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Modeling of Water balance in semiarid region of Mexico

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Around the world water is becoming scarce, especially in the semiarid regions where there is a high inter-annual variability in the amount and distribution of the rainfall. Studies on this kind of environments would allow us to understand the mechanisms that determine the spatial and temporal distribution of the water balance components. The present study was carried out from October 2005 to October 2008 in three semiarid sites located in the south of the Mexican Plateau: El Carmen in Guanajuato State and Amazcala and Cadereyta in the State of Queretaro. The work aim was to provide a better understanding of the hydrological processes that occur in the semiarid ecosystems, specifically through two objectives (1) to quantify and to model the rainfall interception process (EI) employing an adequate sampling strategy and an evaluation of the models developed by Rutter et al. (1975) and Gash (1979) in two shrubs species: huisache (Acacia farnesisna) and mesquite (Prosopis laevigata) both, in situ and ex situ and (2) to quantify and model the water balance in order to define the distribution of the water and energy balance components in El Carmen and Cadereyta. For this purpose, the SiSPAT (Simple Soil Plant Atamosphere Transfer) model was used based on a parametrisation of the soil, plants and atmosphere components. It was found that EI represented between 20% and 22% of the total rainfall (PG). Gash's model reproduced EI with satisfactory efficiency (E>0.6), wind's speed and maximum intensity have a local effect on EI. It was also found that, using SiSPAT, the water balance components were particularly sensitive to parameters associated with the soil and the leaf area index. The model results showed that during the studied period, the annual evapotranspiration in Cadereyta was less than PG (-10 and -5%) and above PG for El Carmen (10 y 30%). Runoff and percolation at 5m were null. Finally in both sites there was a simulated loss of water stored in the soil. This, was attributed to a deficit in the 1D model which cannot account for suspected lateral input and preferential flows in the studies sites.