Geophysical Research Abstracts,
Vol. 11, EGU2009-5871, 2009
EGU General Assembly 2009

Modeling and measuring 3-D root water uptake from the plant to the field scale

M. Javaux (1,3), Cl. Doussan (2), I. Srayeddin (2), A. Pohlmeier (3), J. Vanderborght (3), and H. Vereecken (3)

(1) Dpt. of Environmental Sciences and Land Use Planning, Universite catholique de Louvain, Louvain-la-Neuve, Belgium (mathieu.javaux@uclouvain.be), (2) EMMAH - UMR 1114 INRA/UAPV – Avignon – France, (3) Agropshere IGC 4 – Forschungzentrum Juelich – Germany

Root water extraction from soil is controlled by the local water potential gradient between soil and roots. However taking this local effect in consideration is challenging given the lack of real data on root architecture, on the distribution of the water potential at the root-soil interface, or on the local hydraulic properties of soil and roots.

In order to numerically investigate the water uptake processes at the plant scale, we built a 3-D model, called R-SWMS, which combines water flow in conducting vessels of a plant and within the soil matrix. We use light transmission imaging techniques to monitor two-dimensional soil water distribution and validate our modeling approach. We show the importance of combining architecture with hydraulic models to obtain an integrated and functional characterization of root-soil interactions.

At the field scale, the spatial variability of plant development and root water uptake cannot be neglected. We show how these processes can be assessed at the field scale thanks to geophysical techniques.