Improving Projections of US Irrigated Agriculture

• Link irrigation water supply with crop water demand by developing a new irrigation algorithm that simulates water limited and growth stage based automatic irrigation

• Evaluate and calibrate the representation of the water cycle in crop models using remotely sensed observations

• Create optimization methods that can inform agricultural management under drought scenarios
Methodology

• Develop new irrigation algorithm for Decision Support System for Agrotechnology Transfer (DSSAT)

• Test the irrigation algorithm sensitivity and optimization methodology using a well-established field trial
  • Corn, University of Florida Agronomy Farm in Gainesville, Florida, 1978-2015

• Estimate the optimal percentage of available water holding capacity threshold (ITHRL) to trigger irrigation at each growth stage

• Expand simulations geographically and assess the ability of DSSAT to reproduce the water cycle using satellite observations
Forrester diagram of DSSAT automatic irrigation algorithm. (a) Irrigation algorithm as originally implemented in DSSAT v4.6. (b) Modified irrigation algorithm. t: time; VWC: volumetric water content; ET: evapotranspiration; AVWAT: available water for irrigation during the growing season; GS: growth stage.
Potential Yield Benefit of Deficit Irrigation

- Non-Optimized: ITHRL = 80%
- Optimized: Using optimization algorithm
- Potential benefit of deficit irrigation decreases with increasing water availability

Distribution of simulated seasonal maize grain yield across 38 years of climate data (1978–2015) in Gainesville Florida. Eight irrigation restriction scenarios were evaluated with different Seasonal available water.