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Water stress and their implications on the ecohydrology of rainforests

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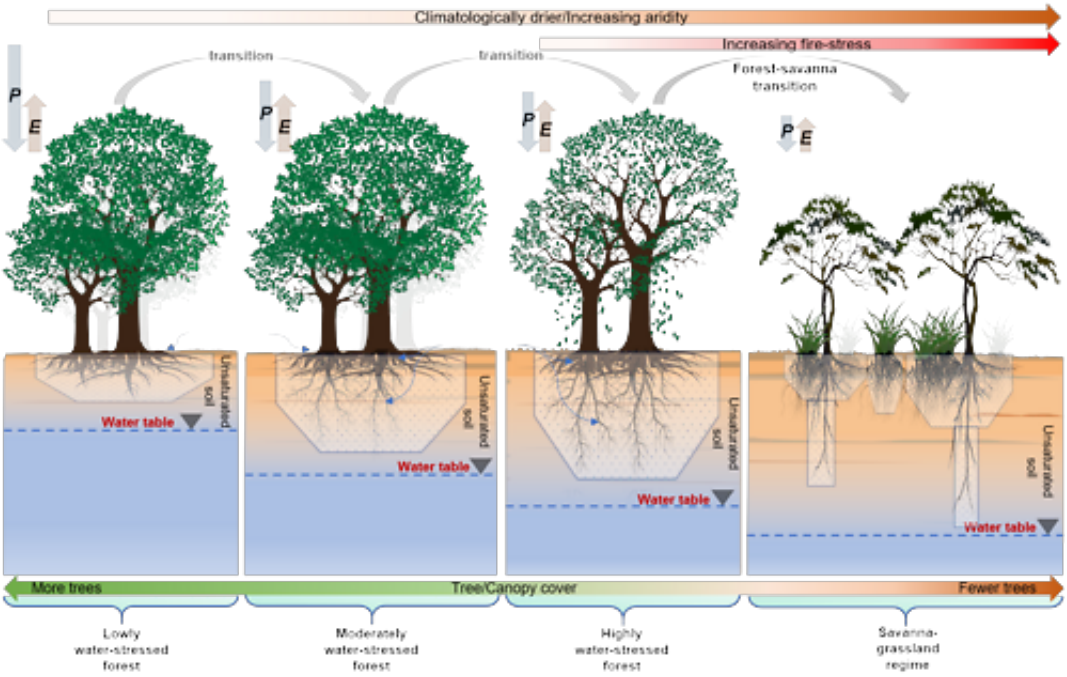
Rainforests have been a major controller of local and global climate by maintaining carbon stocks and regulating global water cycle. However, the water cycle is increasingly impacted by climate change and ongoing deforestation, which forces rainforest ecosystems to adapt differently to increasing water-stress. To understand future rainforest dynamics towards changing hydroclimate, their resilience capacity to future changes and estimating potential tipping points, it is detrimental that we quantify moisture available to vegetation. However, due to the physical limitations in quantifying subsurface moisture availability of terrestrial ecosystems at continental scales, only rainfall is considered a primary control variable to represent the forest's ecohydrological status. In the present study, using remote-sensing derived rootzone storage capacity (S_r), we analyze the water-stress and drought coping strategies along rainforest-savanna transects in South America and Africa at different tree cover densities. We further classified the ecosystem's adaptability to water-stress into four classes: *lowly*, *moderately*, *highly* water-stressed forest, and *savanna-grassland* regime using empirical and statistical analysis. Based on these analyses, we can show that forests subsequently invest in their rooting strategy and modify their above-ground forest cover in response to the water-stress experienced by it. We observed that remote sensing-based rootzone storage capacity reveals important subsoil forest dynamics and can act as an important hydroclimatic stress indicator for vegetation. Monitoring of rootzone storage capacity helps open new paths to understanding the eco-hydrological state, ecosystem resilience, and adaptation dynamics in a rapidly changing climate.



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