

Response of soil N mineralization and nitrification to N additions in three subtropical forests in southern China

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Dissolved ammonium nitrate was applied monthly or bimonthly onto the forest floor of two young forest (a pine forest and a pine and broadleaved mixed forest, both about 70 years old) and one old-growth forest (greater than 400 years old, evergreen broadleaved) in southern China over 5 years, to investigate how nitrogen (N) input influences soil net N mineralization and nitrification. These three forests have been experiencing high atmospheric N deposition in the last two decades (20-50 kg N ha⁻¹ yr⁻¹ in precipitation) and a considerable amount of N leaching has been observed. Six monthly field incubations were performed during the study period using the intact tube incubation method. Our results showed that in situ rates of soil net N mineralization was significantly higher in the pine forest (7.7 mg N kg⁻¹ mo⁻¹) and old-growth forest (8.2 mg N kg⁻¹ mo⁻¹) than in the mixed forest (4.4 mg N kg⁻¹ mo⁻¹). The difference among forest types was more pronounced for net nitrification rate, which was approximately 4 times higher in the pine and mixed forests than in the mixed forest. No alteration of soil N transformation rate was observed during the five years of N additions in the mixed forest, while N additions resulted in substantial increases in the pine forest after 1.5 year. In the old-growth forest, N mineralization and nitrification significantly increased in the second year of N additions but decreased since the third years. Our results suggest that the responses of soil N microbial processes are determined largely by the duration of N treatment and by forest types (or soil N status) in the study region.

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