Geophysical Research Abstracts
Vol. 21, EGU2019-1281, 2019
EGU General Assembly 2019

Soil-tree-atmosphere gas exchanges CO_2, CH4, and N2O in a tropical rainforest, in French Guiana

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Ecosystem and Functional Ecology; Forests and Woodlands

Climate change is due to increased concentrations of the three main greenhouse gases (GHG), $i.e.$ CO_2, CH_4 and N_2O. Tropical forests contain about 30% of global soil carbon (C) stocks but, because of warm temperature and soil conditions, are characterizes by rapid C turnover rates. In fact, tropical forest soils are the largest natural sources of CO_2 and N_2O and can be significant sinks of CH_4. However, the net global warming potential (in terms of CO_2equivalent) from GHG exchanges with tropical forest ecosystems is not well known, because there have been very few simultaneous direct and long-term measurements of the fluxes.

To date, the vast majority of research on GHG fluxes has been focused on forest soils. Very recently, studies demonstrated that tropical tree stems can act as conduits of soil-produced trace GHGs, but efforts should be pursued to have a detailed picture of distribution of the GHG among different compartments of tropical forest ecosystems ($i.e.$ soil, tree stems, leaves).

In this context, during my PhD project, emphasis will be placed on CO_2, CH_4 and N_2O exchanges between soil, stem, foliage and atmosphere combining gas chamber setups and eddy-covariance technics in a tropical forest, in French Guiana. Indeed, I will examine the role of tropical tree compartments on GHG fluxes to better understand GHG dynamics and balance. To carry out this study, measurements on CO_2, CH_4 and N_2O fluxes include fluxes from a flux tower and forest soils, at semi hours' time scale, which provide a wealth of eddy covariance- and soil chamber-based GHG flux data. I will extend these measurements with gas exchanges from tropical tree stems and canopy leaves on different tree species. More specifically, I will set up experiments to define seasonal variations in CO_2, CH_4 and N_2O fluxes in tree stems and leaves and disentangle main environmental drivers thereof.