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Macroscopic Cellular Automata for groundwater modelling

Giovanni Ravazzani (1), Dario Rametta (2), and Marco Mancini (1)

(1) Politecnico di Milano, DIIAR, Milano, Italy (giovanni.ravazzani@polimi.it, +39-0223996231), (2) ENI spa, San Donato Milanese, Italy

A groundwater model representing two-dimensional flow in unconfined aquifers is presented. The model is based on the paradigm of the macroscopic cellular automata, that represents dynamical systems which are discrete in space and time, operate on a uniform, regular lattice and are characterised by local interactions. Physically based equations are implemented to simulate the flow of water between adjacent cells. The model was validated against solutions of simple problems both in steady and transient condition including analytical solution and simulation performed with MODFLOW-2000 model. The developed code is simple enough to facilitate its integration into other models such as land surface models.. The good performance without detriment to accuracy makes the model adequate to perform long simulation time analysis.