

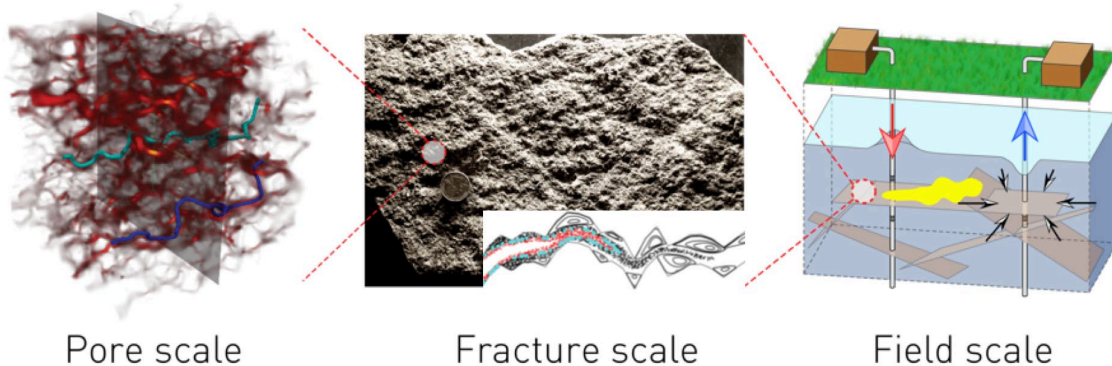
Understanding Anomalous and Reactive Transport in Hydrologic Systems: From Fracture Flows to Stream flows

Peter K. Kang

Department of Earth and Environmental Sciences, University of Minnesota

Fluid flow and reactive transport in porous and fractured media control many critical hydrologic processes from groundwater flows to hyporheic flows. However, predicting flow and transport in hydrologic systems is challenging due to the multi-scale heterogeneity that is ubiquitous in porous and fractured media. I will start by presenting various research projects that I have conducted to improve the predictability of fluid flow and mass transport in porous and fractured media. The examples span multiple scales: pore- to fracture- to field-scale (Figure).

In addition to the multi-scale heterogeneity, a wide range of flow regimes, from laminar to turbulent flows, occur in hydrologic systems, exerting additional challenges. For example, vortex flows in fractures and rivers may exert dominant control over solute transport and reaction. While the existence of vortices in hydrologic systems is well known, the effects of vortices on *transport* and *reaction* remains poorly understood. My research group recently investigated the effects of vortices on transport and reaction in hydrologic systems: from fracture flows to hyporheic flows to stream flows. Our results point to a heretofore unrecognized link between vortex flows and reactive transport in hydrologic systems.



Brief Bio: Peter Kang



I am a geoscientist whose research focuses on the physics of flow and reactive transport in porous and fractured media. I joined the Department of Earth and Environmental Science at the University of Minnesota as an assistant professor and a Gibson Chair of Hydrogeology in August 2018. I was a research scientist at Korea Institute of Science and Technology (KIST) from 2015-2018, and was a postdoctoral associate in the Earth Resources Laboratory (ERL) at MIT before joining KIST. I received my MSc (2010) and PhD (2014) in Civil & Environmental Engineering at MIT, and obtained BSc of Civil, Urban & Geosystem engineering at Seoul National University in South Korea with *summa cum laude* in 2008.