Geophysical Research Abstracts
Vol. 21, EGU2019-1806, 2019
EGU General Assembly 2019
© Author(s) 2018. CC Attribution 4.0 license.

How do plants share water sources in a rubber-tea agroforestry system during the pronounced dry season?

Junen Wu, Wenjie Liu, and Chunfeng Chen

CAS Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Xishuangbanna Prefecture, China (wujunen@xtbg.ac.cn)

Extensive cultivation of rubber plantations in Xishuangbanna in southwest (SW) China has resulted in negative hydrological consequences, particularly drought, during the pronounced dry season. Although rubber-tea agroforestry is regarded as the most successful agroforestry system for improving the sustainability of rubber agriculture and environmental conservation, plant water use patterns and their related interactions have rarely been examined in such systems. How do coexisting plants compete and share water under water deficit remains to be explored. Therefore, we used stable isotope (δ^2H and δ^{18}O) methods to determine the spatial water use patterns of both rubber trees and tea trees in a rubber-tea agroforestry system during the pronounced dry season and explored the movement of soil water in this system. The results of the MixSIAR model (a Bayesian mixing model) indicated that tea trees primarily uptake water from the 5–30 cm soil layer (40.3%, on average), and rubber trees primarily uptake water from the 30–80 cm soil layer (35.3%, on average) and absorb soil water evenly along slopes during the dry season. These results suggest that rubber trees and tea trees have different but complementary water use patterns. We also observed that the soil of the uphill and downhill tea rows contained much more water; however, the collaborative hydraulic redistribution in the studied agroforestry system could redistribute the soil water along the slope and below the ground well. Therefore, soil drought on terraces can be alleviated during the dry season. Our results confirmed that the tea tree is an appropriate crop for intercropping with rubber trees when considering water sharing and water management and provided a practical analysis of water use benefits from a rubber agroforestry system during drought stress.