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# Biogenic Volatile Organic Compound emission patterns in tropical tree species: linking isoprene/monoterpene emission capacity and resource allocation strategies

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Around 1-2% of the net C production by land vegetation is re-emitted to the atmosphere as Biogenic Volatile Organic Compounds (BVOCs). Besides de small contribution to C balance, BVOCs play important roles in biogeochemical and physical processes, as well as in biosphere-atmosphere interactions, by influencing atmospheric oxidative capacity and potentially forming secondary organic aerosols. Isoprene and monoterpenes account for the largest amount of global fluxes, but emission patterns by species are still puzzling and hinder accurate modeling. Estimates are that only about 30% of tree species can emit isoprene, and that this capacity has evolved and been lost multiple times during evolution. Isoprene emission mitigates heat and drought stress in leaves, and hypotheses suggest that emission capacity would be associated with sun-exposed, high canopy trees. All tree species are capable of emitting monoterpenes, but there are major differences in compound structural diversity and magnitude of emissions. Monoterpenes are usually associated with defense strategies against herbivory, and higher emission rates, storage and compound diversity would potentially be observed in perennial, shade-tolerant trees. In terms of plant C production costs, monoterpene emissions and storage should be more costly compared to isoprene emissions. We hypothesize that there is a trade-off relationship between isoprene and monoterpene emission capacities, and that this trade-off is linked to the fast-slow plant economics spectrum, which groups species according to the allocation of carbon towards growth (fast trees) or survival (slow trees) strategies. We predict that the capacity to emit isoprene tends to appear in fast trees, whereas higher total C costs, emission rates, storage and diversity of monoterpenes are more associated with slow trees. We measured isoprenoid leaf flux, storable isoprenoid content, photosynthetic rate, stomatal conductance and plant functional traits of i) leaf (leaf area, specific leaf area, leaf dry matter content, leaf thickness, force to tear, stomatal size and density, leaf vessel density), ii) wood (stem and twig wood density, stem and twig wood water content, active xylem depth), and iii) whole-plant (proportions of basal area to total height, active xylem area to basal area, crown area/volume to basal area) for 30 Amazonian tree species (3 individuals per species) of 17 families. Measurements were carried out from October to December 2018 at the Amazonian Tall Tower Observatory (ATTO) experimental plots in the central Brazilian Amazon. We will present multivariate relationships between isoprenoids and plant functional traits that reveal the influence of resource allocation strategies on the mysterious evolutionary pattern of emissions. A better mechanistic understanding will improve emission estimates for unmeasured species, and thereby improve the scaling of emission estimates across tropical forests. To the authors' knowledge, this is the first research that approaches isoprenoid emission patterns from the perspective of a broad set of plant functional traits. Considering that global climate change will possibly affect species turnover and composition of Amazonian tree communities and that BVOC emissions are dependent on species diversity and strategies, this new approach may shed light on future patterns of global BVOC fluxes and hence impacts in ecosystem-atmosphere dynamics.