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The effects of warming on tropical forest Net Ecosystem Exchange

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I present the results of two experiments. In the first, leaves and branches of mature trees, lianas, and gap species were warmed in an Amazonian forest for 4 months to observe the effect of warming on photosynthesis, stomatal conductance, and transpiration. Electric resistance heaters increased air temperatures near the leaves by approximately 2ºC. Sunlit leaf temperatures increased by 2–3ºC on average, but during some periods leaf temperatures increased by 45ºC. Maximum photosynthesis (Amax) decreased significantly in the warmed leaves vs. the control leaves over the 13-wk study period with an average decrease in Amax of 1.4 umol/m2s (19% decrease from a mean Amax of 7.2 umol/m2s) when measured at 30ºC and there were no signs of acclimation to higher temperatures within existing leaves. In the second, I investigated whether the increase in daytime Net Ecosystem CO2 uptake (NEE) during smoky periods in an Amazon forest is caused by increased irradiance in the lower canopy, which results from increased above canopy diffuse light, or by decreased canopy temperature, which results from decreased above canopy net radiation. I found that the increase in CO2 uptake at high aerosol optical depths is primarily a result of increased shaded light in the subcanopy (accounting for $\sim$80%) and to a lesser extent the effect of decreased canopy temperature (accounting for $\sim$20%).