Title: Hydroclimatic Controls over Global Variations in Phenology and Carbon Flux

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Abstract

The connection between phenological and hydroclimatological variations are quantified through joint analyses of global NDVI, LAI, and precipitation datasets. The global distributions of both NDVI and LAI in the warm season are strongly controlled by three quantities: mean annual precipitation, the standard deviation of annual precipitation, and Budyko's index of dryness. Upon demonstrating that these same basic (if biased) relationships are produced by a dynamic vegetation model (the dynamic vegetation and carbon storage components of the NCAR Community Land Model version 4 combined with the water and energy balance framework of the Catchment Land Surface Model of the NASA Global Modeling and Assimilation Office), we use the model to perform a sensitivity study focusing on how phenology and carbon flux might respond to climatic change. The offline (decoupled from the atmosphere) simulations show us, for example, where on the globe a given small increment in precipitation mean or variability would have the greatest impact on carbon uptake. The analysis framework allows us in addition to quantify the degree to which climatic biases in a free-running GCM are manifested as biases in simulated phenology.