

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

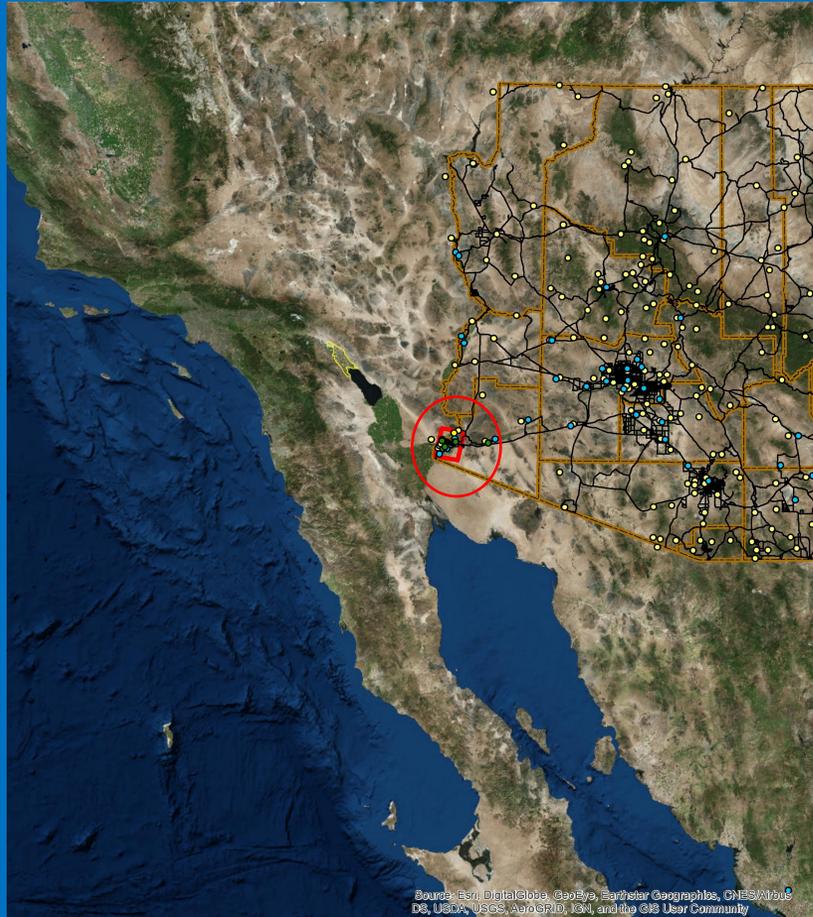
Andrew French¹, Charles Sanchez², and Mazin Saber²

1. USDA/ARS Maricopa, Arizona

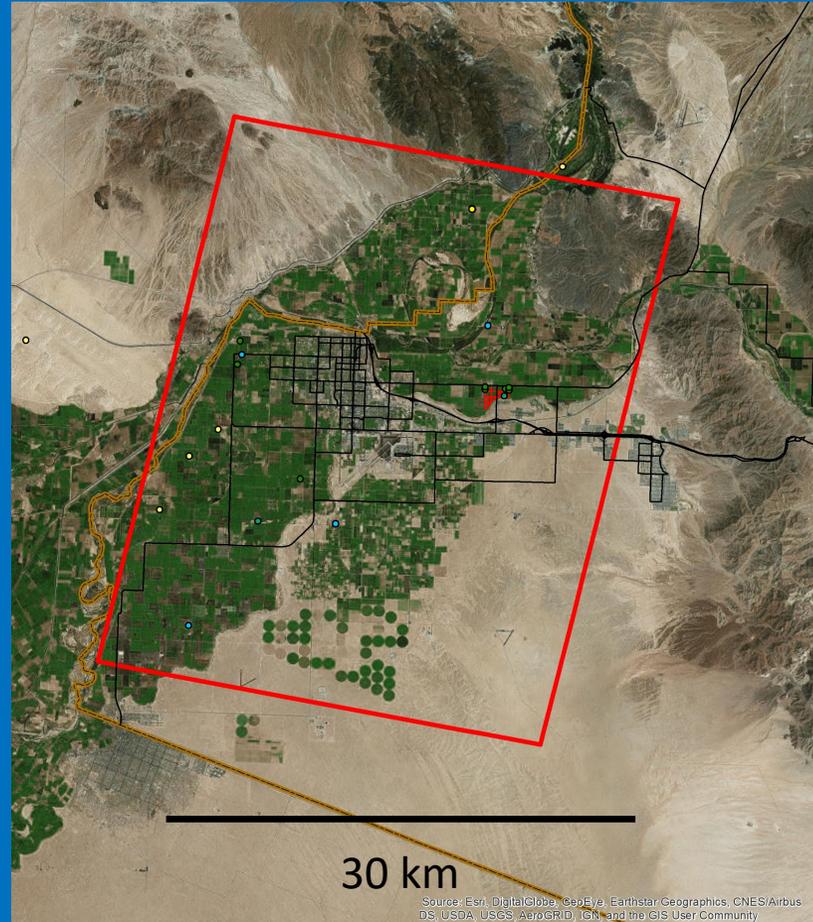
2. University of Arizona, Maricopa, Arizona



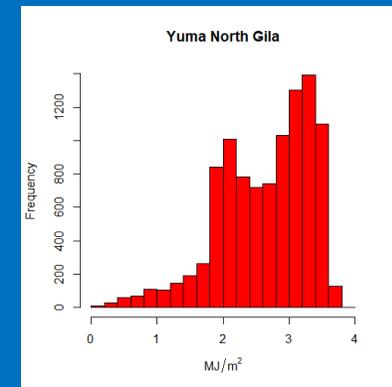
Yuma, Arizona Study Region



Regional Southwest



Yuma Irrigation Districts



Solar Radiation
Noon, 1988-2015

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



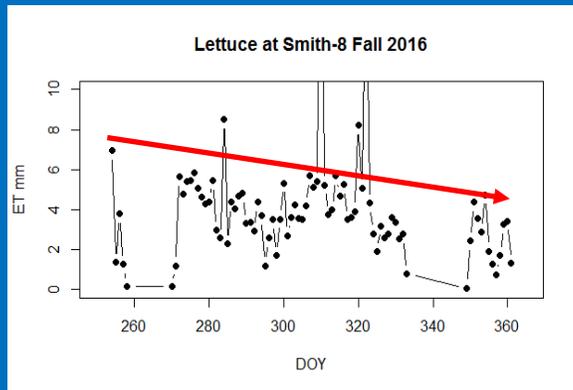
- A three-year project (Fall 2016- Summer 2019)
- Quantify water and salt budgets over multiple crops in the Yuma, Arizona Region
- Research conducted under Public/Private Partnership
- Active data collection September-June over leafy greens, wheat, hay crops
- Water inputs, infiltration, and evaporative 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

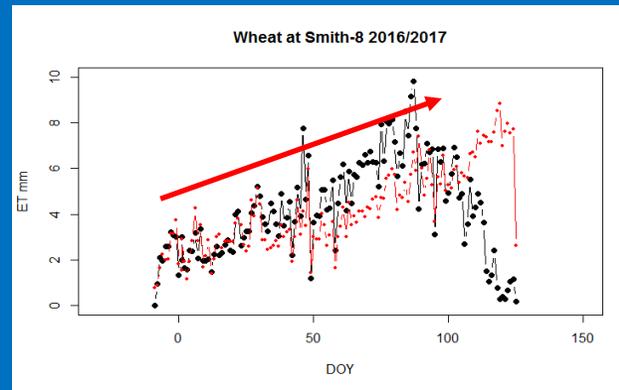
- Eddy covariance flux data
 - 5-7 rotating sites, Campbell and Licor sensors (4 4-way Rn)
 - IRT on 4 tripods
 - Lettuce, Spinach, Durum Wheat, Sudangrass, Cotton, Fallow
 - 30-min flux
 - 20 Hz time-series
- Irrigation data
 - Volume, delivery times, method (sprinkler, flood)
- Soil moisture sensors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

ECOSTRESS Opportunities for Agricultural Water Management

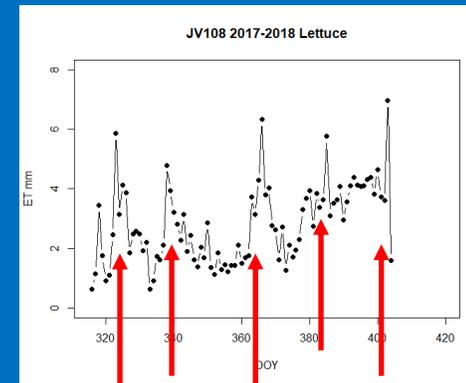
- Spatial resolution to discriminate temperature and canopy density variations
- Temporal resolution to identify changes in growth stages and crop conditions
 - Diurnal scale
 - Seasonal scale
- Accuracy to forecast one week in advance of irrigation deliveries



Decreasing Water Use with
Cooler Temperatures



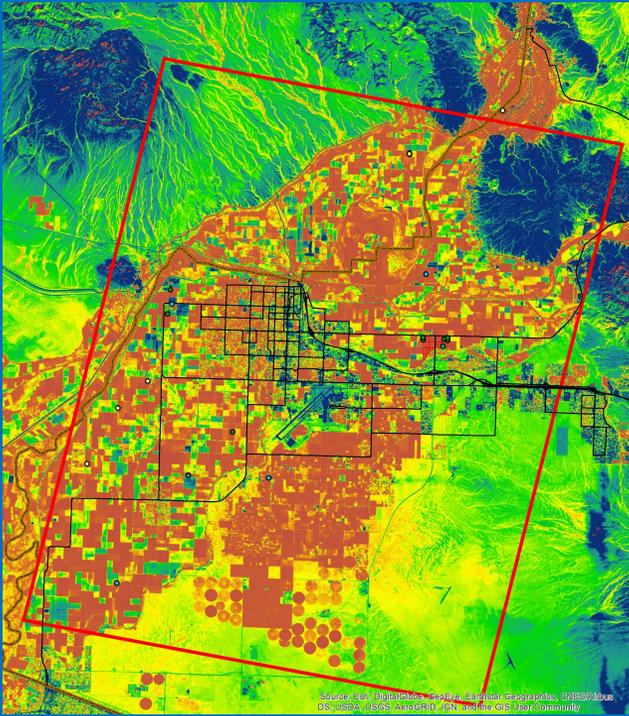
Increasing Water Use with
Hotter Temperatures



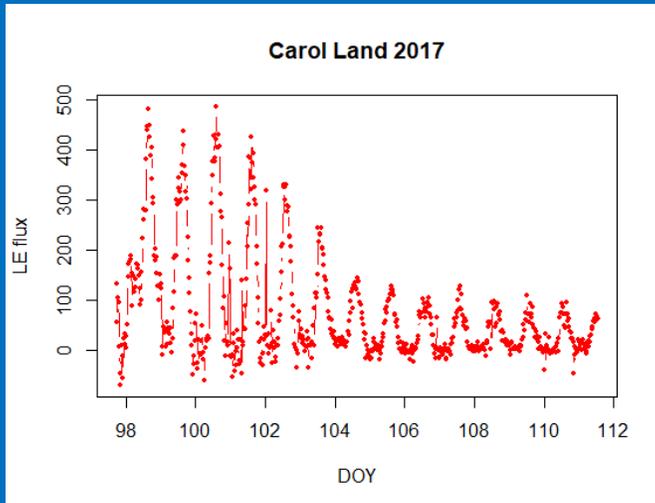
Irrigation event
detection &
quantification

Eco-hydrological Modeling and earth observations for water management: Yuma, Arizona

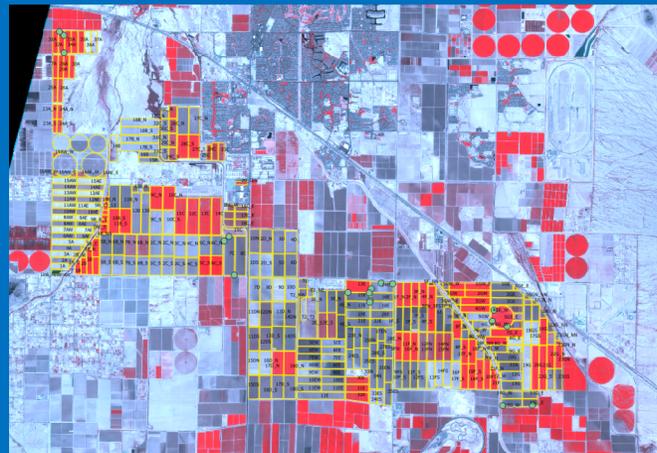
- Eddy covariance, water deliveries, soil moisture monitored at two lettuce/wheat sites as proposed.
- Project has expanded to include 7 total EC stations and 2 LAS systems, nearly year-round.
- Crop portfolio includes iceberg lettuce, romaine, spinach, durum wheat, sudangrass, Bermuda grass
- Following 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



Landsat Vegetation Index at Yuma, AZ



Eddy Covariance at Yuma following site



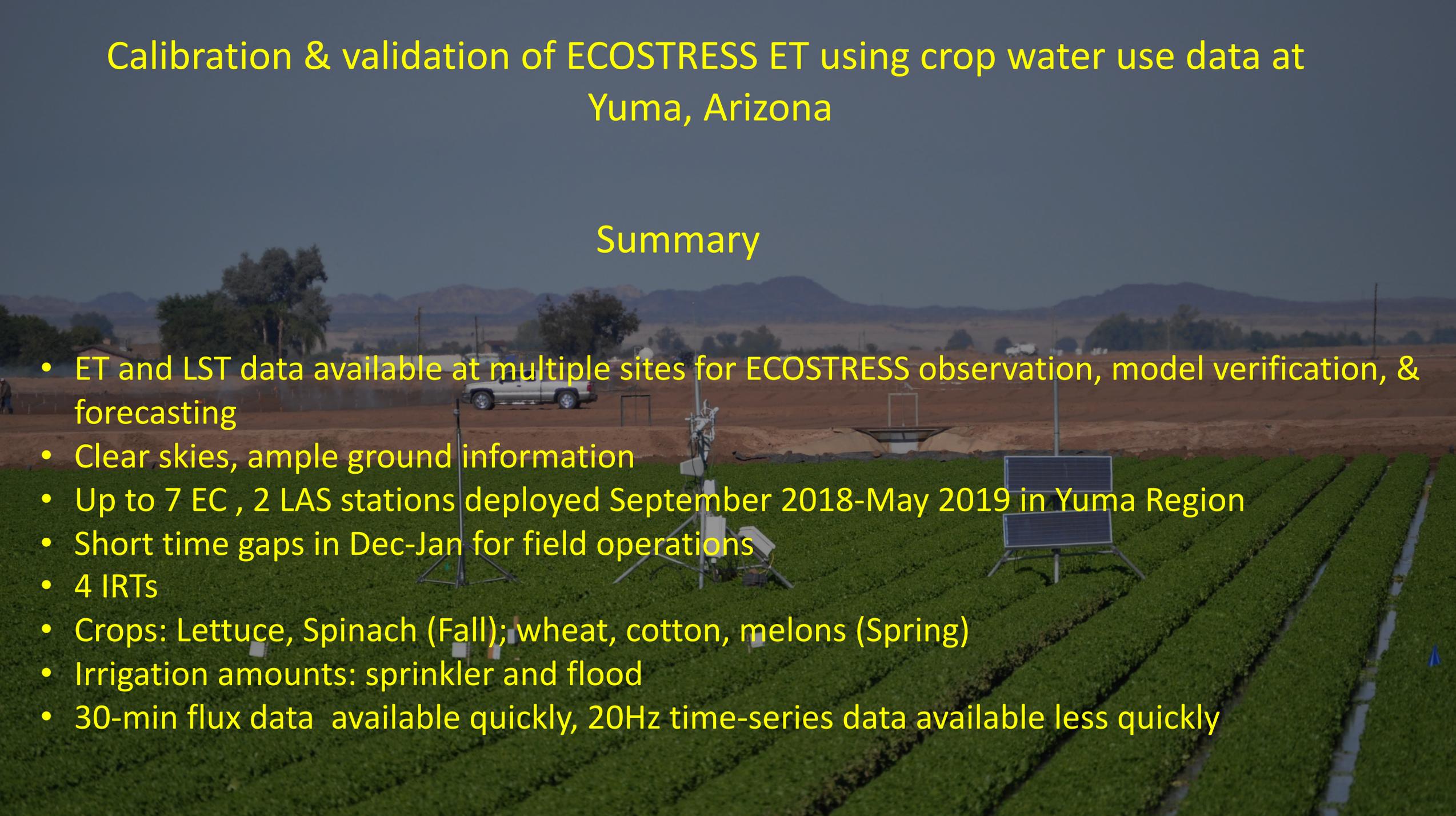
Venus VI mapping, Ak Chin



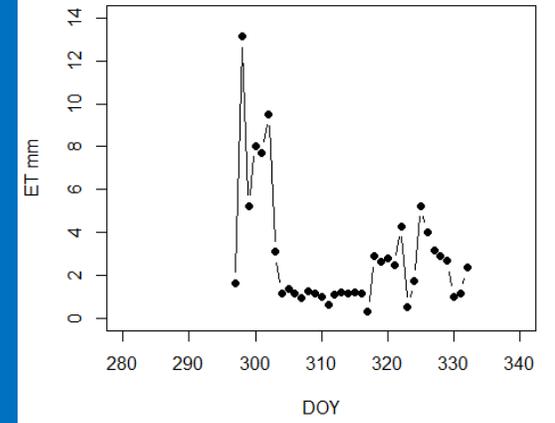
LAI validation cotton site

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

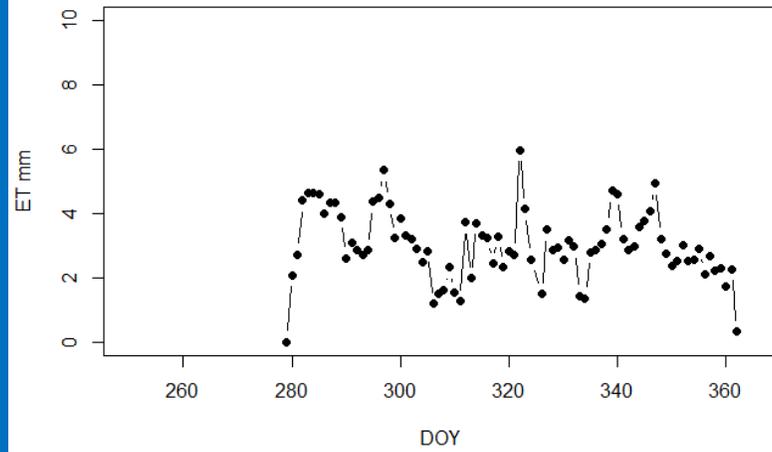
Summary

- 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
- 

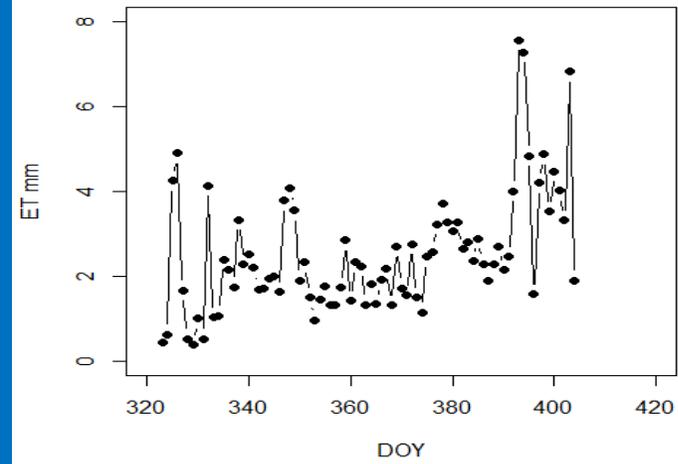
JV311/312 2017 Spinach

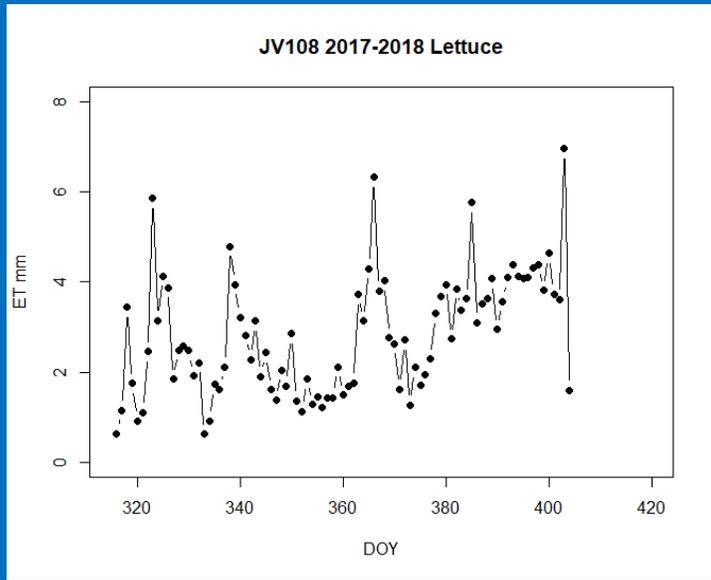


Smith 6; 2017

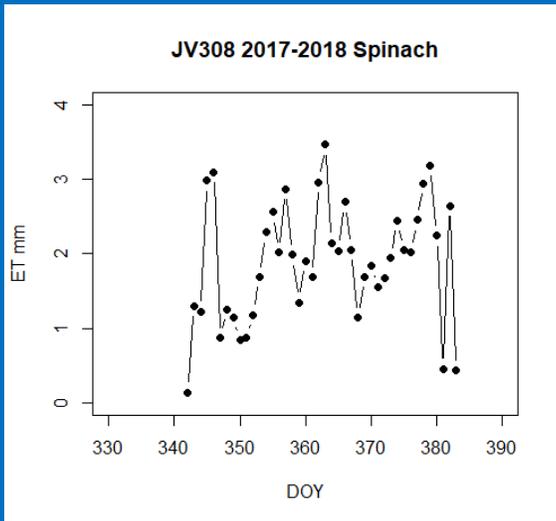


JV187 2017-2018 Lettuce





Irrigation events over lettuce



Water use for short-season crops



Search Criteria Summary (Show)

