

Water Suspension Infiltration with Adsorption Including Heat Transport in Unsaturated-Saturated Porous Media

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Abstract - Transportation of heat and water suspension (water and silt) in unsaturated-saturated porous media is considered. Moreover, the water in suspension is contaminated and this contaminant is adsorbed by the porous media matrix. Also, the inner heat exchange between water suspension and the matrix of porous media is considered in the complex model. The deposition of silt in the matrix is characterized by a filtration function and the contaminant adsorption is modeled by a sorption isotherm. The mathematical model includes a coupled system for the water suspension infiltration, silt, and contaminant (uniformly mixed in the water) transport with dispersion and their deposition and adsorption in porous media. Filtration function expresses the rate of silt deposition depending on the amount of (immobile) deposited silt. Contaminant adsorption is modeled in terms of the contaminant concentration in suspension, the amount of adsorbed contaminant, and the rate of adsorption. The main goal is to develop a suitable numerical approximation that can be applied to the solution of direct and inverse problems. In the numerical experiments, we demonstrate the correctness and the effectiveness of the used method.

Keywords: suspension and heat transport, heat energy exchange, silt deposition, contaminant adsorption, porous media, numerical modelling