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Monitoring salt accumulation in the root zone by electrical resistivity tomography

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Soil salinity is one of the major abiotic stresses in arid and semiarid regions limiting plant growth and productivity. Hence, it is important to monitor and predict salinization of the root zone and its impact on plant growth and productivity. For the prediction and evaluation of different salinity levels in soils, simulation models are often used but a major drawback of these simulations is that the biophysical processes in the salt-affected root zone are not adequately represented. Even if some models already consider the impact of environmental conditions on the salt tolerance of the plants, they still neglect other relevant factors, which will affect for example root water uptake. Especially, the extraction of water by the roots might cause an additional accumulation of the salts around the roots.The main aim of the current study is to investigate the root development and salt accumulation over time under controlled conditions. To do so the saline water distributions within the root zone of tomato plants grown in lysimeters was monitored by Electrical Resistivity Tomography (ERT). In total, four lysimeters were equipped with ERT and additional ones with TDR to monitor water and electrical conductivity changes. The lysimeters were treated with three different irrigation waters from high to low salinity. The ERT results showed that the root zone was influenced by water content and salinity changes, which are not only a result of different irrigation and salt concentration of the irrigation water but also affected by the root water uptake. To disentangle the effects of changing water contents in the root zone and to delineate the root systems from the signal the ERT measurements will be coupled to a hydrological simulator and a close loop inversion will be performed.