Geophysical Research Abstracts
Vol. 20, EGU2018-18851, 2018
EGU General Assembly 2018

Multi-temporal variation in water consumption of summer maize as determined by the Water Transformation Dynamical Processes Experimental Device

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A better understanding of the multi-temporal variation in evapotranspiration (ET) at different crop growth stages is the key for determining a reasonable irrigation schedule. In this study, a new device named 'Water Transformation Dynamical Processes Experimental Device' (WTDPED) was developped by coupling large weighting lysimeter with chamber. The device has been used to monitor ET for maize under controlled environmental and groundwater conditions, and the multitemporal variations of ET considering the combined impact of environmental factors (air temperature (AT), relative humidity (RH)) and groundwater in homogeneous and layered soils were focused on. During the whole growing period, the ET peaked at 14:00–15:00 on a daily basis. The variation in daily ET followed a bell curve during the entire growing period. The 5-day ET reached its maximum during the 12th leaf and maturity stage. The correlation coefficient between ET and AT reached its maximum
value of 0.70 during planting and the third leaf stage. The negative correlation coefficient between RH and ET reached its maximum during the 12th leaf and tasseling-silking stage. Groundwater recharge was positively correlated to ET and the daily contribution was up to 10.07%. The silt sandy loam–loam layered soil was favorable for water and nutrient uptake during the entire growing period of maize.