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Soil water content and green water estimations in a small farmed semiarid catchment

I. Mekki (1), M. Voltz (2), N. Ben Mechlia (3), and J. Albergel (4)

(1) INRGREF, Ariana, Tunisia (mekki.insaf@iresa.agrinet.tn), (2) INRA, Umr Lisah, INRA/IRD/Supagro, Montpellier, France (voltz@supagro.inra.fr), (3) INAT, Tunis, Tunisia (benmechlia.netij@iresa.agrinet.tn), (4) IRD, Umr Lisah, INRA/IRD/Supagro, Nairobi, Kenya (albergel@ird.fr)

The main objective of this work is to analyze the spatial and temporal variation of soil water content and green water production over a farmed water harvesting catchment, located in north-eastern Tunisia. The area has a typical Mediterranean climate with a hot dry summer and a cool season, extending from October to April, where rainfall normally meets the water requirements of the usually grown cereals and legumes (500mm). The catchment has an area of 2.6 km^2 and comprises at its outlet a dam, which retains the runoff water in a reservoir. Soil water balance measurements were carried out, about weekly, over two successive cropping cycles (2000-2002) on a network of eleven plots of 2 m^2 each, representing the main land use and soil types. Soil water store investigations targeted the different individual plots as well as the entire catchment. We used a simple water balance model, where the root zone is considered as a single reservoir, to simulate soil water content variations. Results show a fairly good agreement between the calculated and measured water store for all experimental sites. The model reproduces accurately the soil water content during the beginning of the rainy season but underestimates it during the season when heavy rains occur. On heavy soils, simulated soil moisture was lower than measured values, giving differences as high as 25% between simulated water store amounts and the neutron probe measurement values. For the cereals/legume/pasture based cropping systems, most of rainfall water is stored in the soil and returns to the atmosphere by evapotranspiration. The 0-0.3 m soil layer is most active for water uptake by crops and intermittent replenishment by rainfall during the growing period; whereas drying involves the entire soil profile over the summer season (May-Seeptmber). The available water holding capacity of the soil turned out to be about seven times the storage capacity of the reservoir, showing the order of magnitude of rainfall partitioning between green water and blue water for cropped catchments, under semiarid arid climates.