Title: Relationships between plant hydraulic traits, gas exchange, and species demography in Panama

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Project Abstract:
Climate change is impacting community demographics of tropical forests globally, but the underlying drivers and mechanisms of these responses are not understood. We investigated how species' physiological traits were associated with demographic trends and changes in climate over a 30-year monitoring period at Barro Colorado Island (BCI), and across an additional 71 sites with species composition inventories distributed along a moisture gradient across Panama. For all sites we collected associated species' trait data from published sources. The community dynamics of evergreen tropical tree species at BCI exhibited the expected life history trade-off of species having high mortality rates, fast growth rates, and high recruitment rates on one end of the continuum, and species on the other end of the continuum showing the opposite patterns. Xylem vulnerability to cavitation was the only tested trait that correlated with the life-history strategies, with fast-living species having more vulnerable xylem than slow-living species. The only significant relationship between demographic rates and climate variables was with temperature and mortality; hotter years exhibited higher mortality. However, despite substantial climate variability, there were no significant temporal changes in community weighted physiological traits at BCI over the monitoring period. Patterns across the regional transect, in contrast, exhibited large variation in response to local climate, with some particularly surprising hydraulic- and carbon-based trait trade-offs. These results suggest that forest communities adapt to local site conditions over longer-time scales than monitored at BCI, and indicate that for the forest at BCI, community-trait shifts may be slower than the rapid and variable changes in climate, potentially resulting in rising mortality as temperature increases.