



Semi-arid ecosystem response under seasonal hydroclimatic forcings

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The interannual variability of seasonal rainfall has been observed to change in conjunction with the magnitude, timing, and duration of seasonality. Such changes are especially pronounced in several seasonality hotspots around the world, including in the semi-arid regions of northeast Brazil. Rainfall variability, combined with a generally low rainfall amount and high year-round potential evapotranspiration, poses challenges here for plant survival in the local ecosystems of dry forests and managed pastures. As a result, the native vegetation has adopted many physiological and phenological strategies to deal with the yearly alteration between favorable (wet) and adverse (dry) growing conditions, including drought deciduousness and succulence. To understand the ecosystem-level response to future changes in climate seasonality, we adopt a new model for resolving the seasonal trajectory of stochastic soil moisture, coupled to a vegetation growth model that accounts for various plant water use strategies and phenological adjustments. This is validated using satellite data (e.g., NDVI) and field surveys, with special attention to the role of water storage capacity of the ecosystem, which governs hysteretic responses under seasonal forcings, and may ultimately determine ecosystem resilience and recovery after periods of drought.