Confronting satellite and field measurement data to improve the understanding of carbon uptake by tree growth in French Guiana

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Climate models predict a range of changes in the amazonian region, including increased frequency of extreme climatic events, increased average temperatures, increased atmospheric CO2 and reduced rainfall intensity.

Understanding tree growth response to climate is important because wood production is the main way carbon enters the forest ecosystem. The response of tropical tree growth to changing climate could drive a change in the direction of the flux from terrestrial ecosystems to the atmosphere.

Recently, the intra-annual variation of chlorophyll activity in Amazonia and in French Guiana has been assessed with the Enhanced Vegetation Index (EVI) from the MODIS satellite data. Unexpectedly, the peak increase in biomass (early wet season), estimated by diameter growth, was not correlated with the peak in chlorophyll activity (early dry season) in French Guiana. This could reflect different timing in the use of photosynthesis products by the plant for primary growth, i.e. shoot growth and leaves production, and secondary growth, i.e. diameter increment.

Here we use three datasets covering French Guiana at an intra-annual time scale, MODIS EVI data, modeled intra-annual tree growth data and climate data, to (i) disentangle the timing of carbon use by the trees for primary growth and secondary growth; (ii) analyze the climate determinants of these two components of growth; and (iii) predict the effect of climate change with IPCC scenarios outputs on the carbon entry in the forests of French Guiana.