Geophysical Research Abstracts, Vol. 9, 04562, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04562

How do interactions between hedgerow networks and bottomland control groundwater recharge and discharge?

Z. Thomas (1), Gh. Ghazavi(1)(2), and Ph. Merot (1)

(1) INRA, AGROCAMPUS RENNES, UMR1069 SAS, France, (2) Shiraz university, Iran, (zthomas@agrocampus-rennes.fr / Phone: +33-223485878)

This study considers the roles of hedgerow networks and bottomlands in the hydrological control of groundwater recharge and discharge. We focused our research on rainfall distribution, groundwater dynamics, and groundwater-stream connexions. During the hydrological year, three periods were identified. Groundwater recharge occurred during the first period on hydrological year (October-February) , during which about 61% of annual rainfall occurred, with a rapid groundwater increase (2 meters). Thus, during this first period, groundwater recharge clearly was controlled by rainfall. From Mars to Mai, groundwater recharge was slow due to low rainfall volume (only 22% of the annual total); during this second period, shallow groundwater controlled recharge. Finally, during the third (Mai-August) period we observed that rainfall decreased to 17% of the annual total and transpiration increased, eventually exceeding rainfall. Results showed that spatial variability of rainfall was related to hedgerow presence. Rainfall interception depended on rainfall intensity, wind direction, and rain duration. Interception was about 20% when trees had leaves and about 15% after trees had lost their leaves. The most important impact of rainfall variability was observed on the vadose zone. For many of the rainfall events observed, comparing the vertical gradient of water potential showed that infiltration was very limited at 2 m upslope and 1 m downslope the hedgerow comparing to 16 m upslope the hedgerow. This seemed to be related to rainfall interception. Also, at the beginning of the first period (autumn) only, inversion of the hydraulic gradient, in the saturated zone, occurred during brief periods (about 6 hours) after peakflow; during these periods, water flowed from the stream to shallow groundwater. We conclude, therefore, that during the first period, when water table level was low, recharge is controlled by rainfall. Also,the hedgerow

network had a role for the local recharge due to soil-water content deficit. In second period when water table level and hydraulic gradient were maximum, recharge was controlled by the shallow water table of the bottomland. Groundwater dynamic during discharge period was closely related to hedgerow network due to transpiration. For the three studied periods, connexion of river and groundwater was involved on water table recharge. Keywords: hedgerow network, water transfer, rainfall interception, hydraulic gradient.