

## Title **Modeling Approaches for CO<sub>2</sub> Sequestration in Conventional and Unconventional Reservoirs**

Speaker Prof. Michael Celia  
 Professor, Civil and Environmental Engineering  
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Date & Time Friday, January 29, 2015 11:00 a.m.  
 Place Meeting room, 2F, I<sup>2</sup>CNER Bldg.1,  
 Ito campus, Kyushu University

### Abstract

Carbon capture and sequestration (CCS) is the only currently available technology that can significantly reduce atmospheric carbon emissions while allowing continued use of fossil fuels for electric power and industrial production. CCS involves capturing the CO<sub>2</sub> before it is emitted to the atmosphere, and injecting it into deep subsurface formations, thereby keeping it out of the atmosphere for centuries to millennia or longer. While conventional, high-permeability formations have traditionally been considered as injection targets, recent proposals suggest possible injection of captured CO<sub>2</sub> into unconventional reservoirs with low permeability, specifically depleted shale-gas reservoirs. Analysis of injection into both types of formations involves computational challenges, in part because of the need for comprehensive environmental risk assessments and associated analysis of possible leakage scenarios. A range of computational models can be developed to answer the most important practical questions associated with both of these injection options. In this presentation, different modeling approaches will be discussed and important practical questions related to injection of CO<sub>2</sub> into both conventional and unconventional formations will be addressed. Identification of important length and time scales, and the possible integration of pore-scale modeling into larger-scale simulation efforts, will be discussed for both conventional and unconventional formations.

### About the Speaker

Professor Michael Celia is the Theodora Shelton Pitney Professor of Civil and Environmental Engineering at Princeton University, where he served as Department Chair for the CEE Department from 2005 to 2011. He is currently Director of the Program in Environmental Engineering and Water Resources. Prof. Celia received a B.S. in Civil Engineering from Lafayette College in 1978, an M.S. in Civil Engineering from Princeton University in 1979, and a PhD from Princeton in 1983. In 1985 he joined the faculty of M.I.T., and returned to Princeton to join the Civil Engineering faculty in 1989. Professor Celia's areas of research include ground-water hydrology, multi-phase flow in porous media, numerical modeling, and subsurface energy systems with a focus on geological sequestration of carbon dioxide and shale-gas systems. He served for 10 years as editor of the journal *Advances in Water Resources*. He is a Fellow of the American Geophysical Union (AGU) and the American Association for the Advancement of Science (AAAS) and the recipient of the 2005 AGU Hydrologic Sciences Award (citation: *For fundamental research contributions to subsurface hydrology and numerical methods in water resources, and for providing a model of Academia at its best*). He was the 2008 Darcy Lecturer for the National Ground Water Association (title of the lecture: *Geological Storage as a Carbon Mitigation Option*; the lecture was given at 52 different venues in 12 countries across North America, Europe, Asia, and Australia). He was also the 2010 Pioneers in Groundwater lecturer for the American Society of Civil Engineers, received the 2012 Hydrology Days Award, and is the recipient of the 2014 Honorary Lifetime Membership Award from the International Society for Porous Media (Interpore). He is also the recipient of the 2015 Argyris Visiting Professorship from the University of Stuttgart. As a contributing author for the IPCC Working Group III *Special Report on Carbon Dioxide Capture and Storage*, Professor Celia shares, with many colleagues, the 2007 Nobel Peace Prize.

Host: Professor Petros Sofronis

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<http://i2cner.kyushu-u.ac.jp/>

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