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Impact of soil water potential pattern on root water uptake distribution and leaf water potential

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Root water uptake is a major process controlling water balance and accounts for about 60% of global terrestrial evapotranspiration. The root system employs different strategies to better exploit available soil water, however, the regulation of water uptake under the spatiotemporal heterogeneous and uneven distribution of soil water is still a major question. To tackle this question, we need to understand how plants cope with this heterogeneity by adjustment of above ground responses to partial rhizosphere drying. Therefore, we use R-SWMS simulating soil water flow, flow towards the roots, and radial and the axial flow inside the root system to perform numerical experiments on a 9-cell gridded rhizotrone (50 cm×50 cm). The water potentials in each cell can be varied and fixed for the period of simulation and no water flow is allowed between cells while roots can pass over the boundaries. Then a static mature maize root architecture to different extents invaded in all cells is subjected to the various arrangements of cells' soil water potentials. R-SWMS allows determining possible hydraulic lift in drier areas. With these simulations, the variation of root water and leaf water potential will be determined and the role of root length density in each cell and corresponding average soil-root water potential will be statistically discussed.