



How to represent root water uptake below the soil voxel scale?

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Models for root water uptake need to rely on simplification assumptions in order to limit the number of input parameters and because detailed information on root architecture is usually not available. The modeled plant root system is simplified in such a way that it properly represents the behavior of more complex root systems with simplified geometry and updated boundary conditions. In this numerical study we investigate how multiple roots embedded in a soil block may be represented by a simplified model. Four approaches are compared: single root approach, multiple roots with no flow boundary conditions, multiple roots with different influence radius and a reference approach, i.e. an explicit representation of all the root segments with a very small soil discretisation. These approaches are compared for a complete root system but implemented at the voxel scale. Results show contrasting behavior resulting from these different approaches. As compared to the reference case, the single root approach gives relatively poor results while the performance of the two other methods depends on the magnitude of the water extraction and the root length density.