

Nonsmooth Problems with Applications in Mechanics  
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## 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 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. This is a joint work with Chiara Gavioli from TU Wien.