTGGCAGAA -3' | 1880-1900 | | |

(Han et al., 2018)

**Table S2** Reaction programs of quantitative PCR for selected functional genes.

| Gene | Primers | Thermal cycling conditions | References |
|---|---|---|---|
| AOB-*amoA* | *amo*A 1F<br>*amo*A 2R | 95° 30"-40(95° 15"-53° 15"-72° 40") | (Rich et al., 2003; Levy-Booth et al., 2014) |
| AOA-*amoA* | *Crenamo*A23F<br>*Crenamo*A616R | 95° 30"-40(95° 5"-53° 34"-72° 60") | (Levy-Booth et al., 2014) |
| *nirK* | *nir*K F560-589<br>*nir*K R906-935 | 95° 30"-40(95° 5"-65° 34"-72° 60") | (Levy-Booth et al., 2014) |
| *nosZ* | *nos*Z-F<br>*nos*Z-R | 95° 30"-40(95° 5"-56° 34"-72° 40") | (Rich et al., 2003) |

(Han et al., 2018)

**Table S3**

Responses of soil properties and microbial biomass to nitrogen addition. Shown is the mean value ± standard error (n = 3). Different letters represent significant difference (one-way ANOVA, $P < 0.05$, LSD post hoc analysis) among different levels of N addition. Note: All the results were collected from surface soil samples (0-10 cm) except for special instructions.

| | **Dry season** | | | | | | | | **Wet season** | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan, 2015 | | | | Jan, 2016 | | | | Jul, 2015 | | | | Jul, 2016 | | | |
| | Control | LN | MN | HN | Control | LN | MN | HN | Control | LN | MN | HN | Control | LN | MN | HN |
| pH | 3.73a | 3.77a | 3.72a | 3.73a | 3.78a | 3.81a | 3.68a | 3.76a | 3.9a | 3.9a | 3.84b | 3.8b | 3.78a | 3.76a | 3.71a | 3.68a |
| | (0.04) | (0.02) | (0.04) | (0.02) | (0.07) | (0.05) | (0.07) | (0.03) | (0.03) | (0.01) | (0.02) | (0.02) | (0.05) | (0.06) | (0.09) | (0.03) |
| TN | 2.9a | 2.43a | 2.73a | 2.63a | 2.31a | 1.88a | 2.22a | 2.08a | 1.86a | 1.7a | 1.99a | 1.89a | 2.38a | 2.41a | 2.32a | 2.38a |
| (mg $g^{-1}$) | (0.41) | (0.17) | (0.36) | (0.17) | (0.44) | (0.22) | (0.15) | (0.38) | (0.13) | (0.38) | (0.52) | (0.32) | (0.28) | (0.18) | (0.03) | (0.25) |
| SOC | 52.3a | 43.8a | 50.5a | 42.4a | 38.0a | 24.8a | 25.2a | 32.1a | 25.5a | 25.8a | 25.7a | 27.6a | 42.3a | 35.0a | 31.0a | 33.7a |
| (mg $g^{-1}$) | (7.5) | (2.4) | (7.02) | (3.5) | (3.7) | (5.7) | (3.5) | (9.8) | (3.3) | (4.7) | (1.7) | (2.9) | (1.4) | (9.2) | (9.0) | (9.5) |
| C/N | 18.0a | 18.0a | 18.5a | 16.1a | 16.7a | 13.2a | 11.3a | 15.2a | 13.6a | 15.3a | 13.3a | 14.7a | 17.9a | 14.5a | 13.4a | 14.1a |
| | (0.5) | (0.3) | (0.2) | (1.1) | (2.3) | (2.5) | (0.9) | (2.4) | (0.8) | (1.0) | (2.4) | (1.0) | (2.5) | (3.3) | (3.9) | (3.2) |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TP | 0.26a | 0.24a | 0.24a | 0.24a | 0.28a | 0.15a | 0.15a | 0.14a | 0.23a | 0.24a | 0.24a | 0.23a | 0.24a | 0.3a | 0.24a | 0.25a |
| (mg $g^{-1}$) | (0.01) | (0.03) | (0.00) | (0.02) | (0.21) | (0.03) | (0.03) | (0.02) | (0.02) | (0.04) | (0.01) | (0.04) | (0.05) | (0.16) | (0.11) | (0.04) |
| SWC (%) | 38.7a | 34.4a | 36.9a | 35.5a | 43.19a | 39.19a | 43.48a | 39.06a | 35.9a | 33.8a | 34.7a | 33.7a | 47.6a | 45.5a | 45.8a | 45.8a |
| | (1.2) | (1.6) | (5.6) | (1.5) | (1.4) | (3.8) | (5.9) | (1.1) | (1.9) | (1.8) | (3.4) | (1.0) | (1.0) | (0.6) | (6.0) | (2.6) |
| $NH_4^+$-N | 2.81b | 3.83ab | 2.75b | 5.44a | 0.97b | 3.21a | 3.81a | 4.64a | 4.43a | 6.73a | 5.98a | 3.04a | 0.97a | 0.64a | 0.37a | 0.28a |
| (mg $kg^{-1}$) | (1.03) | (1.10) | (0.58) | (0.95) | (0.25) | (1.15) | (0.74) | (1.18) | (2.23) | (3.46) | (1.24) | (1.21) | (0.66) | (0.19) | (0.06) | (0.05) |
| $NO_3^-$-N | 6.42a | 5.15a | 7.85a | 9.8a | 4.95c | 5.57c | 9.7a | 7.81b | 7.08a | 7.54a | 6.96a | 9.62a | 11.45a | 13.63a | 13.9a | 13.06a |
| (mg $kg^{-1}$) | (0.63) | (2.02) | (4.05) | (2.23) | (0.75) | (0.63) | (1.35) | (1.00) | (1.67) | (0.73) | (1.91) | (0.8) | (2.62) | (1.89) | (1.96) | (0.57) |
| MBC | 508.8a | 447.5a | 466.6a | 382.1a | 435.3b | 421.2b | 525.5a | 419.2b | 504.5a | 521.2a | 464.8a | 498.2a | 671.0a | 540.0a | 690.3a | 800.7a |
| (mg $kg^{-1}$) | (161.9) | (88.4) | (162.8) | (39.3) | (60.6) | (24.3) | (33.1) | (5.4) | (25.1) | (57.4) | (56.0) | (33.6) | (52.8) | (187.7) | (326.7) | (216.1) |
| MBN | 72.7a | 70.4a | 58.0a | 60.6a | 74.0a | 67.3a | 88.2a | 64.9a | 49.4a | 51a | 47.2a | 49.7a | 130.8a | 122.7a | 123.2a | 119.1a |
| (mg $kg^{-1}$) | (20.4) | (15.7) | (13.3) | (11.1) | (6.3) | (18.2) | (8.2) | (1.3) | (0.9) | (6.1) | (4.4) | (3.5) | (45.3) | (24.8) | (21.2) | (8.5) |

(Nie et al., 2018)

**Table S4 Results of repeated measures ANOVA demonstrating the effects of N additions and sampling time on inorganic N contents, $R_m$, $R_n$, and $R_l$. Pillai's trace from multivariate testing was used for within-subject testing when the assumption of multisample sphericity was not met.**

| | Treatment/effect | *F*-value | *P*-value |
|---|---|---|---|
| $NH_4^+$-N | Time | 12.08 | 0.219 |
| | Time × N | 3.28 | 0.034 |
| | N | 1.91 | 0.206 |
| $NO_3^-$-N | Time | 45.38 | < 0.0001 |
| | Time × N | 1.494 | 0.103 |
| | N | 10.223 | 0.004 |
| $R_m$ | Time | 429.8 | 0.037 |
| | Time × N | 0.97 | 0.554 |
| | N | 4.66 | 0.036 |
| $R_n$ | Time | 1753 | 0.018 |
| | Time × N | 0.996 | 0.536 |
| | N | 4.106 | 0.049 |
| $R_l$ | Time | 50.91 | 0.108 |
| | Time × N | 1.079 | 0.48 |
| | N | 5.787 | 0.21 |
| $N_2O$ | Time | 4.189 | 0.003 |
| | Time × N | 1.373 | 0.118 |
| | N | 5.571 | 0.003 |

**Table S5 Results of repeated measures ANOVA of functional gene abundances. Pillai's trace from multivariate testing was used for within-subject testing when the assumption of multisample sphericity was not met.**

| | Treatment/effect | *F*-value | *P*-value |
|---|---|---|---|
| AOA | Time | 16.44 | 0.003 |
| | Time × N | 0.910 | 0.533 |
| | N | 1.319 | 0.334 |
| AOB | Time | 23.85 | 0.001 |
| | Time × N | 0.784 | 0.633 |
| | N | 18.235 | 0.001 |
| *nirK* | Time | 0.857 | 0.477 |
| | Time × N | 6.747 | < 0.0001 |
| | N | 1.076 | 0.413 |
| *nosZ* | Time | 9.154 | 0.012 |
| | Time × N | 1.61 | 0.425 |
| | N | 1.231 | 0.36 |

**Table S6 The rates of annual $N_2O$ emission with N addition**

| $N_2O$ flux （$\mu g\ m^{-2}\ h^{-1}$） | Control | LN | MN | HN |
|---|---|---|---|---|
| 2015 | 40.4 (6.5) b | 54.8 (5.8) b | 52.7 (5.3) b | 95 (9.0) a |
| 2016 | 45.1 (5.7) a | 46.2 (5.4) a | 48.5 (6.1) a | 57.0 (5.7) a |

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