Geophysical Research Abstracts
Vol. 16, EGU2014-3161, 2014
EGU General Assembly 2014

Surface water and shallow groundwater interactions in semiarid agro-ecosystems of the western USA

Carlos Ochoa (1), Steve Guldan (2), Alexander Fernald (2), Vince Tidwell (3), Emile Elias (2), Karina Gutierrez (3), and Mike Borman (1)

(1) Oregon State University, Corvallis, United States (carlos.ochoa@oregonstate.edu), (2) New Mexico State University, Las Cruces, NM, United States, (3) Sandia National Laboratories, Albuquerque, NM, United States

Surface water and groundwater interactions in agro-ecosystems of semiarid regions can translate into multiple hydrological benefits including aquifer recharge, temporary storage, and delayed return flow. Our ongoing research effort aimed to better understand surface water and shallow groundwater interactions and their contribution to aquifer recharge and stream flow is being conducted in five relatively narrow floodplains in the semiarid western United States. Over the last several years, we have monitored multiple hydrologic parameters in three flood-irrigated valleys of northern New Mexico. This year we are monitoring two sprinkler-irrigated floodplain valleys in semiarid landscapes of eastern Oregon. At all locations, we measure multiple hydrologic parameters including irrigation diversions, soil moisture, shallow groundwater fluctuations, and weather variables. Data collected are being used to quantify different water budget components such as deep percolation, waterway seepage, evapotranspiration, and aquifer recharge. Results from one of our study sites in New Mexico showed that on average, canal seepage was 12%, and deep percolation ranged from 9 to 32% out of total canal inflow during the irrigation season. Also, shallow aquifer recharge ranged from 1044 to 1350 mm yr-1 during a 3-year evaluation period. At a second study site, canal seepage was 59% and deep percolation averaged 30% of total water diverted. Timing and magnitude of surface water and shallow groundwater interactions is also being evaluated. Results show that replenishment of the shallow aquifer follows a seasonal pattern, driven primarily by canal seepage and irrigation percolation contributions. At one of our study sites, each year the water table reaches a peak of up to 0.8 m within three to five weeks after the onset of irrigation; this increase in water table levels is maintained throughout most of the irrigation season that ends in October. After the end of irrigation season, in the winter time, the river acts as a drain and the water table drops to baseline levels. This is similar to the other two study sites being evaluated in New Mexico. For the two study sites in Oregon, because of the use of the use of less-water application systems we expect to see a more muted response regarding water table response to irrigation percolation inputs. Results from this research effort enhance understanding of surface water and groundwater interactions and the role that irrigation plays in providing soil and aquifer recharge in agro-ecosystems of arid and semiarid environments.