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Temporal dynamics of patterns and structure of electrical conductivity and water storage along three transects irrigated with water at different salinity levels

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This study evaluated the role of local scale soil heterogeneities on water and salinity distribution in the soil. The study used a large spatial and temporal dataset of Electromagnetic Induction (EMI), Time Domain Reflectometry (TDR) and Diviner 2000 sensor readings collected at regularly spaced monitoring sites and in several time campaigns along three transects irrigated with water at different salinity levels. The experiment was carried out in a 558m2 field at the Mediterranean Agronomic Institute of Bari, south-eastern coast of Italy. The experimental field consisted of three adjacent transects, 30 m long and 4.2 m wide, with a distance between transects of 3.0 m. The three transects were irrigated with irrigation water at three different salinity levels (1dSm-1, 3dSm-1, 6dSm-1). The irrigation volumes were calculated according to the time-dynamics of water storage measured by the Diviner 2000 capacitance sensor. For each transect, thirteen access tubes, 2 m apart, were installed along the middle line at 60 cm depth to monitor water content in the soil before and after irrigation.
A Fourier's analysis was applied to explore the different patterns and structures of variability of the original TDR data series. The analysis was also applied to filter the original data series, in order to extract the predominant, high-variance signal after removing the noise of both the EMI and TDR data series.
It is our opinion that identifying the predominant patterns of variability should reveal specific features of the space-time variability of soil water content and salinity to be explicitly used for upscaling water flow and salt transport processes from local to field scale.