



Distinguished Seminar Series

Energy, Mass, and Momentum Transfer Across “Interfaces” in Subsurface Systems – Role, Challenges, and Opportunities in Multi-scale Laboratory Experimentation

Tuesday, April 11th
Time: 4:00 pm
Marquez Hall 204



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Engineering
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Environmental Processes

ABSTRACT Fundamental to the distribution of fluids in surface and subsurface are the processes of energy, mass, and momentum transfer at its boundaries. I will introduce a class of problems that offers special challenges when these processes occur across physical interfaces shared by two dynamically different physical systems (e.g. land and atmospheric). Some of the challenges are a result of hard to define interface topologies, abrupt transition of phase properties, contrasting phase flow and energy dynamics, difficult to characterize simultaneously occurring but different types of transfer processes, and modeling complexities. The data to study these processes cannot always be obtained from controlled field experiments where many factors contribute to the uncertainty of measurements and parameter estimates. The primary thesis of this talk is that laboratory experimentation at multiple test scales will continue to play an important and a useful role in hydrology and subsurface sciences and will provide new opportunities to improve fundamental process understanding. This knowledge will lead to increased accuracy of predictions and improved upscaling methods. However, performing such experiments pose many challenges such as acquisition of data at different observational scales and close to interfaces, capturing critical features of geologic heterogeneity, mimicking field specific pressure and temperature dependent phase interaction parameters under ambient laboratory conditions, and simulating climate drivers, among others. Through examples in multiphase systems, coastal aquifer salinization, and land/atmospheric interactions, I will show how to address some of these challenges through the design and implementation of theory-driven experiments.

Bio Prof. Illangasekare presently holds the AMAX Endowed Distinguished Chair of Civil and Environmental Engineering position at the Colorado School of Mines. He received a Ph.D. in Civil Engineering from Colorado State University with a focus on groundwater hydrology. He holds an honorary Doctorate in Science and Technology from the University of Uppsala, Sweden. He has published papers and book chapters on hydrology, groundwater and soil contamination, modeling and climate change. He has received numerous honors and recognitions that include: *Darcy Medal* from the *European Geological Society*, Fellow of American Geophysical Union (AGU), Fellow of American Association for the Advancement of Science (AAAS), Soil Science Society of America (SSSA) and Fellow of American Society of Civil Engineers. He received the AGU's prestigious 2015 Walter Langbein Lecture Award. In November 2016, he received the Prince Sultan Abdulaziz International Groundwater Prize from Secretary General Ban Ki-Moon at the United Nations. In January 2017, President Obama appointed him to the US Nuclear Waste Technology Review Board.