EGU22-9641
https://doi.org/10.5194/egusphere-egu22-9641
EGU General Assembly 2022


# Carbon cycle responses in the Amazon region to large scale climatic modes of variability

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Drying is expected in many regions of the world by the end of the 21st century under increased greenhouse gas emissions. Climate projections robustly indicate that the tropical Amazon region is particularly sensitive to future climate change. On the one hand, an increased occurrence of heat and aridity events may largely impact the main vegetation processes in the coming decades. On the other hand, these extreme heat and drought events interfere with and are mediated by slowly changing climatic conditions, primarily those associated with raising $CO_2$ concentrations, that could alleviate negative impacts of global warming on regional ecosystems and carbon stocks. In this context, the relationship between extreme climatological events and climatic modes of variability plays a critical role. Throughout the tropics, El Niño Southern Oscillation (ENSO) is the predominant mode regulating vegetation's carbon dynamics, with significant reductions in terrestrial carbon uptake being related to increased temperatures and decreased precipitation associated with its Niño positive phase. However, its future amplitude and contribution to extreme climatological events and consequently to tropical atmosphere-carbon fluxes is still debated in the scientific community. At the same time, the importance of other modes of variability on the terrestrial vegetation dynamics and carbon sinks remains unexplored. On this premise, this research aims at filling this gap of knowledge by exploiting the results of several Earth System Models (ESM) simulations contributing to CMIP6 for three future scenarios: ssp585, ssp370, and ssp534-over. Given its importance for the balance of the global carbon cycle, the focus of the analysis is on the Amazon region. In this contribution, we will illustrate multi-model results concerning the projected future behavior of selected climatic modes of variability that are known to affect the Amazon region. A special focus will be on climate modes' characteristic timescales and amplitudes since these could effectively enhance or damp climatological extremes.