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To What Extent Can Variability of Tropical Vegetation Growth Be Predicted Using Sea Surface Temperatures?

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Sea surface temperature (SST) largely controls spatiotemporal changes in global precipitation, temperature and radiation, modulating terrestrial ecosystem productions, especially in the tropical region, where the most productive biome on earth exists. The lag in response of terrestrial ecosystem to SST variations from different ocean regions, however, offers a unique opportunity to investigate the predictability of tropical vegetation growth with SST even several months in advance. Using latest fine spatial resolution remote-sensing vegetation indexes, observation-based GPP products, and SST indexes from different ocean basins (e.g., the Pacific, Atlantic, and Indian) for the period 2000–2013, we thus aim to address the following scientific questions. How does ecosystem production react to SST dynamics on seasonal to intra-seasonal time scales? Which SST index or combination of SST indexes has the most pronounced influences on the tropical ecosystem dynamics? How many months do SST index lead the onset of vegetative responses? How well does the empirical model based on the understanding of vegetation responses to SST can predict vegetation dynamics? We will examine the predictability of vegetation dynamics in response to SST based their correlations and regressions with SST for selected historical period (e.g., 2000-2012). We will establish an empirical model with optimal parameters for the hindcast prediction. We will then validate the stastical model against independent observations that were not involved in the model construction (e.g., the same observations for year 2013 or different observational data). We will finally evaluate the reliability of the statistics-based model at extracting key oceanic impacts on tropical terrestrial ecosystem production using dynamic experiments of ACME driven by observed SST.