Bare-Soil Evaporation Under Semiarid Field Conditions

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ABSTRACT

Bare-soil evaporation is an important component of the water balance in semiarid systems. However, little is known quantitatively about the influence of soil texture on bare-soil evaporation. We hypothesized that soil texture would have a great influence on both the temporal dynamics of bare-soil evaporation as well as on the depth –to which evaporation-influenced soil water content throughout a 51-d simulated drought period. We measured soil water in lysimeters filled with three different soils. We measured daily evaporation gravi metrically and estimated evaporation rates using the energy balance method of Ben-Asher et al. We estimated soil water content at depths of 3.8 cm, 11.4 cm, 19.0 cm, 26.6 cm, and 34.2 cm (Layers 1–5, respec tively) with time domain reflectometry rods and with soil cores. Bare soil evaporation during the first 15 d of the experiment was »25% higher in the silt loam than the sand loam, and »42% higher than the clay loam. By Day 30, bare-soil evaporation in all soils was »0.5 mm d 21 . Soil water content decreased in all five lysimeters layers, tand it was related to time and depth *(r* 2 values ranged from 0.60 to 0.95). The slope describing change in soil water content was greatest in the top 3.8-cm layer in all soil types (20.52 in the clay loam, 20.32 in the silt loam, and 20.21 in the sand loam). At 14 d, bare-soil evaporation had the greatest influence on the upper 4.62 cm in the sand loam and the upper 7.18 cm in the clay and silt loams. At 51 d bare-soil evaporation had the greatest influence on the upper 7.36 cm in the sand loam, the upper 9.79 cm in the silt loam and the upper 14.1 cm in the clay loam.