

For the Hyporheic Zone, a Novel Thermodynamic Mechanism

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Objective

- To determine if biogeochemical activity in the hyporheic zone can be described by thermodynamic mechanisms.

New Science

- A four-part thermodynamic mechanism distinct from classical paradigms and governs the biogeochemical impacts of groundwater-river water mixing.
- This mechanism leads to nonlinearities through space and time in the concentration of dissolved organic carbon throughout the larger-scale hyporheic corridor.
- The ecology of microbes within the zone of stimulated activity is tied to biochemical processes distinct from those occurring in other parts of the system.



Significance

- Reveals novel mechanisms that must be accounted for within predictive hydro-biogeochemical models
- Demonstrates the larger scale consequences of small-scale processes, providing a point of reference for moving process knowledge across scales
- Indicates important feedbacks among organic carbon thermodynamics, biochemical mechanisms, microbial ecology, and dynamic hydrology