Nitrous oxide flux from soil amino acid mineralization.
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Abstract:
Nitrous oxide (N2O) production in soils results from both aerobic and anaerobic processes, complicating efforts to predict N2O flux in nonfertilized soils. We have been monitoring N2O efflux and environmental influences on N2O production in semi-arid soils with a wide range in N contents. Surface N2O fluxes ranged from 0.05 mg m$^{-2}$ d$^{-1}$ in low N sites to 0.46 mg m$^{-2}$ d$^{-1}$ in high N sites during periods when soils were moist and warm, but decreased when soils were dry or cool. We were unable to produce anaerobic denitrifier N2O in laboratory incubations unless highly labile C (glucose) was added to soils, indicating that aerobic processes dominate N2O production in these semi-arid soils. We hypothesized that the soil amino acid (AA) composition is linked to C and N mineralization in these soils, and used data from laboratory incubations to develop a model to quantify the contribution of AA mineralization to N2O production. Our model, using CO2 respired from incubated soils as a measure of organic matter C mineralization, a preincubation soil AA composition of each soil, and the N2O-N conversion rate from AA mineralization, effectively predicted the range of N2O production by soils in laboratory incubations. Results indicate that N2O production in nonfertilized soils is a predominantly aerobic process that can be predicted by moisture, temperature, and AA composition.

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