Do plant species influence soil gas fluxes in tropical forests?

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Large spatial variability of soil gas fluxes remains a cause for significant uncertainty in the global budgets of CO_2 and N_2O. In tropical forests spatial variability can be substantial because soil gas fluxes are dependent on carbon inputs (litter or root components) from the trees into the soil. To assess whether tree species influence soil gas fluxes, we measured soil gas fluxes close (<3m) to and away (>10m) from the stem of large individuals of 15 tree species at 3 Ultisol and 2 Oxisol sites within the Tapajos National forest south of Santarém, Pará, Brazil. In addition to soil gas fluxes we measured air and soil temperature, bulk density, soil moisture, pH, tree growth rate and total biomass within 3m of each flux location. We found that site, tree species and soil texture do not influence soil CO_2 fluxes from terra firme soils, though overall and within site soil CO_2 fluxes close to large trees (21.8±0.58 Mg-C ha^{-1} y^{-1}, mean±SE) are 45% higher than away from trees (15.0±1.0 Mg-C ha^{-1} y^{-1}). Site, tree species, and soil texture do influence soil N_2O fluxes. Mean N_2O fluxes at the km 67 and 83 sites were respectively 96 and 147% greater than at the km 72 site and respectively 147 and 211% greater than N_2O fluxes at the sandy sites. Site comparison by species revealed that half of the species and the controls did not differ significantly between the km 67, 72, and 83 sites. On Ultisols mean N_2O fluxes close to *Caryocar villiosum* ($133.4_{21.2}^{25.2}$ µg-N m^{-2} h^{-1}) are ~2.5 times larger than close to *Erisma unicinatum* ($42.2_{5.4}^{6.3}$ µg-N m^{-2} h^{-1}) and *Voychsia maxima* ($36.6_{6.5}^{7.9}$ µg-N m^{-2} h^{-1}) individuals. We conclude that tree species can influence soil N_2O fluxes within tropical forests and that local biomass or stem proximity influences CO_2 fluxes.

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