

OpenET

Filling the Biggest Data Gap in Water Management



Search



Select Year
2018



Variable
ET

Raster View



Field View

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

mm ☒ in

☐ Cities

[Create Custom Data](#)

Cumulative Evapotranspiration (in)



[About Field Boundaries](#)

100 mi

Opacity

1

6

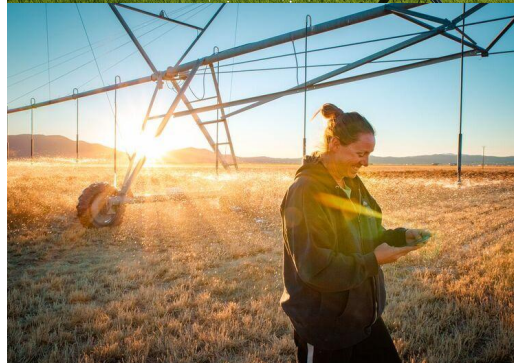
+

-



OpenET Goals:

Reliable ET data are produced and available at low cost, and **easily accessible via etdata.org** for any area within the Western US.



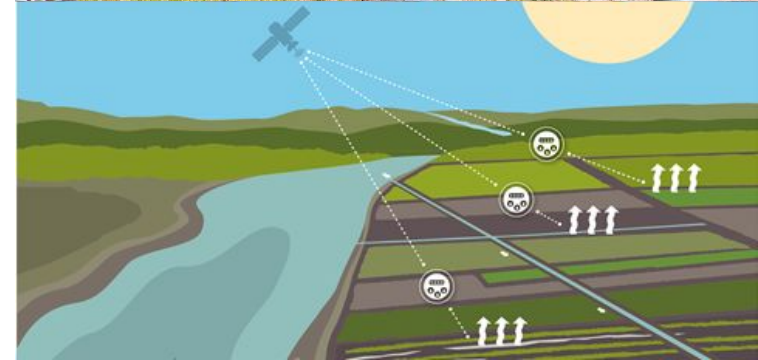
There is trust in the validity of the data and information provided by the platform, and it is utilized by private and public resource managers at the local, state and federal levels.

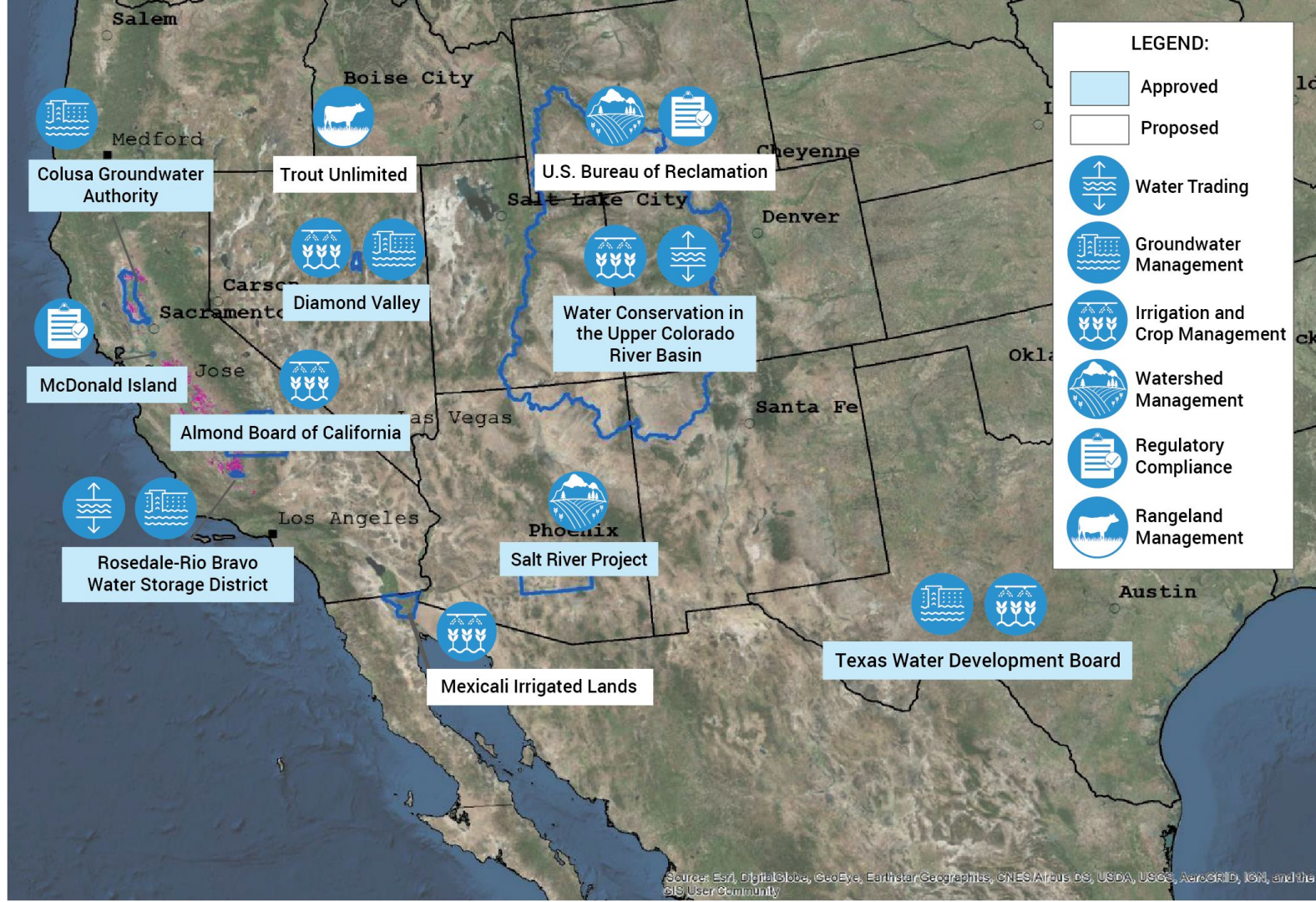


A variety of **sustainable resource management practices are enabled** at a much larger scale than is currently possible.

Measuring ET enables:

- development of realistic water budgets
- incentives for conservation and innovation
- proper credit for reduced use
- reduced transaction costs for water trading programs
- increased on-farm efficiencies

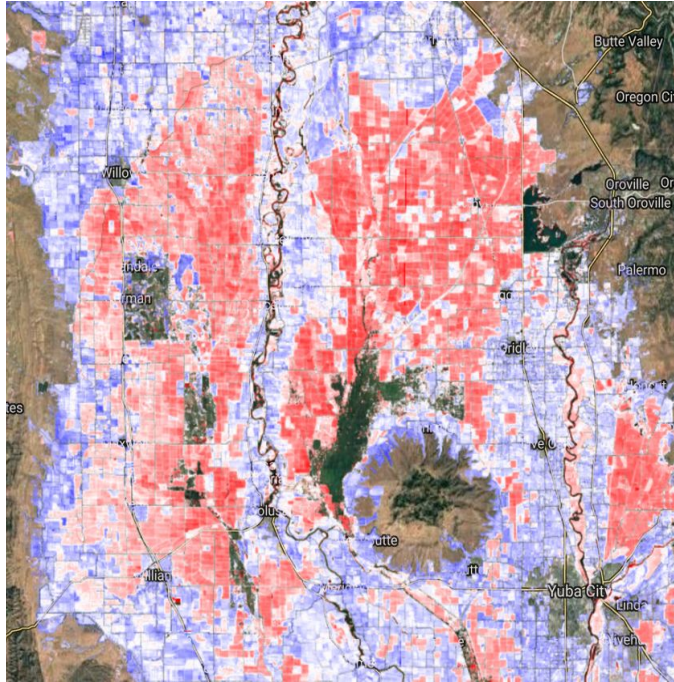




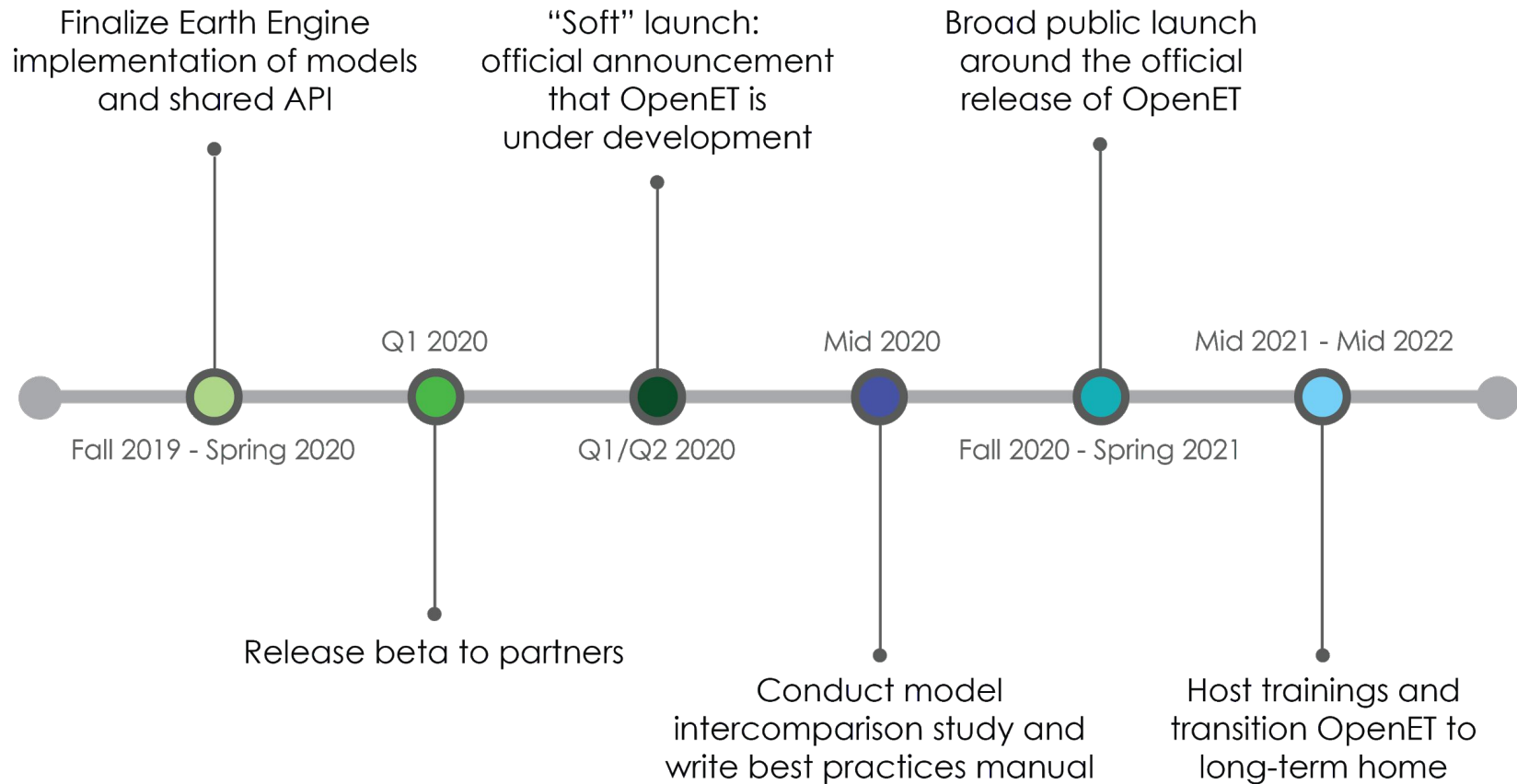
The OPENET Team

- Multimodel Development, Integration, API, UI (Habitat Seven, DRI, NASA)** Justin Huntington, Jamie Herring, Charles Morton, Britta Daudert, Alberto Guzman, Jody Hansen, Jordan Harding
- ALEXI / disALEXI (USDA, NASA, U. Maryland, U. Wisconsin)** Martha Anderson, Yun Yang, Christopher Hain, Mitch Schull, Mutlu Ozdogan
- METRIC / EE Flux (DRI, U. Nebraska, U. of Idaho)** Ayse Kilic, Rick Allen, Peter Revelle, Samuel Ortega, Charles Morton
- Priestley-Taylor Jet Propulsion Laboratory (NASA)** Josh Fisher, Gregory Halverson
- SIMS (NASA, CSUMB, Stanford University)** Forrest Melton, Alberto Guzman, Lee Johnson, Tianxin Wang, Conor Doherty
- SSEBop (USGS)** Gabriel Senay, MacKenzie Friedrichs
- Google Earth Engine** Tyler Erickson
- Environmental Defense Fund** Maurice Hall, Robyn Grimm, Dana Rollison

The Value of a Community Effort



- Ability to rapidly compare results from different models to identify consistent differences → identification of opportunities to improve methods / models
- Collaboration to improve consistency of data inputs and reduce redundancy
- Collaboration on evaluation and intercomparison → larger pool of ground measurements and approaches



Summary of Technical Progress

- 1) Completing final model data production runs
- 2) Completing reload of geodatabase
- 3) Reviewing field boundaries for North Dakota -> Texas
- 4) Completing updated website for the OpenET Data Explorer
- 5) OpenET Model Intercomparison and Accuracy Assessment ongoing
- 6) Rapid progress on OpenET API Development

ET Intercomparison and Accuracy Assessment

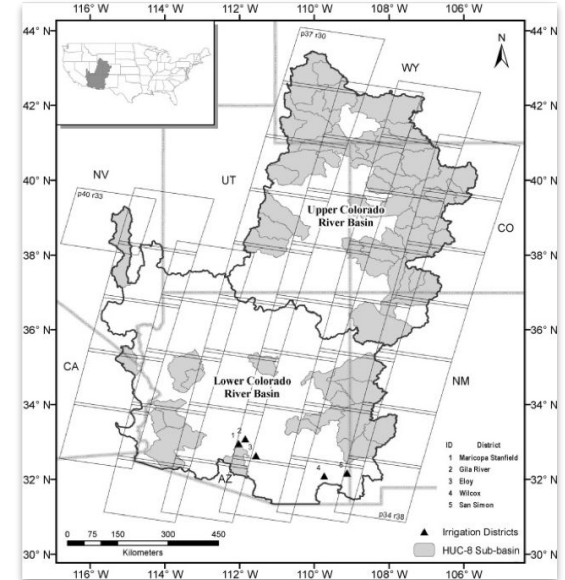
Flux towers



Groundwater pumping records

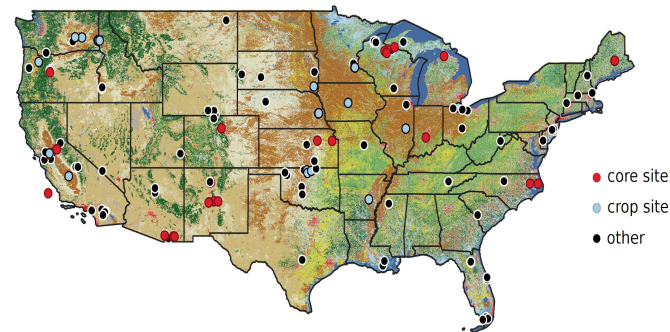


Water balances

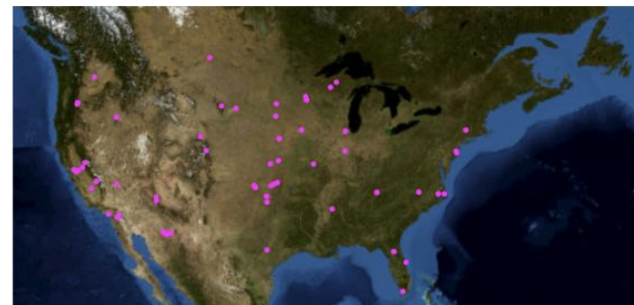


Flux Tower Data

- 157 (of 198) Ameriflux sites (26 crop and 26 core sites) had sufficient data to assess energy balance closure
- Rigorous QA/QC of ground data:
 - Average daily energy balance closure ratio of >0.75 for growing season and >0.6 for winter
 - Maximum of five missing days per month
 - 87 Ameriflux sites passed filters for multiple months and their energy balance was closed by adjusting LE and H
- > 30 additional flux tower sites for agricultural sites from USDA, UCCE, USBR, and university partners
- DRI leading intercomparison; 50% of sites withheld for final, blind intercomparison and accuracy assessment



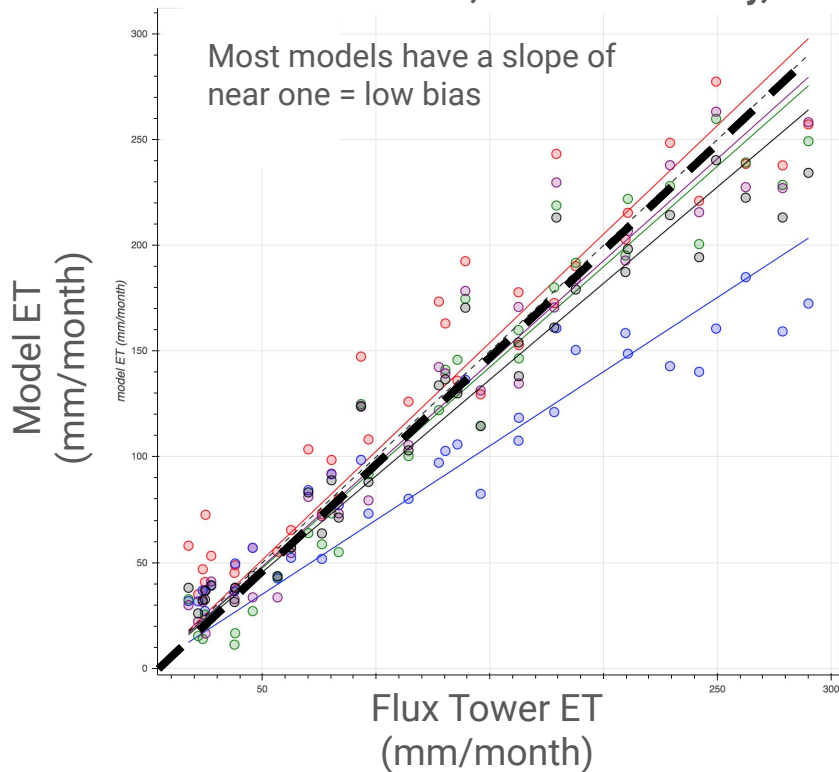
Ameriflux Sites Evaluated



Ameriflux Sites Selected for Intercomparison

Examples of Initial Results

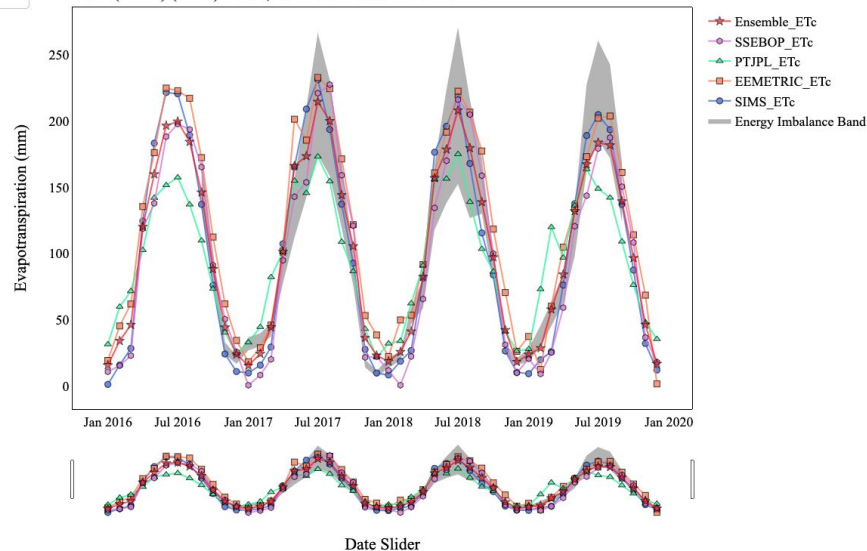
Almond Orchard, S. Central Valley, CA



Pistachio Orchard, S. Central Valley, CA

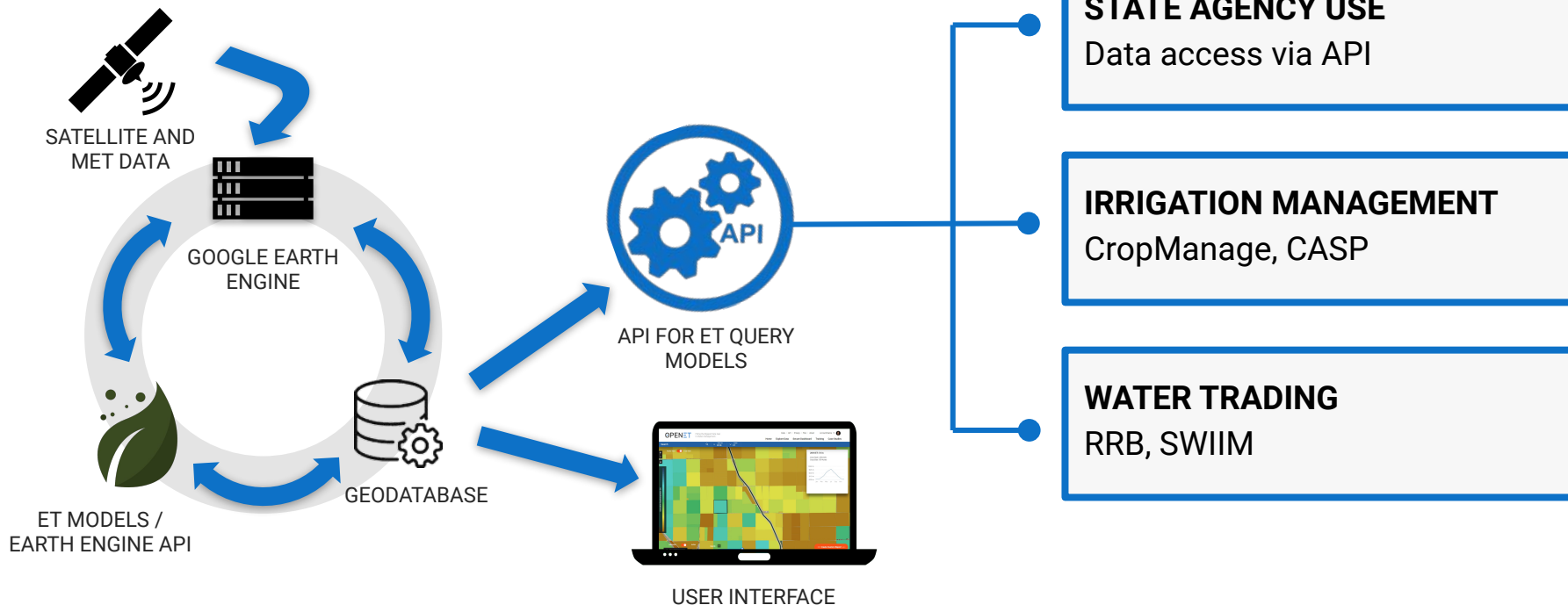
Intercomparison of Monthly ET (mm) Pistachio Low Salinity [3x3 Grid]

$EBC = (H+LE)/(Rn-G) = 0.71$; Correction Factor = $1/EBC = 1.41$



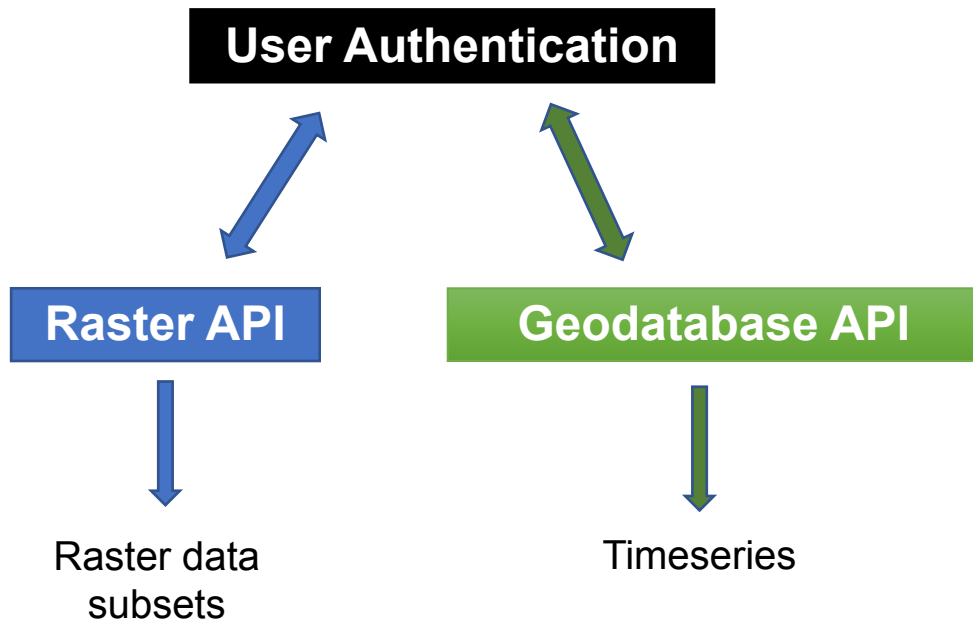
OpenET API for Integration with Other Software

Goal: Increase access to consistent, accurate, scientifically based satellite ET data for a range of **applications**



OpenET API

- Follows the OpenAPI Specification (<https://www.openapis.org/>)
- OpenET API authentication uses Google authentication credentials
- Graphical user interface for API built on swagger.io
- Custom reporting interface (in development) will also provide a graphical interface for the API



OpenET API

Raster API

- Primary purpose is to allow user to retrieve raster (gridded) data for archiving
- Retrieve data for a pixel or polygon
- Retrieve full timeseries or calculate summary (sum, mean, median, max, min, range) over date range
- Returns data as json or csv for pixel queries
- Returns GeoTIFF or Earth Engine asset for polygon queries

Geodatabase API

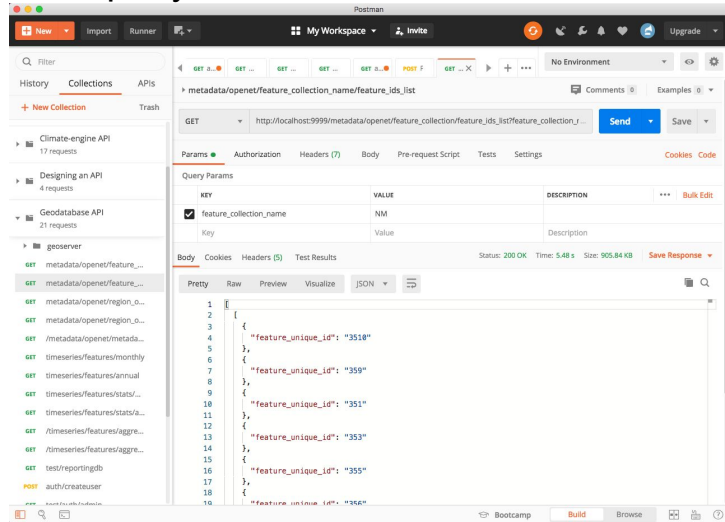
- Primary purpose is to allow user to retrieve data or timeseries for geometries or individual fields / polygons
- Retrieve data for a feature or collection of features
- Retrieve full timeseries or calculate summary (sum, mean, median, max, min, range) over date range
- Returns data as geojson or csv for polygon queries

Many ways to make an API request

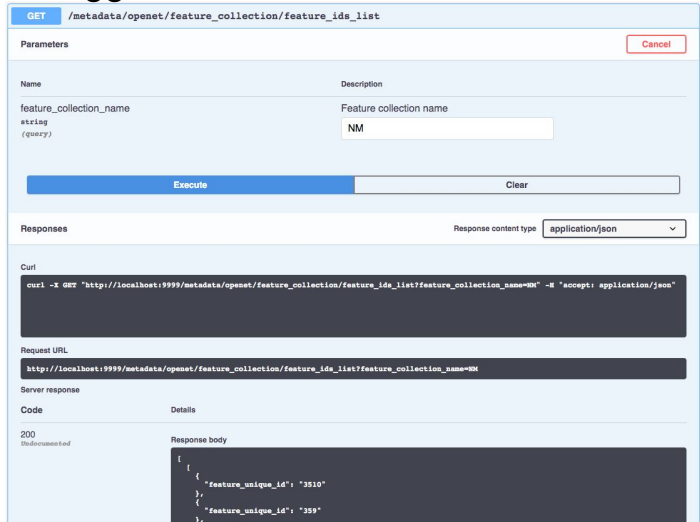
Command-line

```
Last login: Tue May 5 15:11:54 on ttys003
-bash: export: `.`: not a valid identifier
-bash: export: `/Users/jhansen/.profile': not a valid identifier
(base) jhansen@jhansen00P:~$ curl -X GET "http://localhost:9999/metadata/openet/feature_collection/feature_ids_list?feature_collection_name=NM" -H "accept: application/json"
[
  {
    "feature_unique_id": "3510"
  },
  {
    "feature_unique_id": "359"
  }
]
```

Third-party GUI



Swagger UI – interactive documentation



localhost:9999

☆

Apps

Javascript resourc...

Php resources

Images

Create a Layer in...

Other Bookmarks

OpenET API ^{1.0}

[Base URL: /]
<http://localhost:9999/swagger.json>

Evapotranspiration at the scale of individual fields

default

Default namespace

▼

POST

/auth/createuser

GET

/home

GET

/metadata/openet/feature_collection/feature_ids_list

GET

/metadata/openet/feature_collection_names

GET

/metadata/openet/metadata/feature_ids_list

GET

/metadata/openet/region_of_interest/feature_ids_list

GET

/test/auth/admin

GET

/test/auth/user

GET

/test/error_handling

GET

/test/rate_limit

GET

/test/reportingdb

GET

/timeseries/features/aggregate/annual

GET

/timeseries/features/aggregate/monthly

←

→

↻

📍

localhost:9999

☆

👤

🔴

📱 Apps

📁 Javascript resource...

📁 Php resources

🖼️ Images

🔍 Create a Layer in...

📁 Other Bookmarks

GET

/timeseries/features/annual

Parameters

Cancel

Name	Description
model string (query)	Model name, ex. ssebop
variable string (query)	Variable name, ex. et
fields string (query)	list of field ids separated by commas
units string (query)	metric or english
start_date string (query)	ex. 2016
end_date string (query)	ex. 2018

Execute

Responses

Response content type

application/json

Code	Description
404	Gets annual timeseries data for one field boundary

Responses

Response content type application/json

Curl

```
curl -X GET "http://localhost:9999/timeseries/features/annual?model=ssebop&variable=et&fields=041%2C042%2C043&units=metrics&start_date=2016&end_date=2018" -H "accept: application/json"
```

Request URL

```
http://localhost:9999/timeseries/features/annual?model=ssebop&variable=et&fields=041%2C042%2C043&units=metrics&start_date=2016&end_date=2018
```

Server response

Code

Details

200

Undocumented

Response body

```
[
  {
    "data_value": 1138.49279785156,
    "end_date": "2016-12-31 00:00:00",
    "feature_unique_id": "041",
    "start_date": "2016-01-01 00:00:00"
  },
  {
    "data_value": 829.21728515625,
    "end_date": "2017-12-31 00:00:00",
    "feature_unique_id": "041",
    "start_date": "2017-01-01 00:00:00"
  },
  {
    "data_value": 833.493286132812,
    "end_date": "2018-12-31 00:00:00",
    "feature_unique_id": "041",
    "start_date": "2018-01-01 00:00:00"
  },
  {
    "data_value": 1087.50390625,
    "end_date": "2016-12-31 00:00:00",
    "feature_unique_id": "042",
    "start_date": "2016-01-01 00:00:00"
  },
  {
    "data_value": 1048.36645507812,
```

Download

Response headers

```
connection: close
content-length: 1561
content-type: application/json
date: Thu, 26 Mar 2020 21:19:27 GMT
server: gunicorn/19.9.0
```

Responses

Code

Description

GET /timeseries/features/aggregate/annual

Parameters

Cancel

Name

Description

model
string
(query)

Model name, ex. ssebop

ssebop

variable
string
(query)

Variable name, ex. et

et

fields
string
(query)

list of field ids separated by commas

041,042,043

spatial_summary
string
(query)

ex. mean

sum

start_date
string
(query)

ex. 2016

2016

end_date
string
(query)

ex. 2018

2018

Execute

Responses

Response content type application/json

Code

Description

404

Gets aggregate data for each field

Responses

Response content type

application/json



Curl

```
curl -X GET "http://localhost:9999/timeseries/features/aggregate/annual?model=ssebop&variable=et&fields=041%2C042%2C043&spatial_summary=sum&start_date=2016&end_date=2018" -H "accept: application/json"
```

Request URL

```
http://localhost:9999/timeseries/features/aggregate/annual?model=ssebop&variable=et&fields=041%2C042%2C043&spatial_summary=sum&start_date=2016&end_date=2018
```

Server response

Code

Details

200

Undocumented

Response body

```
[
  [
    {
      "aggregate_value": 3565.69,
      "end_date": "2016-12-31 00:00:00",
      "start_date": "2016-01-01 00:00:00"
    },
    {
      "aggregate_value": 3035.92,
      "end_date": "2017-12-31 00:00:00",
      "start_date": "2017-01-01 00:00:00"
    },
    {
      "aggregate_value": 2979.61,
      "end_date": "2018-12-31 00:00:00",
      "start_date": "2018-01-01 00:00:00"
    }
  ],
  {}
]
```

Download

Response headers

```
connection: close
content-length: 416
content-type: application/json
date: Thu, 26 Mar 2020 21:18:07 GMT
server: gunicorn/19.9.0
```

Responses

Code

Description

404

Gets aggregate data for each field

Current and Upcoming Milestones...

Initiation of OpenET API Working Group this Month

Purpose

Provide input on the API design, identify priorities for functionality for a wide a range of applications, assist with testing and review of documentation.

Process

- 1) First calls in late May: Review current API design and provide input on proposed design and functionality.
- 2) OpenET team reviews feedback from working group and incorporates feedback into API alpha version.
- 3) Second call in June/July: Introduction to OpenET API and documentation; working group receives access to OpenET API beta version for testing.
- 4) Working group tests OpenET API beta (~4-6 weeks)
- 5) Third call with working group to review results from beta testing. OpenET team incorporates feedback into API for release to working group and public.

Internal Partner Release of Web Interface

EARLY JULY

MID JULY

EARLY AUGUST

AUGUST – OCTOBER

Provisional UI released to project partners:

- Use Case Partners
- Working Group Members
- Advisory Board & Steering Committee

Webinars to answer questions and solicit early feedback on:

- Functionality
- Content

Final date for partners to submit feedback to OpenET team

Incorporate feedback and re-release to partners

Evolving Use Cases

How a high-elevation irrigation study in Kremmling could help Colorado avoid future water shortages

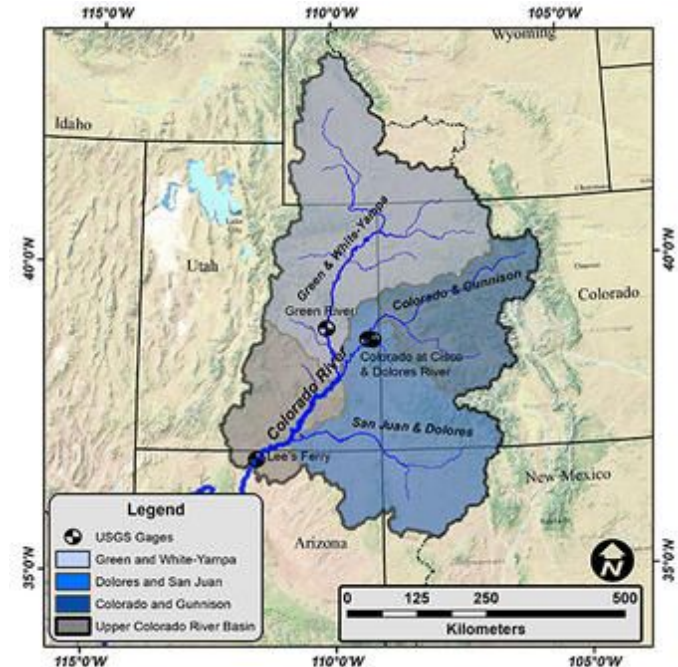
News [FOLLOW NEWS](#) | April 10, 2020

By Sarah Tory
Aspen Journalism



Rancher and fly-fishing guide Paul Bruchez raises cattle on 6,000 acres near Kremmling. Bruchez has taken an active role in Colorado River issues ever since his family suffered from a critical water shortage during the 2002 drought.

Courtesy Russ Schnitzer



Soft (Media) Launch: Summer 2020

Capital Press

Western farm water use data to go online

By SIERRA DAWN McCLAIN Capital Press 6 hrs ago



A new online system, OpenET, will help track water use across the West when it goes into operation next year, its supporters say.

Capital Press File

[Buy Now](#)



Irrigation data has historically been limited in scope and expensive to access. A new project seeks to change that.

OpenET developers claim it will help expand irrigation practices that maximize "crop per drop," reducing costs for fertilizer and water.

Temerosa Ranch

Researchers from NASA, the Desert Research Institute and the Environmental Defense Fund, with support from Google Earth Engine technology, are working to create an online platform with free, accessible, satellite-based water data open to anyone.

"OpenET could be revolutionary."
BUZZ THOMPSON,
STANFORD UNIVERSITY'S
WATER IN THE WEST PROGRAM

"I think this could be a good thing for agriculture."
DON PARRISH,
AMERICAN FARM BUREAU

FEB

Growers Webinars

JULY

(Tentative) Beta Release

AUGUST

Press Release, Webinars