COMPARISON OF THE AM400 AND IRROMETER MONITOR FOR PRECISE IRRIGATION SCHEDULING

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Summary

The efficient use of irrigation water requires several kinds of information. One element of an efficient irrigation scheduling is monitoring the soil to assure that the crop irrigation goals are being met. During previous years various soil moisture measuring devices have been tested for irrigation scheduling in silt loam and sandy loam (Eldredge et al. 1993; Shock et al. 1998a, 2002, 2003). In this year's trial Watermark soil moisture sensors were tested as read automatically by Irrometer Monitors and AM400 dataloggers. Practical suggestions are provided to use soil moisture sensors to the benefit of crop production and water conservation.

Introduction

Precise irrigation scheduling is necessary to optimize marketable yield of high-value crops while conserving water and protecting water quality. Irrigation scheduling is greatly facilitated by any soil moisture sensor that can provide timely and responsive information on soil water or soil water potential status. For a particular sensor to be useful for a particular crop and soil, it needs to respond rapidly and reliably to the range of variation of water status in that soil, which is important for marketable yield.

Materials and Methods

The response of Watermark soil moisture sensors to irrigation events and the termination of irrigation was read automatically using two AM400 Hansen data loggers (M.K. Hansen Co., East Wenatchee, WA) and two Irrometer Watermark Monitors (Irrometer Co., Riverside, CA) in furrow- and drip-irrigated onion.

Automated reading of Watermark soil moisture sensors was done in a furrow-irrigated Greenleaf silt loam planted to onions. The sensors were installed with their centers 8 inches deep directly below the onion plants. The sensors were installed in the lower part of the field where the furrow irrigations were less effective at wetting the soil. Six Watermark soil moisture sensors and a temperature probe were connected to each AM400 Hansen datalogger that automatically read the sensors three times a day. Data were recovered from the AM400s using a palm computer as previously described (Shock et al. 2001).

Seven Watermark soil moisture sensors and a temperature probe were connected to two Irrometer Watermark Monitors. A computer and the WaterGraph program (Irrometer Co., Inc.) was used to set the sensor data collection frequency at 15 minutes. Data was recovered from the Irrometer Watermark Monitors using a laptop and the WaterGraph program.

Results and Discussion

The automated collection of Watermark sensor data by an AM400 Hansen datalogger and an Irrometer Watermark Monitor (Irrometer Co.) provided similar interpretation of wetting and drying cycles in both a furrow-irrigated onion field (Fig. 1) and in a drip-irrigated onion field. There were few soil water fluctuations in the drip-irrigated onion field and the results are not shown. The Watermark sensors responded to irrigation within 1 hour. Small differences in calibration equations can be noted (Fig. 1D) and slight differences in the interpretation of soil water potential near saturation are evident (Fig. 1C).

The AM400 was convenient for following and scheduling irrigation events in the field due to its graphic display. Irrometer Watermark Monitor was convenient for setting the data logger reading frequency, easy data retrieval, and computer-aided interpretation of the data. The operation, advantages, and limitations of Watermark soil moisture sensors are described elsewhere (Shock 2003).

The results from both data loggers were readily applicable for the management of onion irrigations. We have previously shown that it is best to furrow irrigate onion grown on silt loam when the soil dries to about -27 kPa clear to the end of the growing season (Shock et al. 1998b, 2000). It is best to maintain drip-irrigated onion grown on silt loam at a water potential of -20 kPa (Shock et al. 2000). The results provided by both data loggers could be readily used to manage accurate irrigation scheduling.

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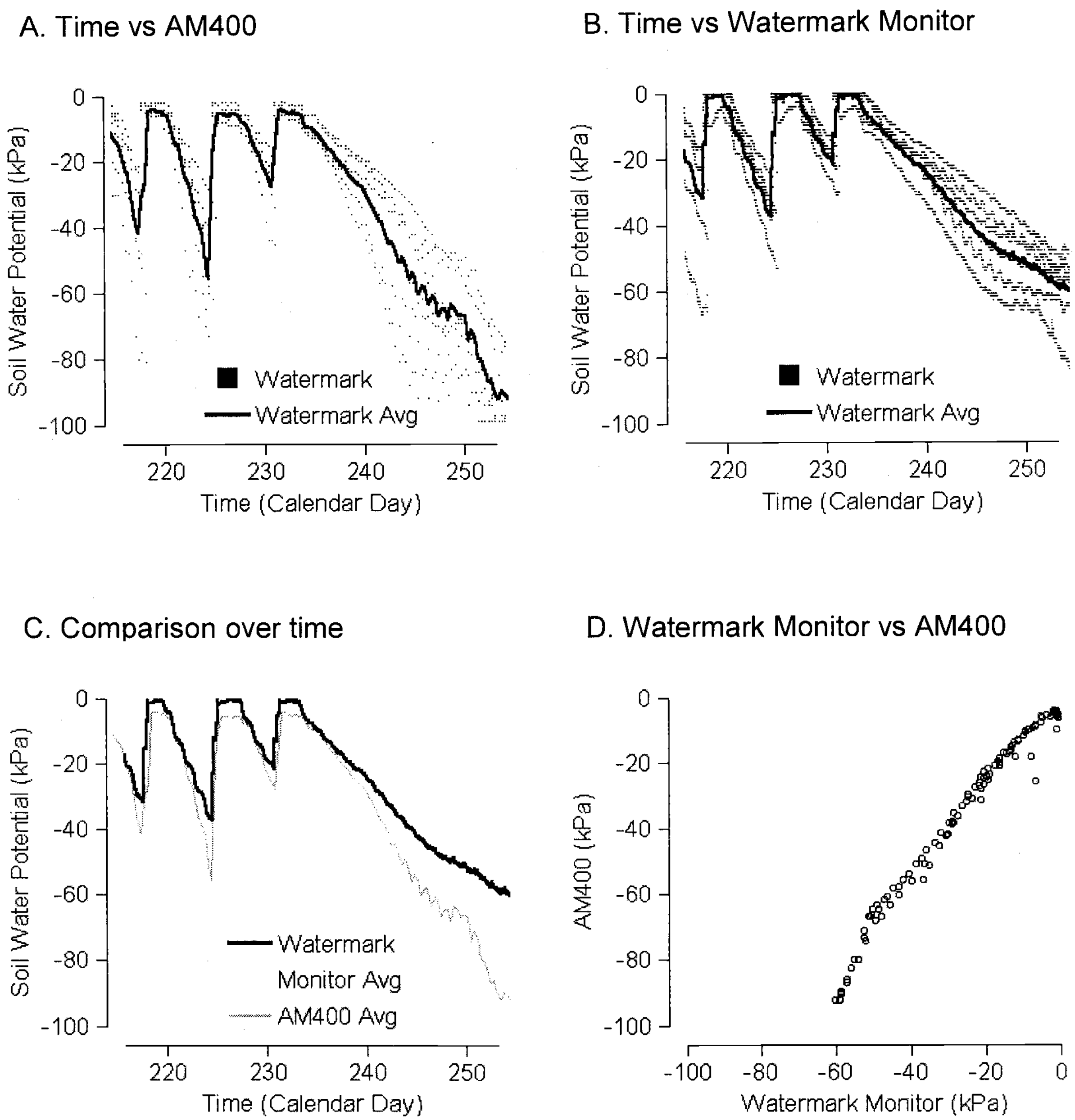

Figure 1. Response of Watermark soil moisture sensors to irrigation events and the termination of irrigation as measured by an AM400 Hansen datalogger (A) and an Irrometer Watermark Monitor (B). The average readings of the an AM400 Hansen datalogger and an Irrometer Watermark Monitor are compared over time (C) and over the measured range of soil water potential (D), Malheur Experiment Station, Oregon State University, Ontario, OR, 2003.