COURSE

TOUGHREACT:
A simulation program for multi-phase fluid and heat flow and reactive geochemical transport in porous and fractured media

CIVIL ENGINEERING SCHOOL

With the collaboration of:

UNIVERSIDAD A CORUÑA FOUNDATION

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PRESENTATION

TOUGHREACT is a general-purpose numerical simulation program for multi-phase fluid and heat flow and reactive geochemical transport in porous and fractured media (Xu et al., 2006 and 2011). The program was developed by introducing reactive geochemistry into the multiphase flow code TOUGH2 V2 (Pruess et al., 1999). TOUGHREACT considers interactions between mineral assemblages and fluids under local equilibrium or kinetic rates. The gas phase can be chemically active. Precipitation and dissolution reactions can change formation porosity and permeability, and can also modify the unsaturated flow properties of the rock. TOUGHREACT is widely used internationally for geothermal energy development, CO_2 geological sequestration, nuclear waste disposal, environmental remediation, and increasingly for petroleum applications.

FORMAT

This training course will give an introduction to TOUGHREACT. Application examples to problems such as reactive transport in groundwater and CO_2 geological sequestration and geothermal system, will be provided. The course will also include a survey of the physical and chemical processes modelled, and of the mathematical and numerical approaches used. The focus will be on enabling users to prepare input data for setting up and solving problems, and on emphasizing their role as prototypes and templates for creating new applications.

Each participant requires to bring their own PC laptop, while the instructor will be able to demonstrate procedures on a projection screen. On the morning of the first day participants will be handed over a USB memory stick containing sample problems (input files) as well as additional materials, to be copied onto the participants' own laptops.

The ToughReact executables must be removed from laptops of course participants at the conclusion of the course. The cost of obtaining software licenses for participants' home institutes is not included in the cost of the training course. TOUGHREACT can be licensed from (1) the Energy Science and Technology Software Center (ESTSC) of the U.S. Department of Energy (Version 1.0; website: http://www.osti.gov/estsc/), and Lawrence Berkeley National Laboratory's Tech Transfer Department (Version 2.0; website: http://esd.lbl.gov/research/projects/tough/licensing/toughreact.html).

GENERAL INFORMATION

The training course is limited to 20 participants and early registration is essential. Please return the attached registration form.

INSTRUCTORS

TIANFU XU

Tianfu Xu is now a chair professor at Jilin University of China. Tianfu Xu had been working at Lawrence Berkeley National Laboratory (LBNL) of USA for 16 years, in which he joined in 1996, initially as post-doctoral fellow, then became a scientist, and staff scientist. He received a bachelor's degree in 1984 from Jilin University of China, a Master degree from Delft University of Technology of The Netherlands, and a PhD from University of La Coruña, Spain (1996). Tianfu has been working on developing new approaches to model multiphase non-isothermal fluid flow and geochemical transport in unsaturated and saturated porous medium and fractured rock systems. He is the chief developer of LBNL's multi-phase non-isothermal reactive flow and geochemical transport simulator TOUGHREACT. The program is widely used nationally and internationally (more than 40 countries around the world) for CO2 geological sequestration, nuclear waste disposal, geothermal energy development, environmental remediation, and increasingly for petroleum applications. Tianfu has authored and co-authored about 60 peer-reviewed journal papers. His papers have been cited by other researchers more than 1300 times (SCI citation). He is one of those who pioneered numerical modeling studies on subsurface multiphase reactive fluid flow and geochemical transport, mineral trapping and chemical aspects of CO2 geological sequestration, and mineral scaling and control mineral dissolution and precipitation in geothermal reservoirs.

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