Calibration & validation of ECOSTRESS ET using crop water use data at Yuma, Arizona

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Quantitative Assessments of Water and Salt balance for Cropping Systems in Lower Colorado River Irrigation Districts

- A three-year project (Fall 2016- Summer 2019)
- Quantify water and salt budgets over multiple crops in the Yuma, Arizona Region
- Research conducted under Public/Private Partnership
- Active data collection September-June over leafy greens, wheat, hay crops
- Water inputs, infiltration, and evaporative fluxes measured at 5-7 sites
- Eddy Covariance fluxes measured at 20 Hz, block averaged 30 minutes
- Rich data set for ECOSTRESS
  - Water use
  - Crop types, crop history, yield
  - High heat stress
  - Clear skies dominate
Calibration/Validation Data Products at Yuma

- Eddy covariance flux data
  - 5-7 rotating sites, Campbell and Licor sensors (4 4-way Rn)
  - IRT on 4 tripods
  - Lettuce, Spinach, Durum Wheat, Sudangrass, Cotton, Fallow
  - 30-min flux
  - 20 Hz time-series
- Irrigation data
  - Volume, delivery times, method (sprinkler, flood)
- Soil moisture sensors & soil textures
- Resistivity surveys (EM38)
- Salinity
- Crop information
  - Type, varieties, planting dates, spacing, row orientation
  - Yield
ECOSTRESS Opportunities for Agricultural Water Management

- Spatial resolution to discriminate temperature and canopy density variations
- Temporal resolution to identify changes in growth stages and crop conditions
  - Diurnal scale
  - Seasonal scale
- Accuracy to forecast one week in advance of irrigation deliveries

Decreasing Water Use with Cooler Temperatures

Increasing Water Use with Hotter Temperatures

Irrigation event detection & quantification
Eco-hydrological Modeling and earth observations for water management: Yuma, Arizona

- Eddy covariance, water deliveries, soil moisture monitored at two lettuce/wheat sites as proposed.
- Project has expanded to include 7 total EC stations and 2 LAS systems, nearly year-round.
- Crop portfolio includes iceberg lettuce, romaine, spinach, durum wheat, sudangrass, Bermuda grass
- Fallowing site monitored
- Landsat and Sentinel 2 data collections
- ECOSTRESS ET validation site
- Potential Venus satellite site
- Water delivery, fractional cover, crop type, planting dates, LAI data collections at Yuma and Ak Chin Reservation
Summary

- ET and LST data available at multiple sites for ECOSTRESS observation, model verification, & forecasting
- Clear skies, ample ground information
- Up to 7 EC, 2 LAS stations deployed September 2018-May 2019 in Yuma Region
- Short time gaps in Dec-Jan for field operations
- 4 IRTs
- Crops: Lettuce, Spinach (Fall); wheat, cotton, melons (Spring)
- Irrigation amounts: sprinkler and flood
- 30-min flux data available quickly, 20Hz time-series data available less quickly
Irrigation events over lettuce

Water use for short-season crops