

## **Quantifying groundwater recharge beneath deficit furrow irrigation: a method comparison**

Jasmeen Moubarak, William Sanford, Jonathan King  
Department of Geosciences, Colorado State University, Fort Collins, Colorado

**Abstract.** With over 80% of the nation's consumptive water use going to agricultural purposes, it is becoming important to explore and understand new conservative irrigation techniques. In order to implement these new techniques, there must be an understanding of the effect they will have on groundwater return flows. Predicting the quantity of groundwater recharge under furrow irrigated agricultural land can be a difficult task due to spatial variability of infiltration down a furrow as well as the heterogeneity of hydraulic properties throughout the vadose zone. There are few methods currently being used to estimate the amount of recharge under these conditions. Each method has its own set of assumptions that create varying degrees of uncertainty in the results. The purpose of this study is to compare the results of a 2D unsaturated zone model with results of two water balance methods beneath an experimental furrow irrigated corn field.

For this study, three adjacent plots near Greeley, CO were instrumented with soil water sensors, neutron probe access tubes as well as drainage lysimeters. The plots each received one of the following irrigation treatments: 1) full irrigation, 2) low frequency/high volume irrigation, 3) high frequency/low volume irrigation. The data collected from each growing season provided direct measurements of deep drainage occurring in these scenarios. Soil textural data was used to create both a homogeneous and heterogeneous model of unsaturated zone flow at each site using HYDRUS-2D. Results of these methods show that the degree of heterogeneity and soil type affects agreement between methods, with some sites showing better agreement than others.