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December 20, 2025

Editor-in-Chief
Environmental Modelling & Software

Dear Editor-in-Chief,

We are pleased to submit the manuscript entitled *"Control-aware physics-informed reinforcement learning for adaptive irrigation under climatic uncertainty"* for consideration for publication in *Environmental Modelling & Software*.

This study proposes a control-aware modelling and learning framework for intelligent irrigation management under stochastic climatic forcing. The work is motivated by a growing need, within the EMS community, for environmental models that are not only physically interpretable but also explicitly compatible with closed-loop decision-making and adaptive control. While physics-based soil–water models remain central to irrigation modelling, their direct integration with learning-based controllers raises challenges related to numerical stability, interpretability, and reproducibility. Our contribution addresses these challenges directly.

The manuscript makes three core contributions aligned with EMS priorities:

- A *control-aware* soil–water modelling abstraction that preserves mass balance and interpretability while remaining numerically stable under repeated policy exploration.
- A structured and reproducible comparison of rule-based control, physics-based RL, and hybrid neuro-physical control under identical soil and climatic forcing, isolating controller effects from physical-model discrepancies.
- A hybrid formulation in which a Neural ODE-inspired residual model (implemented in discrete time) corrects control-relevant model mismatch while preserving the physical backbone; the residual is exposed to the controller for error-aware decisions.

Importantly, the proposed framework is not intended as a high-fidelity ecohydrological simulator. Instead, it is deliberately positioned as a control-oriented abstraction for adaptive decision-making under uncertainty. The appendices explicitly position this choice relative to Richards-equation-based and ecohydrological formulations, clarifying intended use.

The manuscript is original, has not been published elsewhere, and is not under consideration by any other journal. All authors have approved the submission.

Thank you for considering our manuscript for publication in *Environmental Modelling & Software*.

Sincerely,

Raymond Houé Ngouna
(on behalf of all authors)