



The science plan for AmazonFACE, a large-scale Free Air CO₂ Enrichment Experiment in the Amazon rainforest

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Tropical rainforests play an important role in the global carbon cycle. They store massive amounts of biomass in their trees and soils, and contribute to climate mitigation by removing carbon from the atmosphere through photosynthesis. In a large-scale free-air CO₂ enrichment (FACE) experiment in a highly diverse, old-growth, tropical forest in the Brazilian Amazon, we will assess the ecosystem responses to rising atmospheric CO₂ concentrations. The main questions are (1) whether elevated atmospheric CO₂ directly and sustainably stimulates photosynthesis (the so-called CO₂-fertilization effect) and (2) will reduce stomatal conductance, leading to reduced water loss at leaf-level and whether this will result in canopy-scale changes in transpiration and soil water availability, (3) how low nutrient availability (particularly phosphorus) will limit the CO₂-fertilization effect, and (4) whether elevated CO₂ concentration will alter the functional composition of vegetation. Also the role of biodiversity (through functional traits) and socio-environmental implications of CO₂ fertilization will be investigated, with a focus on impacts, adaptations and the science-policy interface. Through integrative modelling activities, the long-term goal of the project is to improve the projections of the Amazon rainforest carbon cycle and regional and global climate under increasing atmospheric CO₂ concentrations. We here present the AmazonFACE science plan, give an update on the state of the experiment construction and show baseline measurements and simulation results.

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