Geophysical Research Abstracts
Vol. 12, EGU2010-3988, 2010
EGU General Assembly 2010

Benchmarking the solute transport module of the WAVE_MAT model

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Modelling water flow and solute transport through heterogeneous unsaturated zone soil under unsteady state conditions requires the use of numerical solutions. The WAVE model (Vanclooster et al., 1996), which solves numerically the 1-D flow and transport equation, is often used to simulate the water and chemical transport (pesticides, nutrients) in agricultural soil. The original version of the model has been encoded in Fortran77. The most recent version (WAVE3.1), has been submitted to many validation and benchmarking studies.

To facilitate the future exploitation and development of the WAVE model, the code is currently transposed in a MATLABTM environment, referred to as WAVE_MAT. Following the principles of good modelling practice, version control for the new WAVE_MAT model is implemented. An essential part of the version control is the benchmarking of each new release.

In this poster, we present the results of benchmarking of the solute transport module of WAVE_MAT_V0060610. We compare results of simulated solute transport with WAVE_MAT_V0060610 with the analytical solutions of the governing transport equation and with those obtained with the HYDRUS-1D model.

The benchmarks are performed for three soil types (clay, loam, and sand) of 100 or 200 cm of profile length and for different solute transport parameters, and for different flow and boundary conditions.

Although the correction of numerical dispersion is not yet applied to WAVE_MAT, the results agree well to the analytical solution for reasonable hydrodynamic dispersivity.