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Compositional response of Amazon forests to climate change

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Abstract

Abstract Most of the planet's diversity is concentrated in the tropics, which includes many regions undergoing rapid climate change. Yet, while climateinduced biodiversity changes are widely documented elsewhere, few studies have addressed this issue for lowland tropical ecosystems. Here we investigate whether the floristic and functional composition of intact lowland Amazonian forests have been changing by evaluating records from 106 longterm inventory plots spanning 30 years. We analyse three traits that have been hypothesized to respond to different environmental drivers (increase in moisture stress and atmospheric CO 2 concentrations): maximum tree size, biogeographic waterdeficit affiliation and wood density. Tree communities have become increasingly dominated by largestatured taxa, but to date there has been no detectable change in mean wood density or water deficit affiliation at the community level, despite most forest plots having experienced an intensification of the dry season. However, among newly recruited trees, dryaffiliated genera have become more abundant, while the mortality of wetaffiliated genera has increased in those plots where the dry season has intensified most. Thus, a slow shift to a more dryaffiliated Amazonia is underway, with changes in compositional dynamics (recruits and mortality) consistent with climatechange drivers, but yet to significantly impact wholecommunity composition. The Amazon observational record suggests that the increase in atmospheric CO 2 is driving a shift within tree communities to largestatured species and that climate changes to date will impact forest composition, but long generation times of tropical trees mean that biodiversity change is lagging behind climate change.

Keywords: Amazon rainforest, climate change, tree community composition, functional traits, tree size, wood de

Full text

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