

7) The mathematical formulation of the underlying physics is detailed extensively in Section 2.1 of the current manuscript. However, it is noted that Figure 1 already incorporates almost all of the detailed mathematical formulations discussed within this section. Consequently, presenting the exact same equations in both the body text and the visual schematic introduces an unnecessary layer of repetition.

The rationale for keeping such an identical, dual formulation across both the text narrative and the figure layout is not clear. To improve readability, streamline the manuscript, and eliminate this redundancy, the authors should decouple these elements. It is highly recommended to either scale back Section 2.1 to focus strictly on the conceptual physical mechanisms and governing assumptions, or strip the heavy mathematical symbols from Figure 1 so it serves purely as a conceptual flowchart.

8) The "Author Contributions" section indicates that the primary author (EW) performed the conceptualization, formal analysis, methodology, software development, visualization, and preparation of the original draft, while the co-authors (FJPW, SDB, AC) primarily provided supervision, funding acquisition, and editorial review.

If the primary author is a postgraduate or graduate student and this manuscript constitutes a core requirement for their degree completion, the inclusion of supervisors as formal co-authors raises a critical question regarding academic integrity and institutional evaluation procedures. A postgraduate degree is explicitly awarded based on a candidate's capacity to demonstrate rigorous, independent research. Because research supervisors frequently serve as the internal evaluators or committee members responsible for assessing the student's independent competency, claiming co-authorship on the primary degree output introduces a conflict of interest, potentially clouding the objectivity of the academic evaluation process.

Furthermore, standard international publishing ethics dictate that providing routine supervisory feedback, proofreading, or editing does not inherently justify peer-reviewed authorship credit. Extending authorship on these grounds sets a problematic precedent that could logically extend to journal reviewers and editors who provide structural edits.

To ensure full transparency, prevent supervisory favoritism, and preserve the integrity of the degree-granting process, the handling editor should require a formal, signed statement from the institutional supervisors. This declaration must explicitly verify that this specific manuscript is entirely independent of the first author's primary degree requirements and graduation claims. The handling editor should carefully scrutinize this declaration to ensure that the work represents a fair, uncompromised evaluation of the student's research output.

9) In the current implementation of the forward simulation framework ([HydraulicModel_comparison.py](#)), the plant hydraulic calibration parameters are constrained by the following optimization boundaries defined within the `run_de()` function:

`Bounds = [R_root: (0.03 * 107, 0.15 * 107), h0_x: (-27000, -15000), tau: (3, 9)]`

However, a structural inconsistency arises when evaluating these bounds against the driving gradient defined in the same script:

```
h_b = -1*np.arange(10,15010+100,dx, dtype=int)
```

If the global optimization engine samples an $h0_x$ value deep within the prescribed bounds (e.g., -25,000 cm), it parameterizes the plant to withstand extreme hydraulic tensions that the simulated bulk soil water potential matrix (h_b) never experiences. Consequently, the governing non-linear xylem cavitation equations are never physically triggered or evaluated during the forward simulation timeline. Because $h0_x$ remains outside the active operating envelope of the soil drying sequence, the objective function loses sensitivity to this parameter. Therefore, to establish a mathematically unconstrained yet physically responsive calibration space, the search bounds for $h0_x$ must directly intersect the window where the plant experiences severe, physiologically relevant drought stress.

SIVARAJAH MYLEVAGANAM, M.S., M.Eng.

Computational Hydrologist | Systems Architect | Environmental Modeler

Email: mylevaganamsivarajah@gmail.com

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