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Research Article

Intensified Precipitation Seasonality Reduces Soil Inorganic N Content in a Subtropical Forest: Greater Contribution of Leaching Loss Than N_2O Emissions

Jie Chen, Yakov Kuzyakov, G. Darrel Jenerette, Guoliang Xiao, Wei Liu, Zhengfeng Wang, Weijun Shen

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Abstract

Soil nitrogen (N) loss has been predicted to intensify with increased global precipitation changes. However, the relative contributions of leaching and gaseous N emissions to intensified N losses are largely unknown. Thus, we simulated intensified precipitation seasonality in a subtropical forest by extending the dry season via rainfall exclusion and increasing the wet-season storms via irrigation without changing the total annual precipitation. Extending the dry season length increased the monthly mean soil NO_3^- content by 25%–64%, net N mineralization rate by 32%–40%, and net nitrification rate by 25%–28%. After adding water in the wet season, the monthly NO_3^- leaching was enhanced by 43% in the relatively dry year (2013, 2,094-mm annual rainfall), but reduced by 51% in the relatively wet year (2014, 1,551 mm). In contrast, the monthly mean N_2O emissions were reduced by 24% in 2013 but increased by 78% in 2014. Overall, the annual inorganic N content was decreased significantly by the precipitation changes. Decrease of soil inorganic N might be linked to the enhanced NO_3^- leaching in 2013, and be linked to the increased N_2O emissions in 2014. However, in both years the annual total amount of N lost through leaching was significantly greater than that through N_2O emissions. The enhanced N_2O emissions driven by wet-season storms were correlated with an increase in *nirS* abundance. Our results suggest that increased frequency of droughts and storms will decrease soil inorganic N content in warm and humid subtropical forests mainly through enhanced leaching losses.

Citing Literature

Supporting Information

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jgrg21332-sup-0001-2018JG004821-SI.docx Word 2007 document , 4.3 MB	Supporting Information S1

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