
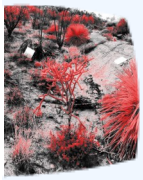
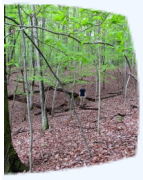

Presented By:
Ciaran Harman Ph.D.
Assistant Professor
Department of Environmental Health & Engineering
Johns Hopkins University

UCI Samueli School of Engineering | Department of Civil and Environmental Engineering

Environmental Engineering Seminar

Friday, October 21st
McDonnell Douglas Engineering Auditorium (MDEA)
1:30PM - 2:30PM

A Unified Approach To Hydrologic Flow & Transport In The Critical Zone

The transit time of water through hydrologic systems is a fundamental control on the biological and chemical transformations that occur within them. New approaches to characterizing these transit times are changing the way we interpret hydrologic tracer dynamics, and are generating more detailed insights into transit times through complex, time-variable hydrologic systems. However these analyzes have typically been separated from analyzes of the hydraulics that drive flow responses. In this talk I will introduce the current methods, and show how it is possible to extend them to generalize relationships between total storage and discharge (which underlie many hydrologic models) into a more nuanced relationship between the age distribution of storage and the age distribution of discharge. This unifies spatially-lumped representations of flow and transport into a single representation that captures the emergent result of interactions between celerity and velocity in hydrologic systems.

Results from a range of systems including small experimental watersheds, stream reaches and their associated hyporheic zones, an experimental lysimeter, and various simulated 'virtual experiments' will be presented in terms of this generalized framework. The results suggest ways that the structure of the transit time distributions, and their variability in time, can be related to the structure of the hydrologic system. This suggests, first, the proposed approach might form the basis of future lumped models of flow and solute transport at subwatershed scales, and second, future research in this area might focus on relating the emergent, unified, flow and transport properties revealed by this type of analysis to the structure of the critical zone.

Ciaran Hartman, Ph.D.
Postdoc 2012, University of Arizona
PhD 2011, University of Illinois at Urbana-Champaign
M.Sc. 2007, University of Illinois at Urbana-Champaign
B. Eng (First Class Honours) 2003, University of Western Australia
B.A. (Asian Studies) 2003, University of Western Australia