Workshop on

Modelling Coupled Processes in Porous Media

19-20 September 2005
Utrecht, The Netherlands

Utrecht University & TNO-NITG

Scope of the workshop
Various important phenomena in the subsurface are often governed by combined effects of fluid flow, mechanical, chemical and/or thermal processes. Examples are gas-production-induced earthquakes, reactive solute transport in aquifers, and safety issues surrounding the geological storage of energy, radioactive waste, and CO2. Although the sophistication of numerical models has increased significantly over the last decades, they typically focus on one or two of the aforementioned processes. This limits their ability to make predictions in many important applications. One approach would be to develop a new multi-disciplinary modeling framework, which can account for all essential processes. Another approach would be to couple existing codes which describe one or two processes in great detail. Both coupling approaches are complicated due to several physical and mathematical constraints and a number of important questions have to be investigated and resolved.

Themes
The issues described above will be the subject of this workshop. In particular, the focus will be on the following themes:
- How to couple various processes?
- How much coupling is needed?
- Coupling of finite element and finite difference methods. How should different spatial discretization be linked together?
- Coupling models/processes with significantly different characteristic time scales (temporal discretization)
- Modelling coupled processes in density-dependent flow and transport, geomechanical processes, and biological systems

Organizing Committee: C.Hofstee, R.van der Wal, W.Zijl, M.Hassanizadeh, C.Berentsen & M.Evertman

Please find out more about this course at:
www.geo.uu.nl/hydrogeology/activities.html

Speakers
Leading experts from various areas of geosciences and mathematics give in-depth lectures over issues identified in the scope. The speakers and there topics are as follows:
- **Jean-Laurent Mallet** (University of Nancy, France**)**
  "Modelling the geometry and the properties of the earth interior: proposal for a new Unified Model"
- **Bernard Schrefler** (University of Padua, Italy)
  "Hydraulic fracturing in multiphase geomaterials"
- **Gabriel Wittum** (University of Heidelberg, Germany)
  "Solving coupled systems of partial differential equations"
- **Karsten Pruess** (Lawrence Berkely National Lab, USA)
  "Geologic storage of greenhouse gases multiphase & non-isothermal effects, and implications for leakage behavior"
- **Peter-Jan van Leeuwen** (Utrecht University)
  "*Time-splitting schemes in oceanic and atmospheric circulation models*"
- **Ruud Schotting** (Utrecht University)
  "Gravity and hydrodynamic dispersion: a nice couple"
- **Malgorzata Peszynska** (Department of Mathematics, Oregon State University)**,** *"Adaptive modeling of coupled multiscale processes of flow and transport in subsurface"*
- **Alain Bossavit** (Lab**.** de Genie Electrique de Paris)
  "Generalized finite differences on non-structured grids: A step towards a discrete form of exterior calculus"
- **Ivar Aavatsmark** (Bergen University)
  "Multi-point flux approximation"
- **Stephan Matthai** (Imperial College London)
  "Modelling multiphase flow in fractured porous rock: interplay between viscous, gravitational, and capillary driven flow"
- **Wolfgang Ehlers** (University of Stuttgart)
  "Coupled solid-fluid phenomena including thermal and localizing effects"
- **Peter Engesgaard** (University of Copenhagen)
  "*Modelling of strongly coupled flow and reactive transport in porous medium: The role of intelligent bacteria"*

Registration
The workshop fee is €200.-(euro). This covers refreshments, lunches, workshop dinner, and the book of abstracts. Lodging and other meals are not covered. Note that the number of participants is limited to 30.

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NWO Nederlandse Organisatie voor Wetenschappelijk Onderzoek