Geophysical Research Abstracts
Vol. 12, EGU2010-1420-4, 2010
EGU General Assembly 2010

Developing an automated water emitting-sensing system, based on integral tensiometers placed in homogenous environment.

Sharon Dabach and Uri Shani
The Hebrew University of Jerusalem, Soil and Water Sciences, Rehovot, Israel.

As the population grows, irrigated agriculture is using more water and fertilizers to supply the growing food demand. However, the uptake by various plants is only 30 to 50% of the water applied. The remaining water flows to surface water and groundwater and causes their contamination by fertilizers or other toxins such as herbicides or pesticides. To improve the water use efficiency of crops and decrease the drainage below the root zone, irrigation water should be applied according to the plant demand.
The aim of this work is to develop an automated irrigation system based on real-time feedback from an inexpensive and reliable integrated sensing system. This system will supply water to plants according to their demand, without any user interference during the entire growth season. To achieve this goal a sensor (Geo-Tensiometer) was designed and tested. This sensor has better contact with the surrounding soil, is more reliable and much cheaper than the ceramic cup tensiometer. A lysimeter experiment was conducted to evaluate a subsurface drip irrigation regime based on the Geo-Tensiometer and compare it to a daily irrigation regime. All of the drippers were wrapped in Geo-textile. By integrating the Geo-Tensiometer within the Geo-textile which surrounds the drippers, we created a homogenous media in the entire lysimeter in which the reading of the matric potential takes place. This media, the properties of which are set and known to us, encourages root growth therein. Root density in this media is very high; therefore most of the plant water uptake is from this area. The irrigation system in treatment A irrigated when the matric potential reached a threshold which was set every morning automatically by the system. The daily treatment included a single irrigation each morning that was set to return 120% of the evapotranspiration of the previous day. All Geo-Tensiometers were connected to an automated washing system, that flushed air trapped in the Geo-Tensiometers.
In treatment A, the system discharge changed according to the plant water demand. The discharge changes followed the water uptake changes during the day and during the entire growth period without any user interference.
The integration of Geo-Tensiometer into the emitter system, together with the irrigation regime, maintained high and constant water content in the root zone in comparison to other irrigation methods, such as daily drip irrigation. Reading the matric potential in this media yielded better indication of water availability to the plants than sensors placed 3 cm from the emitters. In addition, the amount of water drainage below the root zone decreased significantly and therefore the threat of polluting groundwater. Furthermore, the automated flushing system eliminated the need for manual maintenance of the tensiometers creating a user friendly system.