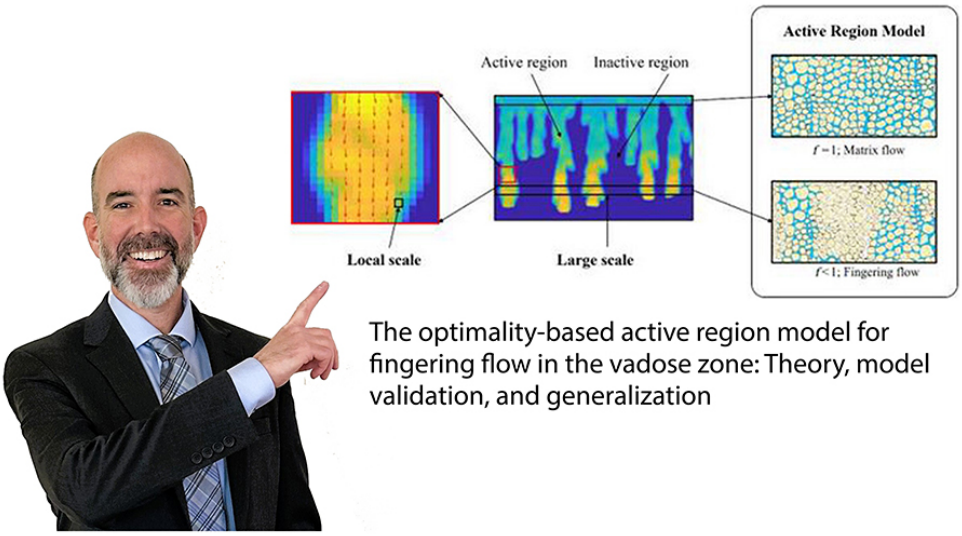
Science Societies

President's pick: SSSA Research July 2026

By Aaron Lee M. Daigh

June 25, 2026



The optimality-based active region model for fingering flow in the vadose zone: Theory, model validation, and generalization

Exciting new research is shared every day among the scientific community in our journals. SSSA is the sole publisher of the Soil Science Society of America Journal and Vadose Zone Journal, and co-publisher of the Journal of Environmental Quality and Agricultural & Environmental Letters with CSSA and ASA.

Each month, I will pick one or two articles among our journals that represent some of the most exciting, creative, and innovative research in our field of soil science. This month, I have chosen the following article from *Vadose Zone Journal*. Congratulations to the authors and thank you for sharing your excellent work!

The optimality-based active region model for fingering flow in the vadose zone: Theory, model validation, and generalization

Fingering flow is a type of preferential flow in which infiltrating water gathers into a few fast, narrow fingers instead of soaking downward as an even front. It can appear even in uniform soil with no macropores, because the wetting front becomes unstable on its own, set by the physics of infiltration rather than by any pre-existing structures. This review presents the optimality-based active region model, informed by nonlinear thermodynamics and the idea that water self-organizes to minimize overall flow resistance. The model lets hydraulic conductivity depend on water flux, not saturation alone, and laboratory and field data support it well, offering a practical way to predict water and contaminant movement where fingering flow occurs.

Authors: H-H. Liu, Y. Liu, S. Zhang, J. Li, Y. Huang

Journal: *Vadose Zone Journal*

Article link: https://doi.org/10.1002/vzj2.70108

Vadose Zone Journal

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