

Interactive comment on “Implementing small scale processes at the soil-plant interface – the role of root architectures for calculating root water uptake profiles” by C. L. Schneider et al.

G. d’Urso (Referee)

DURSO@UNINA.IT

Received and published: 11 October 2009

The single root model proposed by Schneider et al. is an attempt toward a coupling of transient water flows in the soil and root domains. Since the pioneering studies of Moltz in 1975, the availability of fast computing procedures enables the numerical solution of microscopic scale root models coupled with 3-D soil water flow equations. To this extent, the paper has valuable innovative contents, which may contribute to a better knowledge of the complex interactions regarding water flow in the soil-root system. However, from a general point of view, I believe that any conceptual schema-

C2330

tisation loses a large part of its value if not adequately supported by experimental observations. This is even more relevant in the field of application-oriented research as the topic of the paper suggests. Furthermore, some parts of the proposed approach are dependent on empirical parameters which have a fixed value in the present study, without any consideration of the model sensitivity. This is especially the case of the axial resistance of xylem in Tab.1, as well as the simplifications adopted for the matric flux potential in Eq.(15). Axial resistance is an extremely variable parameter related to many physiological factors in a quite complex and not precisely quantifiable way. The difficulties related with a precise characterisation of the soil-root interface are the main reason for the success in many applications of macroscopic approaches to root water uptake, such as the Feddes’ model used for a comparative analysis in the present study. Apart from the consideration on the many possible ways of applying a macroscopic approach with spatially variable root density functions, the two approaches are not comparable due to different scales and aims. At the pedon-scale, which the macroscopic approaches refer to, the parameterisation of the sink term as a function of soil water potential and soil depth explains sufficiently well the biophysical continuity of water fluxes in the soil-plant-atmosphere, as demonstrated by a large number of experimental investigations under different environmental conditions, with special concern to irrigated crops (aim). There is of course the need for developing alternative and more accurate approaches to model root water uptaking (especially for complex root systems, such as tree crops and natural vegetation); but instead of an ill-posed criticism toward another approach, I would rather see a numerical study adequately supported by observations.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 6, 4233, 2009.

C2331