Biogenic Volatile Organic Compound Emissions from A Changing Amazon: The Effect of Climate and Land Use Changes On Emissions

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Abstract

Biogenic Volatile Organic Compounds (BVOCs) are emitted to the atmosphere mostly by plants. They have diverse functional roles at multiple scales, from cellular protection and defense at the foliar level through chemical signaling within and among plants to regulating large-scale biogeochemical processes, such as the effect on atmospheric chemical composition and contribution to aerosol formation. The Amazon forests comprise the dominant source of BVOCs to the global atmosphere, and, over the last four decades, several studies have measured BVOC concentrations in the air, mainly in central Amazonia. Yet, while there is much to be investigated in undisturbed forests, the Amazon is already undergoing changes in land use and climate, especially in the Amazon Arc of Deforestation, where BVOC emissions and related processes at the biosphere-atmosphere interface may be changing in ways we do not yet understand. This study aimed to identify and quantify the main BVOCs emitted by trees and crops in a changing Amazon region. We measured the above-canopy BVOC concentration and leaf-level BVOC emissions of crops (cotton and corn) and dominant tree species in a mosaic of disturbed forest fragments and agricultural fields in southwestern Amazonia during the wet and dry seasons of 2023. Surprisingly, our preliminary results showed higher emissions of monoterpenes (MT) and sesquiterpenes (SQT) (up to six times higher) compared to isoprene for most trees and crops, and we suggest that this may be related to increased abiotic stresses (e.g., heat and drought) in this region. However, our ambient air measurements showed much lower concentrations of MT and SQT compared to isoprene, indicating that the atmosphere in this region is very reactive and that only leaf-level measurements are likely to give us a true measure of monoterpene and sesquiterpene emissions for predicting their influence on atmospheric chemical-physical processes in this changing Amazon region.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

GEIA: Global Emissions Initiative