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The effect of irrigation frequency on water depletion by bell pepper: the added value of electrical resistivity tomography

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The dynamics of root uptake, and its relation to soil moisture, is a very important component in the terrestrial water balance and may determine water resources management, ecology and agriculture. In this research we explore the spatial and temporal distribution of soil water under different irrigation schemes in high resolution using electrical resistivity tomography (ERT).
Bell pepper was planted in containers and irrigated in two different schemes, differing only in irrigation frequency. The daily dose remains the same for both treatments. This irrigation difference results in different spatio-temporal distribution of the soil water in the root zone, which in turn implies spatio-temporal differences in root uptake. The experiment was conducted under very high evapotranspiration (ET) conditions. The resistivity surveys, using 96 electrodes placed around the growth chamber were taken over 10 times daily.

Plants subjected to high frequency irrigation generally were faster in growth and matured about a week earlier. This is primarily attributed to the higher water content that exists in the root zone, and primarily during the high ET periods at noon. The 3-D resistivity distributions provide an interesting insight into the water depletion by the crop in space and time. However, the ERT survey also encountered some challenges related to time-varying error levels and electrode contact changes during wetting and drying cycles.