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Monitoring Near Surface Soil Water and Associated Dynamics of Infiltration and Evaporation Fluxes

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In-situ monitoring of soil water has the advantage of integrating the precipitation and evaporation history and gradual changes in hydraulic properties on the aggregate response of the system, which is manifested as soil water storage. Near-surface soil water and temperature dynamics were monitored throughout a five year period on sweep-tilled (ST) and and no-till (NT) and through phases of a wheat-sorghum-fallow rotation to examine the temporal dynamics of infiltration and evaporation. Plots were established in a fallow field under stubble-mulch tillage management on a Pullman clay loam (fine, mixed, superactive, thermic Torrertic Paleustolls). Soil water contents were monitored using time-domain reflectometry (TDR) at 0.05 to 0.3 m and using a neutron moisture gage to a depth of 2.3 m. Soil temperature, precipitation and net radiation were also monitored. Cumulative infiltration and evaporation were estimated using a water balance approach in conjunction with a calibrated drainage model. Autocorrelation statistics were carried out for the entire field during the first year prior to implementation of the tillage treatment to evaluate spatial dependency of soil water contents and change in water storage after precipitation events. Soil water contents at 0.05 and 0.1 m were lower in recently tilled ST plots, even following repeated precipitation events. Water contents at soil depths $\geq$ 0.2 m were not influenced by tillage. Tillage effects on three-day cumulative evaporation depths depended on the rotation phase, which was likely related to the recency of tillage and residue cover. Likewise, tillage effects on cumulative infiltration depths for short duration storm events depended on the rotation phase, with similar infiltration depths after wheat harvest. Field variability of cumulative infiltration also differed with respect to tillage.