

HEIKO BERNINGER

## On Nonlinear Domain Decomposition Methods for Jumping Non-linearities

A large class of quasilinear elliptic pdes can be reduced to semilinear problems by Kirchhoff-transformation. For example, the time-discretized Richards equation can be reformulated in this way as a convex minimization problem for which fast multigrid solvers are available [2]. Unfortunately, in most practical applications the constitutive relationships generating the nonlinearity are not constant on the whole computational domain but change discontinuously across certain subdomains. In this talk we consider nonlinear, non-overlapping domain decomposition methods based on a corresponding domain decomposition. Kirchhoff transformation/monotone multigrid then is applied as a fast solver for the resulting local nonlinear problems on the subdomains. In particular, we concentrate on iterations of Dirichlet-Neumann and Robin-Robin type. Theoretical convergence results as well as numerical computations will be presented.

Joint work with Ralf Kornhuber and Oliver Sander (Freie Universität Berlin).

[1] H. Berninger. *Nonlinear Domain Decomposition Methods for Saturated-Unsaturated Flow in Porous Media*. Dissertation, FU Berlin, in preparation.

[2] R. Kornhuber. On Constrained Newton Linearization and Multigrid for Variational Inequalities. *Numer. Math.* 91 (2002), 699–721.