Geophysical Research Abstracts
Vol. 12, EGU2010-11278, 2010
EGU General Assembly 2010

Determination of hydraulic properties of a tropical soil using inverse modeling

Martina Sobotkova (1), Michal Snehota (1), Chittaranjan Ray (2), and Michal Dohnal (1)

(1) Czech Technical University in Prague, Faculty of Civil Engineering, Prague, Czech Republic (martina.sobotkova.1@fsv.cvut.cz), (2) University of Hawaii at Manoa, Environmental and Process Engineering, Water Resources Research Center, 2540 Dole Street, Honolulu, Oahu, USA

Pesticides and other contaminants that have polluted ground water on the island of Oahu, Hawaii have passed through hundreds of meters of vadose zone. The sorption and degradation of these contaminants in soil affect the concentration reaching the ground water. An accurate description of contaminant mass arrival in ground water also depends on flow behavior of water through the vadose zone. The goal of this study was to examine the flow behavior of water and determine hydraulic parameters of an Oxisol using a laboratory infiltration-outflow experiment on two medium-sized undisturbed soil columns. The soil columns were collected from the B horizon of Wahiawa Oxisol from the Poamoho Experiment Station of the University of Hawaii located in center region of Oahu island, Hawaii, USA. Infiltration-outflow experiments were conducted using a semi-automatic set-up to determine the parameters of the water retention curve and hydraulic conductivity function of the soil. Water flow through the soil cores was simulated by numerical solution of the one-dimensional Richards equation representing a single-domain porous medium. Using measured soil hydraulic parameters, initial forward modeling was carried out and then the parameters were estimated by inverse modeling using various scenarios. A combination of manual optimization and inverse modeling produced a good fit between model outputs and measured data of water flux and pressure head. Water content for a given pressure from the retention curve measured directly on small soil samples were lower than that obtained through parameter optimization based on experiments on larger undisturbed soil samples. Laboratory experiments were conducted at the University of Hawaii in the framework of the project “Evaluation of the fate and transport of selected chemicals in Hawaii soils”, Hawaii Department of Agriculture, 6/02-7/05. The work was also partially supported by research project No. 103/08/1552 under the Czech Science Foundation.