



Agent-based model of soil water dynamics

Benjamin Mewes and Andreas Schumann

Institute of Hydrology, Water Resources Management and Environmental Engineering, Ruhr University Bochum, Bochum, Germany

In the last decade, agent based modelling became more and more popular in social science, biology and environmental modelling. The concept is designed to simulate systems that are highly dynamic and sensitive to small variations in their composition and their state. As hydrological systems often show dynamic and nonlinear behaviour, agent based modelling can be an adequate way to model aquatic systems. Nevertheless, up to now only a few results on agent based modelling are known in hydrology.

Processes like the percolation of water through the soil are highly responsive to the state of the pedological system. To simulate these water fluxes correctly by known approaches like the Green-Ampt model or approximations to the Richards equation, small time steps and a high spatial discretisation are needed. In this study a new approach for modelling water fluxes in a soil column is presented: autonomous water agents that transport water through the soil while interacting with their environment as well as with other agents under physical laws.

Setting up an agent-based model requires a predefined rule set for the behaviour of the autonomous agents. Moreover, we present some principle assumptions of the interaction not only between agents, but as well between agents and their environment. Our study shows that agent-based modelling in hydrology leads to very promising results but we also have to face new challenges.