

Response of a seasonally dry tropical forest to interannual rainfall variability

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Abstract

Seasonally dry tropical forests (SDTFs) are well adapted to seasonal and interannual rainfall variability and have mechanisms to control growth dynamics under water limitation. The forest starts flushing the leaves following the first rainfall events of the wet season, after which it grows fast and remains green until litterfall starts at the end of the wet season. Although ecosystem adaptation is known to buffer seasonal rainfall variability, yearly fluctuations in biomass productivity are still observed. In order to understand the origin of these productivity fluctuations, here we analyze the effects of rainfall variability (seasonal, interannual, and spatial) on the growth dynamics of an SDTF located in the semi-arid region of Brazil. We used a coupled soil water and vegetation model to simulate soil moisture and NDVI dynamics in three sites across a rainfall gradient (from 400 to 800 mm year⁻¹) to compute specific assimilation (kA) and respiration (kR) rates for 19 hydrological years. Based on the time-series of the rainfall and kA, the analysis shows that in all three sites kA tends to increase following dry years and to decrease following wet ones, whereas kR is about ten times smaller and does not vary particularly over time. The observed patterns of kA and kR suggest an interannual mechanism to buffer long-term rainfall variability and mitigate water stress by tuning assimilation rates.





