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Soil and canopy energy balances in a maize field with subsurface drip irrigation

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Abstract Research was conducted at the experimental station of the Agricultural Engineering Research Institute (AERI), Karaj-Iran, on a maize field under subsurface drip irrigation during summer 2009. Bowen ratio techniques (BREB) were used to obtain the field energy balance and soil surface energy balance, including the total latent heat flux (λE) and soil surface latent heat flux (λEs). Accompanying other measurements resulted in four energy balance components at the field level (Rn, G, H, λE) and soil surface level (Rns, G, Hs, λEs). The energy balance components at canopy level (Rnc, Hc, λEc) were then calculated based on the difference between the corresponding values at field level and the soil surface. Data for the BREB method were collected from above canopy level, at canopy level and at the soil surface. Daytime averages of energy balance components in terms of (w/m^2) were calculated. During the measurement period, net radiation values ranged between 304 to 333 w/m^2, and net radiation reaching the soil surface ranged between 67 to 107 W/m^2. The Rns values decreased with crop growth and LAI increase later in the crop development period. It was shown that λE accounted for 62–83% of Rn and λEs accounted for about 57–71% of Rns in subsurface drip irrigation. Results for a sample day showed that, of the total available energy for evapotranspiration, only 15% was used as sensible heat while the rest was used for evapotranspiration. The soil heat flux was less than 10% of net radiation, of which 93% of available energy was used for soil evaporation. At canopy level, about 19% of the available energy was used as sensible heat.