OPENET

Filling the Biggest Data Gap in Water Management

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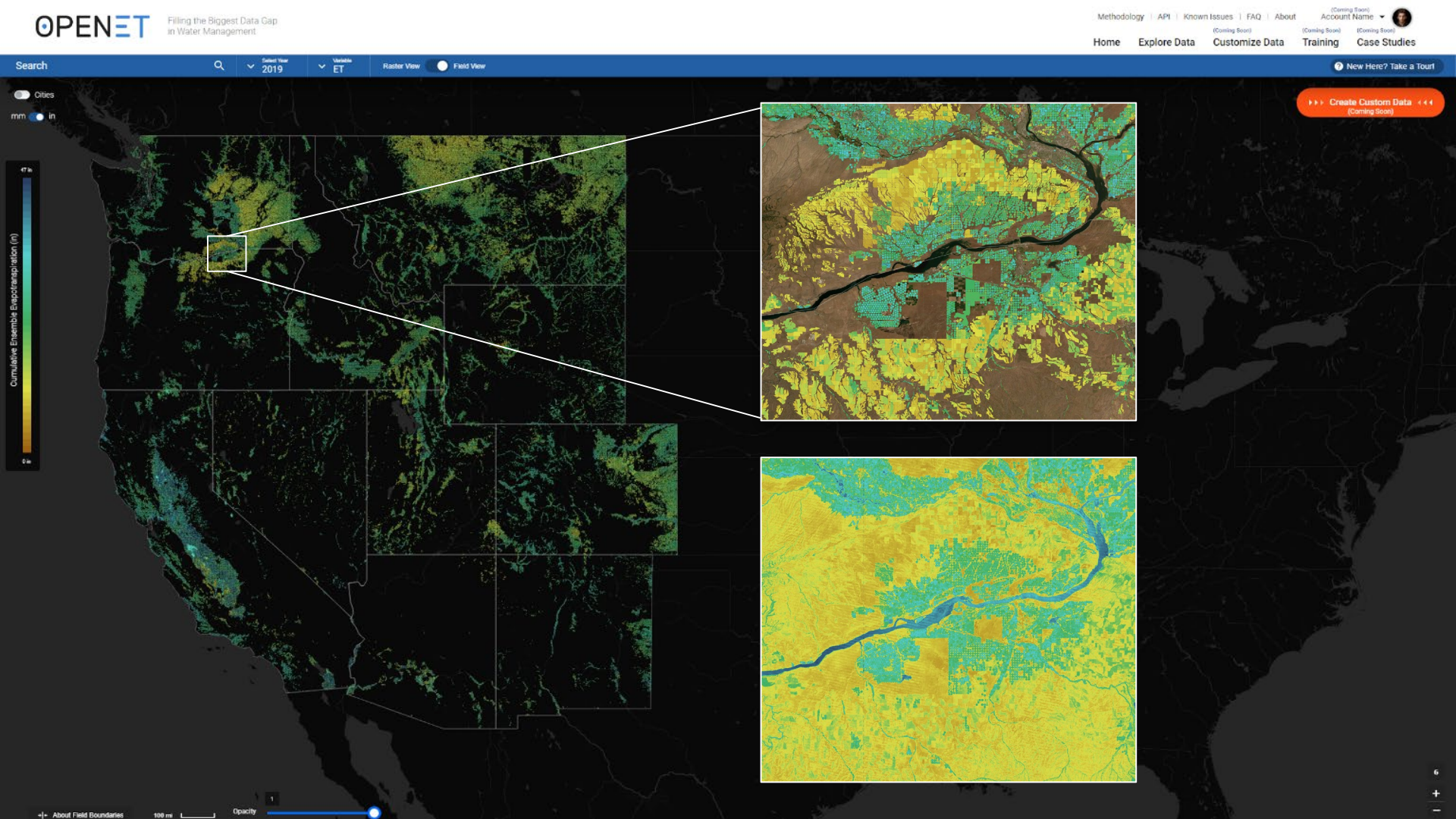
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Create Custom Data
(Coming Soon)
47 in
Cumulative Ensemble Evapotranspiration (in)
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About Field Boundaries
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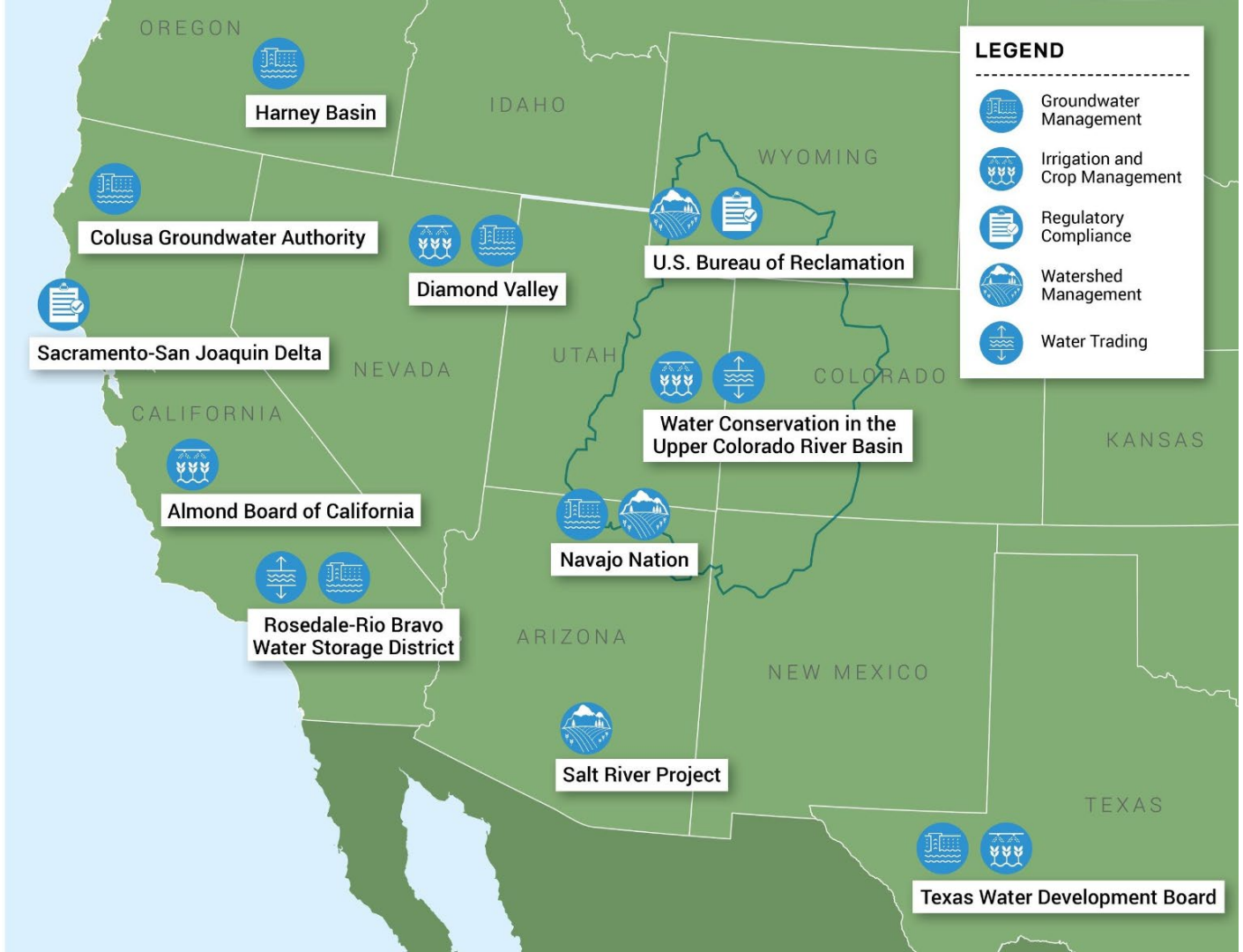
OREGON
Harney Basin
IDAHO
WYOMING
Colusa Groundwater Authority
Diamond Valley
U.S. Bureau of Reclamation
Sacramento-San Joaquin Delta
NEVADA
UTAH
COLORADO
CALIFORNIA
Water Conservation in the Upper Colorado River Basin
KANSAS
Almond Board of California
Navajo Nation
Rosedale-Rio Bravo Water Storage District
ARIZONA
NEW MEXICO
Salt River Project
TEXAS
Texas Water Development Board
LEGEND
Groundwater Management
Irrigation and Crop Management
Regulatory Compliance
Watershed Management
Water Trading

The OPENET Team

Environmental Defense Fund Robyn Grimm, Dana Rollison, Maurice Hall

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USDA, NASA Marshall Space Flight Center, U. Maryland, U. Wisconsin (ALEXI/DisALEXI) Martha Anderson, Yun Yang, Christopher Hain, Mitch Schull, Mutlu Ozdogan

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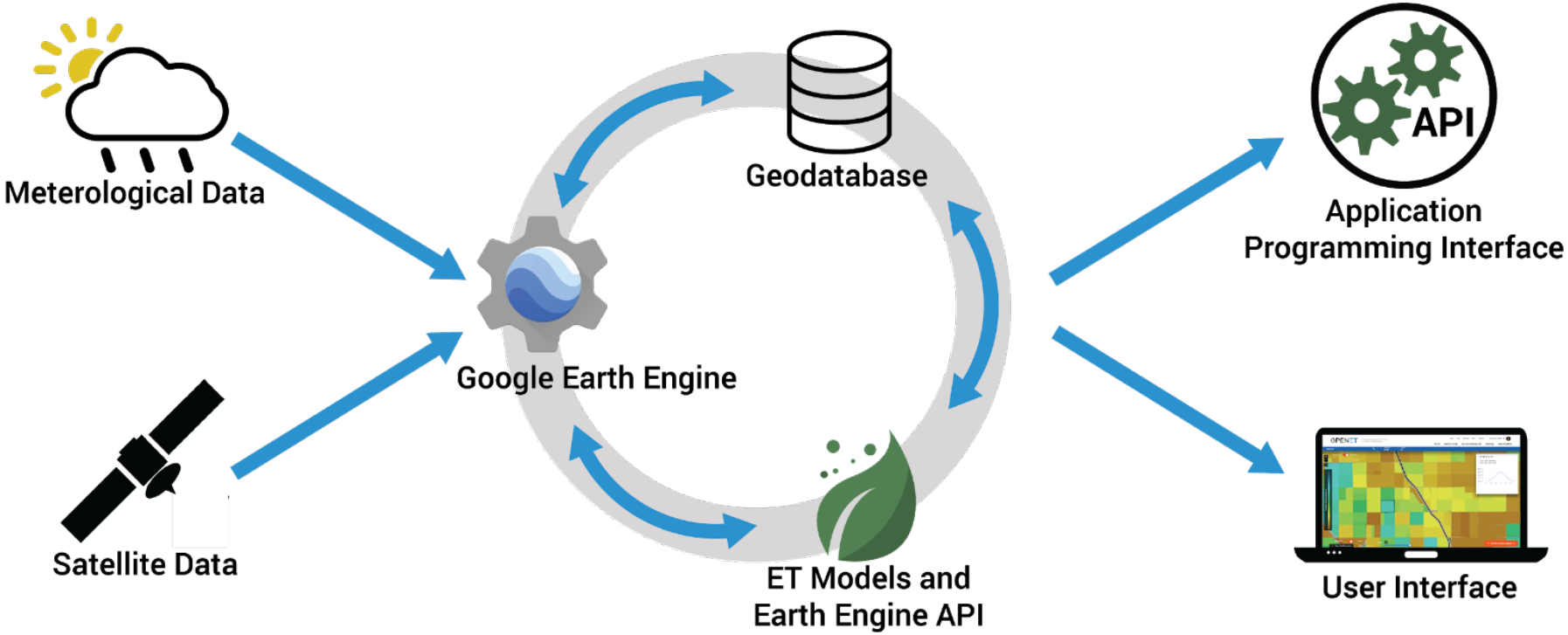
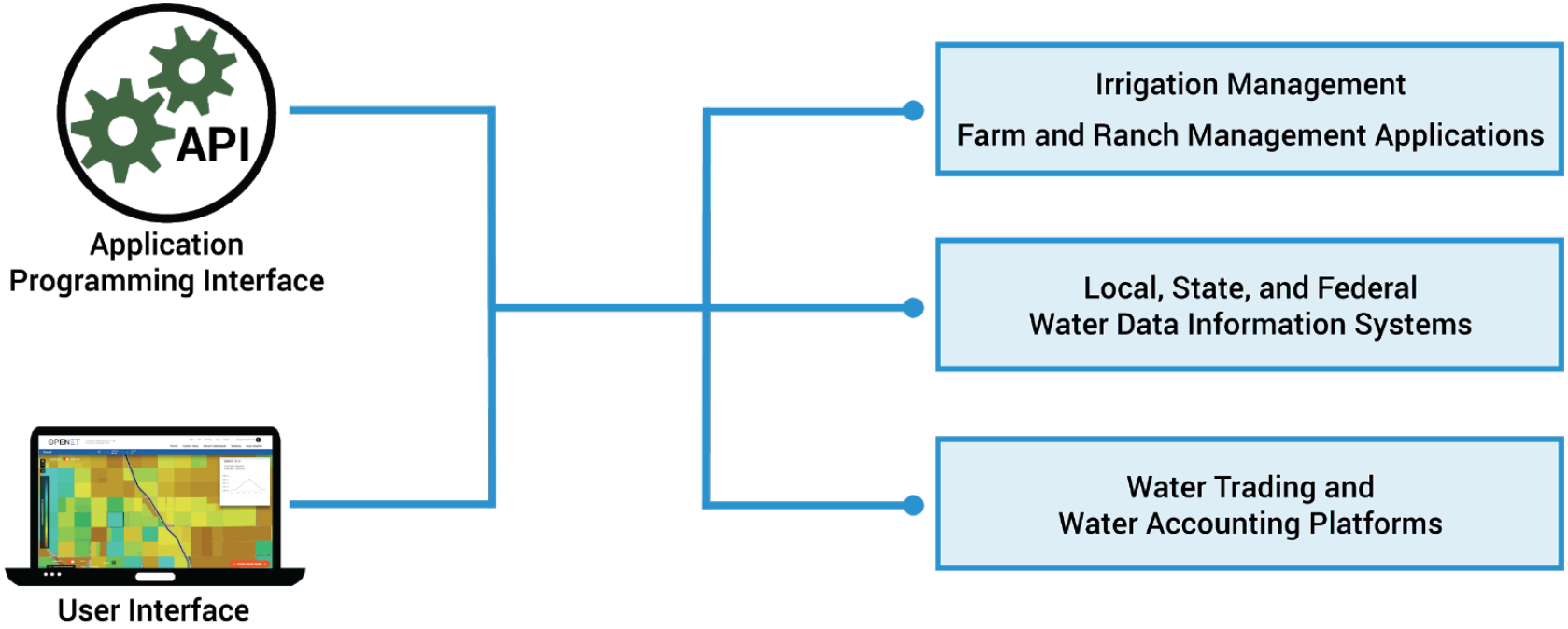
USGS (SSEBop) Gabriel Senay, MacKenzie Friedrichs

Google Earth Engine Tyler Erickson

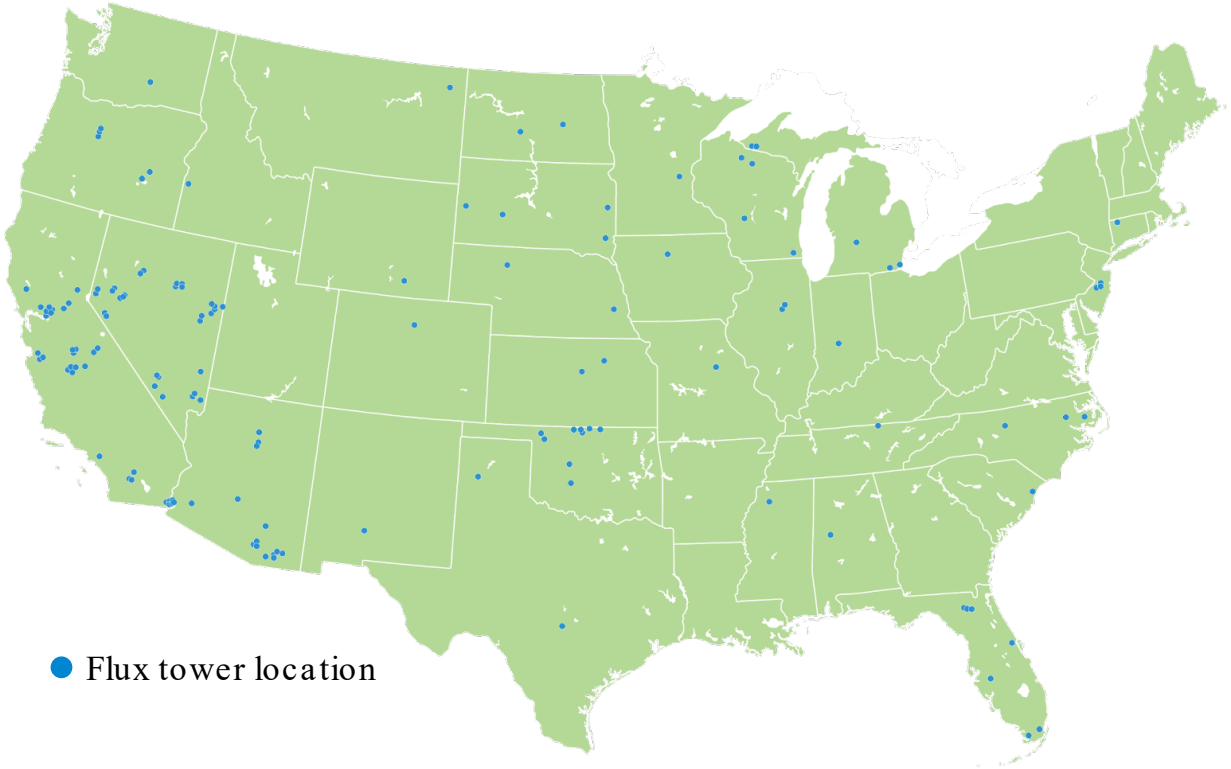
How OpenET Works



OpenET API for Integration with Other Software

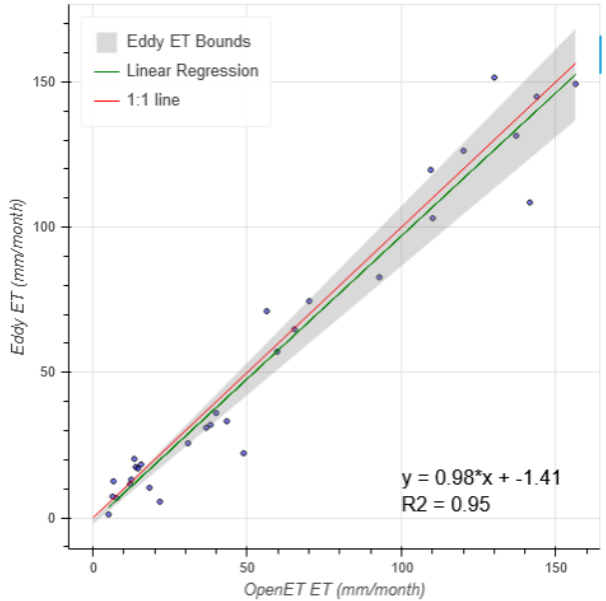


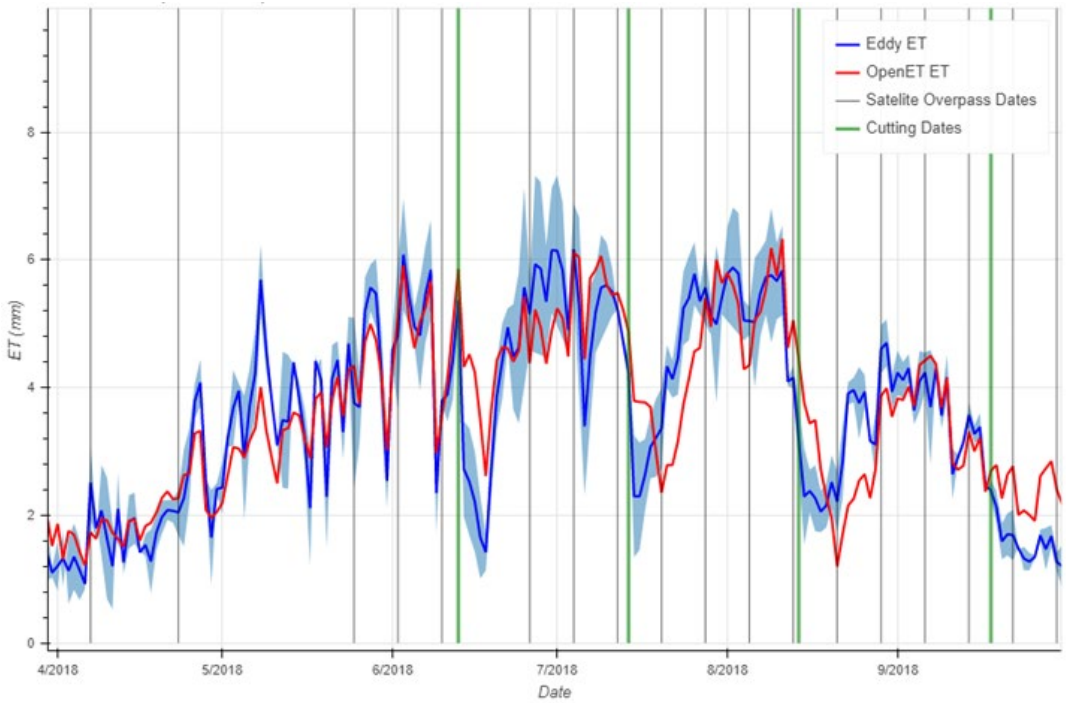
Intercomparison and Accuracy Assessment



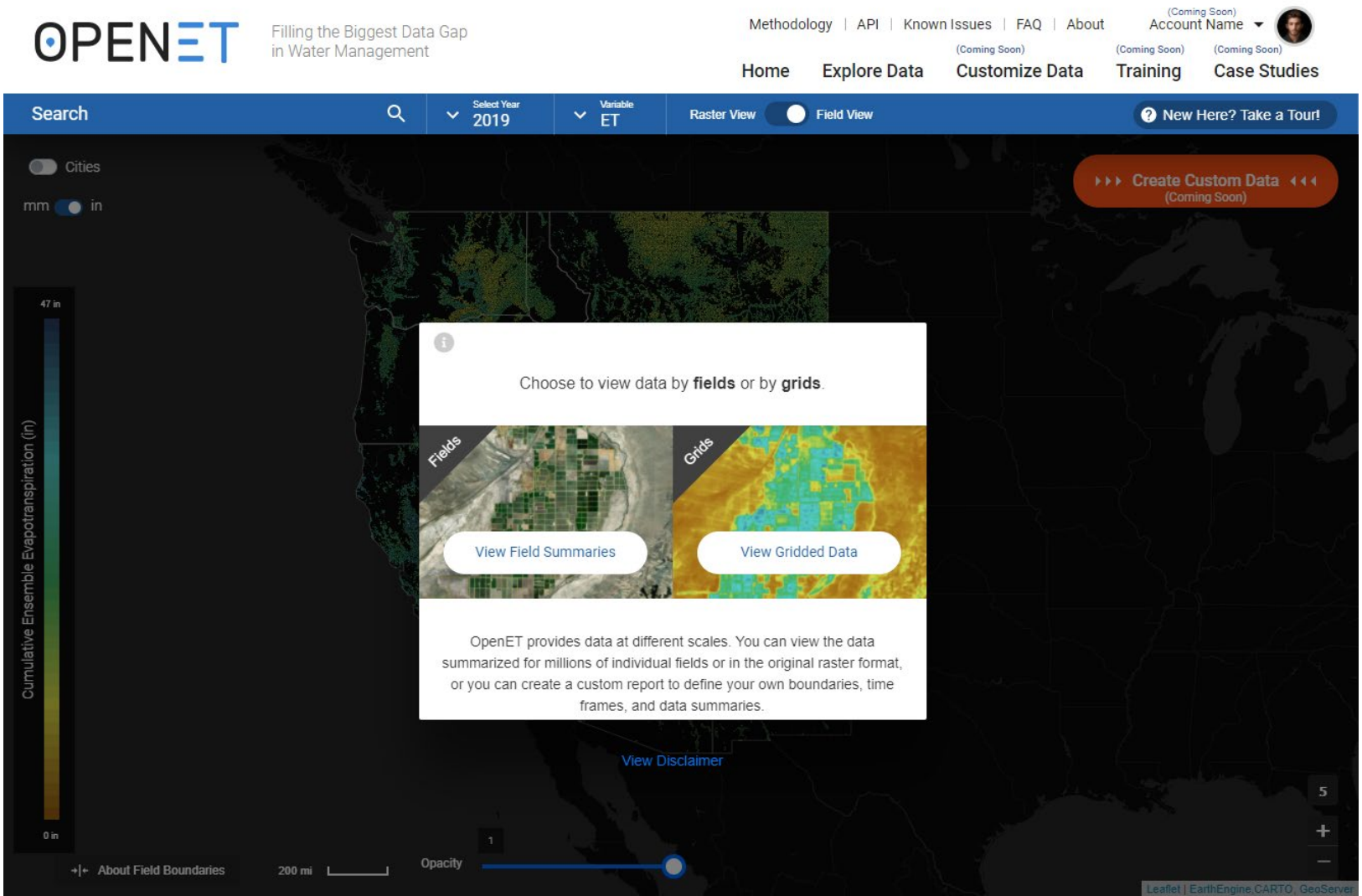
Phase I comparison complete (60+ flux tower sites)
Phase II 'blind' comparison ongoing for 130+ flux tower sites

Alfalfa | Harney County, SE Oregon





Rep. Mark Owens' Field of Alfalfa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Cities
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Create Custom Data (Coming Soon)
47 in
Cumulative Ensemble Evapotranspiration (in)
0 in
Choose to view data by fields or by grids.
Fields
Grids
View Field Summaries
View Gridded Data
OpenET provides data at different scales. You can view the data summarized for millions of individual fields or in the original raster format, or you can create a custom report to define your own boundaries, time frames, and data summaries.
View Disclaimer
About Field Boundaries
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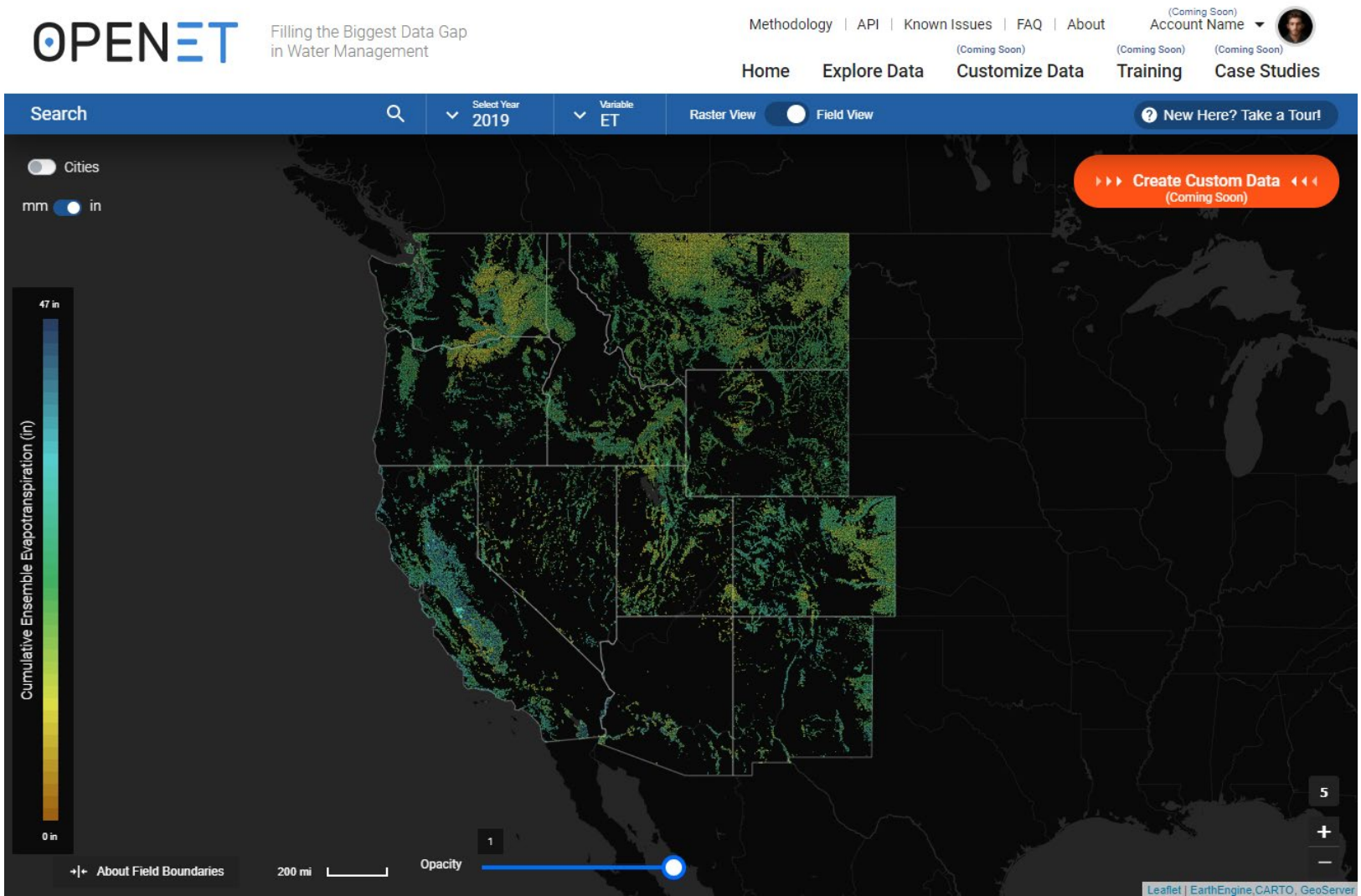
Leaflet | EarthEngine,CARTO, GeoServer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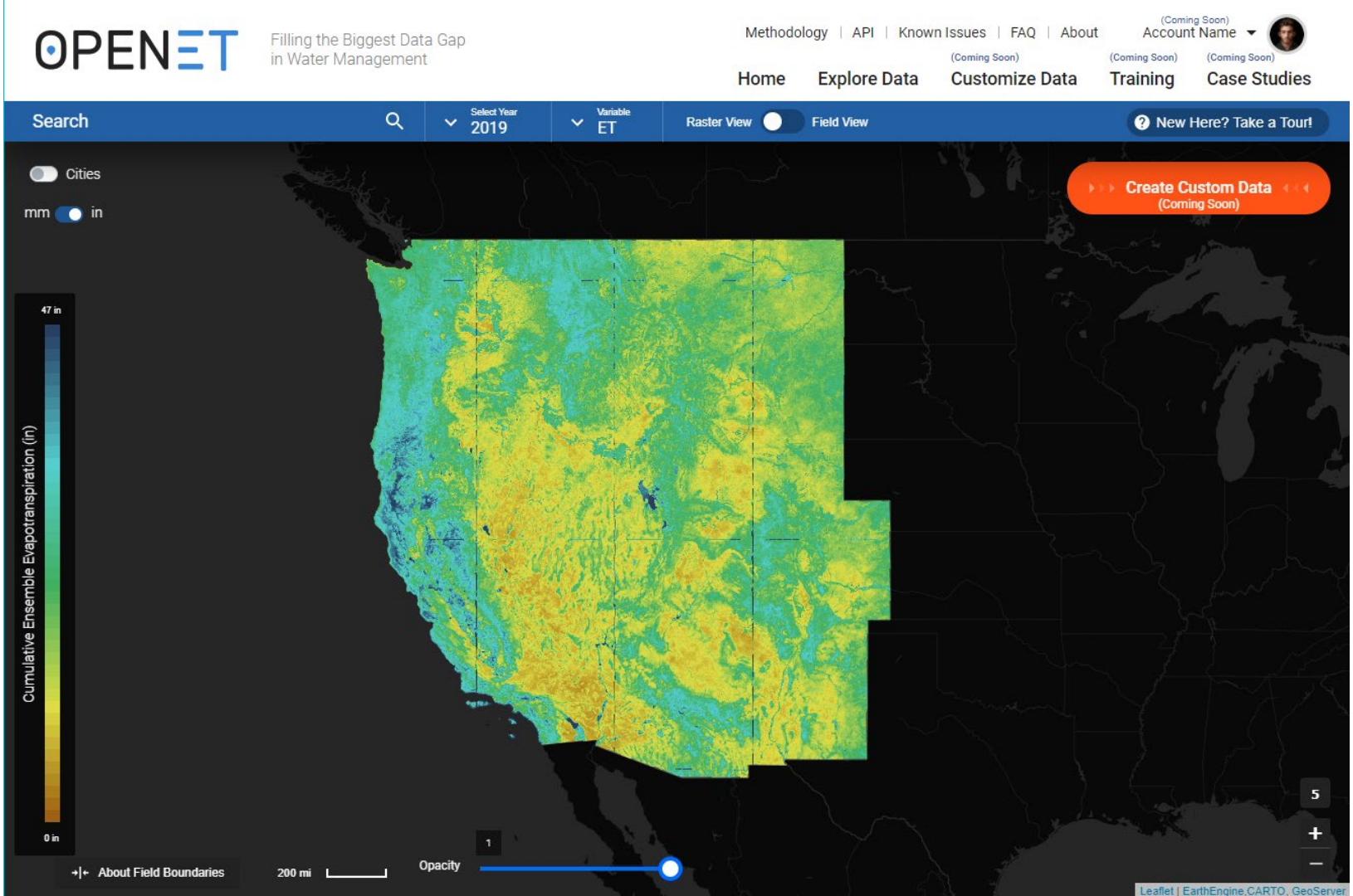
Leaflet | EarthEngine,CARTO, GeoServer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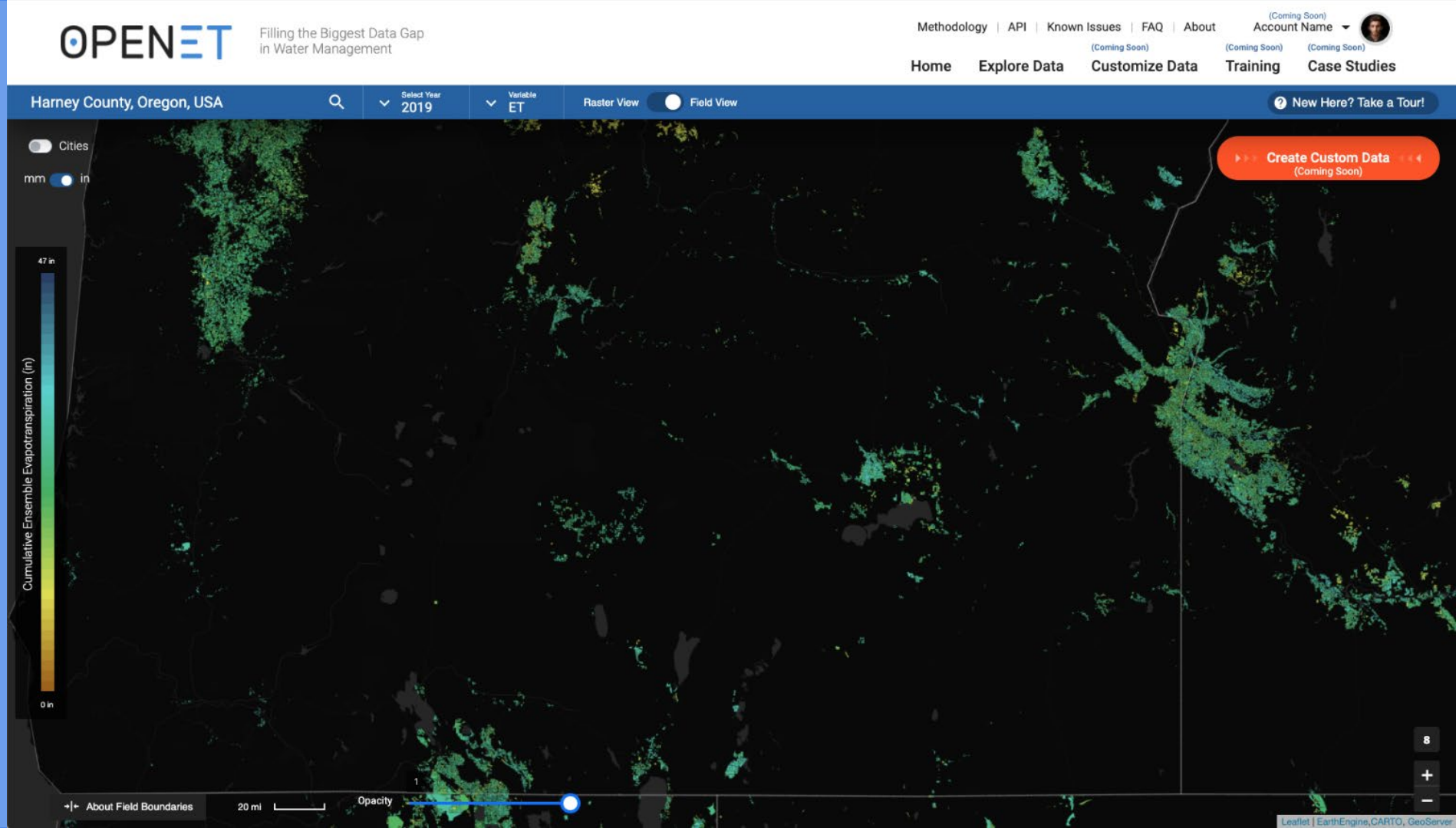
Leaflet | EarthEngine.CARTO, GeoServer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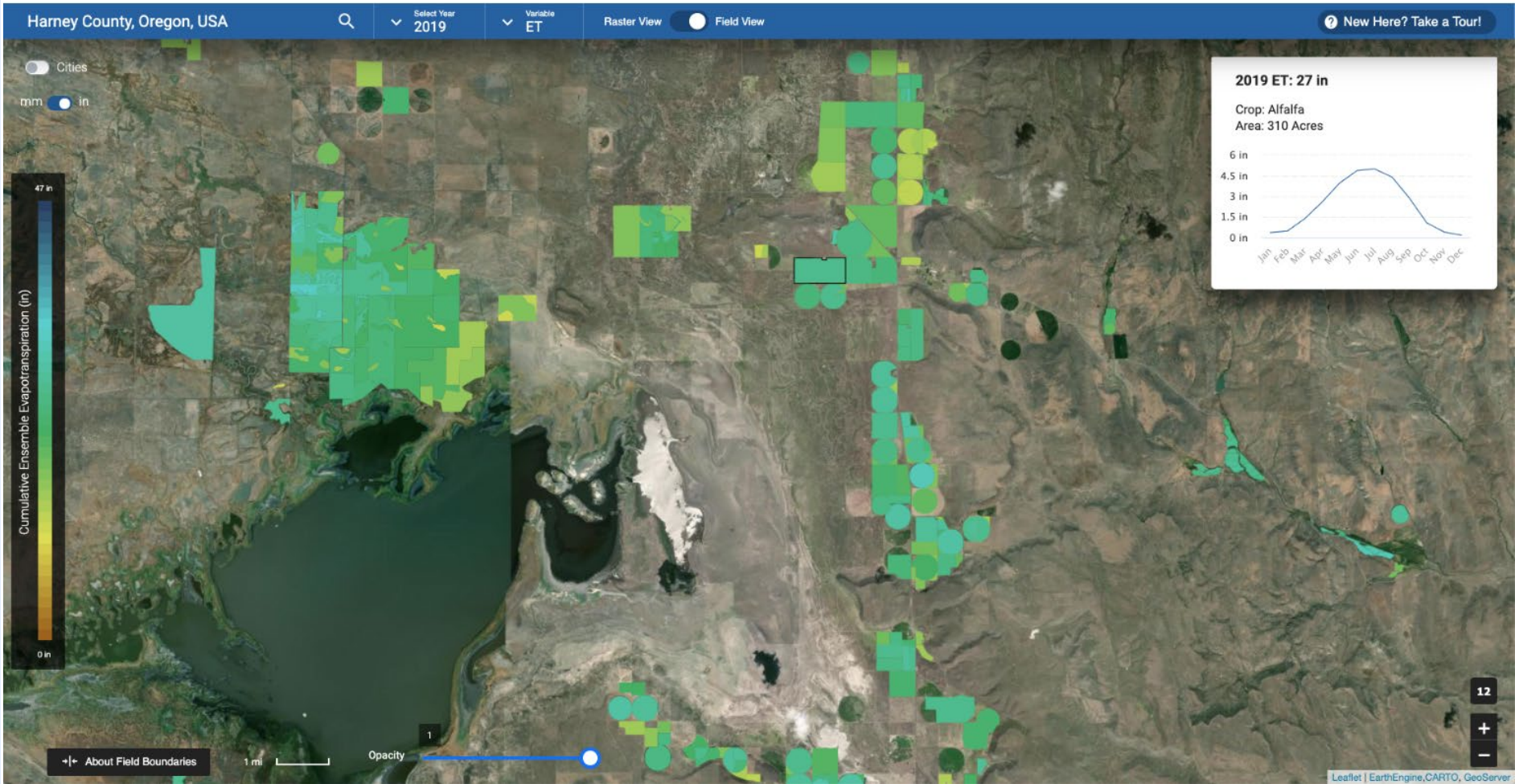
Leaflet | EarthEngine,CARTO, GeoServer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2019 ET: 27 in
Crop: Alfalfa
Area: 310 Acres
6 in
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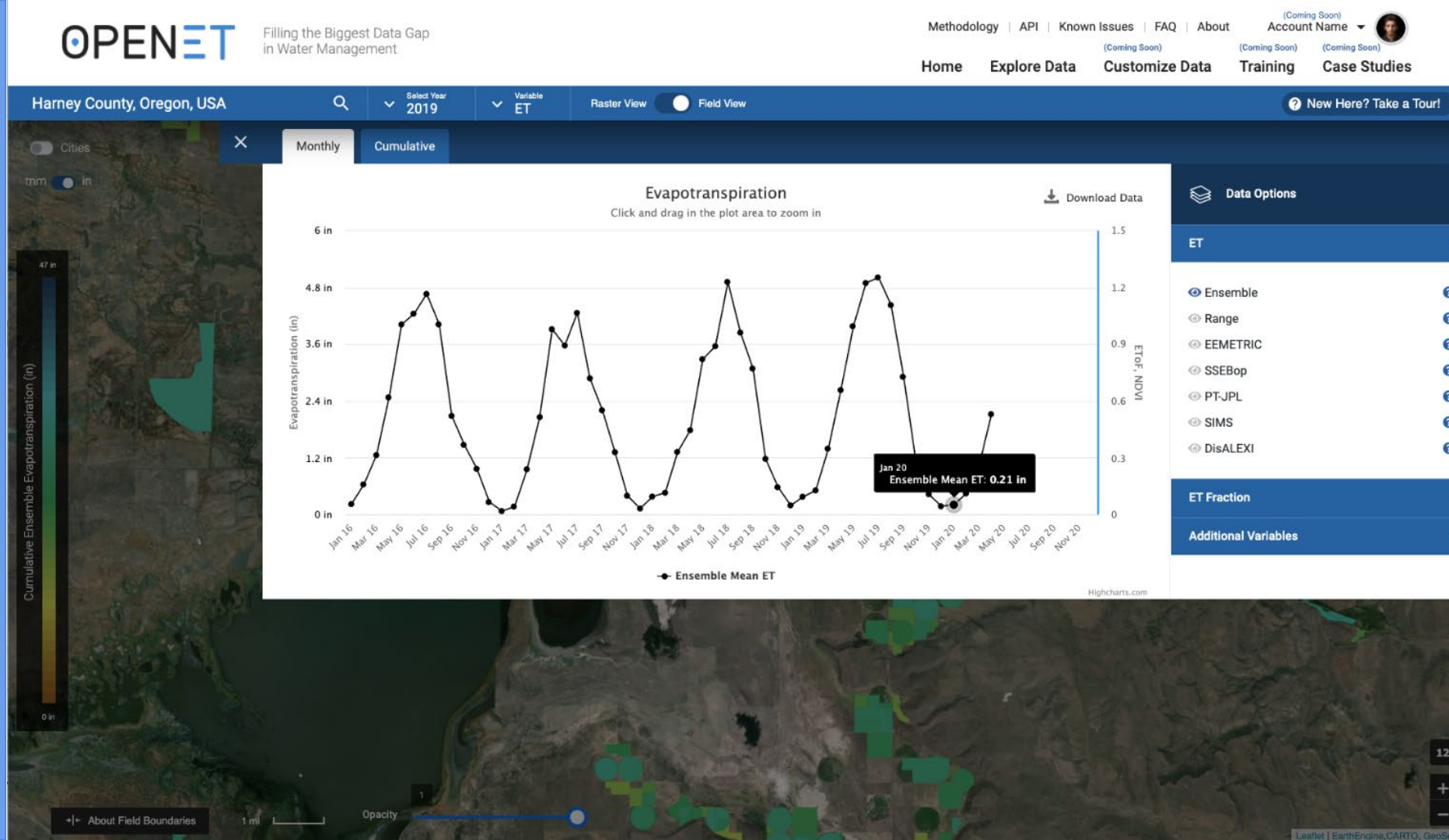
Leaflet | EarthEngine,CARTO, GeoServer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3.6 in
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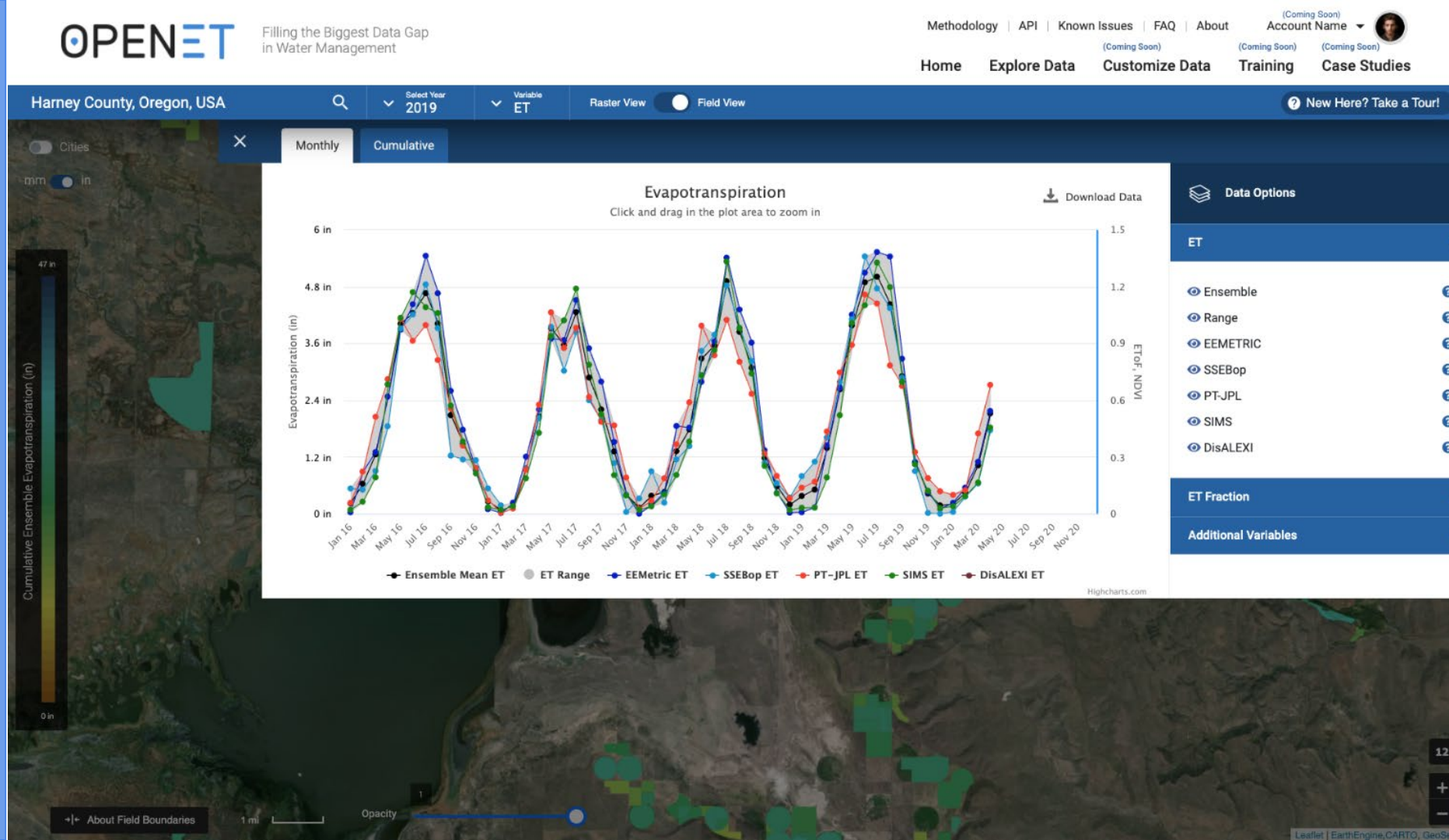
Leaflet | EarthEngine,CARTO, GeoServer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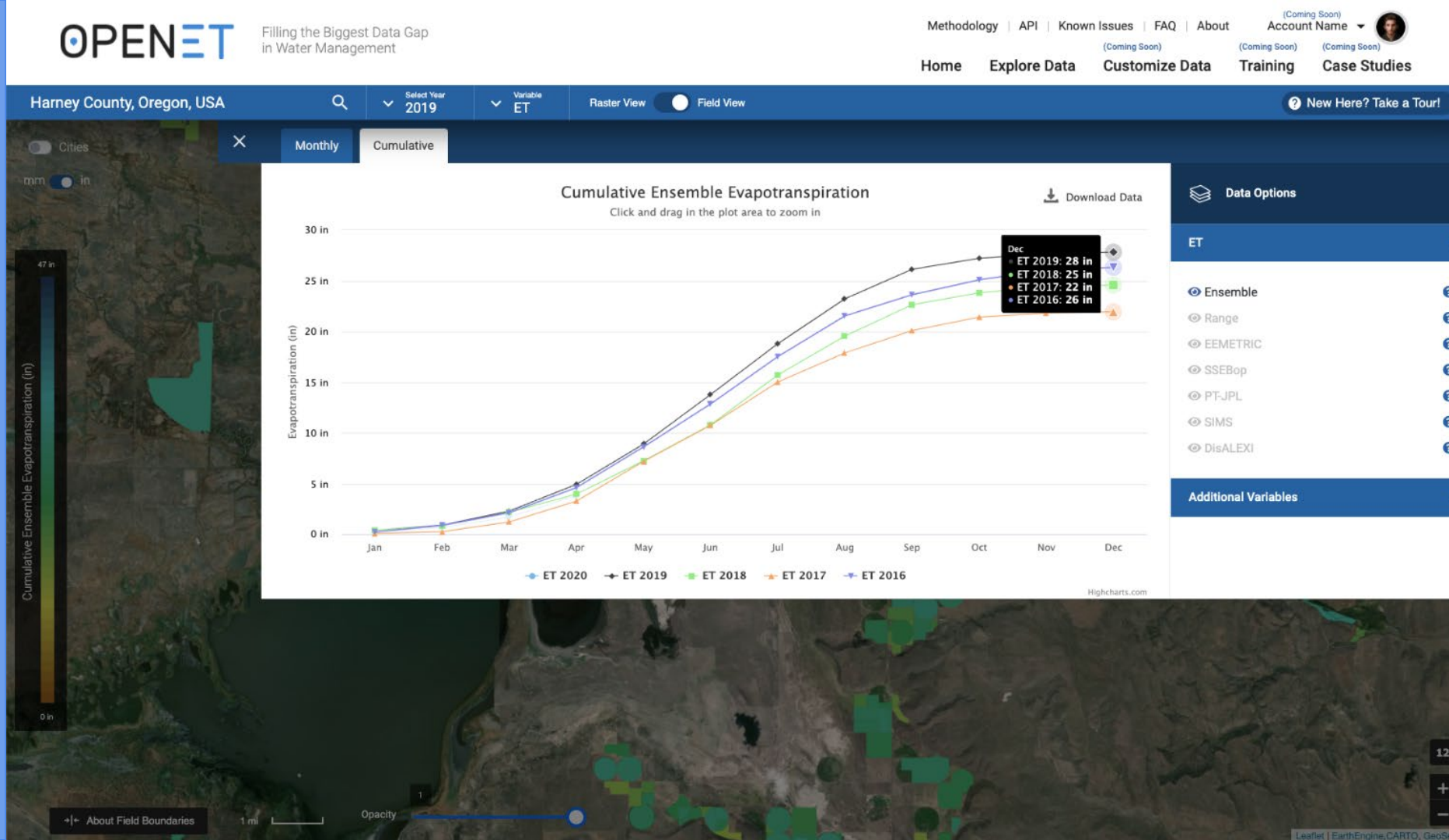
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25 in
20 in
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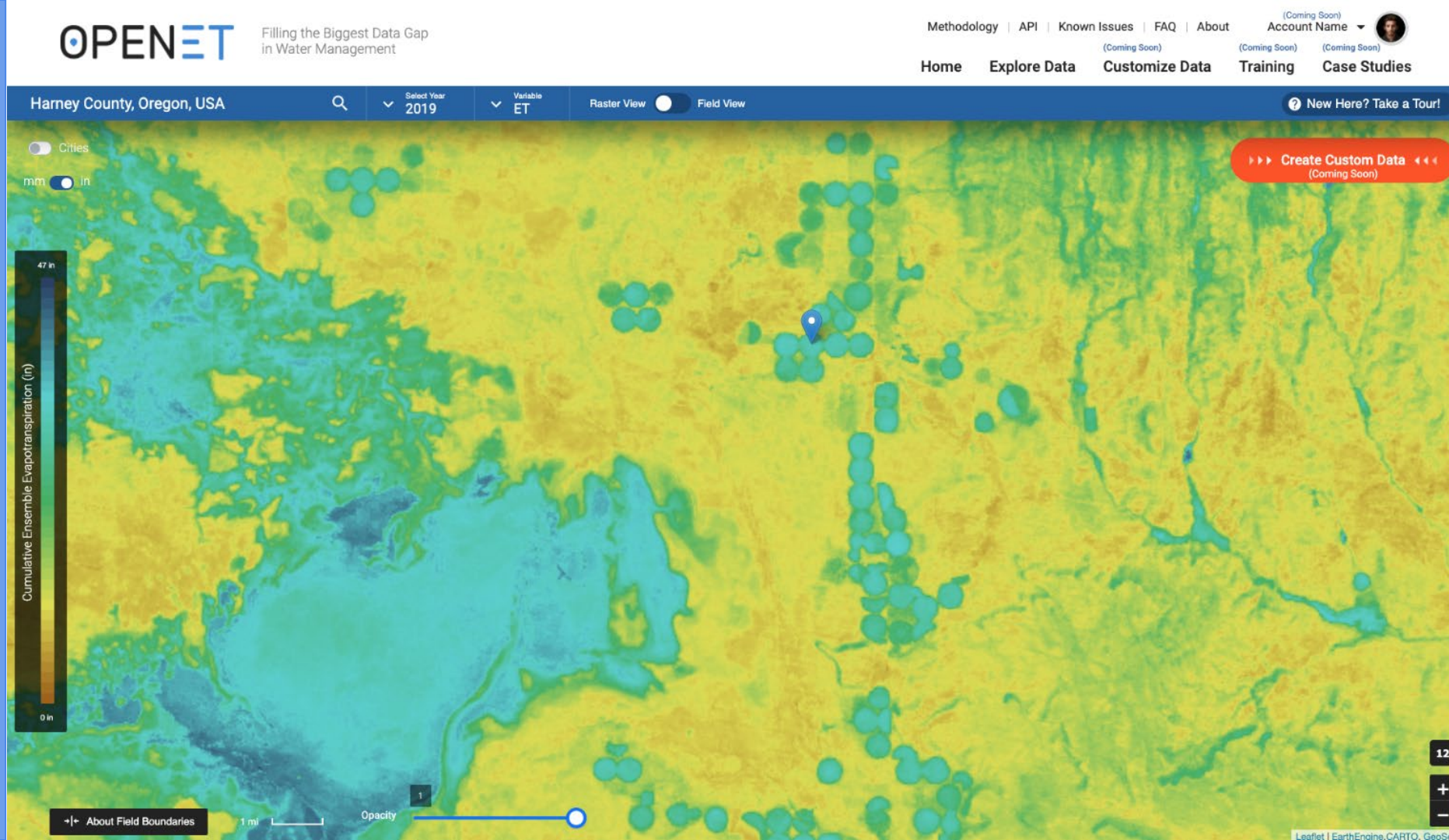
Leaflet | EarthEngine,CARTO, GeoServer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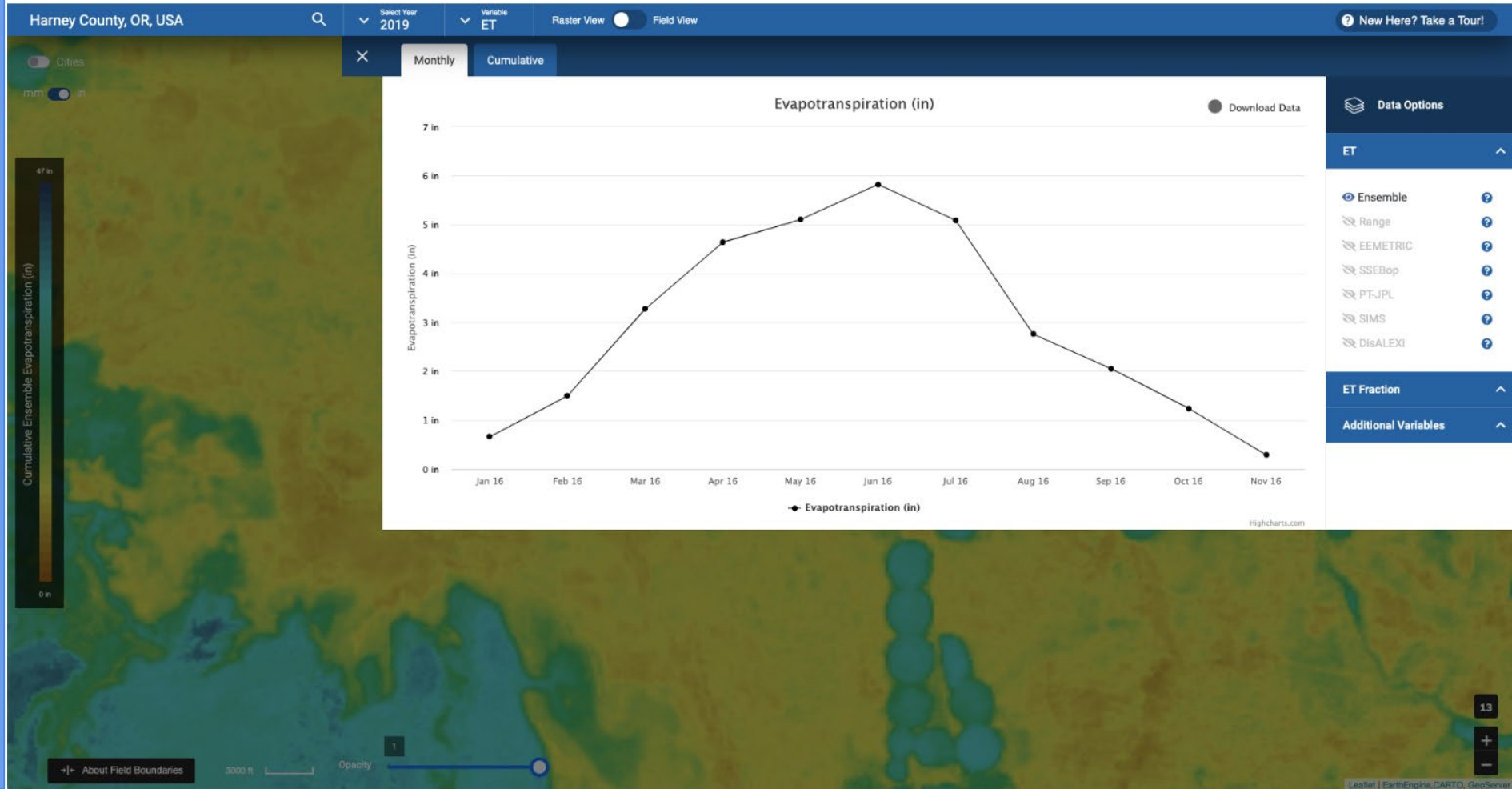
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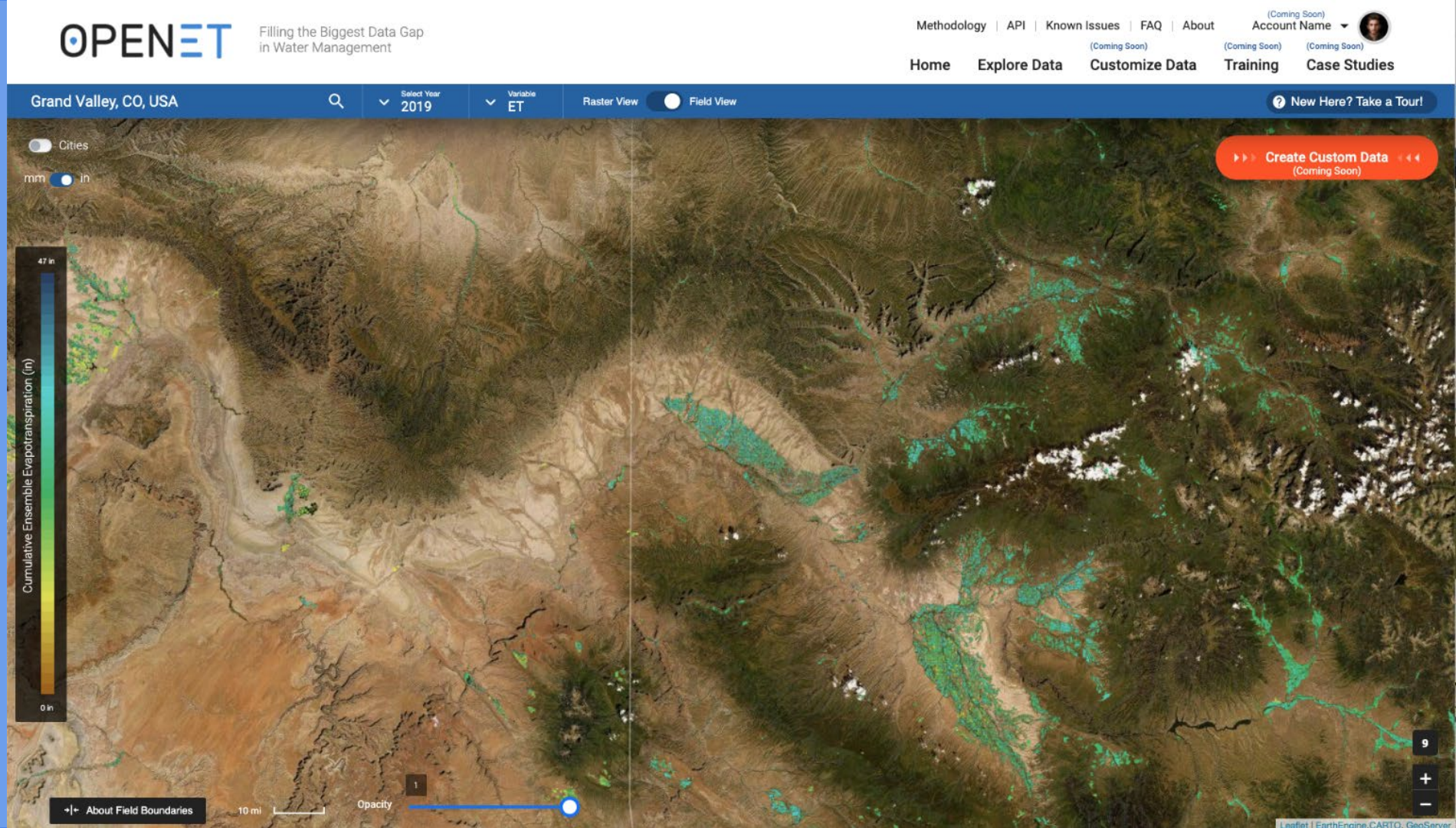
Leaflet | EarthEngine,CARTO, GeoServer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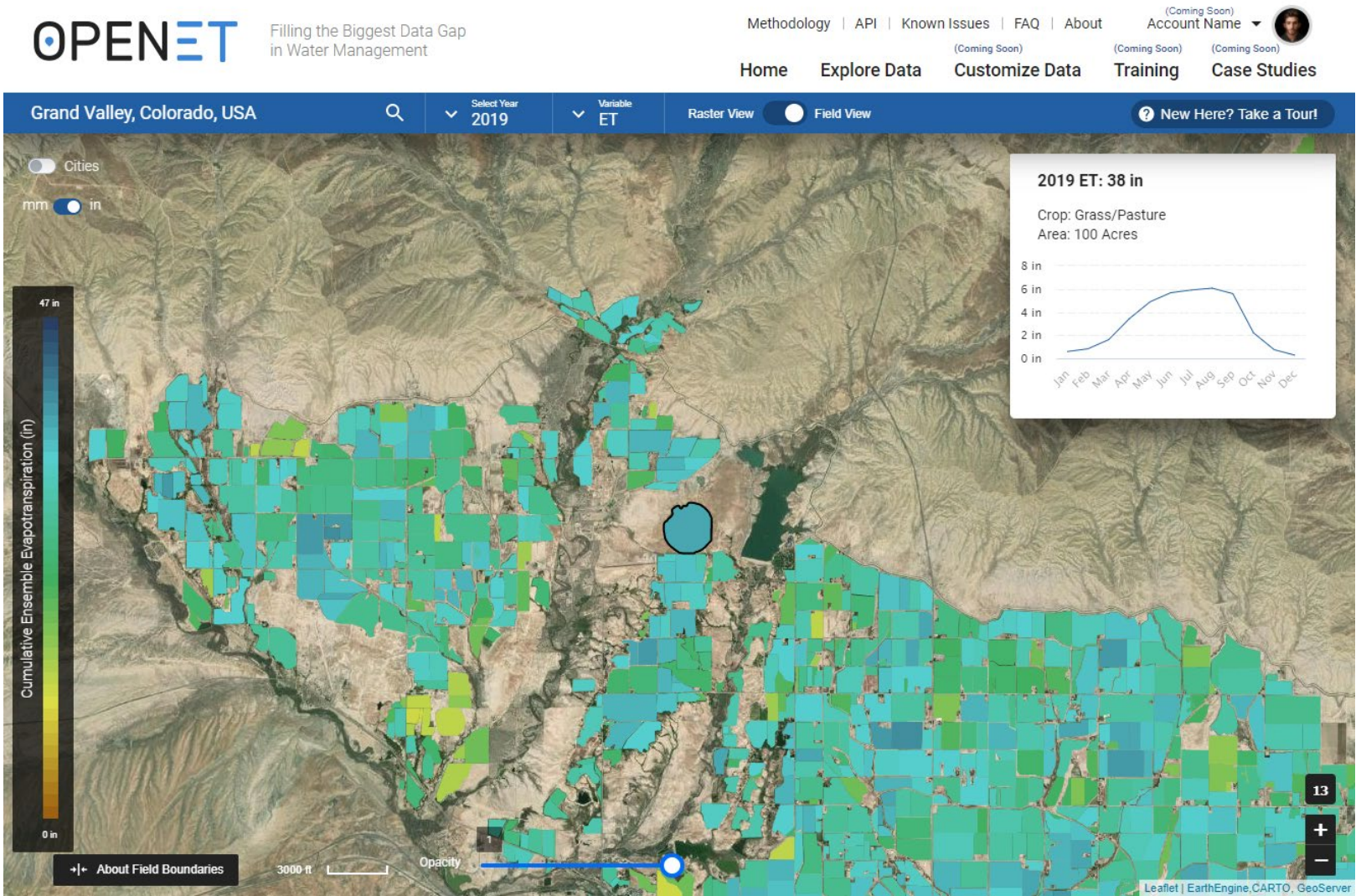
Leaflet | EarthEngine,CARTO, GeoServer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New Here? Take a Tour!
Cities
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Cumulative Ensemble Evapotranspiration (in)
0 in
2019 ET: 38 in
Crop: Grass/Pasture
Area: 100 Acres
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6 in
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About Field Boundaries
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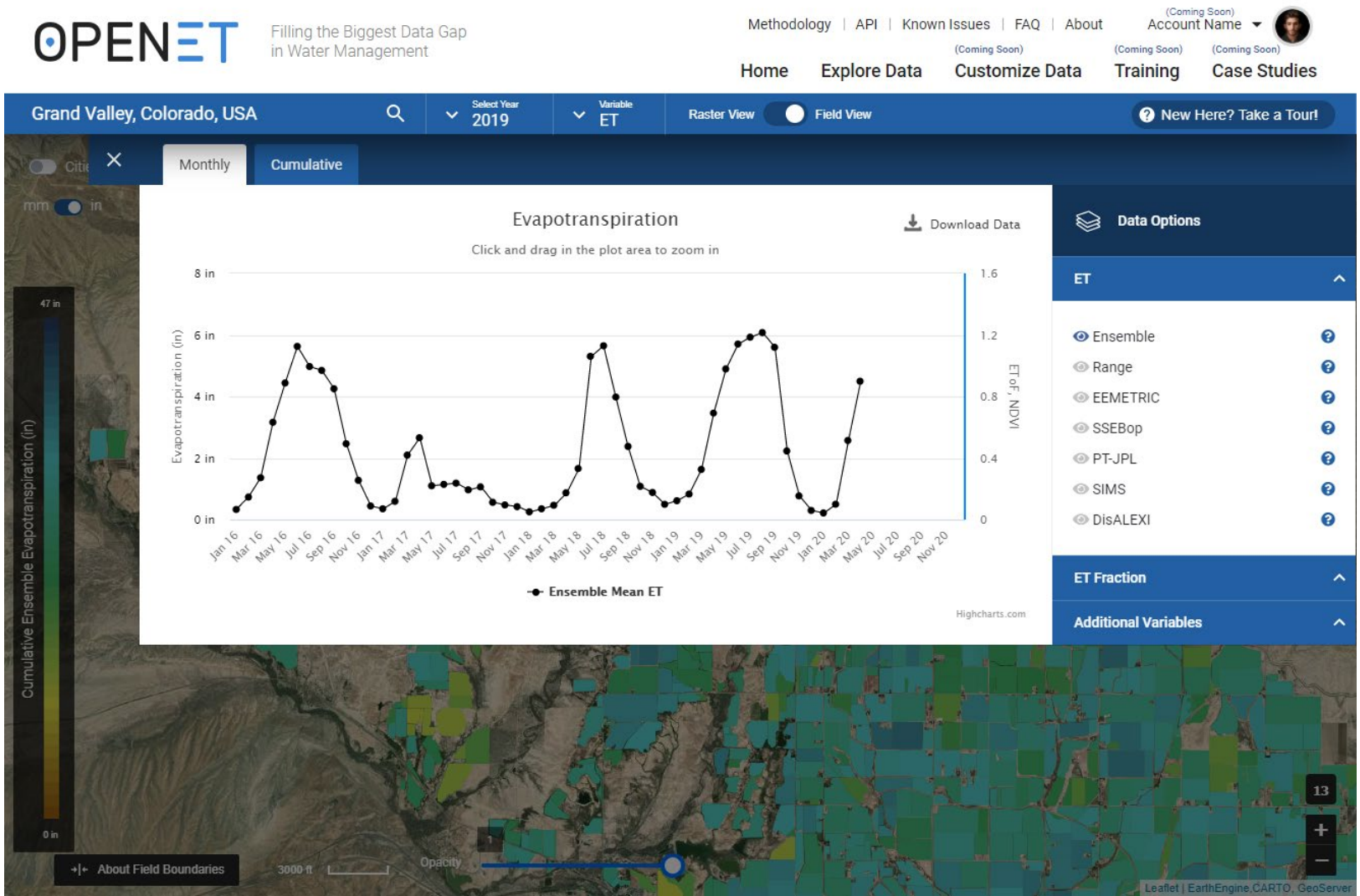
Leaflet | EarthEngine,CARTO, GeoServer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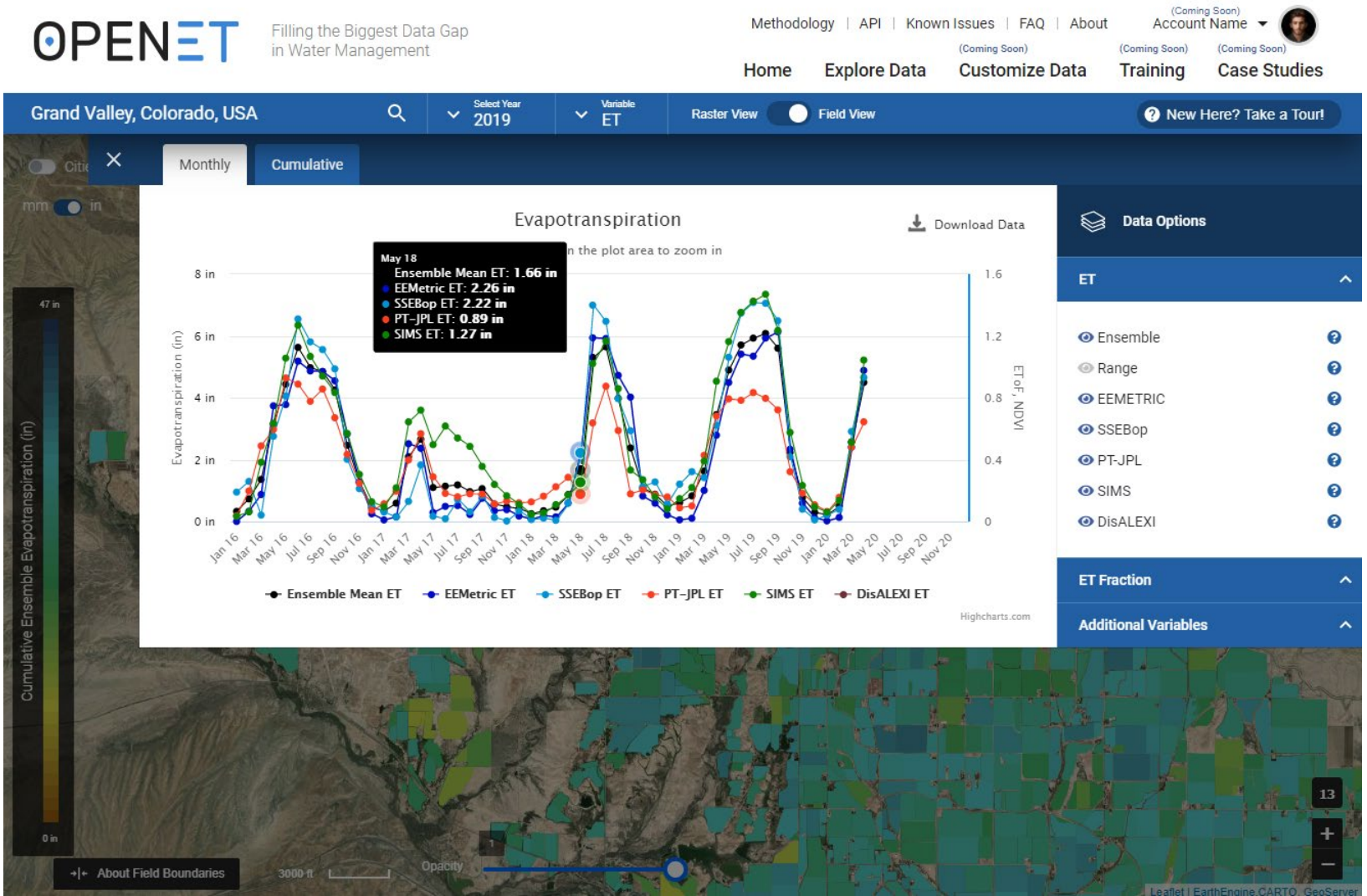
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Cumulative
Evapotranspiration
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May 18
Ensemble Mean ET: 1.66 in
EEMetric ET: 2.26 in
SSEBop ET: 2.22 in
PT-JPL ET: 0.89 in
SIMS ET: 1.27 in
Evapotranspiration (in)
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EEMetric ET
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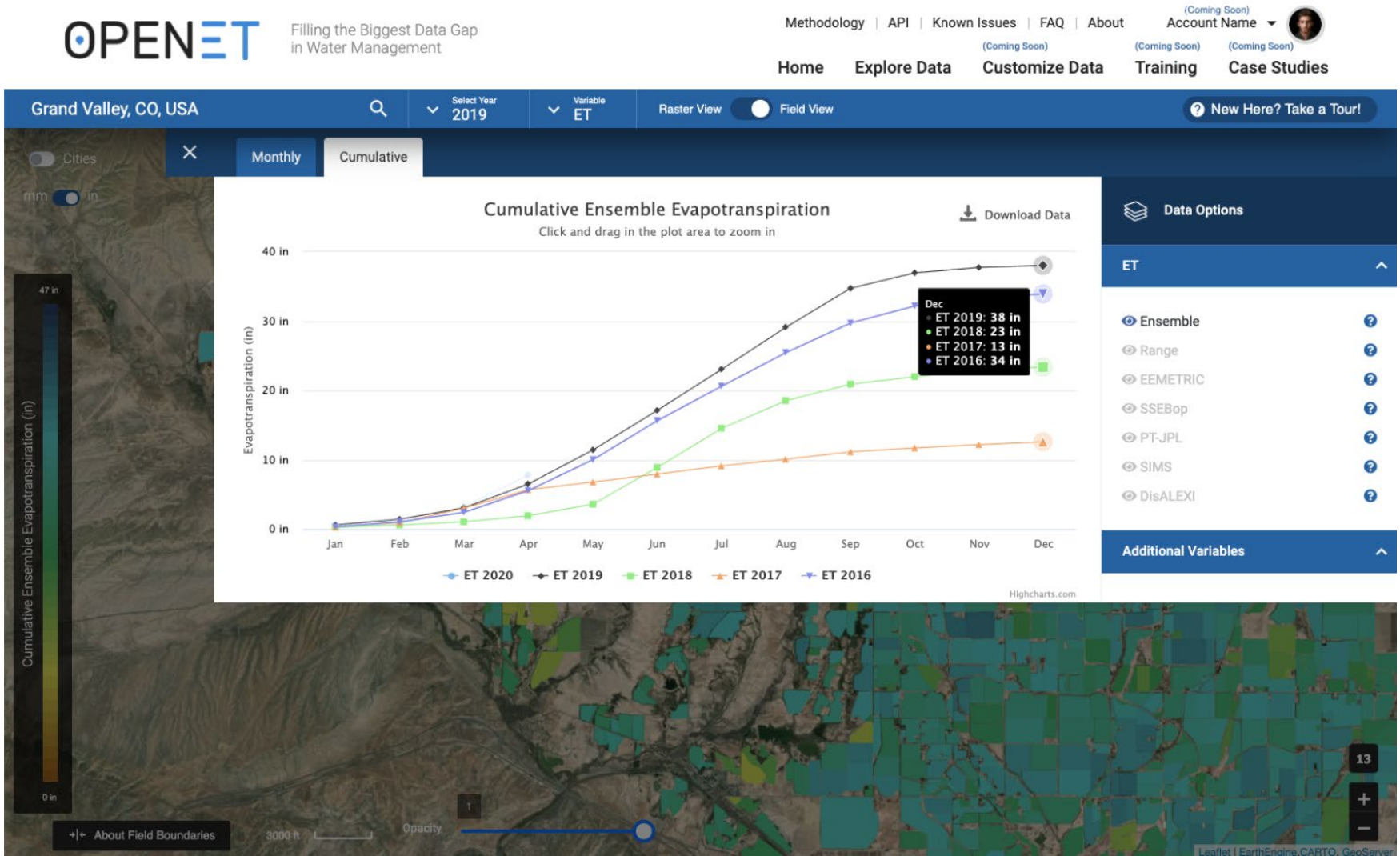
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Monthly
Cumulative
Cumulative Ensemble Evapotranspiration
Click and drag in the plot area to zoom in
Download Data
Evapotranspiration (in)
40 in
30 in
20 in
10 in
0 in
Jan
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ET 2019: 38 in
ET 2018: 23 in
ET 2017: 13 in
ET 2016: 34 in
ET 2020
ET 2019
ET 2018
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Highcharts.com
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OpenET will go live in 2021

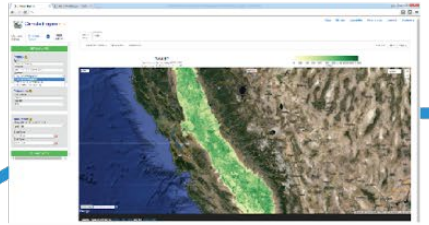
Forrest Melton, forrest.s.melton@nasa.gov
Justin Huntington, justin.huntington@dri.edu
Maurice Hall, mhall@edf.org

Extras

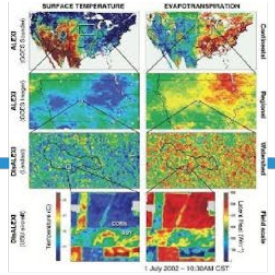
Measuring ET enables:

- 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

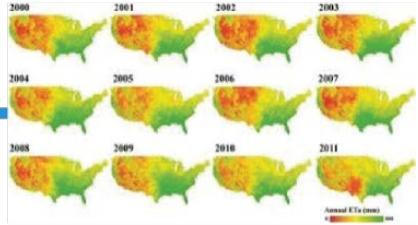
OpenET Uses Well-Established Methods



EE METRIC
University of Nebraska,
University of Idaho

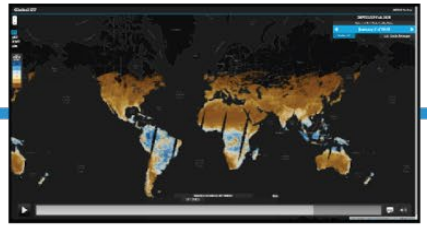


ALEXI/DisALEXI
USDA, NASA, University of Maryland,
University of Wisconsin

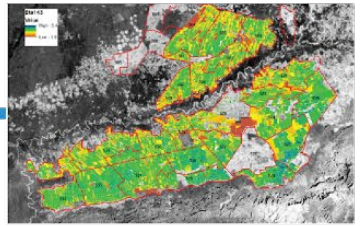


SSEBop
USGS

SIMS
NASA, CSUMB, Stanford University



PT-JPL
NASA



SEBAL

OpenET Uses Data from a Constellation of Satellites

Image credit: NASA/Goddard Space Flight Center Conceptual Image Lab

USGS-NASA Landsat 5/7/8
(TM / ETM+ / OLI)
30m/0.22 acres | overpass every 8-16 days

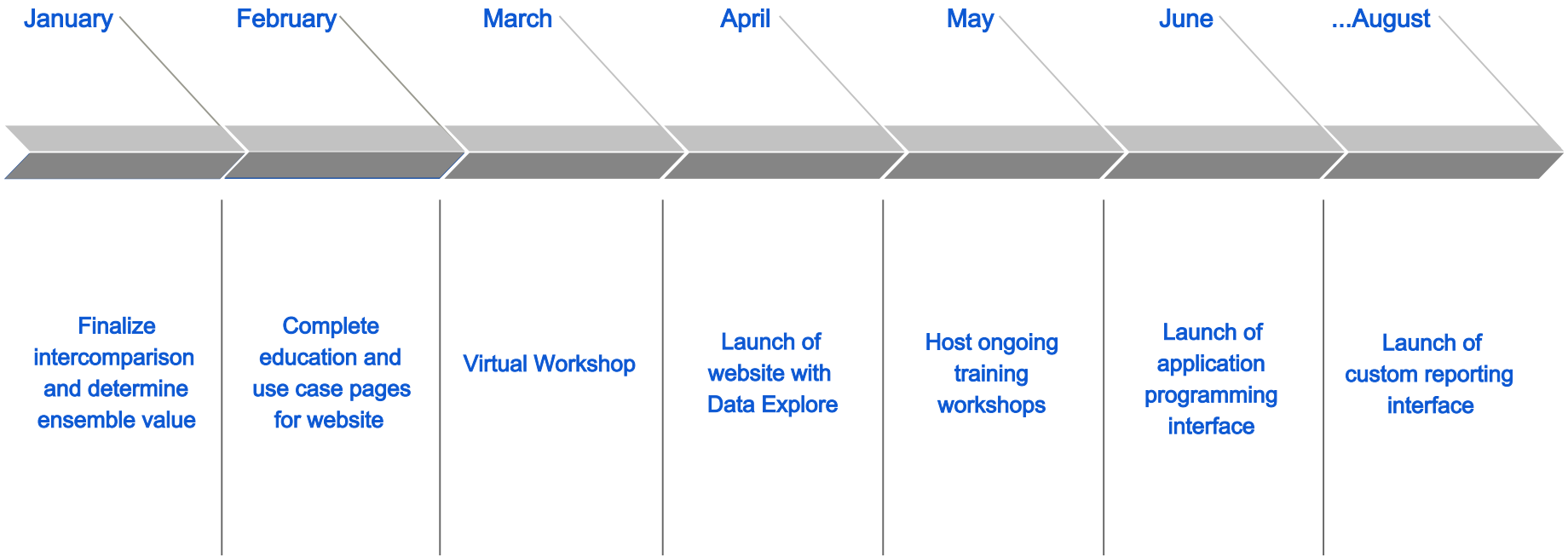
NASA Terra / Aqua
1 km | daily overpass

NASA-NOAA Suomi NPP
~300-375m | daily overpass

NOAA GOES-15/16/17
0.5-4 km | < hourly

ESA Sentinel-2A, 2B
20m/0.1 acres | overpass every 5-10 days

Key Milestones for Next 8 Months



Oregon Use Cases

- OWDR/WUDR grant for 10 years of Oregon wide data
- Harney Basin Use Case
- Walla Walla Basin Historical Study
  - 1984-2020 to support basin study, ~500K irrigated acres, 1.1M acres total for watershed
- USBR Klamath Naturalized Flow Study
  - 1984-2020 to support naturalized flow study, ~1M irrigated acres

Phase I Results for Cropland Sites

Fig. 1: Model agreement for total seasonal ET for croplands

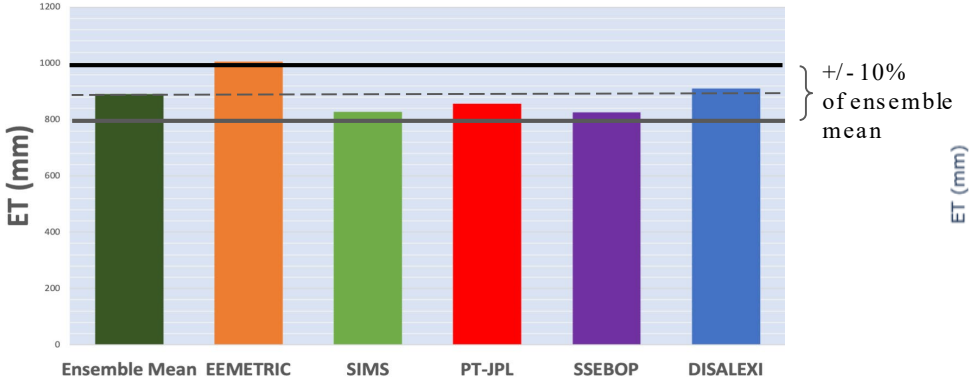
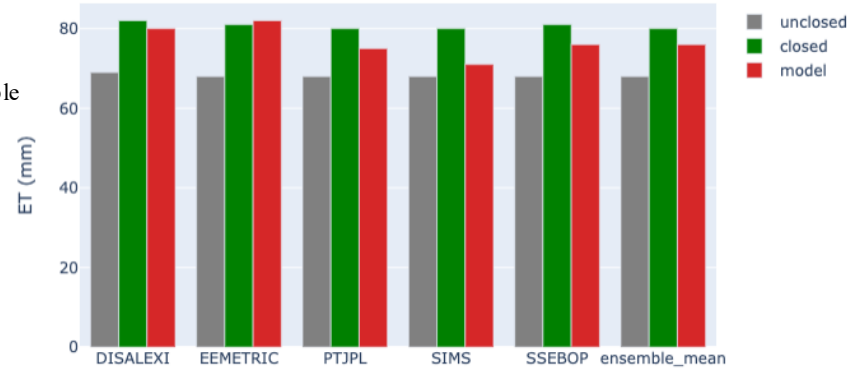
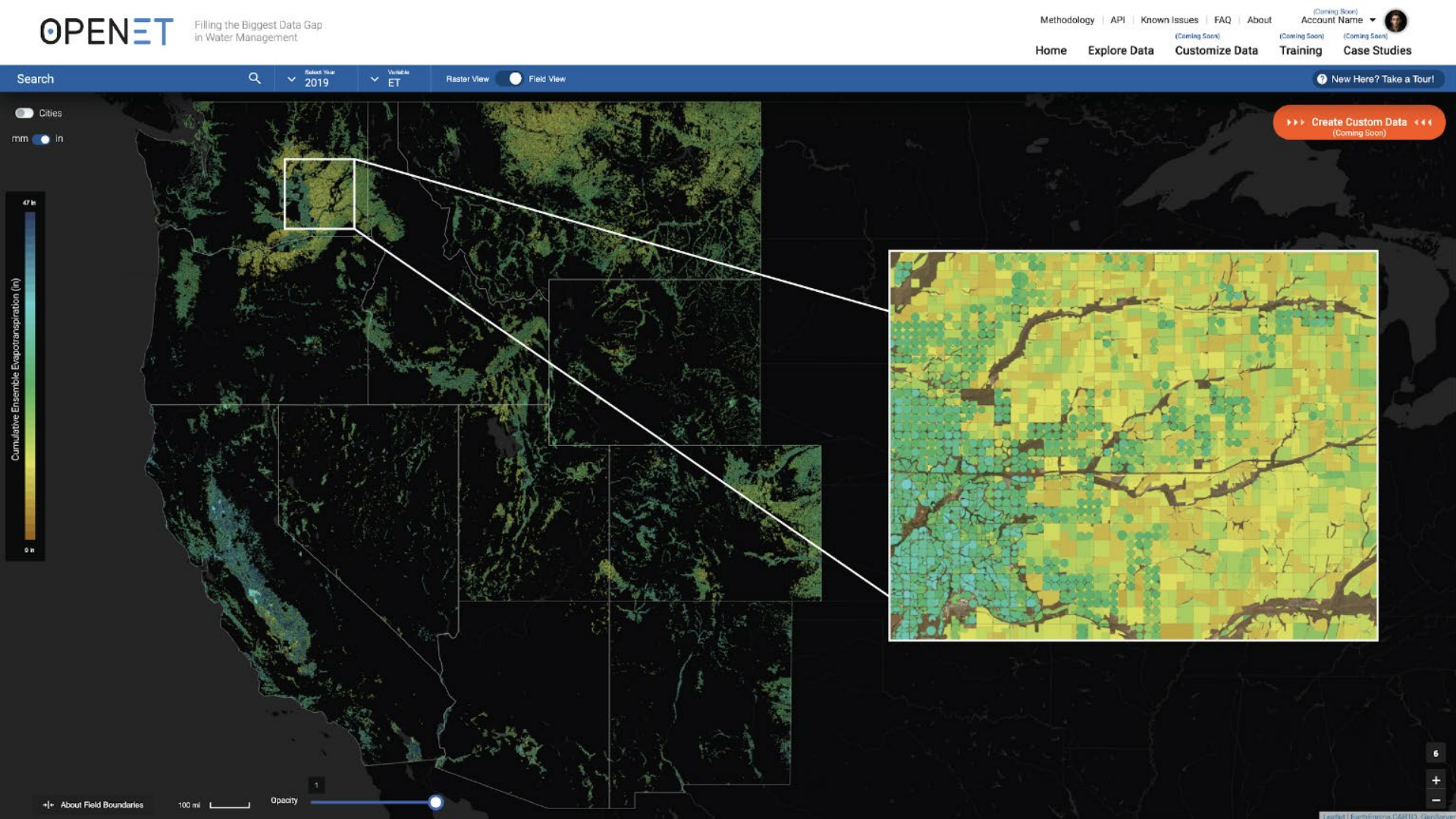


Fig. 2: Model agreement with flux towers (croplands, full period)



n = 24 sites	Ensemble Mean	EE-METRIC	SIMS	PT-JPL	SSEBOP	DisALEXI
Slope	0.98	1.05	0.97	0.94	0.92	1.03
MAE (mm/day)	0.49	0.71	0.70	0.61	0.79	0.62
RMSE (mm/day)	0.62	0.88	0.87	0.81	0.99	0.79
R-squared	0.92	0.85	0.89	0.87	0.81	0.89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Variable ET
Raster View
Field View
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Cities
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Cumulative Ensemble Evapotranspiration (in)
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Create Custom Data
(Coming Soon)
About Field Boundaries
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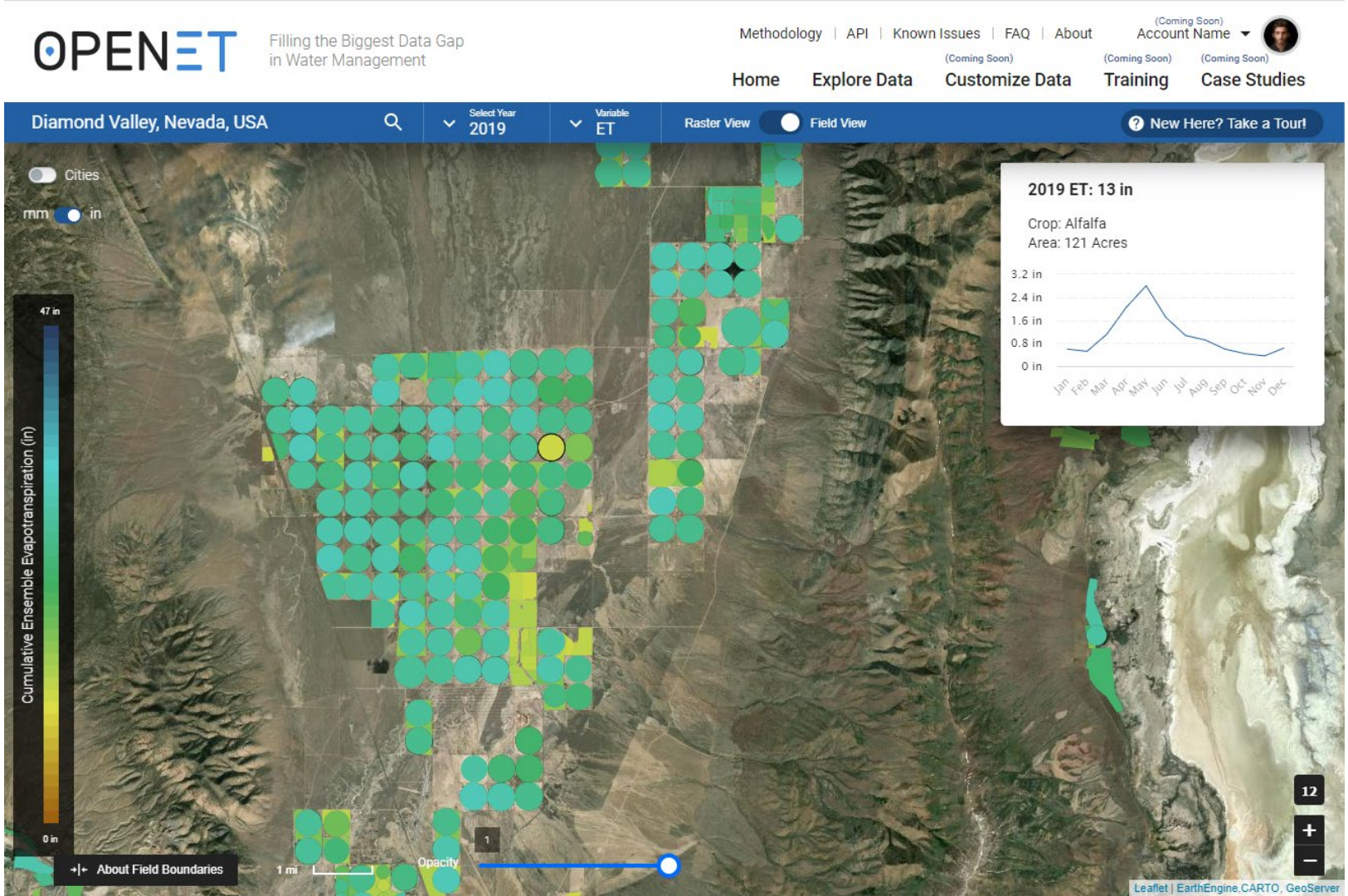
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Cumulative Ensemble Evapotranspiration (in)
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About Field Boundaries
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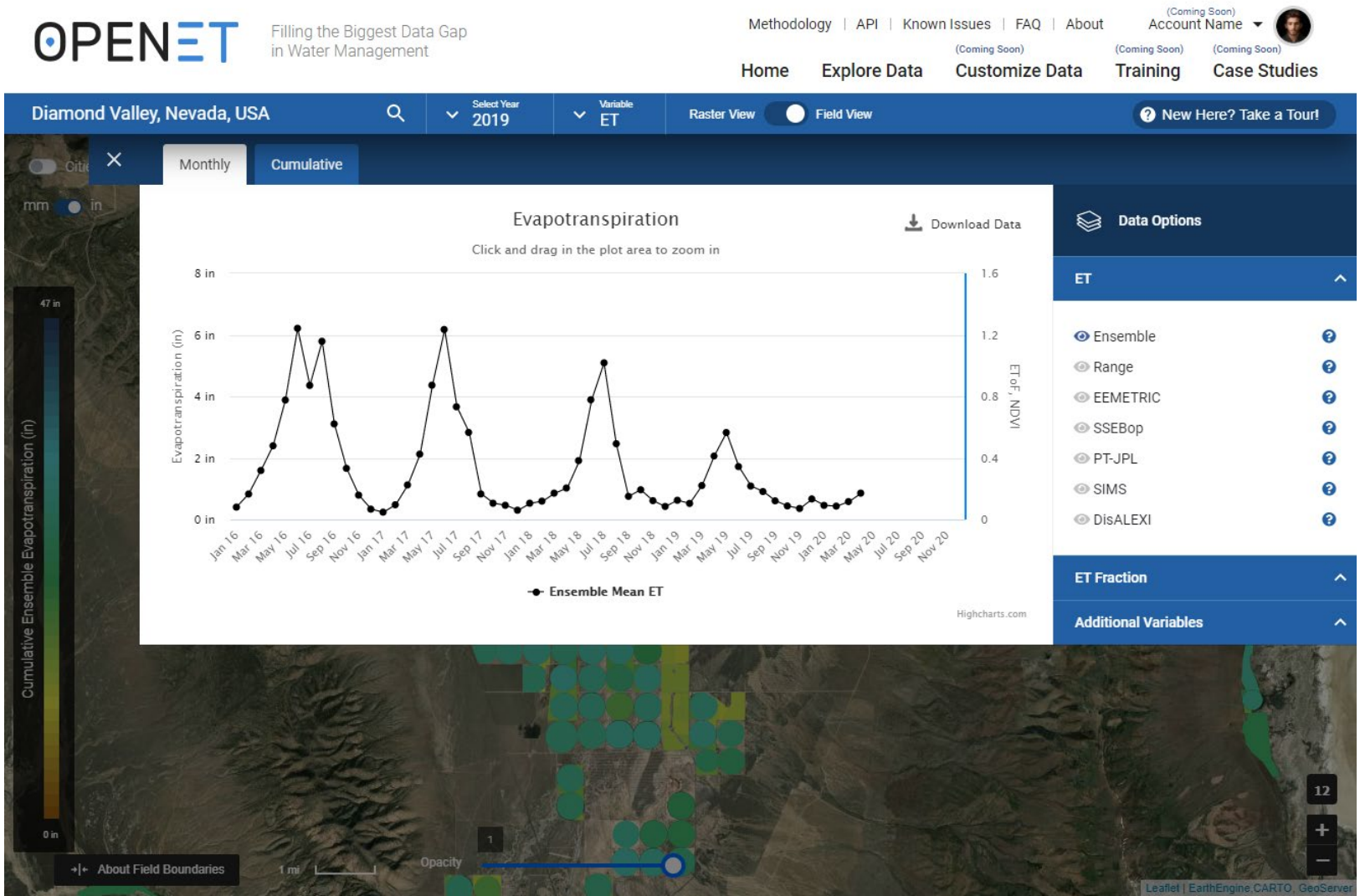
2019 ET: 13 in
Crop: Alfalfa
Area: 121 Acres
3.2 in
2.4 in
1.6 in
0.8 in
0 in
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
12
Leaflet | EarthEngine,CARTO, GeoServer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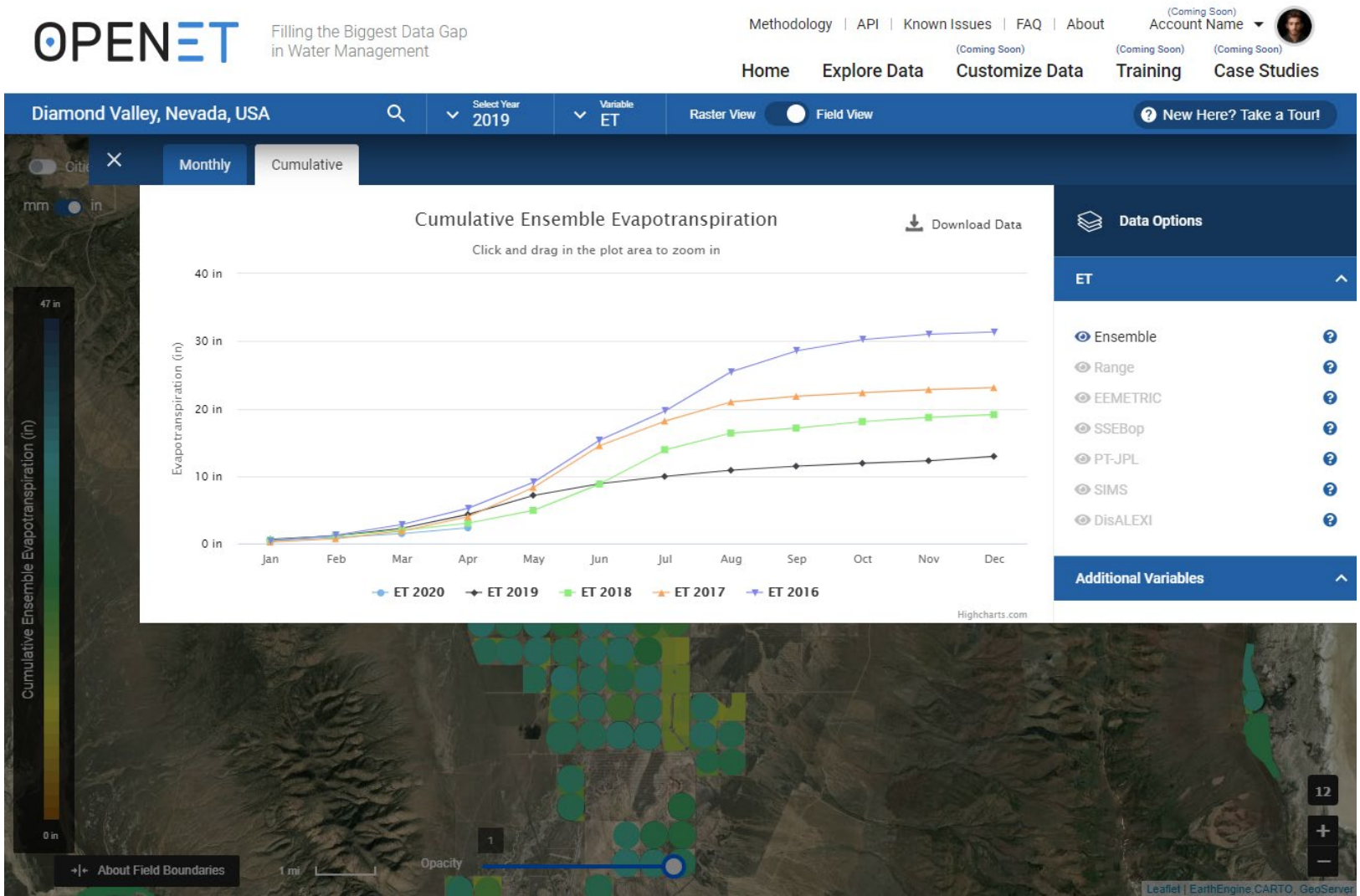
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30 in
20 in
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ET 2016
Highcharts.com
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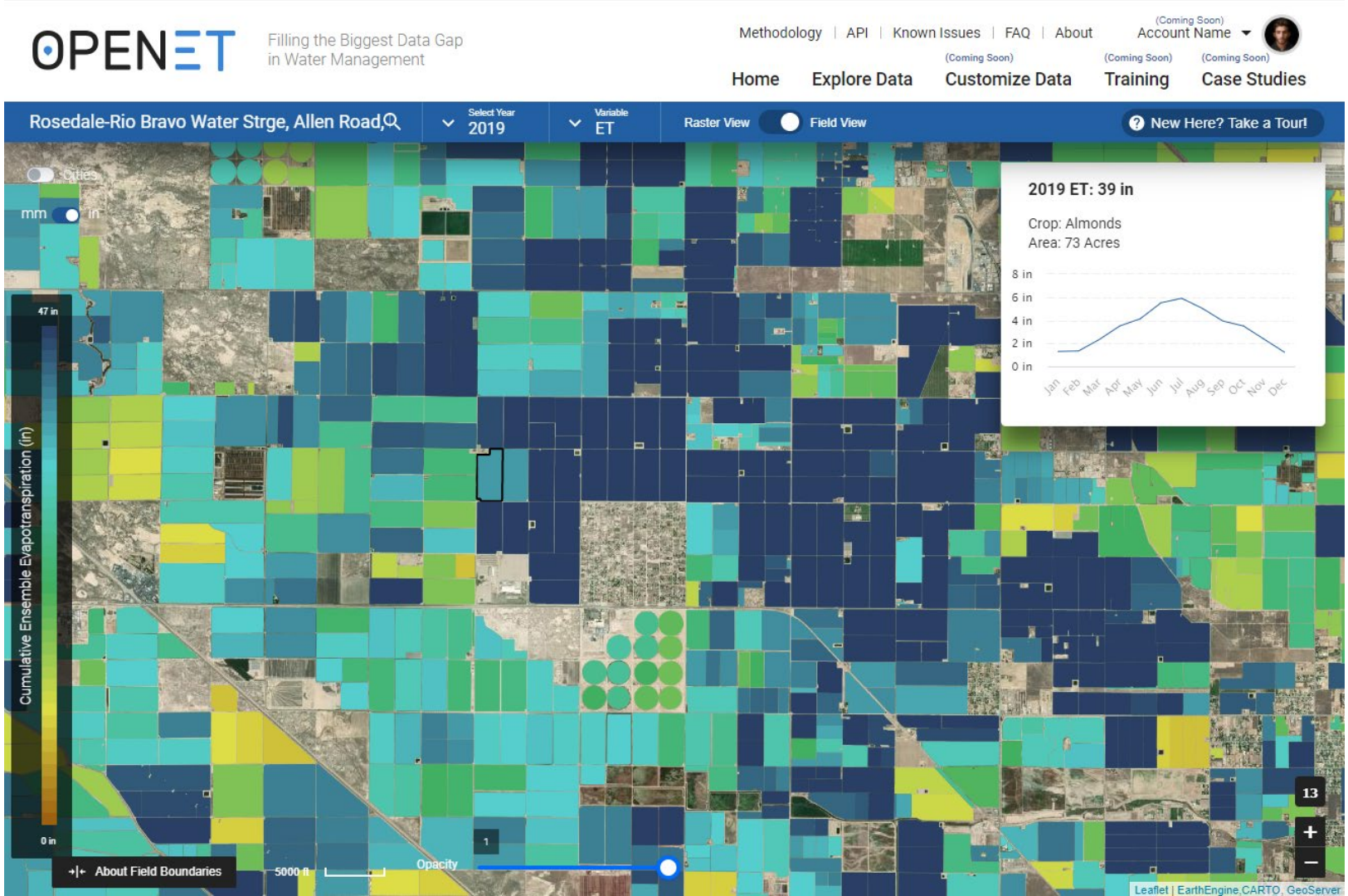
Leaflet | EarthEngine,CARTO, GeoServer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2019 ET: 39 in
Crop: Almonds
Area: 73 Acres
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About Field Boundaries
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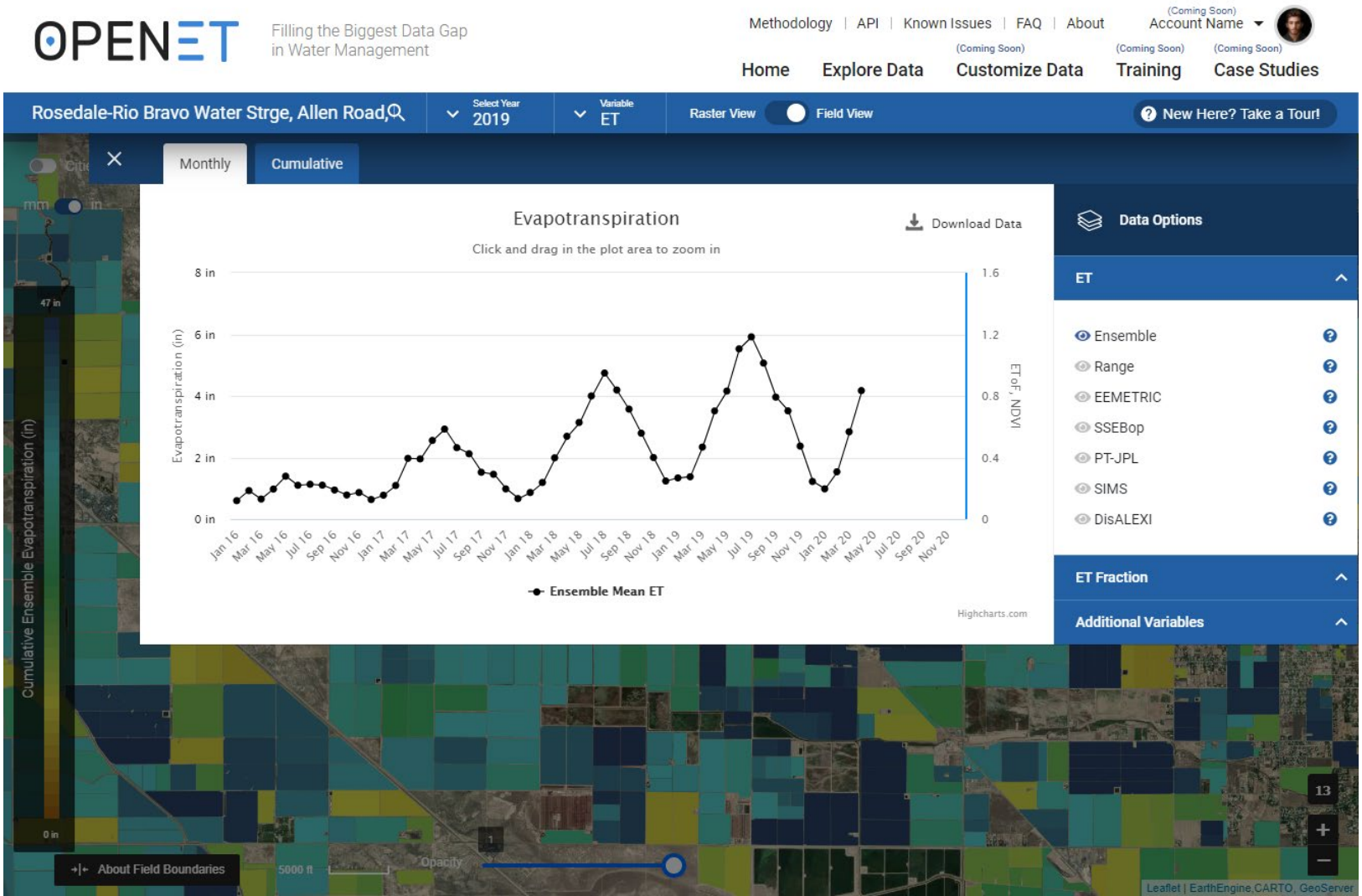
Leaflet | EarthEngine,CARTO, GeoServer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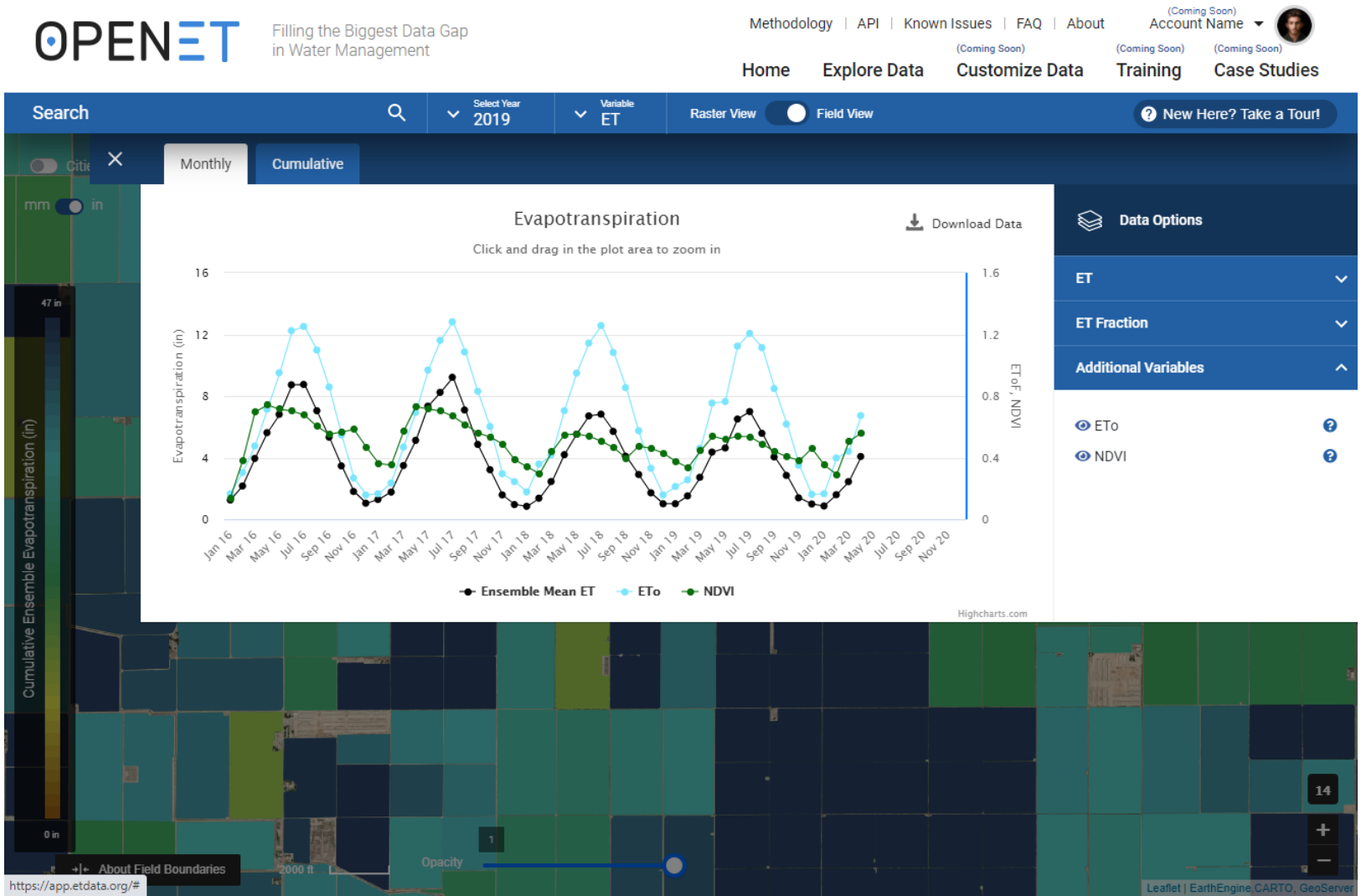
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