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Trees influence preferencial flow and water uptake in tropical savanna

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To address potential competition between trees and grasses for soil water, and to disentangle the main process responsible for local soil water dynamics in pasture ecosystems, we conducted a study of the soil water content and water source partitioning of grasses and trees within a pasture in the Copan River catchment, Honduras. We used differences in the 2H/1H (δD) isotopic signature of soil water (δSW) and the local meteoric water line (LMWL; δLMWL) as a relative index of evaporation, following a recent model proposed by Hasselquist et al (under review). The model uses Lc-excess calculated as the absolute value of the difference between measured δD and that predicted by the local meteoric water line (lc-excess = ¦δDM – δDP¦). Lc-excess values close to zero indicate little difference between soil water samples and local precipitation, whereas larger values indicate a greater degree of evaporation .()...(adapted from Landwehr and Coplen, 2006). From the relation between Lc-excess and SWC, we can tease apart different processes by which trees influence local soil water dynamics, where one such processes indicate that if preferential flow, i.e quick flows through macropores that by-pass the soil matrix, is the main pathway for water movement in the soil, then the Lc-excess values of soil water at deeper depths will be closer to zero than those of the surface soil, whereas relatively higher Lc-excess values would indicate increasing dominance of matrix flow. We found that soil underneath trees was wetter than underneath grasses at the dry season and we can relate this with a lack of clear relationship between Lc-excess and SWC and with the tree´s apparent shift to groundwater sources for root uptake especially in the dry season. Due to the positive correlation between Lc-excess and SWC under trees and due to the lower Lc-excess values found at subsoil below trees during the dry season, we can infer that preferential flow is also facilitated by the trees enhancing its contribution to groundwater recharge. The possible water losses via interception linked with trees on the soil water dynamic was counterbalanced by the positive contribution of trees to preferential flow and groundwater recharge.