Geophysical Research Abstracts
Vol. 13, EGU2011-9349, 2011
EGU General Assembly 2011

Heterogeneity in river-groundwater interactions: Causes and effects over multiple scales

Aaron Packman
Northwestern University, Civil and Environmental Engineering, Evanston, United States (a-packman@northwestern.edu)

Many different mechanisms of river-groundwater interaction are now understood to occur over a wide range of spatial scales. At small scales, turbulent flow-boundary interactions are known to induce porewater flow at the grain scale. At intermediate scales, flow is induced by and around many different geomorphic features ranging from ripples to meanders. At large scales, regional groundwater flow systems interact with river channels to produce patterns of gaining and losing reaches. All of these flows interact to produce a complex mosaic of interfacial exchange between rivers and the subsurface, and this pattern changes over time as river and groundwater conditions vary. Most analyses of river-groundwater interactions and exchange flows consider the channel properties to follow regular patterns and the subsurface to be homogeneous, but rivers show pronounced complexity in channel topography and subsurface structure, as well as temporal variability. I will present experimental results and simulations that illustrate the interaction of porewater and exchange flows induced at multiple scales, discuss the limited amount of information available on the effects of subsurface heterogeneity on river-groundwater exchange, and describe potential theoretical frameworks for assessing the effects of spatial and temporal variability on solute transport in river systems.