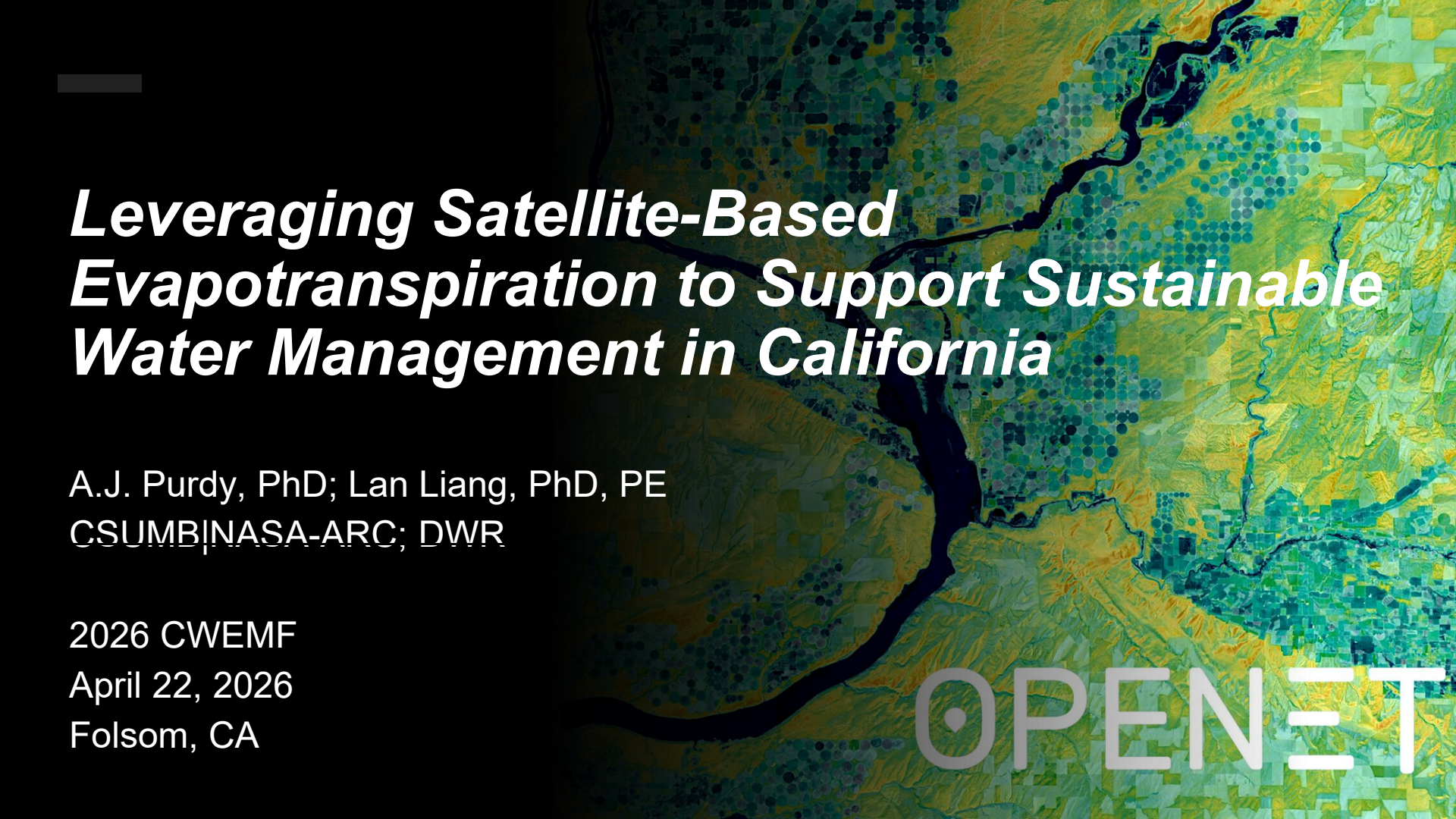




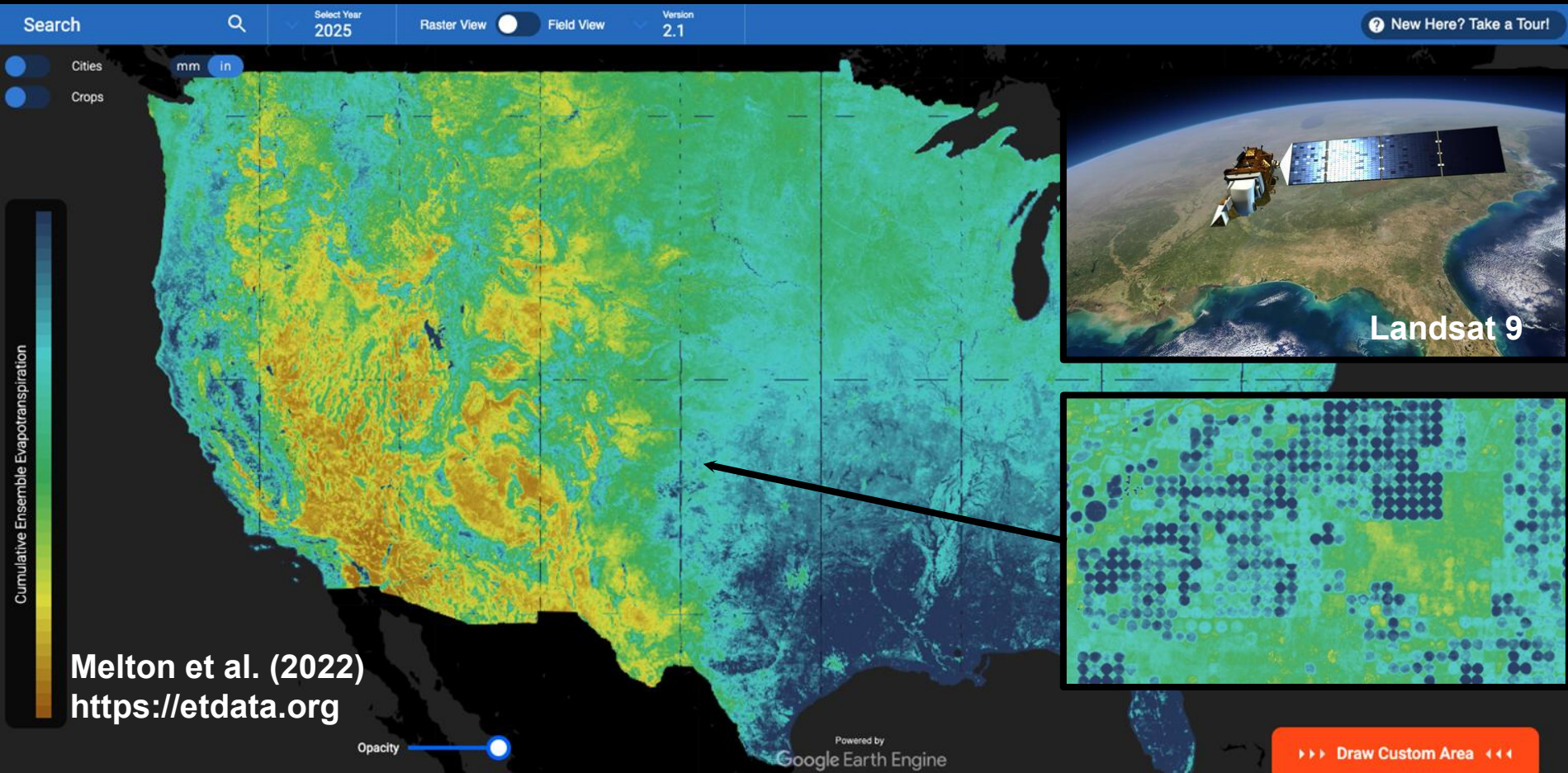
Leveraging Satellite-Based Evapotranspiration to Support Sustainable Water Management in California

A.J. Purdy, PhD; Lan Liang, PhD, PE
CSUMB|NASA-ARC; DWR

2026 CWEMF
April 22, 2026
Folsom, CA

OPENET

OpenET: Field-scale Evapotranspiration Data for Water Resources Management



Maricopa, AZ, USA



Select Year
2025

Raster View

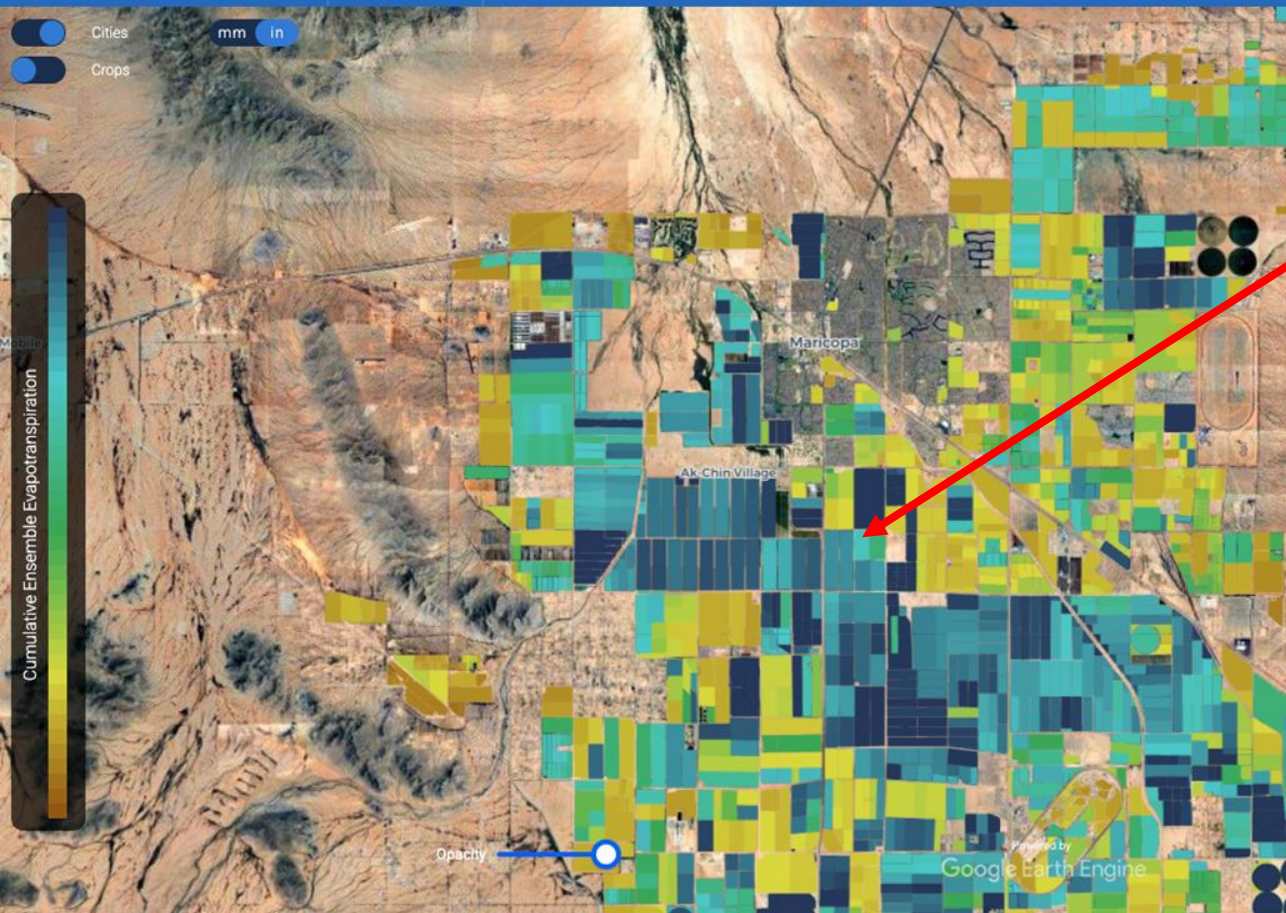
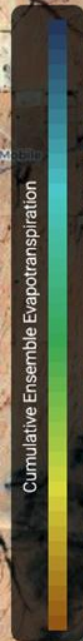
☒ Field View

[New Here? Take a Tour!](#)

☒ Cities

☒ mm ☒ in

☒ Crops



2025 ET: 60 in

75.88 Acres

USDA/CDWR Crop Type: Alfalfa



Opacity

Powered by
Google Earth Engine

[Draw Custom Area](#)

Maricopa, AZ, USA



Select Year
2025

Raster View



Field View

[New Here? Take a Tour!](#)

Cities

mm

in

Crops

Monthly

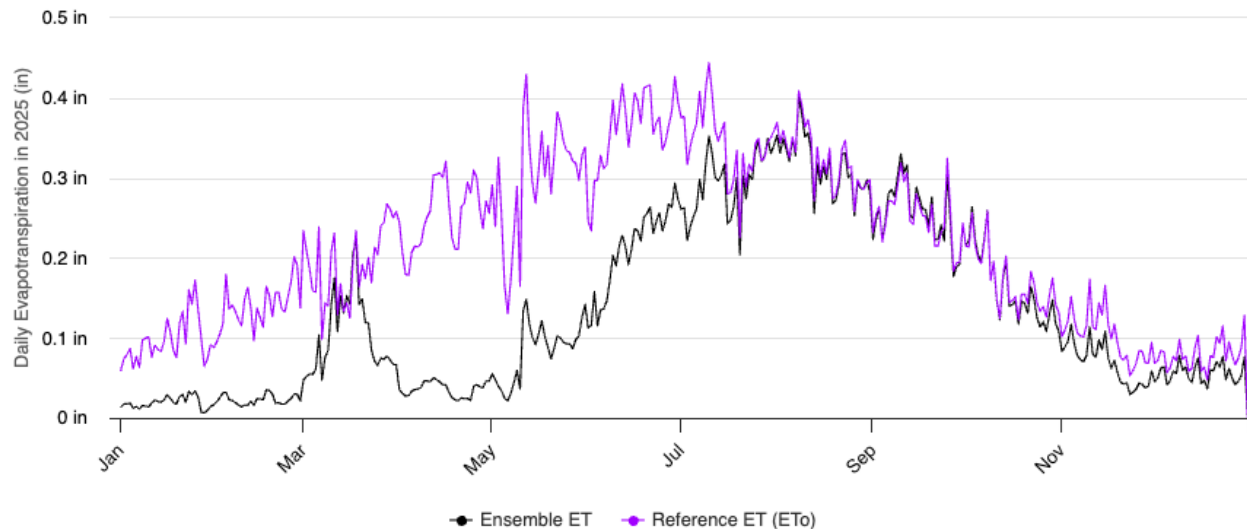
Cumulative

Daily

2025

Daily Evapotranspiration in 2025 (in)

[Download Data](#)



Highcharts.com



Daily Data Options

ET



ET Fraction



Additional Variables



☐ Precip (gridMET)



☒ ETo

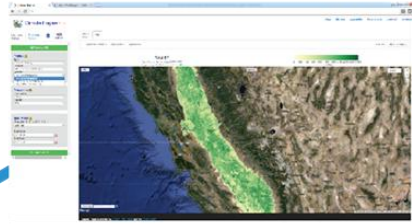


☐ NDVI



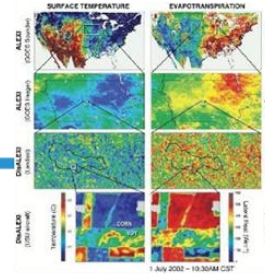
[Draw Custom Area](#)

OpenET Ensemble of Models



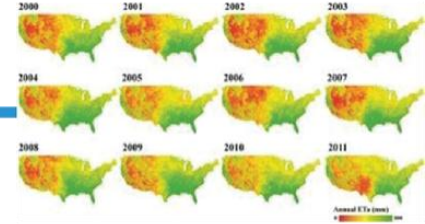
EE METRIC

University of Nebraska,
University of Idaho



ALEXI/DisALEXI

USDA, NASA, University of Maryland,
University of Wisconsin



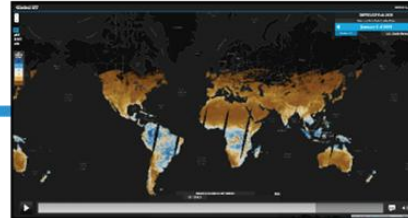
SSEBop

USGS



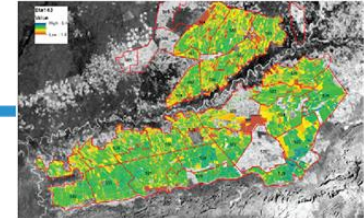
SIMS

NASA, CSUMB, Stanford University



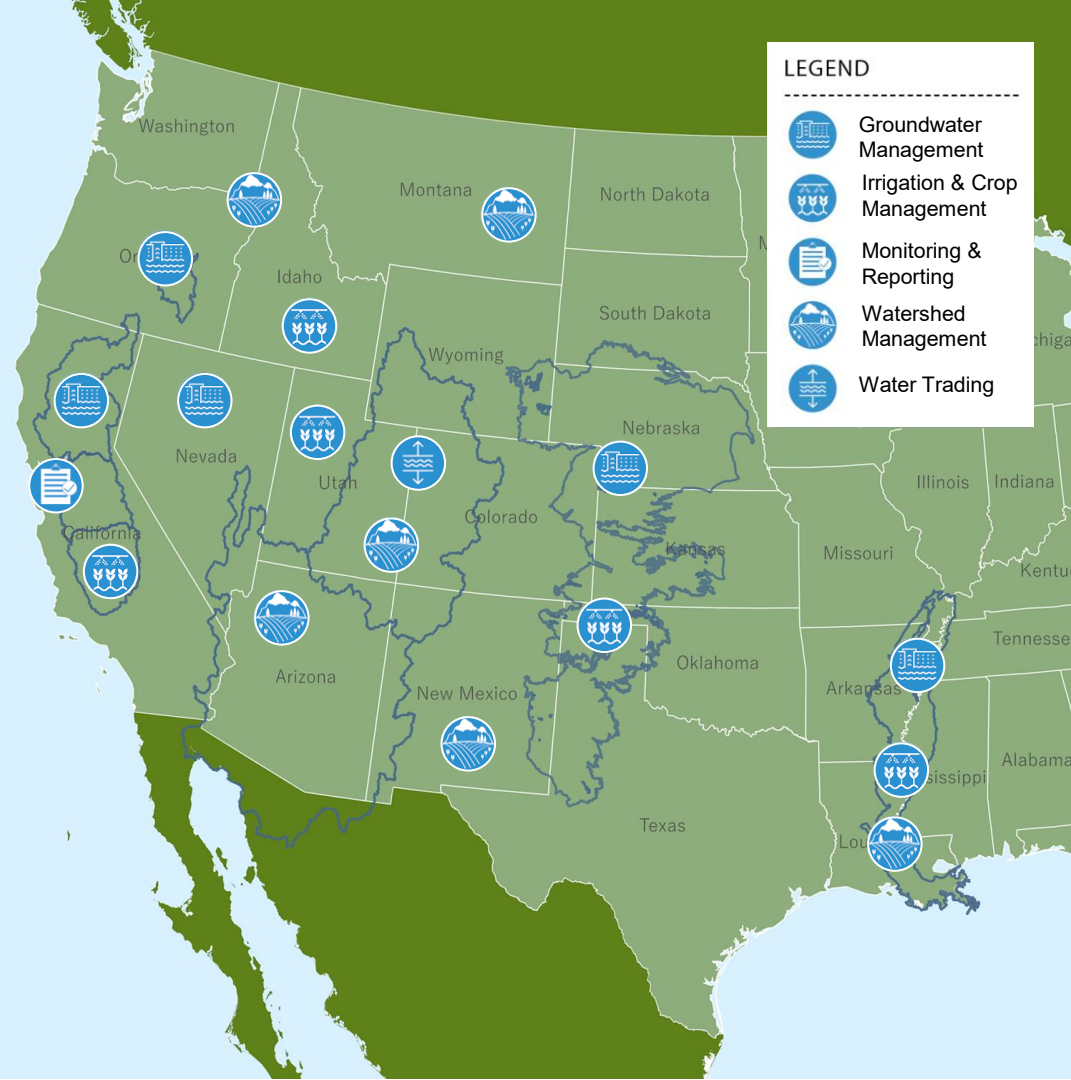
PT-JPL

NASA



SEBAL

Universidade Federal
do Rio Grande do Sul

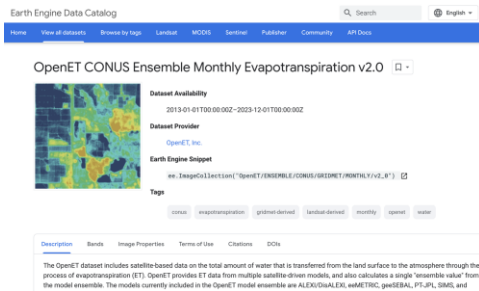


OpenET: Open Data and Open Science



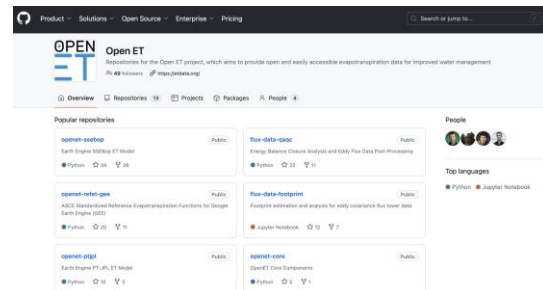
OpenET Data Explorer

<https://explore.etdata.org>



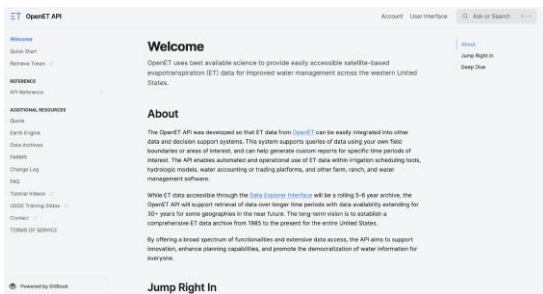
OpenET GEE Data Catalog

<https://developers.google.com/earth-engine/datasets> (search for 'OpenET')



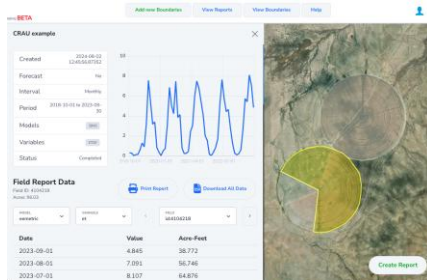
OpenET Open Source Repositories

<https://github.com/Open-ET/>



OpenET API

<https://openet.gitbook.io/docs>



OpenET FARMS user interface

<https://farms.etdata.org/>

- >15,300 users
- > 850,000 data retrievals
- Backed by dedicated science and software engineering team

OpenET resources for California

Advancing Groundwater Sustainability with California DWR & OpenET



GROUNDWATER MANAGEMENT, REGULATORY COMPLIANCE, WATER MANAGEMENT

OpenET is partnering with the California Department of Water Resources (CA DWR) to provide consistent, science-based evapotranspiration (ET) data to state agencies, Groundwater Sustainability Agencies (GSAs), and other local entities. This collaboration strengthens water management and Sustainable Groundwater Management Act (SGMA) implementation by making reliable, cost-effective ET data widely accessible. Through this contract, GSAs and their designated consultants receive free expanded access to ET data via a California-specific API, along with support from the OpenET team on data use and integration.

Accurate consumptive use data are essential for groundwater management, water budgeting, and long-term planning. OpenET offers a transparent and cost-effective approach by providing consistent ET data across California's landscapes, which can be directly integrated into groundwater sustainability plans, water budgets, groundwater models, and accounting frameworks. Many GSAs and water users rely on OpenET within water accounting platforms to track and manage water budgets at the field or management-area scale.

Beyond day-to-day management, OpenET supports long-range planning by helping agencies evaluate water demand, consumption patterns, and the trade-offs associated with various conservation practices, including infrastructure investments, on-farm efficiency improvements, and land-use transitions.

Across the state, OpenET is being used in several notable applications. In Merced County, the Merced Irrigation District and Merced Irrigation–Urban GSA use OpenET within the Groundwater Accounting Platform to provide growers and managers with a clearer understanding of consumptive use. In the Sacramento–San Joaquin Delta, the Central Delta Water Agency and South Delta Water Agency use OpenET through the Alternative Compliance Program to improve water use reporting and support more transparent, consistent data practices.

[Download CA PDF Handout](#)



For CA DWR OpenET support, contact
cadwr-support@openetdata.org



Expanded API access to support water management applications

Category	Public Data Quota	CA API Data Quota
Monthly Request Limit	100	1,000
Maximum Field IDs	100	5,000
Maximum # of Polygons	50	8,000
Maximum Area/Request (acres)	50,000	10,000,000

User Support & Training

Statewide GeoTIFFs hosted by DWR

- Monthly data (all models & all years)
- Daily data (available for select years)

Building trust through transparent assessment

Eddy Covariance Sites After QA/QC



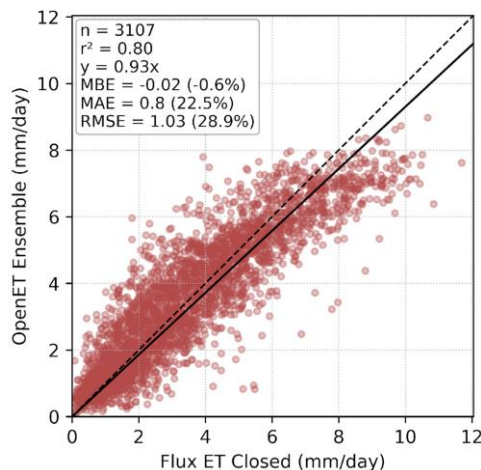
National evaluation included 152 benchmark ET sites. Volk et al., (2024)

Forthcoming California evaluation includes 47 sites

Eddy covariance quality
control & post-processing
following Flux Data QAQC
Volk et al., 2023

Matching OpenET values to flux footrpings

Identify priority land uses for future research



Comparing ET to Irrigation

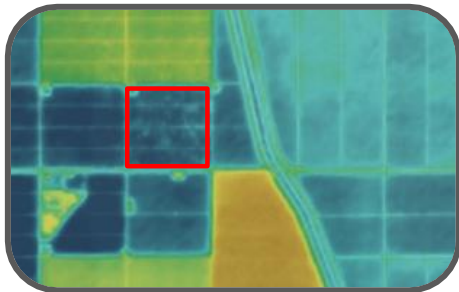
ET $\neq$ Irrigation

$$ET \leq \text{Irrigation} + \text{Precipitation} + \Delta S$$

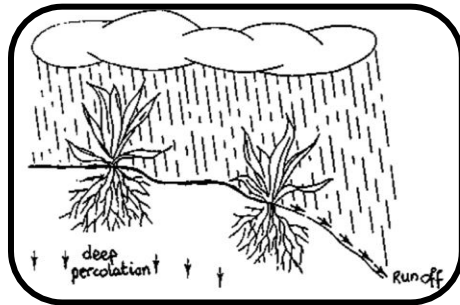
Collecting quality
meter data



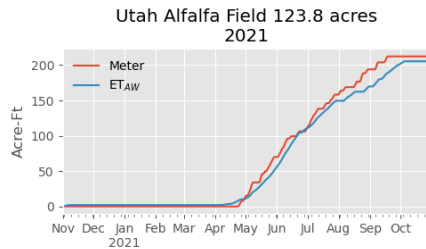
Matching place of use
to ET time series



Accounting for
effective precipitation

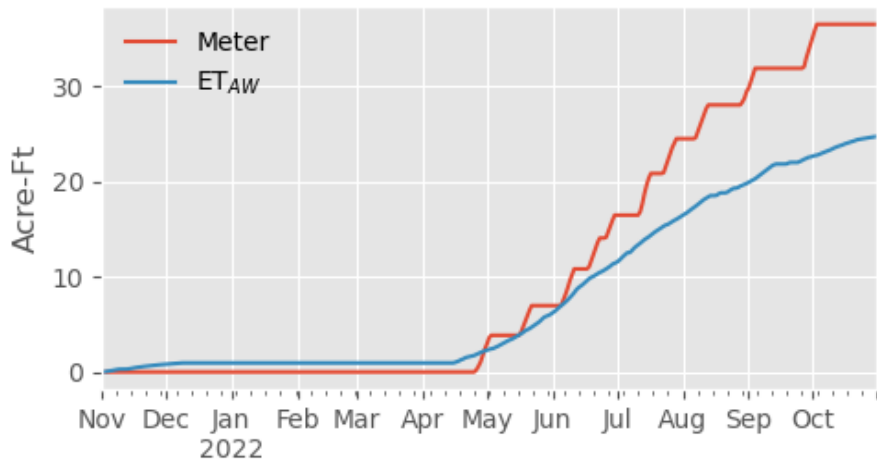


= Useful Comparison



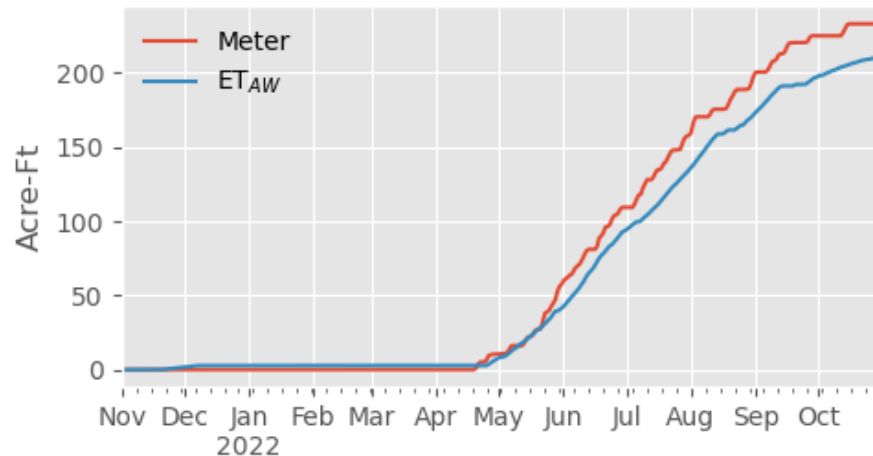
Pairing ET with meter data to maximize value

Alfalfa Field 11.7 acres



Lower Crop Use Efficiency

Alfalfa Field 110.4 acres



Higher Crop Use Efficiency

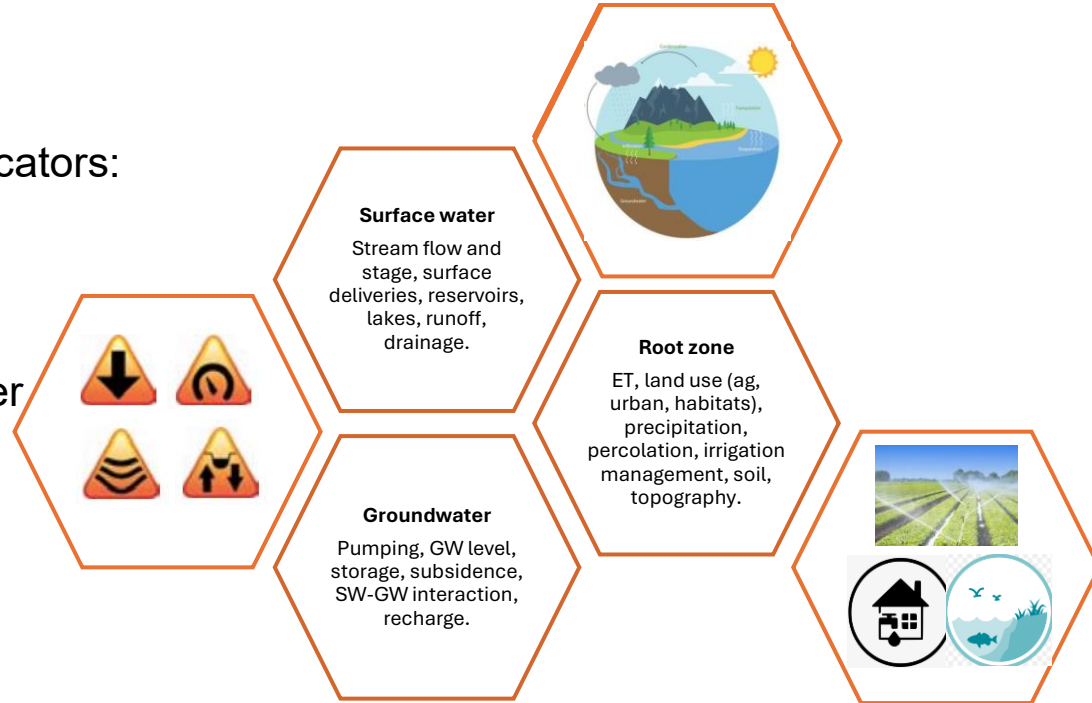
ET application in groundwater sustainability management

- Use remotely sensed ET(RSET) to estimate water use and groundwater condition.
- Multiple components in root zone water budget affect pumping.
 - ET, land use, precipitation, soil properties, irrigation, surface deliveries, topography, groundwater...
- Pumping is the major reason affecting groundwater condition.



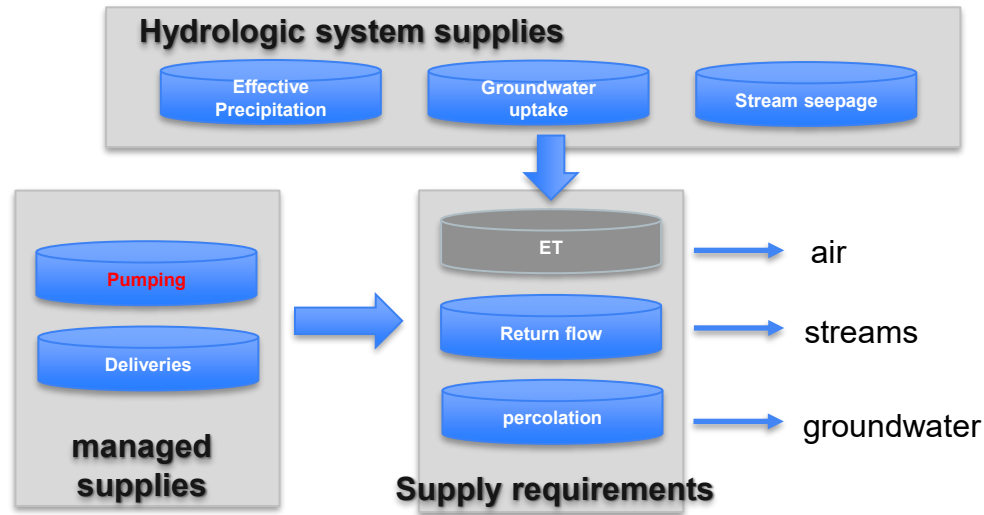
ET application in integrated hydrological models

- RSET used in DWR and GSA hydrological models in Central Valley
 - IWFM
 - MODFLOW
 - C2VSimFG
 - Local GSA models
- Six groundwater sustainability indicators:
 - Groundwater level
 - Groundwater storage
 - Land subsidence
 - Interconnected surface water
 - seawater intrusion
 - Water quality



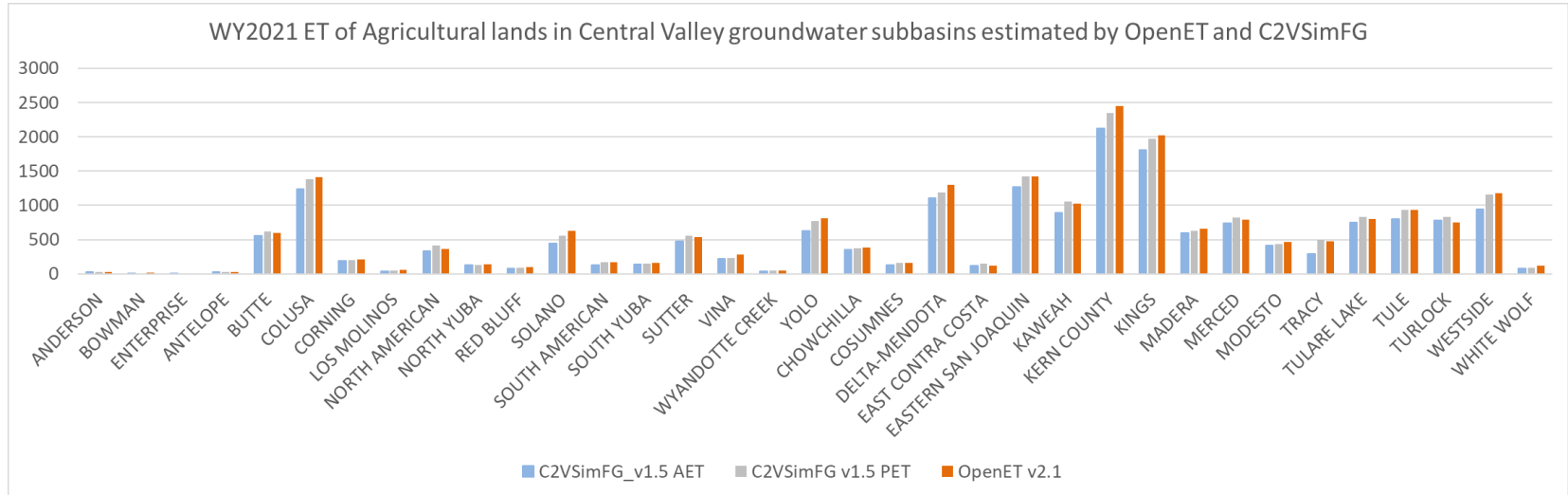
Land surface water budget

- Major reason of groundwater change in Central Valley: pumping
- Pumping lacks measurements.
- Pumping is mostly estimated from land surface water budget.



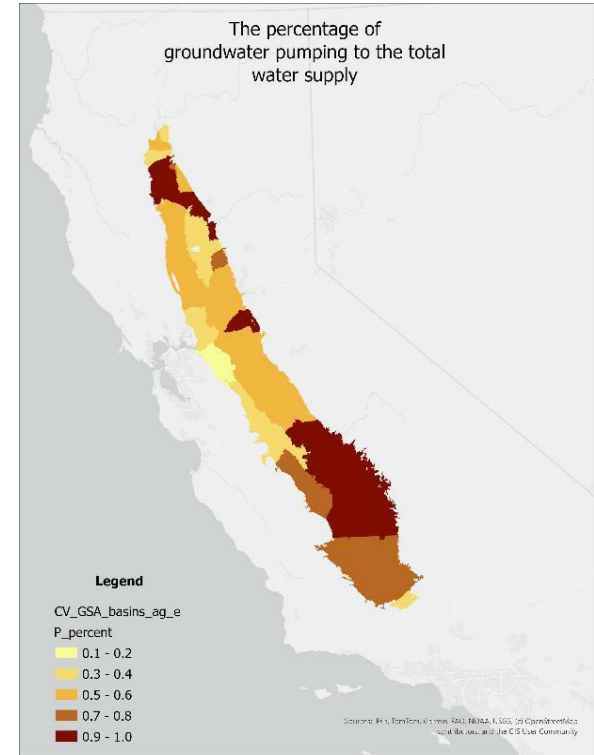
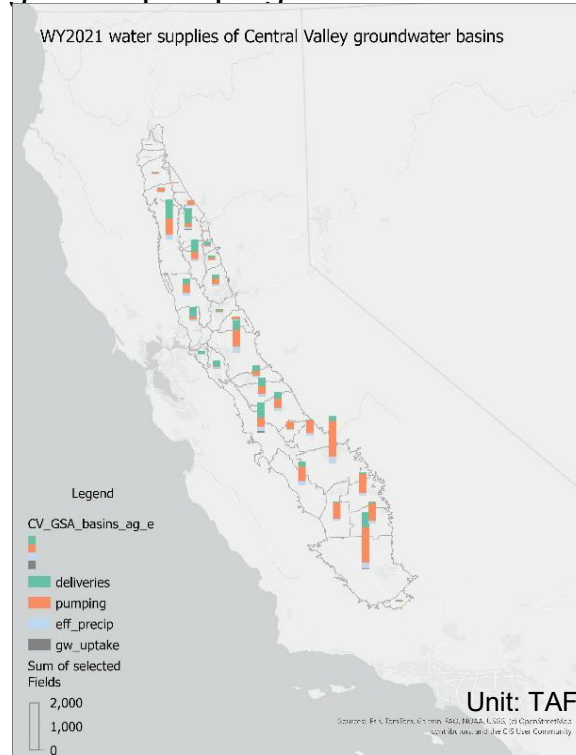
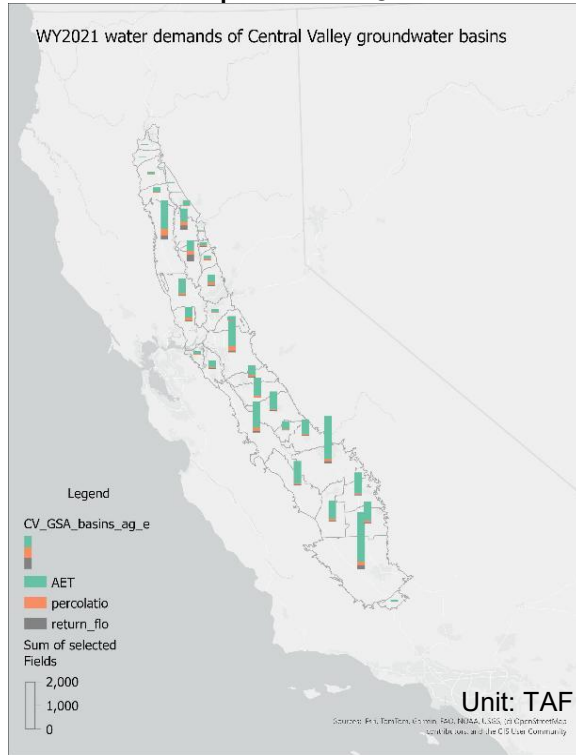
ET by groundwater subbasins

- C2VSimFG v1.5 used ITRC and OpenET provisional RSET and calibrated with observed groundwater level and GSP reported data.
- The spatial distribution and magnitudes of RSET provides reliable magnitudes and spatial distribution of consumptive use.



C2VSimFG v1.5 estimated water budgets

- The uncertainties of RSET is much less than other unknown or uncertainties in water budgets.
- The integrated model with RSET requires much less calibration than without RSET.
- Example: WY2021 water budget and pumping estimate



Conclusions

- OpenET uses transparent methods to produce consistent, reliable ET data.
- Expanded OpenET access is available for state and local GSA agencies and farmers with DWR support.
- Models benefit from consistency in RSET-estimated water use information, especially for multiple scales.
- The RSET introduced uncertainties in water budget and groundwater estimates could be calibrated and validated through other observed data in the hydrological system.
- Additional ground evaluations can be used to continue to improve OpenET models over time.

Questions?

OpenET Data Access



<https://etdata.org/>



<https://cadwr.app.box.com/v/OpenET-California>