Diurnal and Seasona Trends in Canopy Transpiration and Conductance of Pristine Forest Types in Belize, Central America.

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Abstract:

Five semi-deciduous broadleaf forest types growing over tropical karst in Belize, Central America, were monitored for three years to study diurnal and seasonal changes of transpiration and micro-meteorologic conditions. The Rio Bravo region where the study was conducted, is situated along limestone plateaus in the E-central part of the Yucatan peninsula at the northern transition zone between tropical rainforests and semi-deciduous forest with one pronounced drought period annually.

The hypothesis was tested that tropical tree species respond to drought (1) by shedding foliage, (2) by reducing transpiration through stomatal regulation, or (3) by continuing to transpire in direct relation to the atmospheric water vapor deficit until the water supply is depleted. Measurements of tree transpiration demonstrated that upland broadleaf forest species responded to drought in one of three hypothesized ways or often in a combination of these ways with one response dominating. The most important factor for actual tree transpiration is the vapor pressure gradient in the forest canopy. While the irradiation influences mainly exposed tree canopy leaves and their stomatal response, the contribution from emergent and dominant trees to the total water consumption of three forests is small. Water availability from the soil can become the limiting factor when the topsoil changes its water permeability seasonally, thus favoring a extremely drought tolerant, xeromorphic vegetation on normally flooded areas. To assess the stand water balance, the complexity of tropical forests in regard to canopy architecture seems to be less important than the identification of physiological response types with different water conservation strategies.

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