Tropical trees as Conduits for Connecting Belowground Microbial Processes to Aboveground Methane Emissions at the Terrestrial Aquatic Interface

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Our project investigates the influence of trees on methane emissions from both flooded (varzea) and *terra firme* forest sites along the Amazon river near Santarem, Brazil. In our first year we (1) identified a site for the flooded forest tower (east of the community of Pixuna across the Amazon river from Santarem); (2) ordered tower parts and instruments for the tower for eddy covariance measurements of methane, carbon dioxide, water and energy; (3) equipped the *terra firme* tower for initial methane flux measurements (started this rainy season with borrowed equipment from AmeriFlux); (4) mentored honors college undergraduate engineering students to design and test chambers for soil/water and tree stem flux system for the flooded site; (5) made initial manual measurements of soil and tree stem fluxes and sampled soil microbial communities in the dry and wet season, and (6) engaged with media liaisons and graduate students from the ASU Cronkite center to document the science process through photo and video shoots and interviews. Initial measurements with the new Licor 7810 (portable CH_4, CO_2, H_2O analyzer) in the dry season/start wet season demonstrated that tree stem methane fluxes were ~10 times larger in the varzea site than the upland site ($63.5_{27.9}^{49.}$ vs $6.0_{2.9}^{4.9}$ **µ**g-C m^{-2} h^{-1} respectively; t-test *P<0.0001*), whereas stem carbon dioxide fluxes were only marginally significantly different between the sites (varzea 163±34 vs upland forest 114±35 mg-C m^{-2} h^{-1}; t-test *P=0.04*). Stem methane fluxes in the dry season appeared to be related to stem wood density with trees with higher wood density showing lower fluxes. Dry season soil fluxes at the upland forest showed mainly methane consumption whereas the varzea sites had mainly methane production (-27_{15}^{19} vs 59_{42}^{58} **µ**g-C m^{-2} h^{-1}, respectively; t-test *P<0.0001*). Soil carbon dioxide fluxes were only marginally different between sites (varzea 271±113 vs upland forest 170±30 mg-C m^{-2} h^{-1}; t-test *P=0.08*). We will discuss these results also in light of the microbial communities as that data becomes available. The next step will be to measure the stem and soil fluxes in the wet season, in late May, when the varzea site will go through the maximum flooding stage.