Analyse numérique

Mercredi 17 mars 2010 – Salle MAA112 – 16.15 h.

Dr. Heiko BERNINGER (Freie Universität Berlin, Allemagne) donnera un séminaire intitulé :

“Saturated-unsaturated porous media flow and its coupling with surface water”

Abstract

The Richards equation is a standard model for saturated-unsaturated fluid flow through porous media. In homogeneous soil monotone multigrid methods can be used to solve the Richards equation. This is achieved by a particular solver-friendly discretization. We illustrate the approach by a numerical example in 3D.

In the heterogeneous case where different layers of homogeneous soil constitute the domain, nonoverlapping Schwarz methods can be combined with monotone multigrid to provide the solution. We give some analytical results for the convergence of these domain decomposition methods in 1D. Furthermore, we present systematic numerical experiments for test cases in 2D, where we optimize the parameters of the Schwarz methods. Surprising similarities to linear cases can be observed.

The coupling with surface water is provided by mass conservation and hydrostatic pressure. First, coupling with static surface water can be treated since our solver for the Richards equation also determines the free boundary given by Signorini-type conditions on seepage faces around lakes. Secondly, a solver of Dirichlet-Neumann type for the coupling of the Richards equation with the shallow water equations is introduced. Numerical results for 2D-1D coupling are presented. Joint work with: R. Kornhuber and O. Sander (FU Berlin)

Lausanne, le 8 mars 2010/AQ/aa

1Les séminaires qui ont lieu à la Section de Mathématiques sont annoncés sur Internet à l’adresse http://www.epfl.ch/cgi-bin/memento/memento.