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Simulation of a precision irrigation-system based on a pedo-specific calibrated wireless soil moisture sensor network

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In many climatic regions, the availability of water in soils determines to a large extent their agricultural productiveness. The hydrologic balance in soils is the result of complex physical processes, which are influenced by diverse geo-parameters with enormous spatial-temporal variations. Therefore, the measurement and quantitative based monitoring of the soil moisture dynamics has always been in the focus of soil physics and soil ecology. Especially in irrigated agricultural areas information about the actual soil water dynamics can deliver valuable data to optimize the irrigation practice with regard to volume and duration of irrigation.

Novel irrigation equipment requires a fine control of the water distribution in the soil. One solution would be to have sensors near the plants' roots controlling the water inflow depending on the particular demand.

Regarding the aspects of climatic change and the decrease of water resources, the term "precision irrigation" is being increasingly discussed. Only in this way we can meet the requirements due to the small-scale heterogeneities in soils. Such a precision irrigation must be based on objective and quantitative criteria, which focus primarily on the physical soil properties and hydrologic balances. This requires measuring arrangements with high spatial resolution in the horizontal and vertical directions. Such a dense soil-hydrological measuring network should ideally be composed of wireless micro-sensors, which are distributed in the investigated soil section and thereby collect data of relevant parameters in the pedosphere using a high temporal resolution and transmitting the information to a central logger-unit.

This contribution will present a simulation-based approach of a precision irrigation-system with particular consideration of pedo-specific properties.