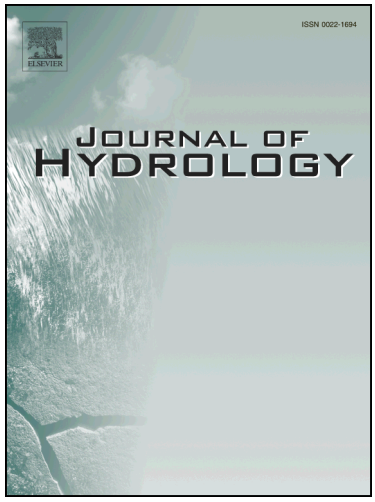

Research papers

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USE OF SMALL SCALE ELECTRICAL RESISTIVITY TOMOGRAPHY TO IDENTIFY SOIL-ROOT INTERACTIONS DURING DEFICIT IRRIGATION

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Abstract

Plant roots activity affect the exchanges of mass and energy between the soil and atmosphere. However, it is challenging to monitor the activity of the root-zone because roots are not visible from the soil surface, and root systems undergo spatial and temporal variations in response to internal and external conditions. Therefore, measurements of the activity of root systems are interesting to ecohydrologists in general, and are especially important for specific applications, such as irrigation water management. This study demonstrates the use of small scale three-dimensional (3-D) electrical resistivity tomography (ERT) to monitor the root-zone of orange trees irrigated by two different regimes: (i) full rate, in which 100% of the crop evapotranspiration (ET_c) is provided; and (ii) partial root-zone drying (PRD), in which 50% of ET_c is supplied to alternate sides of the tree. We performed time-lapse 3-D ERT measurements on these trees from 5 June to 24 September 2015, and compared the long-term and short-term changes before, during, and after irrigation events. Given the small changes in soil temperature and pore water electrical conductivity, we interpreted changes of soil electrical resistivity from 3-D ERT data as proxies for changes in soil water content. The ERT results are consistent with measurements of transpiration flux and soil temperature. The changes in electrical resistivity obtained from ERT measurements in this case