# Dry season source water partitioning in contrasting tropical ecosystems of Costa Rica

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June 14, 2022

## Abstract

Tracer-aided studies to understand source water partitioning in tropical ecosystems are limited. Here we report dry season source water partitioning in five unique ecosystems distributed across Costa Rica in altitudinal (<150-3,400 m asl) and latitudinal (Caribbean and Pacific slopes) gradients: evergreen and seasonal rainforests, cloud forest, Páramo, and dry forest. Soil and plant samples were collected during the dry season (2021). Plant and soil water extractions (triplicates) were conducted using controlled centrifugation. Stem water extraction efficiency and stem water content were calculated via gravimetric measurements. Water source contributions were estimated using a Bayesian mixing model. Isotope ratios in soil and stems exhibited a strong meteoric origin. Enrichment trends were detected mainly in stems and cactus samples within the dry forest ecosystem. Soil profiles revealed nearly uniform isotopic profiles; however, a depletion trend was observed in the Páramo ecosystem below 25 cm depth. More enriched compositions were reported in cactus samples for extracted water volumes above ˜20% ( *Adj.* $r^2$=0.34, $p$<0.01). The most prominent dry season water source in the evergreen rainforest (74.0%), seasonal rainforest (86.4%), and cloud forest (66.0%) corresponded with soil water. In the Páramo ecosystem, recent rainfall produced by trade wind incursions resulted in the most significant water source (61.9%), whereas in the dry forest, mean annual precipitation (38.6%) and baseflow (33.1%) were the dominant sources. The latter highlights the prevalence of distinct water uptake sources between recent cold front's rainfall to more well-mixed soil moisture during the dry season.

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