

CFD modeling of contaminant transport in soils including the effect of chemical reactions

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Abstract The movement of chemicals through soils to the groundwater is a major cause of degradation of water resources. In many cases, serious human and stock health implications are associated with this form of pollution. In this work, a CFD model is presented for simulation of the flow of water and air and contaminant transport through unsaturated soils with the main focus being on the effects of chemical reactions. The governing equations of miscible contaminant transport including advection, dispersion–diffusion and adsorption effects together with the effect of chemical reactions are presented. The model is applied to the simulation of a real case study in-site of the oil production field in Libya involving transport of contaminants in a soil with particular reference to the effects of chemical reactions. Comparison of the results of the numerical model with the experimental results shows that the model is capable of predicting the effects of chemical reactions with very high accuracy.

Keywords: contaminant transport, unsaturated soil, chemical reaction, CFD.
