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Comparing root architectural models

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Plant roots play an important role in several soil processes (Gregory 2006). Root architecture development determines the sites in soil where roots provide input of carbon and energy and take up water and solutes. However, root architecture is difficult to determine experimentally when grown in opaque soil. Thus, root architectural models have been widely used and been further developed into functional-structural models that are able to simulate the fate of water and solutes in the soil-root system (Dunbabin et al. 2013).
Still, a systematic comparison of the different root architectural models is missing. In this work, we focus on discrete root architecture models where roots are described by connected line segments. These models differ (a) in their model concepts, such as the description of distance between branches based on a prescribed distance (inter-nodal distance) or based on a prescribed time interval. Furthermore, these models differ (b) in the implementation of the same concept, such as the time step size, the spatial discretization along the root axes or the way stochasticity of parameters such as root growth direction, growth rate, branch spacing, branching angles are treated.
Based on the example of two such different root models, the root growth module of R-SWMS and RootBox, we show the impact of these differences on simulated root architecture and aggregated information computed from this detailed simulation results, taking into account the stochastic nature of those models.

References

Dunbabin, V.M., Postma, J.A., Schnepf, A., Pagès, L., Javaux, M., Wu, L., Leitner, D., Chen, Y.L., Rengel, Z., Diggle, A.J. Modelling root-soil interactions using three-dimensional models of root growth, architecture and function (2013) Plant and Soil, 372 (1-2), pp. 93 – 124.
Gregory (2006) Roots, rhizosphere and soil: the route to a better understanding of soil science? European Journal of Soil Science 57: 2-12.