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Soil moisture dynamics in an amazonian tropical forest

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Master's student Regison de Oliveira inspecting sensors in a 17-m-deep pit in an old-growth forest at the Tropical Silviculture Experimental Station north of the City of Manaus, Amazonas State, Brazil. Photo by Dr. Marcelo Mota.

Soil moisture plays a key role in hydrological, biogeochemical, and energy budgets of terrestrial ecosystems. Therefore, accurate soil moisture measurements are important, especially in the Amazon, the largest continuous tropical forest in the world. Time domain reflectometry (TDR) sensors are widely used to measure soil moisture and require site calibration to convert the TDR's dielectric permittivity measurement (K_a) to volumetric water content ($?_v$).

In a recently published *Vadose Zone Journal* article, researchers developed a site-specific calibration of TDR sensors in an old-growth upland forest in the central Amazon, evaluated the performance of the calibration, and then applied it to determine the dynamics of soil moisture content within a 14.2-m-deep vertical soil profile.

They found that the widely used K_a–$?_v$ relationship (Topp model) underestimated the calibrated water content ($?_v$) by 22–42%, indicating significant error in the Topp model when applied to well-structured, clay-rich tropical forest soils. The calibrated $?_v$ data showed a variety of depth and temporal variations, highlighting the importance of soil textural differentiation, root uptake depths, as well as event to seasonal precipitation effects.

Data like this can help improve our understanding of ecohydrological processes within tropical forests as well as models of these systems in the face of changing environmental conditions.

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Negrón-Juárez, R., Ferreira, S.J.F., Mota, M.C., Faybishenko, B., Monteiro, M.T.F., … & Chambers, J.Q. (2020). Calibration, measurement, and characterization of soil moisture dynamics in a central Amazonian tropical forest. *Vadose Zone Journal*, *19*, e20070. **https://doi.org/10.1002/vzj2.20070**

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