Poster #116

Plant Physiological Thermal Acclimation of Understory Shrubs in a Puerto Rican Tropical Rainforest.

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Tropical forests cycle more carbon than any other biome, yet there is still inadequate data to predict how these critical ecosystems will respond to Earth's warming climate. Previous research suggests that tropical species are currently operating at or near their thermal optimum temperatures and, due to the narrow temperature ranges, tropical plant species may be unable to physiologically acclimate to predicted shifts in temperature regimes. This study presents initial results of plant physiological responses to the first-ever field-level warming experiment in a tropical forest: Tropical Response to Altered Climate Experiment (TRACE). In a Puerto Rican tropical rainforest, three 4-m diameter forest understory plots were heated 4°C above mean ambient surface temperature of three control plots using infrared heaters. We tested for thermal physiological acclimation of two common understory shrub species, *Psychotria brachiata* and *Piper glabrescens*, by measuring the instantaneous photosynthetic, stomatal conductance, and respiratory responses to elevated temperatures. Pre-treatment measurements were taken in January and August of 2016, TRACE warming treatments were initiated in October 2016, and post-treatment measurements were taken in January 2017 after three months of warming. Heated plants showed evidence of acclimation, with higher photosynthetic optimal temperatures (T_{opt}); however, maximum photosynthetic rates (A_{opt}) and overall carbon uptake was lower in heated than control plants. Preliminary data suggest that the declines in photosynthesis above the optimum temperatures is due to stomatal closure. Leaf respiration rose exponentially with temperature, and preliminary data show evidence for respiratory acclimation. Results suggest that, while these plants may be acclimating by shifting their photosynthetic peaks to warmer temperatures, net CO_2 uptake may be overall suppressed or unchanged. We also present the results of a pilot study where we developed and tested a novel leaf-warming device which will be installed in the forest canopy using an access tower near the TRACE understory warming experiment in the Summer of 2017. The device successfully warms individual or groups of canopy leaves 3°C degrees above an adjacent control leaf. When combined with the understory warming experiment, we will have a synthetic mechanistic view of how both canopy and understory tropical species may respond to future, warmer temperatures.