Ecosystem fluxes during drought and recovery in an experimental forest

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Severe droughts endanger ecosystem functioning worldwide. We investigated how drought affects carbon and water fluxes as well as soil-plant-atmosphere interactions by tracing 13 CO 2 and deep water 2 H 2 O label pulses and volatile organic compounds (VOCs) in an enclosed experimental rainforest. Ecosystem dynamics were driven by different plant functional group responses to drought. Drought-sensitive canopy trees dominated total fluxes but also exhibited the strongest response to topsoil drying. Although all canopy-forming trees had access to deep water, these reserves were spared until late in the drought. Belowground carbon transport was slowed, yet allocation of fresh carbon to VOCs remained high. Atmospheric VOC composition reflected increasing stress responses and dynamic soil-plant-atmosphere interactions, potentially affecting atmospheric chemistry and climate feedbacks. These interactions and distinct functional group strategies thus modulate drought impacts and ecosystem susceptibility to climate change.

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