

Actual Evapotranspiration Measurement Trough Eddy Covariance in Uruguay

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Abstract

Tough there have been great advances in estimating actual evapotranspiration, achieving accurate estimates at the field level is still a challenge. The characterization of site specific characteristics influencing evapotranspiration like soil properties impose a great challenge to the use of modeling, and the accurate characterization of the variability within a field of crop status may bias estimates. Using remote sensing to estimate crop status and energy balance at a fine scale overcome some of these issues. Nevertheless there is a need to have accurate and precise measurements of evapotranspiration that can serve as validation sites. The eddy covariance method provides the accuracy and footprint necessary to be used as a reference. Two towers were installed between 2010 and 2015 at two contrasting locations each year in the south-west of Uruguay at agricultural fields with wheat-soybean crop rotation. The sites were maintained at the same location during wheat and soybean, and were moved when other crops were planted at the site. Each tower had instruments to measure in parallel the energy balance (radiometers, flux plates and soil temperature probes), and evapotranspiration directly from eddy covariance (sonic anemometer, IRGA). All locations met fetch requirements, were representative of agricultural fields and were situated in an area dominated by agricultural land. Season long totals showed large variability depending on crop status and seasonal precipitation regime that determined crop growth and leaf area development. Even after full canopy cover was reached (maximum Kc) there was large variation in evapotranspiration reflecting periods of severe stress in some years. This study provides reference values for a significant number of growing conditions and years and highlights the need for considering the variability among years and crops when making estimates of demand for supplemental irrigation. It also provides reference values for methods based on remote sensing of evapotranspiration.

Keywords: Eddy covariance, eta, water use efficiency, soybean