



Effects of different root morphological characteristics on root extraction functions and soil water dynamics for three crops

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Simulations of root water uptake applying a macroscopic model of water transport in SPAC were conducted using a software package GLOBAL, based on the solution of the one-dimensional Richards equation. The main objective was to examine the contribution of various root extraction functions (sink terms) to the changes in soil water content profiles during vegetation periods of three crops. The root extraction functions were estimated for spring barley, winter rye and maize using different morphological parameters such as dry mass, length and surface area density distributions of roots.

It was observed that the “root mass“ extraction curves and the resulting soil water content distributions slightly deviated from the “length” and “surface area” ones. For the crops with longer vegetation periods as winter rye and maize, the differences were more pronounced, especially in the top soil layer. Calculating the water storage, however, it was found that the deviations due to the various root extraction curves considered were within the error of direct measurements. Sensitivity of the model based on the Richard’s equation to the different root morphological characteristics and thus to the resultant extraction functions was found to be rather low, which caused small differences in the soil water content distribution. Hence, any of the examined root morphological characteristics can be applied for the evaluation of the root extraction

functions.