

Waeber, E. L., Wankmüller, F. J. P., Di Bert, S., and Carminati, A.: Plant Effective Conductance Fails to Predict Soil–Plant Hydraulics in Sandy Soils, EGU sphere [preprint], <https://doi.org/10.5194/egusphere-2026-5107>, 2026.

It is a well-known fact that human survival undoubtedly relies on the survival of plants and trees for food production, respiration, natural filtration, and cooling functions. Therefore, research on plants and trees—specifically their critical survival factors—constantly grows in importance due to humanity's reliance on them.

In this research, the authors study water uptake by plants through a series of conductance. In other words, since the exact nature and mechanism of plant water uptake from soil is unknown, the authors evaluate two distinct models. The first is a plants-only model, which assumes that the hydraulics of varying soil types are not important. The second model considers both plant and soil hydraulics to create a fully defined framework, acknowledging that the actual underlying science remains partially unknown. Based on these models, the authors claim that the plants-only model works well in fine-grained soils such as clay and silt loam, but fails in coarser-textured soils like sandy loam. Based on the current version of the manuscript, the following points are brought forward for discussion:

1) There is a distinct lack of alignment regarding the designated soil classification across different sections of the paper. The **title of the manuscript** asserts that plant effective conductance fails to predict soil-plant hydraulics specifically in "**sandy soils**." Conversely, the **abstract** narrow-focuses this claim, specifying that the model fails in coarser-textured soils like "**sandy loam**" [lines 10–11].

According to standard soil taxonomy, "sandy soil" is a generic broad class, whereas "sandy loam" represents a specific texture class with a distinct sand-silt-clay ratio. This mismatch introduces ambiguity regarding the true experimental boundaries and definitive outcomes of the study. The authors must harmonize the terminology across the title, abstract, and text to accurately reflect the exact soil textures tested.

2) Throughout the manuscript (e.g., figure 1, line 146, and line 153), the authors consistently distinguish between their two frameworks by calling them the "simple model" and the "complex model." Labeling frameworks as "simple" or "complex" introduces an unnecessary layer of subjectivity into a scientific text; complexity is relative and varies based on a reader's perspective. To establish a more structured and rigorous presentation, the authors should abandon these subjective descriptors. Instead, the frameworks should be renamed based on their underlying physics and integrated components—for instance, the "plants-only model" versus the "coupled soil-plant hydraulic model."

3) In the plants-only model [lines 154-155], the authors implement an assumption where k_s approaches infinity. However, an explicit, formal definition of the parameter k_s is entirely missing from the current text. Furthermore, the manuscript asserts that as k_s tends to infinity, the root-surface soil-root interface water pressure head ($h_{s,r}$) collapses to the bulk soil water pressure head ($h_{s,b}$) [lines 154-155].

It is presumed that this logic is derived from Equation (5). In Equation (5), if the parameter C_s is mathematically proportional to the saturated hydraulic conductivity (k_{sat}), root length (L_{root}), and supplementary architectural parameters, then an infinite k_{sat} will cause C_s to approach infinity. Within the operational formula for $h_{s,r}$, an infinite denominator drives the

term E/C_s to zero, thereby simplifying the expression to $h_{s,r} = h_{s,b}$. If this represents the authors' underlying derivation, it establishes that k_s is functionally utilized as the **saturated hydraulic conductivity** in Equation (5). The authors must explicitly clarify whether this is the intended mechanism. Furthermore, they must provide the explicit mathematical steps and parameter definitions that justify the assumption that $h_{s,r} = h_{s,b}$, as these formal derivations are currently absent.

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PROFESSIONAL SUMMARY

Computational Hydrologist, Systems Architect, and Environmental Modeler with a proven track record of engineering high-velocity software and mathematical solutions to complex catchment anomalies. Expert in continental-scale hydrological datasets, Physics-Informed Machine Learning, and high-resolution gridded watershed frameworks. Core contributions include solo-engineering the foundational spatial integration of the multi-million-element USGS NHDPlus dataset into the United States national grid using Soil and Water Assessment Tool (SWAT), and serving as the principal technical architect behind the 3D mathematical physics modeling for Singapore's sovereign urban stormwater initiatives.

CORE TECHNICAL COMPETENCIES

Hydroinformatics Frameworks: Expert in orchestrating multi-scale water frameworks and hydroinformatics pipelines using engines like SWAT.

Geospatial Engineering: Full-stack development across ESRI enterprise ecosystems and advanced open-source spatial stacks.

Intelligent Modeling: Design and deployment of Physics-Informed Machine Learning models.

Advanced Analytics: Production-grade integration of spatio-temporal statistical pipelines, custom APIs, and advanced clustering matrices.

CONCISE CAREER TRAJECTORY & IMPACT

- **One Tool Any Country (OTAC) Global Framework (Ongoing):** Conceptualized and independently developing a multi-year global Python framework fusing surface/groundwater, water quality, and climate science with GCMs, satellite imagery, and advanced ML pipelines.
- **Continental-Scale Big Data Integration:** Executed the integration of the multi-million-element **USGS NHDPlus** watershed dataset into the United States national grid using the **SWAT**.
- **Enterprise Software Engineering Support:** Engineered custom codebase workarounds for enterprise clients directly at **ESRI Headquarters (Redlands, CA)**.
- **Sovereign Infrastructure Modeling:** Modeled 3D rain garden physics at the **National University of Singapore (NUS)**, directly defining Singapore's National Bioretention Guidelines.
- **Academic Instruction:** Delivered advanced undergraduate engineering curriculum covering core disciplines in hydrology, hydraulics, and fluid mechanics.

SCIENTIFIC SERVICE & GOVERNANCE

- **Interactive Scientific Peer Review:** Contribute analytical commentaries within the interactive open-access review platforms of **Hydrology and Earth System Sciences (HESS / European Geosciences Union)**, driving technical accountability in climate and hydrological literature (e.g., *hess-2023-275*).
- **Selected Peer-Reviewed Publication:** Mylevaganam, S., Srinivasan, R., & Singh, V. (2015). Ecohydrologically Driven Catchment Evaluation and Prioritization. *Open Journal of Applied Sciences*, 5, 325-334.

EDUCATION & CREDENTIALS

M.S. in Spatial Science (Hydrology) | Texas A&M University, USA

- MS GPA: 4.0/4.0 | Doctoral Coursework GPA: 3.78/4.0

M.Eng. in Water Engineering and Management | Asian Institute of Technology, Thailand

- Coursework GPA: 3.83/4.0 | Research GPA: 4.0/4.0

B.Sc. Eng. in Civil Engineering | University of Moratuwa, Sri Lanka

- GPA: 3.86/4.0 | First Class Honors