OOS 11-5 - Does Amazon forest leaf phenology mediate transpiration seasonality and hence, ecoclimate teleconnections?

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Tuesday, August 8, 2017: 9:20 AM

Portland Blrm 258, Oregon Convention Center

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Background/Question/Methods

Recent work suggests that high rates of Amazon forest transpiration in the late dry season moisten the boundary layer, triggering earlier onset of the deep atmospheric convection and the start of the wet season. Hydro-meteorological principles imply that this flux pattern should emerge whenever soil water supplies are adequate to allow increasing solar energy input during the dry season to drive increasing evaporation of soil water. However, the ecological mechanisms that mediate this seasonal pattern are unclear. Dry season increases in leaf area index could increase transpiration, but recent remote sensing and LiDar studies suggest that LAI varies little during the dry season. Dry season increases in average stomatal conductance, due to changes in

leaf age and leaf demography, offer another mechanism for increasing dry season transpiration.

Here, we investigated whether leaf aging and seasonal shifts in leaf demography in a central-Amazon forest could regulate the seasonality of atmospheric water fluxes. We assessed how stomatal conductance varies with leaf age and how leaf demographic composition (leaf age categories) varies over the dry season. We examined the magnitude of variation in transpiration during the dry season at this site by partitioning transpiration from eddy covariance-derived evapotranspiration.

Results/Conclusions

We found that stomatal conductance reaches a peak when leaves are mature (fully expanded and green) and declines thereafter. On average, mature leaves had 34% greater stomatal conductance than old leaves. For many trees, the emergence and development of new leaves early in the dry-season thus drives an increase in the preponderance of recently mature, high-conductance leaves over the course of the dry season, potentially explaining observations of increasing whole-forest evapotranspiration during this time.

This work suggests that the timing of leaf phenology in intact forests may play a role in preserving the earlier onset of wet seasons at larger scales, and hence the ecoclimate teleconnections that follow from seasonality.

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