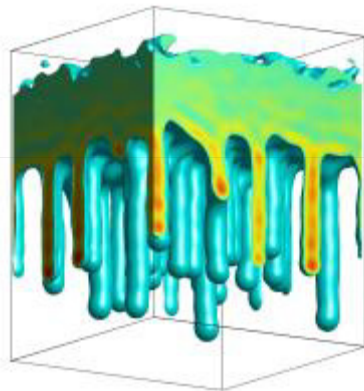

Center for Environmental
& Applied Fluid Mechanics

Weekly Seminar: Spring 2011

Date: **Friday, April 8, 2011**
Time: **11:00 AM**
Location: **Gilman Hall 50 (Marjorie M. Fisher Hall)**
Speaker: **Ruben Juanes**
MIT

Title: ***"Nonequilibrium physics of multiphase flow through porous media:
Origin of gravity fingering during infiltration"***

Abstract



The simultaneous flow of several fluid phases through a porous medium is a pervasive phenomenon in nature. It occurs, for instance, during infiltration of water into soil, and during the formation of methane hydrates in ocean sediments and permafrost. It is also central to many energy technologies, such as production of oil and gas reservoirs, and CO₂ injection into geologic formations. Yet—and unlike flows of a single fluid—our ability to model multiphase flow at the macroscopic scale is still in a stage of infancy.

In this talk, I will present a new mathematical framework to model multiphase flows. The new theory incorporates one basic feature—the system is out of thermodynamic equilibrium. I will present the application of the new theory to infiltration of water into soil, and answer a long-standing question in soil physics: why does the infiltration front lead to preferential flow paths, in the form of gravity fingers? This result directly impacts the prediction of travel times of contaminants through the vadose zone, the recharge rate of shallow aquifers, and has important implications on the ecology of arid environments.

Bio

Ruben Juanes is the ARCO Associate Professor in Energy Studies in the Department of Civil and Environmental Engineering at MIT. Prior to joining the MIT faculty in 2006, he was Acting Assistant Professor at Stanford University (2003-2005), and Assistant Professor at UT Austin (2006). He leads a research group in the area of multiphase flow in porous media, with application to geophysical problems in the areas of energy and the environment. He holds MS and PhD Degrees from the University of California at Berkeley.