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Modeling Evapotranspiration over Low Vegetation Crop Cover using Multispectral and Thermal Infrared Imagery Acquired with a Low Altitude Unmanned Aerial System

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The development of unmanned aerial systems (UAS) has provided greater opportunities for collecting remotely sensed data for various applications. One particular area that UASs have potential to have a positive impact is in the remote sensing of evapotranspiration (ET) to be used in managing irrigation scheduling. UASs are becoming more widely adopted for their potential of increasing spatiotemporal resolution in estimating ET, making near real-time irrigation management with these systems more feasible. Other remote sensing platforms such as satellites or manned aircraft have either a low spatial resolution or revisit frequency or are too costly for covering small areas, which prohibits the collection of the necessary data to manage irrigation in near real-time. One method of estimating ET is with the two source energy balance model (TSEB) that uses radiometric surface temperature to estimate the surface latent and sensible heat fluxes. While the TSEB model has been used quite extensively with satellite and airborne imagery, more research is needed for estimating ET under partial canopy covered surfaces using ultra-high spatial resolution imagery. For this work, multispectral and thermal infrared imagery collected over a 65 hectare maize field with low vegetative cover was used in the TSEB model to estimate ET spatially. After generating the surface fluxes, a two-dimensional flux footprint was used to aggregate the spatial fluxes and compare with measured fluxes using an Eddy Covariance flux tower located within the field.