

Seminar at WIAS Berlin

Degenerate hysteresis in partially saturated porous media

Pavel Krejčí

Czech Technical University in Prague, Faculty of Civil Engineering

krejci@math.cas.cz

Abstract: We propose a model for fluid diffusion in partially saturated porous media taking into account hysteresis effects in the pressure-saturation relation. The resulting mathematical problem leads to a diffusion equation with Robin boundary condition for the pressure in an N -dimensional domain with a Preisach hysteresis operator under the time derivative. The problem is doubly degenerate in the sense that the saturation range is bounded, and no a priori control of the time derivative of the pressure is available. A bootstrapping argument based on particular geometric properties of the hysteresis operator makes it possible to prove the existence and uniqueness of a strong solution to the problem for arbitrarily large data. This is a joint work with Chiara Gavioli from TU Wien.