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Isotopic signatures of microbial pathways of N_2O production and consumption inferred from *in situ* soil surface emission and depth soil gas samples

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Measurements of $\delta^{15}N^{bulk}$, $\delta^{15}N^{\alpha}$, $\delta^{15}N^{\beta}$, $\delta^{18}O$ of N_2O on *in situ* soil emissions and gas samples collected during the rainy season in a tropical forest (Tapajos National Forest, TNF, Pará, Brazil), and in a tropical agricultural corn field ("Fundo Tierra Nueva", Guárico State, Venezuela) show that we can differentiate the N_2O production and consumption pathways by means of N_2O stable isotopic values alone. The Brazilian Amazon Rain Forest natural soil gas samples from this study produced N_2O that was isotopically heavier in both bulk ^{15}N and ^{18}O than the Venezuelan agricultural corn field. We did not find a statistically significant difference between the ^{15}N site specific emission-weighted average from the Brazilian Amazon soils and the Venezuelan agricultural corn field, suggesting that the site specific determinations might not be as useful to partition natural soils versus agricultural soils sources as the bulk ^{15}N isotopic composition is. The relationship between $\delta^{15}N^{\alpha}$, and $\delta^{15}N^{\beta}$, versus $\delta^{18}O$, was, however, a robust indicator of a significant N_2O reduction to N_2 via denitrification in the Brazilian Amazon soils prior to emission. The Brazilian Amazon soils and the Venezuelan agricultural field show that most of the N_2O emitted to the atmosphere is denitrification-derived given the similar site specific emission weighted average values found for both places.