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CHARACTERIZATION OF THE BOUNDARY CONDITIONS IN AN AQUIFER MODEL: ABOUNDARY DATA COMPLETION METHOD

Xavier Escriva[a] , Thouraya N. Baranger[b] , Nejla Hariga Tlatli[c]

[a] LMFA, CNRS UMR 5509, Université de Lyon, Lyon, F-69 003, France; Université Lyon1, Villeurbanne, F-69622, France. E-mail: Xavier.Escriva@univ-lyon1.fr
[b] LaMCoS, INSA-Lyon, CNRS UMR5259, F69621; Université de Lyon, Lyon, F-69003, France; Université Lyon1, Villeurbanne, F-69622, France. E-mail: Thouraya.Baranger@univ-lyon1.fr
[c] LAMSIN-ENIT, INAT, Tunisia. E-mail: Nejla.Tlatli@inat.agrinet.tn

Summary

Since many decades, extended researches have been dedicated to polluant contamination in water resources. The analysis of polluant contamination in groundwaters and hence its prediction requires a full prediction of the flow and contaminant transport in underground domain. As groundwater flows occurs in porous media, its characterization depends of the soil properties like permeability and flow variables like hydraulic head imposed at the domain's edges (boundary data). The characterization of permeability of the medium is a hard topic du to the inaccessibility in deep layers of the media to measurements and predictions. A wide panel of research papers in hydrogeology are aimed to the prediction of the permeability of the porous media through the solving of inverse problems ([2], [3], [8]). Still, the prediction correctness of the flows in porous media is also sensitive to the boundary conditions which remains inaccessible like other model properties. Our contribution is related to the determination of unaccessible boundary condition data in groundwater flows in a saturated and homogeneous porous medium modeled by Darcy equations. The resulting mathematical problem is a inverse Cauchy problem, also called boundary data completion problem ([5]). The illposedness of this problem is loosen by use of a reciprocity gap based idea and a variational formulation framework which allow the finite element discretization for the minimization the resulting energy-like error functional and the partial differential operators ([6],[1],[4]). In this paper, we will detail the boundary data completion problem and our solving methodology. The method will be applied to the recovery of the boundary condition data of a hydrogeologic model in a realistic configuration: the study of the flow in the Rocky Mountain Arsenal,USA ([7],[9]). Sensitivity of the recovered boundary data against physical and numerical parameters will be discussed.

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