

GC21H-03 Drought and tree mortality in tropical rainforest: understanding and differentiating functional responses

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Our understanding of how forests respond to drought is especially constrained with respect to widespread tree mortality events. This limitation is particularly clear for tropical forests, despite the risk of drought to these ecosystems during the coming decades. We present new findings from the only current long-term 'ecosystem-scale' (1 ha) rainfall manipulation experiment in tropical rainforest, the Esecaflo experiment at Caxiuana National Forest, Para State, Brazil. Throughfall has been partially excluded from experimental forest at the Esecaflo experiment for more than a decade. We have previously demonstrated a capacity to model short-term physiological responses well, but longer term physiology and ecological dynamics remain challenging to understand and represent. In particular, high mortality and increased autotrophic respiration following extended drought are poorly understood phenomena, and their interaction with hydraulic responses and limitations needs to be characterised. We present initial data that for the first time combine carbon use and hydraulic metrics, comparing drought-vulnerable and non-vulnerable species that have experienced extended soil moisture deficit, as imposed in the experiment, also considering the response in soil respiration. We also discuss how these findings can be used to develop future empirical and modelling studies aimed at improving our capacity to predict the effects of drought on tropical forest ecosystems in Amazonia and in other tropical forest regions where species characteristics and environmental constraints may influence both short and long-term responses to drought.

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