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Resilience of tropical dry forests to climate change

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Tropical dry forests (TDFs) worldwide have an environment-sensitive phenological signal, which easily marks their response to the changing climatic conditions, especially precipitation and temperature. Using TDF phenology as a proxy, this presentation aims to evaluate the current continental response of TDFs to climate change across the Americas. In our study we use a meta-analysis that integrates the MODIS Enhanced Vegetation Index (EVI), climatic variables, and in-situ litterfall data. The first analysis evaluates the relationship between MODIS-EVI and in-situ litterfall as it fits into the global context. Secondly, the relationship between MODIS-EVI and precipitation in wet and dry years, under severe and moderate drought, and under multi-year droughts is used to understand the resilience and physiological response of forests under water stress conditions. The second analysis looks at the long-term trends in MODIS-EVI (from 2000-2018) to determine if there have been significant trends. These trends correlate with changes in biophysical variables including soil moisture, length of growing season, temperature, precipitation, and successional stage. Trends and correlations in Annual Net Primary Productivity (ANPP) were tested for statistical significance and regressed against biophysical variables. Finally, a significant difference between neutral, El Niño and La Niña years are analyzed. Our results indicate that statistically significant phenological changes are observed in TDFs away from the equator, with significantly increasing ANPP in Mexico and significantly decreasing ANPP in Brazil and Argentina. Our MODIS-EVI and hydro-climate analysis indicates that TDFs are drought adapted, with the recovery of normal Water Use Efficiency (WUE) within one year after a drought ending. Severe droughts take two years to recover normal WUE but are resilient to the current climatic conditions across all sites in the Americas. Climate scenarios for the future are variable across the Americas, making it difficult to determine with certainty whether the entirety of this biome will remain resilient, but there is a strong indication that the TDFs will remain resilient to reduce precipitation.