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A model to predict CWD residence times in tropical forests along an altitudinal gradient in Australia

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More reliable knowledge on the complex responses of vegetation to climate change is one of the most urgent needs for tropical forest preservation and recent data models indicate an increase of tree mortality in tropical forests as a consequence of climate change[1]. Coarse woody debris dynamics in tropical forests remain poorly understood[2]. Tropical forests are known for possessing a wide range of wood densities- with different wood traits and secondary wood chemical components-, adding complexity to the accurate estimations of coarse woody debris residence times (τ). Quantifying τ in these ecosystems along an altitudinal gradient provides a way to improve our understanding of carbon dynamics in the face of climate change.

This study examines τ from different tree tropical forest species -ranging from soft to hardwoods- and under different decay status, to understand the effects of climate on the chemical and physical decay of CWD on an elevation gradient from 102 m above sea level (MAT = 23.7˚C) to 1500 m above sea level (MAT = 16.7˚C) in Australia. Wood density together with Carbon:Nitrogen ratio enabled prediction of the variation in τ between decay classes within tree species, between tree species and along the elevation gradient. τ increased with decreasing the decay status, increasing wood density and temperature also played an important role as τ increased with increasing site elevation. The study also highlighted the importance of including seasonal variation of climate in short term field studies, as a single wet season reduced the τ of the CWD compared to τ after a year of exposure. Intraspecific variation of plant traits and secondary wood chemicals explained the observed range in τ for species with similar wood densities, decreasing with increasing decayed status of the samples. This study will aid in the development of predictive relationships between wood density and environmental variables to infer carbon dynamics at local and global scale through the creation of a model to predict τ.

[1]Phillips, O. L., *et al*., (2010). Drought–mortality relationships for tropical forests. *New Phytologist*, **187**, 631-646.[2]Cornwell, W. K., *et al*., (2009). Plant traits and wood fates across the globe: rotted, burned, or consumed?. *Global Change Biology*, **15**, 2431-2449.