



## **Minimum growth controls the inter-annual variability of GPP for tropical evergreen forest**

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Tropical evergreen forests contribute big parts of the terrestrial gross primary productivity (GPP) variabilities. Recent studies illustrate that the variability in GPP is controlled by vegetation phenology and physiological processes through various biotic and abiotic factors in temporal and boreal biomes. However, it is still unclear whether the seasonality and physiology controls the GPP inter-annual variabilities (IAV) in tropical biomes and how they interact with the environmental factors. In this study, we used 34-year (1980-2013) of GPP (FLUXCOM GPP) time-series, gridded chlorophyll fluorescence (SIF) data and two sites of eddy-covariance data to demonstrate that the GPP IAV in three tropical forests could be explained (Amazon, 95%; Africa, 84% and South East Asia, 99%) by the combination of two physiological variables, scalared maximum growth (GPPmax) and minimum growth (GPPmin). For 76% of the tropical evergreen forest areas, GPPmin is the dominant variable in controlling the GPP IAV. Further hydrometeorological analysis showed that it was because the response ratio of GPPmin to rainfall is higher than that of the GPPmax. These findings highlight the asymmetric seasonal responses of plant productivity to hydrometeorological factors and indicate a relative important focus on the dry days in tropical forest management.