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Vadose-zone monitoring strategy to evaluate desalted groundwater effects on hydraulic properties

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Desalinated brackish groundwater is becoming a new source of water supply to comply with growing water demands, especially in (semi) arid countries. Irrigation with desalinated or a blend of desalinated and ground/surface water, presents associated impacts on plants, soil and aquifer media. Mixed waters with different salinities can lead to the formation of unexpected chemical precipitates. The use of desalted groundwater for irrigation counts with potential drawbacks, among them: changes of hydraulic properties of soil-aquifer systems (e.g. hydraulic conductivity, porosity) as a consequence of mineral precipitation; root growth blockage and plant uptake of pollutants; as well as leaching of contaminants to groundwater.

An experimental plot located at SE Spain, covered by grass and irrigated by sprinklers with a blend of desalted and groundwater from a brackish aquifer, has been monitored in order to characterize at field scale the possible impacts on soil hydraulic properties. The monitoring strategy to control water and heat flux includes traditional and more updated devices. The field instrumentation, vertically installed from the ground surface and spatially distributed, consisted of: ten tensiometers (Soilmoisture Equipment Corp, Goleta, CA, USA) at different depths (two per depth); and, two access tubes (fiber glass, 44mm diameter 2m length) for soil moisture measurements from TRIME-FM TDR probe (Imko GmbH, Ettlingen, Germany). Automatic logging is carried out from a trench located in the border of the experimental plot and it takes in: a set of five 5TE devices (Decagon Devices Inc, Pullman, WA, USA) vertically installed, which measure volumetric water content, electric conductivity and temperature; and additionally, a suction sensor at 0.6m depth. Finally, a periodic sampling of undisturbed soil cores (2m length) takes place for the purpose of imaging porosity changes from environmental scanning electron microscope (ESEM). First results about water and heat flux, as well as changes in the soil hydraulic properties, are presented in the current work.