

## Poster #1-1

### Root Phosphatase Response to Elevated CO<sub>2</sub> is Tree Species Dependent

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A source of major uncertainty in understanding the global carbon cycle is the response of tropical forests to altered climatic regimes, in particular – the duration and magnitude of the tropical carbon sink. The Next Generation Ecosystem-Experiments – Tropics project is a model- data driven endeavor that focuses on uncovering underlying mechanisms that regulate the exchange of CO<sub>2</sub> between tropical forests and the atmosphere. Decades of research have shown a consistent trend of increasing plant growth with elevated CO<sub>2</sub> – presuming adequate water and nutrients. However, phosphorus is often a limiting nutrient in tropical forests and it is still unclear how phosphorus limitation may constrain responses to elevated CO<sub>2</sub>.

A recent modeling study by Yang et al. 2016 showed that phosphorus limitation could constrain NPP under elevated CO<sub>2</sub>, suggesting an important role for belowground mechanisms to alleviate phosphorus limitation. In tropical forests, a large amount of phosphorus is locked into organic compounds, which must be mineralized by phosphatase enzymes released from plants and microbes prior to uptake. To improve ecosystem models, root and microbial functions that potentially alleviate P limitation are important to take into account, driving our study to test whether elevated CO<sub>2</sub> does increase phosphatase activity and whether it could be related to root morphological traits, microbial community composition, and leaf functional traits.

In collaboration with the Smithsonian Tropical Research Institute we grew seedlings of four tropical tree species: *Inga spectabilis*, *Adenanthera pavonina*, *Tabebuia rosea*, *Tabebuia guaycan* in greenhouses at ambient (400 ppm CO<sub>2</sub>) or elevated (800 ppm CO<sub>2</sub>) conditions for four months. We measured root and soil phosphatase, root morphology, photosynthesis, and we will extract DNA and RNA for microbial community composition and function. Initial ANOVA results with tree species and treatment as factors indicate that response to elevated CO<sub>2</sub> is likely tree species dependent. All tree species except for *I. spectabilis* showed increased root specific phosphatase, though individual t-tests show that the elevated CO<sub>2</sub> response was significant only in *A. pavonina* (p <0.05). Plant biomass and total root phosphatase were positively correlated, where the largest plants, which belonged to the tree species *I. spectabilis*, also had the highest total phosphatase activity. Further work with this dataset will explore connections between root phosphatase and other root and leaf functional traits to better understand the role of traits in diverging elevated CO<sub>2</sub> response and their possible model implications for the tropical carbon sink.