



How relevant are hydrological 1D models for predicting root water uptake processes?

Mathieu Javaux (1,2), Xavier Draye (2), Valentin Couvreur (2), Harry Vereecken (1), and Jan Vanderborght (1)

(1) Institut für Bio- und Geowissenschaften, Forschungszentrum Juelich GmbH, Juelich, Germany, (2) Earth and Life Institute, Universite catholique de Louvain, Louvain-la-Neuve, Belgium (mathieu.javaux@uclouvain.be)

Soil water uptake models used in hydrology often neglect biological aspects of water uptake. In this talk, we review the main assumptions made in traditional 1D-water extraction models and confront it to knowledge in plant physiology. The concepts of uptake based on root length density profiles, stress function and compensation coefficients are discussed. We show how different plant-related physiological processes may affect root water uptake predictions. In particular, we discuss the impact of radial conductivity and xylem conductance on uptake and sink term profile. Thanks to simulations with a bio-physical 3-D model, we run virtual experiments showing the impact of conductivity changes. We propose a new concept for encompassing the root architecture and its conductivity properties into a 1D profile. This concept is compared with 3-D simulations and experiments.