Amazon forest tree species composition influences soil fluxes of CO2 and N2O

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Carbon dioxide (CO2) and nitrous oxide (N2O) are important greenhouse gases, but the mechanisms controlling their emissions from tropical systems are still poorly understood. For example, models using soil microclimate variables typically fail to capture large spatial and temporal variability, especially in N2O. We tested the hypothesis that tree species composition influences trace gas emission, possibly through its effects on local litter chemistry, root chemistry, and root exudation. We established a spatially distributed sampling scheme (across 50 ha in the Tapajós National Forest near Santarém, Brazil) with flux measurement points located near a stratified sample of 10 different canopy and emergent tree species. Our initial results indicate that the species identify of individual trees significantly influenced the magnitude of nearby N2O fluxes, and that soil parameters like bulk density, moisture and temperature could not by account for observed flux variability. We also found evidence that species-specific leaf hyperspectral reflectance spectra that have been used to predict leaf nitrogen variations may also be useful in predicting the magnitude of N2O fluxes observed near different species. These results suggest that information on species distributions may improve estimates of ecosystem scale fluxes of important trace gases, and that hyperspectral remote sensing techniques may be useful in acquiring the relevant ecosystem-scale information to make such estimates.

Science Theme: TG (Trace Gases)

Session: 2C: Trace Gases and Aerosols

Presentation Type: Oral

Abstract ID: 90

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