



Karlstad Applied Analysis Seminar (2024)

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Analysis of partial differential equations for moisture transport in porous media

Abstract

In this talk, I will present the results for an initial boundary value problem for nonlinear parabolic equations on one-dimensional interval. This study is based on a mathematical model describing water movement in porous media proposed by Fukui et al. in 2018. Their model consists of two diffusion equations obtained from the mass conservation law for water and air. We note that the equations are type of quasilinear parabolic forms with diffusion coefficients depending on the unknown function. Since it is very difficult to analyze both equations simultaneously, we focused only on the diffusion equation for water as a first step of this research. The existence of strong solutions to this problem is not expected due to non-monotonicity of the boundary conditions. Therefore, by introducing weak solutions of this problem we can present some theoretical results related to our problem. Also, I will show convergence of numerical solutions constructed by finite volume method to the weak solution. This research is joint work with Toyohiko Aiki (Japan Women's University, Japan) and partially supported by EBARA Corporation, Japan.