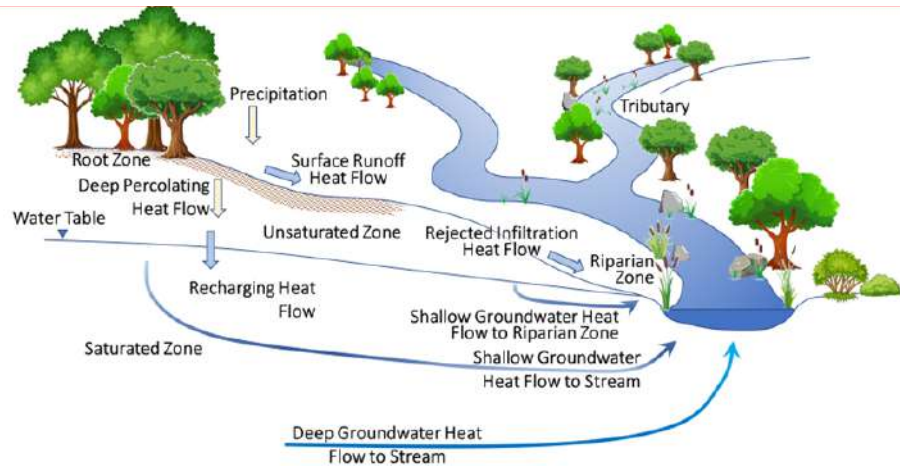


WATERSHED HEAT FLOWS, LAGS AND DAMPENING UNDER CLIMATE FORCING

OCTOBER 13RD 2023 AT 1.00 PM | AULA BIBOLINI, DIATI DOOR 3, GROUND FLOOR

ABSTRACT

Although there is widespread agreement that climates are warming, the response of aquatic ecosystems to that warming is not well understood. This work explores the role of distinct watershed pathways in lagging and dampening climate-change signals. It subjects a synthetic flow and transport model to a 30-year-warming signal based on climate projections. The system corresponds to a temperate watershed roughly 27 km on a side and consists of a) overland flow, b) infiltration through an unsaturated (UZ) zone above an unconfined sandy aquifer, and c) groundwater flow along shallow and deep pathlines discharging to surface water. Numerical simulations show about 40% of the warm-up applied to infiltration arrives at the water table – the UZ stores a large fraction of the upward trending heat signal. The warmed recharge flows through the saturated zone; only about 10% of the original warm-up signal is returned to streams. However, increases in the simulated streamflow temperatures are of similar magnitude as increases at the water table, due to addition of heat by storm runoff, which bypasses UZ and groundwater storage. An ongoing application to a real-world watershed in Wisconsin, USA using the synthetic methodology promises to extend the original findings in possibly surprising ways.



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BIO

Daniel T. Feinstein has worked in the field of quantitative hydrogeology for 30 years. He studied groundwater modeling at the New Mexico Institute of Mining and Technology and at the University of Wisconsin-Madison before working as a consultant on remediation projects for Papadopulos & Associates and Gerahty & Miller. In 1997 Mr. Feinstein joined the USGS where he specialized in interpretive studies involving regional groundwater modeling, simulation of groundwater/surface-water interactions, and contaminant transport. He recently headed up a pilot modeling study of the Lake Michigan Basin as part of a USGS program to determine the status, trends, and prospects of water availability in the United States. His current research interests include statistical models which emulate process-driven simulations of groundwater age and stream depletion by wells, and transport models which forecast heat flow under climate change. Mr. Feinstein is an adjunct professor at the Geosciences Department of the University of Wisconsin-Milwaukee and teaches modeling courses in Italy.

