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ABSTRACT	Transpiration in humid tropical forests modulates the global water cycle and is a key driver of climate regulation. Yet, our understanding of how tropical trees regulate sap flux in response to climate variability remains elusive. With a progressively warming climate, atmospheric evaporative demand [i.e., vapor pressure deficit (VPD)] will be increasingly important for plant functioning, becoming the major control of plant water use in the twenty-first century. Using measurements in 34 tree species at seven sites across a precipitation gradient in the neotropics, we determined how the maximum sap flux velocity (vmax) and the VPD threshold at which vmax is reached (VPDmax) vary with precipitation regime [mean annual precipitation (MAP); seasonal drought intensity (PDRY)] and two functional traits related to foliar and wood economics spectra [leaf mass per area (LMA); wood specific gravity (WSG)]. We show that, even though vmax is highly variable within sites, it follows a negative trend in response to increasing MAP and PDRY across sites. LMA and WSG exerted little effect on vmax and VPDmax, suggesting that these widely used functional traits provide limited explanatory power of dynamic plant responses to environmental variation within hyper-diverse forests. This study demonstrates that long-term precipitation plays an important role in the sap flux response of humid tropical forests to VPD. Our findings suggest that under higher evaporative demand, trees growing in wetter environments in humid tropical regions may be subjected to reduced water exchange with the atmosphere relative to trees growing in drier climates.
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