RSHS18-126
Remote Sensing and Hydrology Symposium (ICRS-IAHS)

Irrigation Management Using Remote-Sensing-Based Spatial Evapotranspiration Modeling in Maize and Soybean in Nebraska, USA

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Remote sensing-based water balance models may improve irrigation management by considering variability both between and within agricultural fields. A spatial water balance model with remote-sensing-based inputs was used to estimate spatial evapotranspiration (ET) and manage irrigation in field studies in Nebraska, USA during the 2015, 2016, and 2017 growing seasons. The ET water balance model used reflectance-based crop coefficients as input. In 2016, a hybrid ET methodology including reflectance-based crop coefficients and a two-source energy balance model was introduced. In 2017, a simple methodology for incorporating point soil water content measurements into the spatial water balance was added. Remote sensing inputs were from Landsat 7 and 8 surface reflectance and thermal infrared imagery. The methodology was tested in a maize-soybean center-pivot-irrigated field at the University of Nebraska-Lincoln's Eastern Nebraska Research and Extension Center, near Mead, Nebraska, USA. Irrigation was applied using a variable rate irrigation system. Irrigation for one treatment was prescribed specifically for each plot using the model; for two treatments irrigation was based primarily on soil water content measurements and the final treatment was rainfed. Comparisons of the model-prescribed irrigation and resulting crop yield with those from other treatments will be presented for each year. The remote-sensing-model-based irrigation scheduling prescriptions appeared to improve when measured soil water content was included.