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Soil water status as a sthocastic process: analysis of field spatial variability

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The description of the complex spatial variability of soil hydraulic properties is essential in developing reliable predictive models of water and solute transport. Questioning the implicit assumption behind the applicability of classical statistics to problems involving spatial variability, led soil scientists to recognize the need for other methods of analysis and estimation. Techniques that appear to have been used most frequently are based on the theory of regionalized variable or on time analysis theory. The purpose of this investigation was to study the stochastic properties of soil water status in terms of water content and pressure head examined on a bare and cultivated soil located in Ponticelli, Naples, Italy. Measurements were made in situ at 0.30m on two parallel transects consisting of 50 positions 1m apart. The ACF and PACF were used to identify the univariate ARMA(1,1) model for the analyzed series and AR(1) model for the extracted signals. Relation with a state-space model are investigated and a bivariate AR(1) model fitted to water content and pressure head. The simultaneous relations between water content and pressure head are considered and estimated. The results are of value for future sampling strategies and give guidelines for proper use of soil water sensors for irrigation scheduling and they should incite to a more use of time and space series.