Agricultural land abandonment mapping using Google Earth Engine

What is agricultural abandonment?


Credit: Andronov

Why agricultural land abandonment is difficult to map?

ELSEVIER

Remote Sensing of Environment

Volume 246, 1 September 2020, 111873

Monitoring cropland abandonment with Landsat time series

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Mapping steps

Data preparation

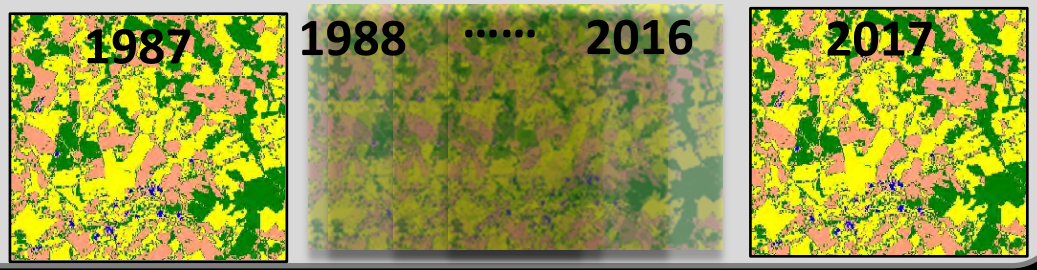
Landsat imagery 1986-2021

Cloud, shadow, snow and ice masking

Step-1 Single-year mapping

Active ag | **Herbaceous** | **Woody lands** | **Others land**

Step-2 Annual mapping



Step-3 Change detection

Permanent ag | **Abandoned ag (and timing)** | **Fallow fields** | **Non ag**

Class definitions

Single-year Analyses and classes

- ***Active agriculture*** is used to grow row crops, and typically tilled resulting in a clear soil signal at some point during the year. Even under no-till cropping, more soil is exposed than in grasslands

- ***Herbaceous*** areas have no shrub or tree component, and are neither plowed nor harvested for hay. Senescence occurs earlier than for woody herbaceous

- ***Woody land*** areas have either shrubs or trees, resulting in a longer vegetative period

- ***Other land*** areas include lands without vegetation cover, e.g. water bodies, barren land etc.

Class definitions

Multi-year Analyses and classes

- ***Permanent agriculture*** is active agriculture that was never abandoned nor permanent grassland nor shrubland
- ***Abandoned agriculture*** is non-woody herbaceous that was once active agriculture, but has been not been plowed for +4 years
- ***Fallow fields*** are similar to non-woody abandoned agriculture, but were plowed in the prior four years

Approach

Step-1: Single-year analyses

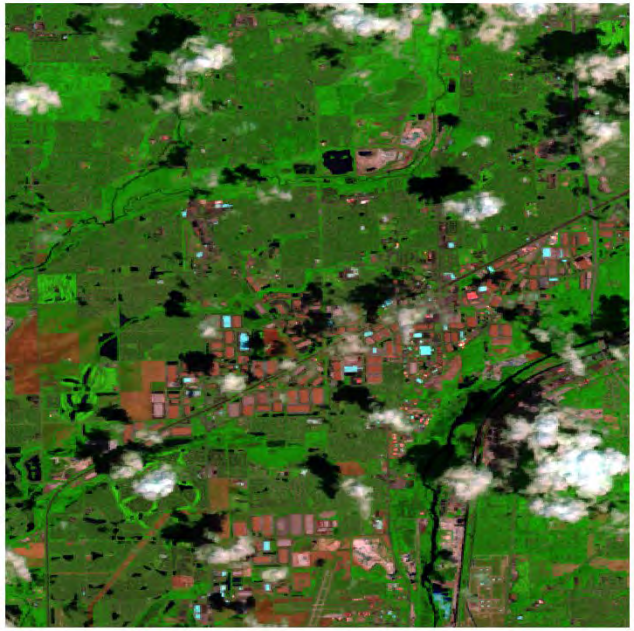
Approach

Step-1: Single-year analyses

- Image metrics
- Training data generation
- Random forest classifier

2017-02-11

2017-06-27



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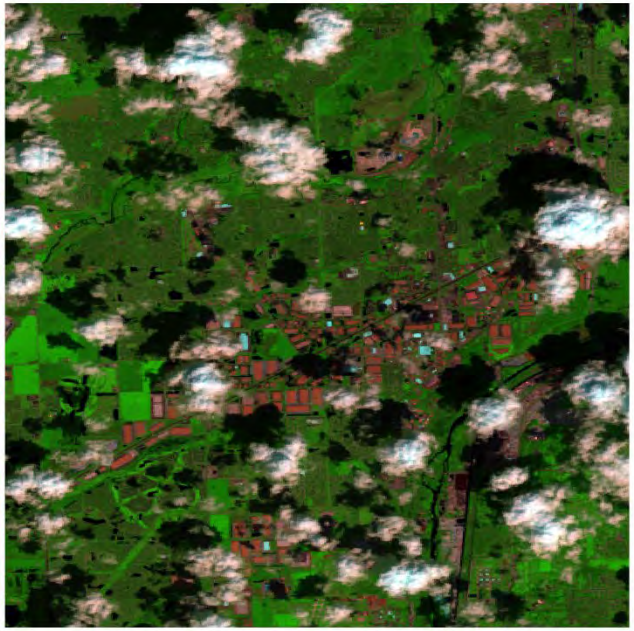

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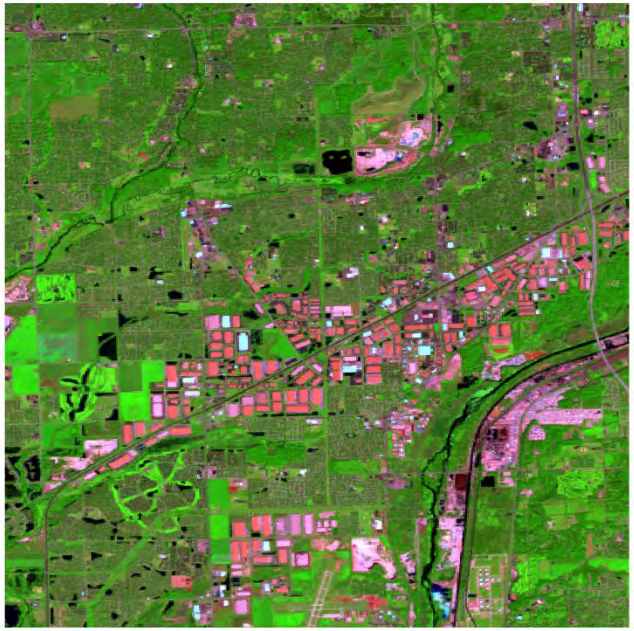

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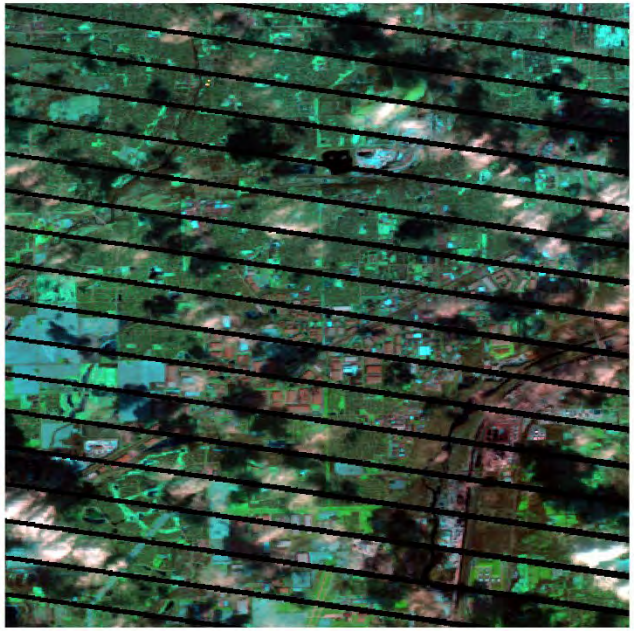
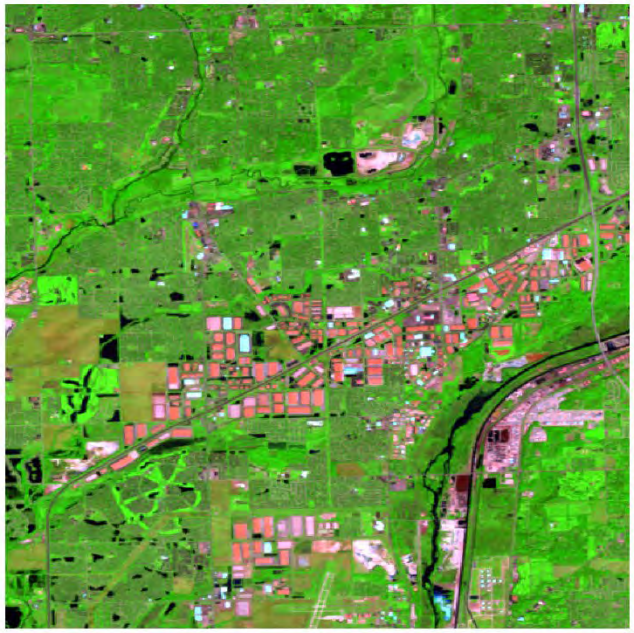
2017-12-12



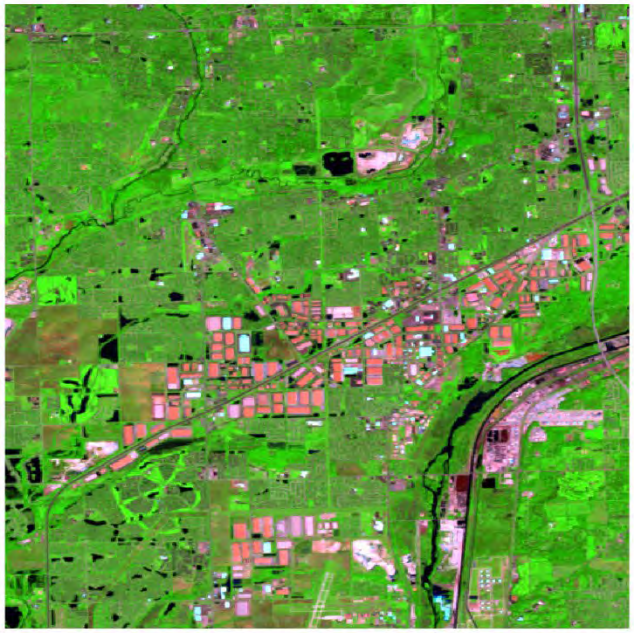
DOY	B1	B2	B3	B4	B5	B7
55	256	625	454	423	114	422
68	294	477	554	456	886	125
126	855	457	457	712	354	421
225	1600	6500	1637	7129	5193	5004
298	586	788	991	258	388	585

Metric	B1	B2	B3	B4	B5	B7
Mean	323	587	610	462	436	388
Median	275	661	506	440	371	422
Q25	155	154	156	188	324	192
Q75	367	666	663	520	513	463
Stdev	185	457	454	188	324	192

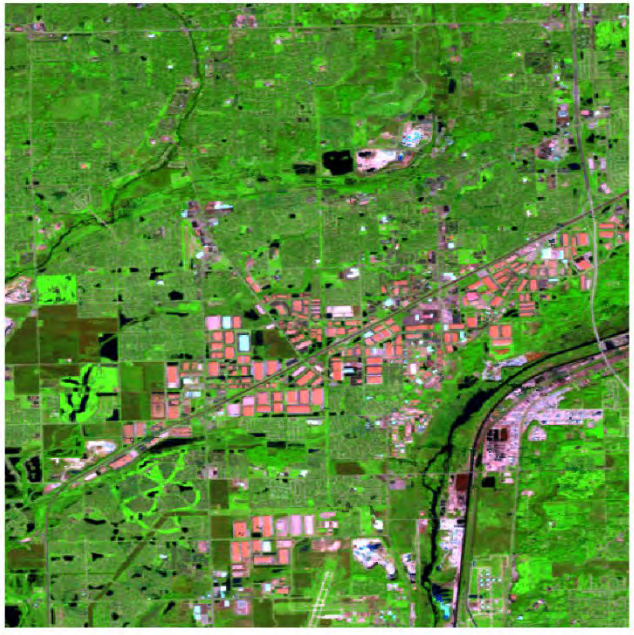
Mean



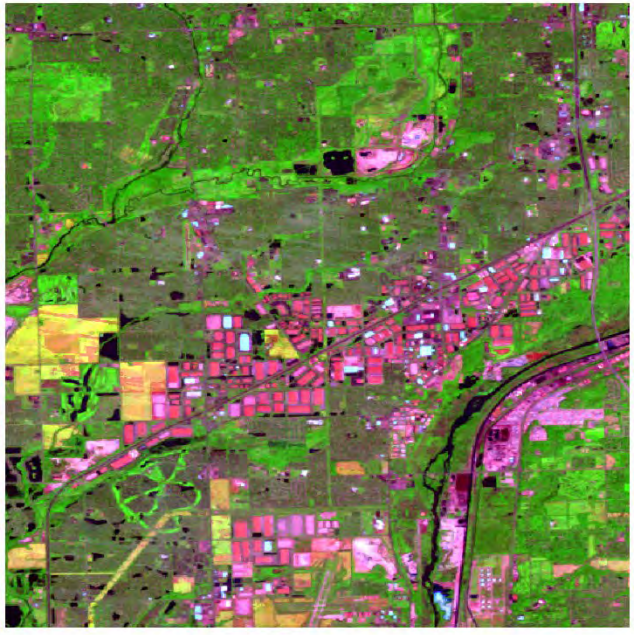
Median



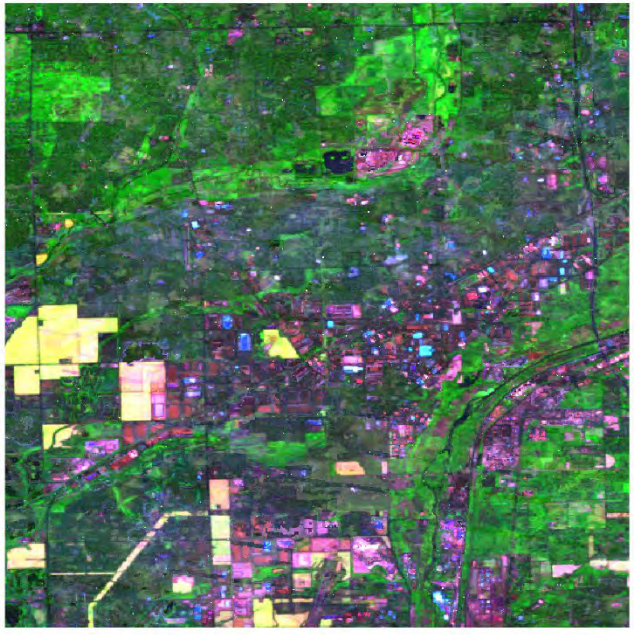
Quantile 20



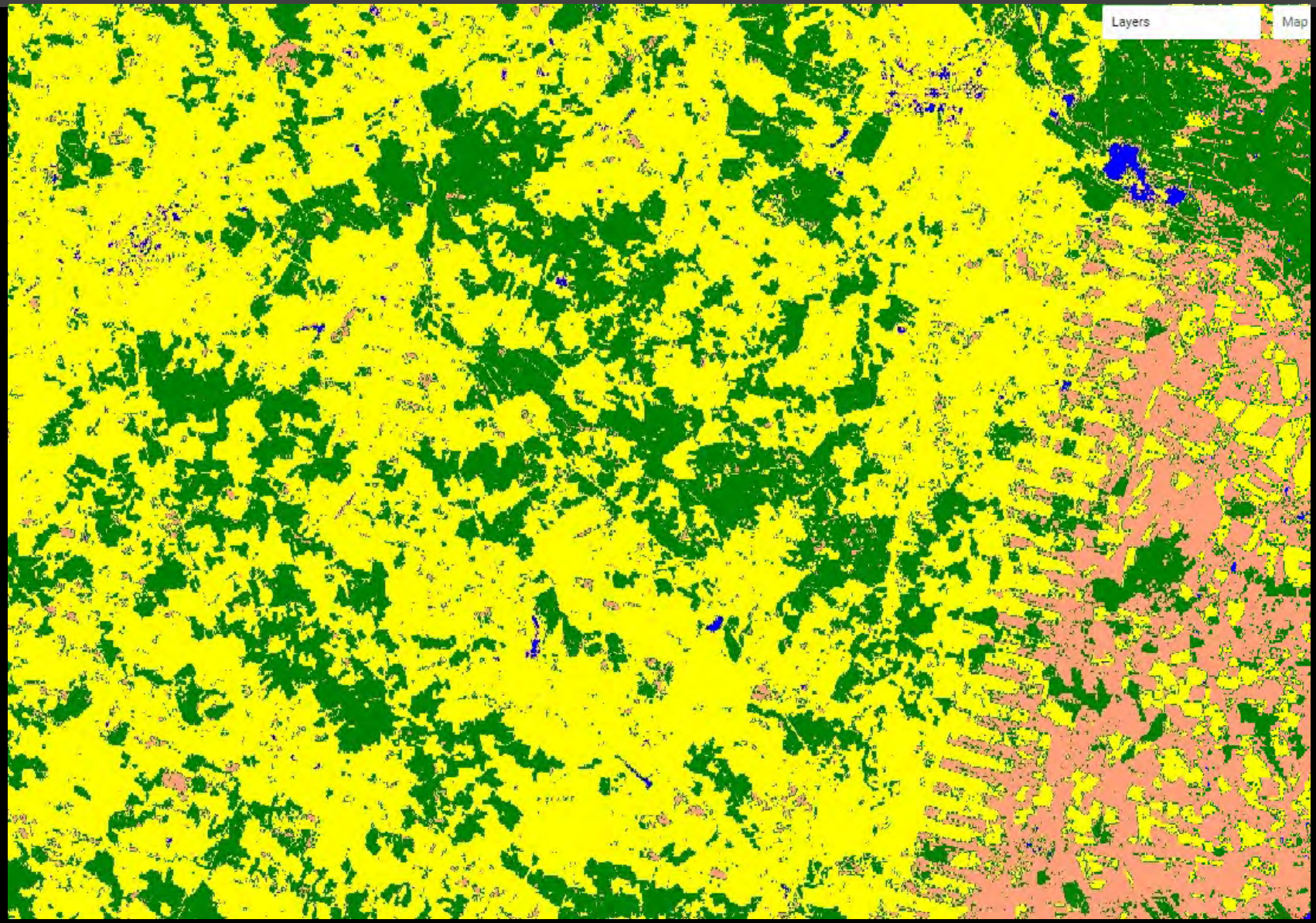
Quantile 80



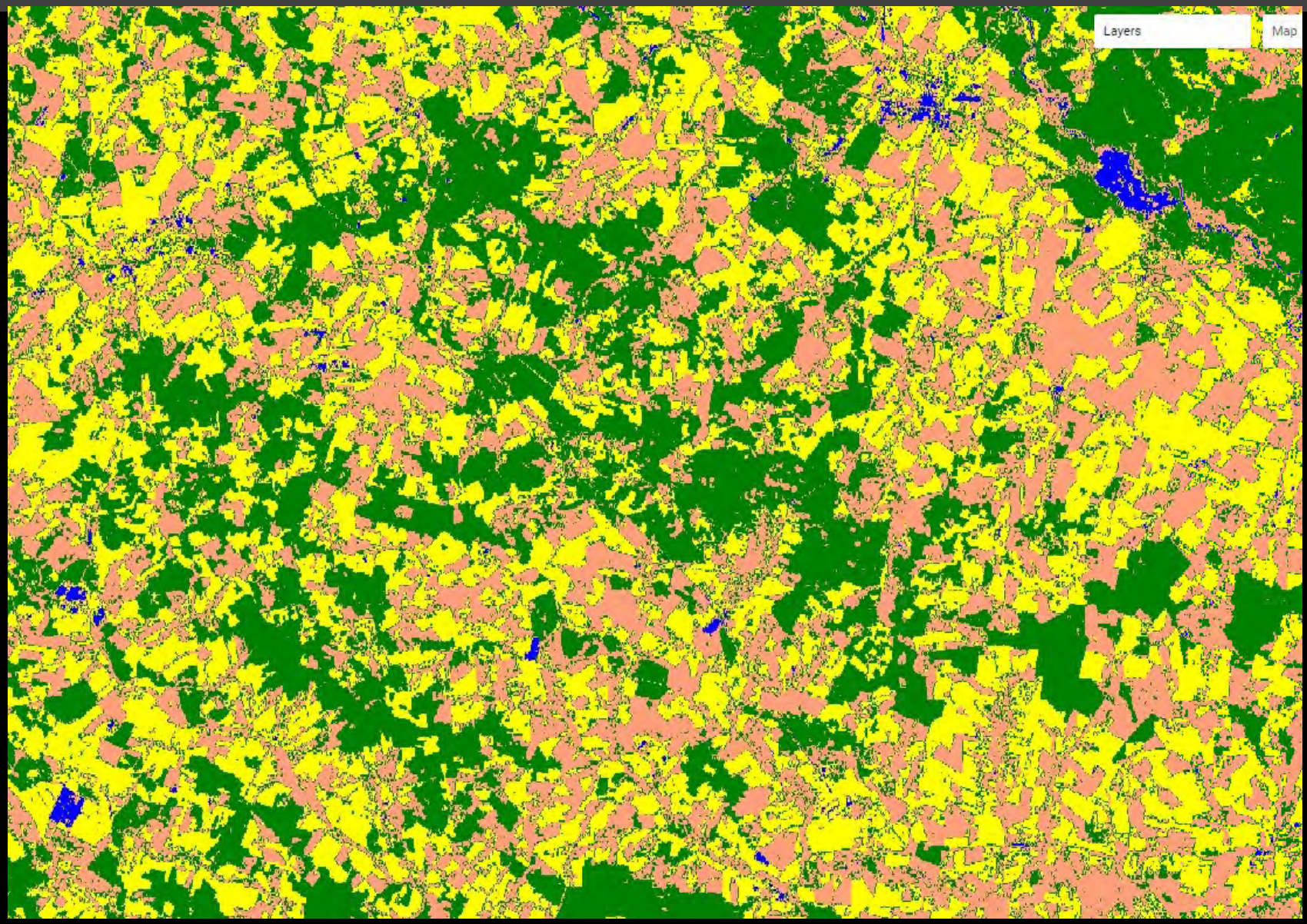
Standard deviation



Classification based on single-date image



Classification based on metrics



Approach

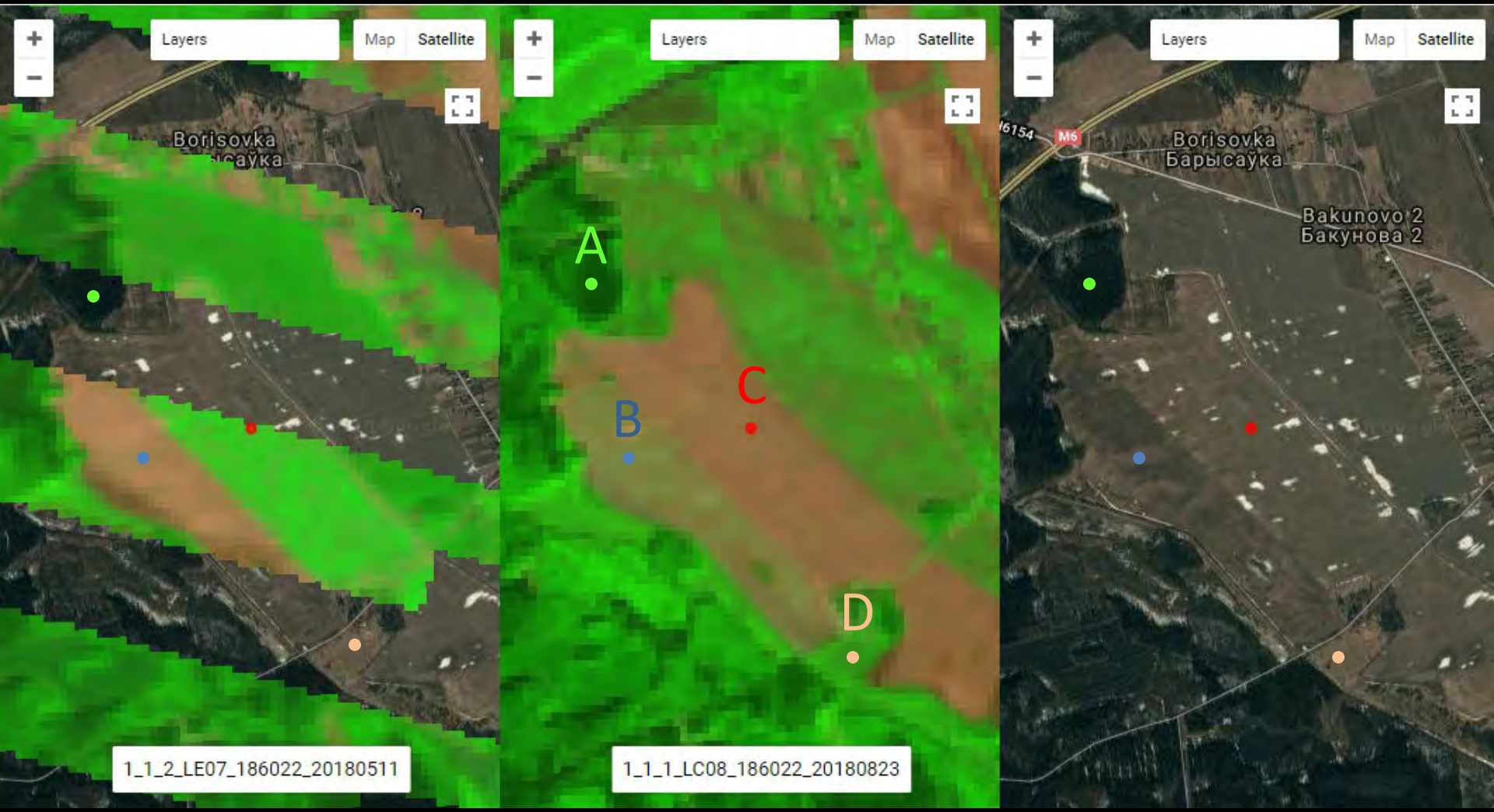
Step-1: Single-year analyses

- Image metrics
- Training data generation
- Random forest classifier

Training data generation

Feature difference

- Spectral
- Temporal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Map
Satellite
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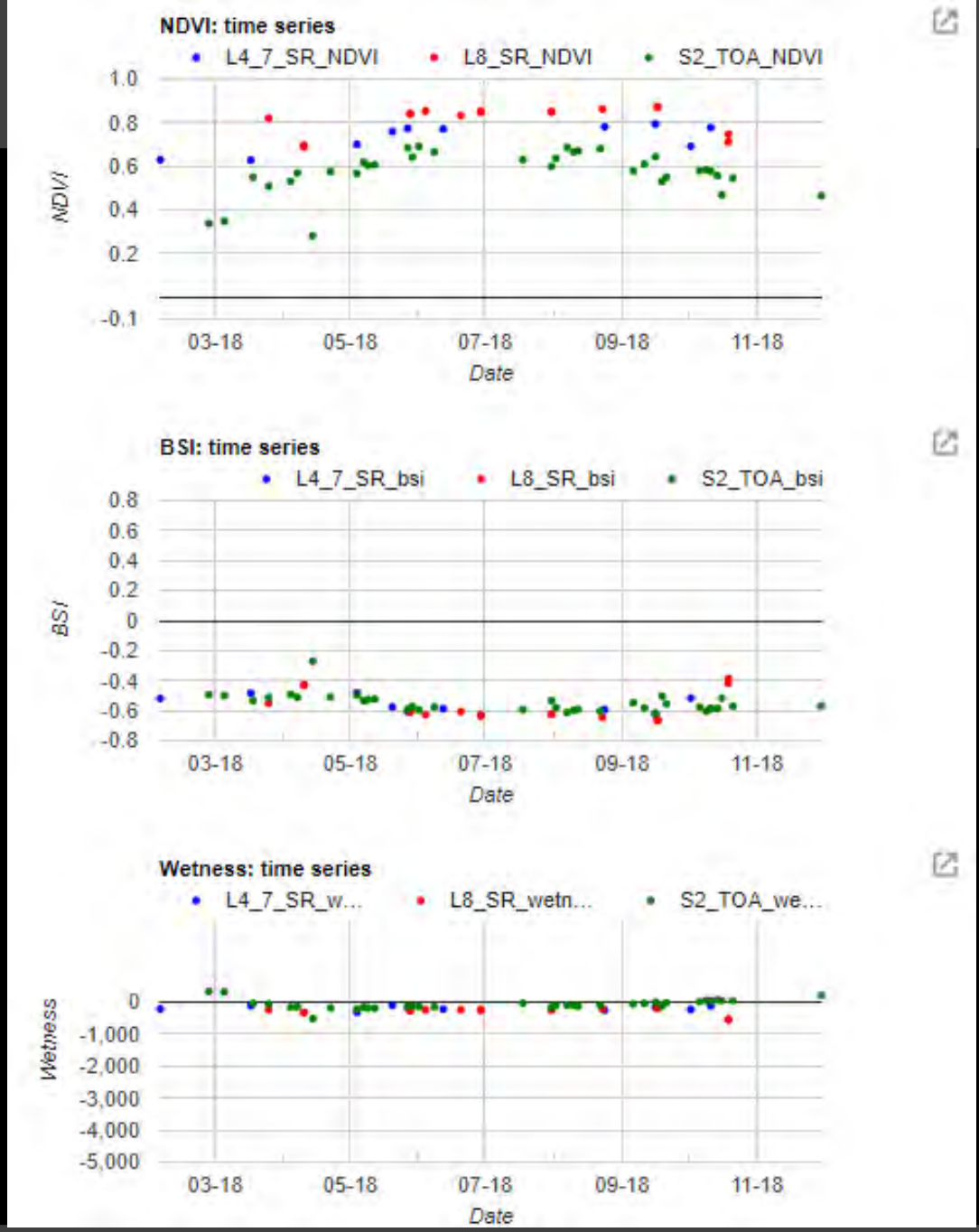
Бакунова 2

A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L8_SR_NDVI
S2_TOA_NDVI
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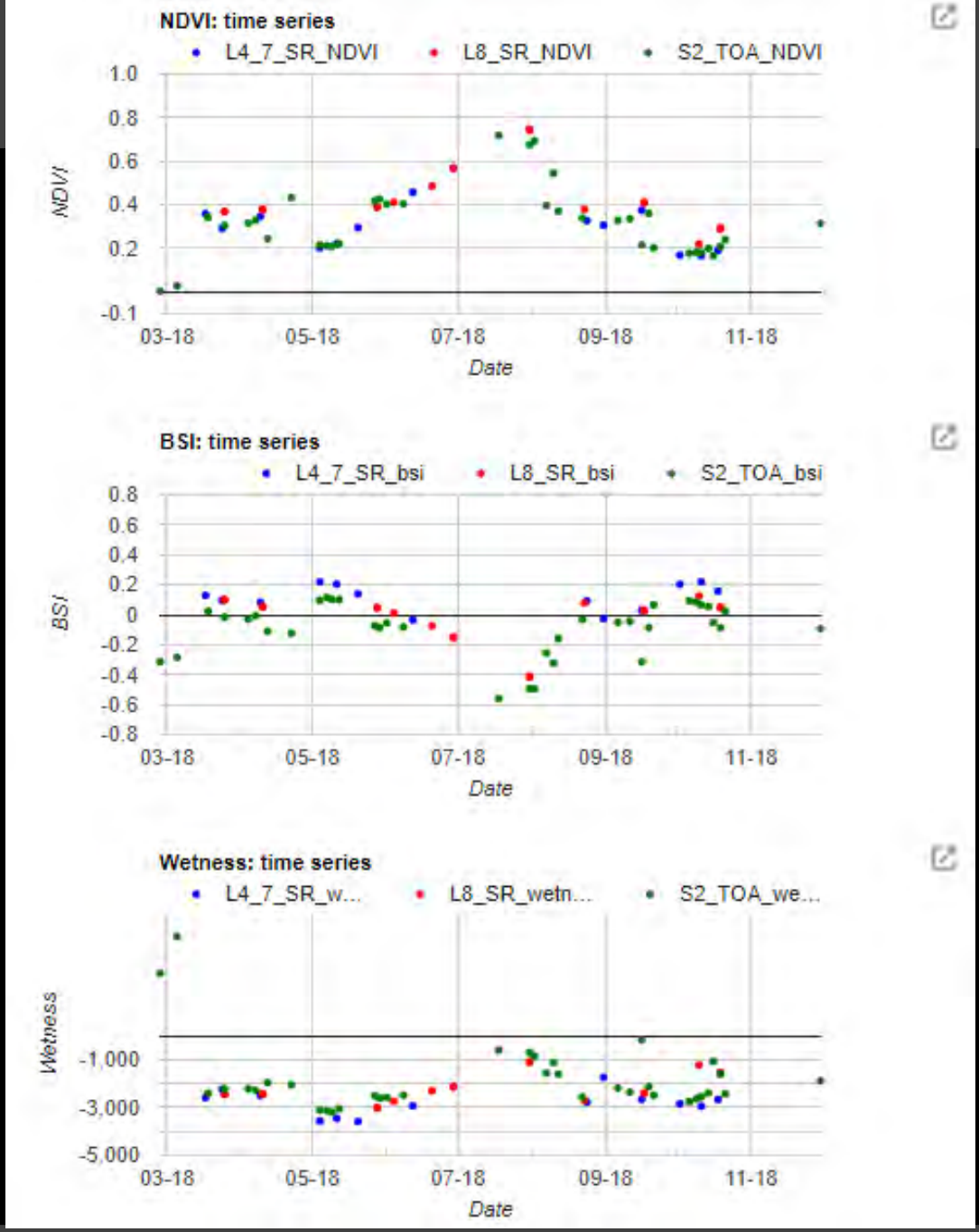
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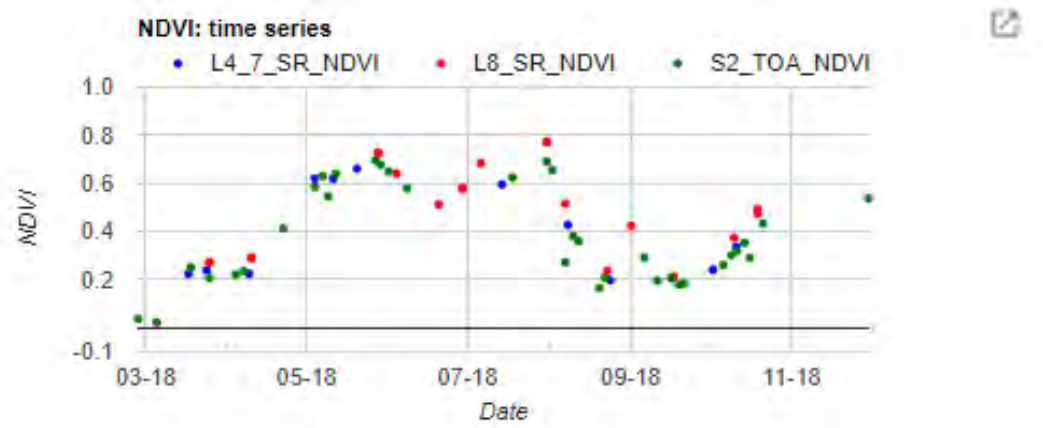
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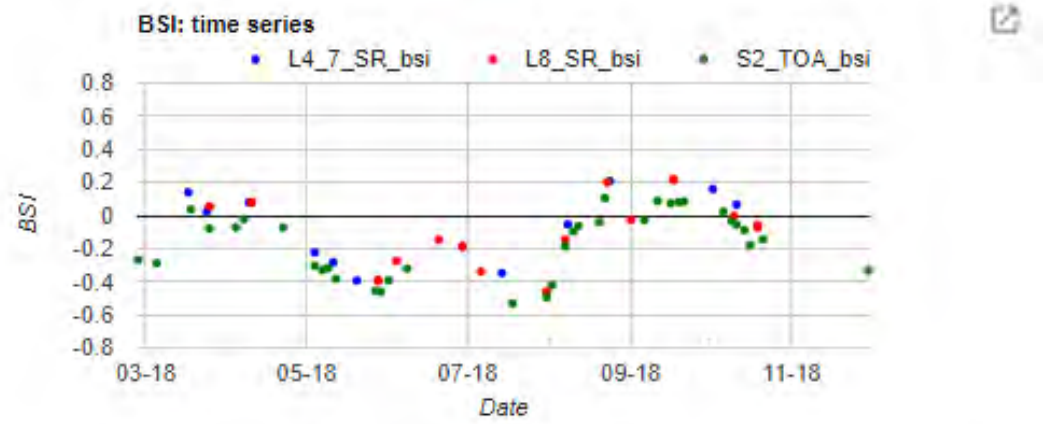
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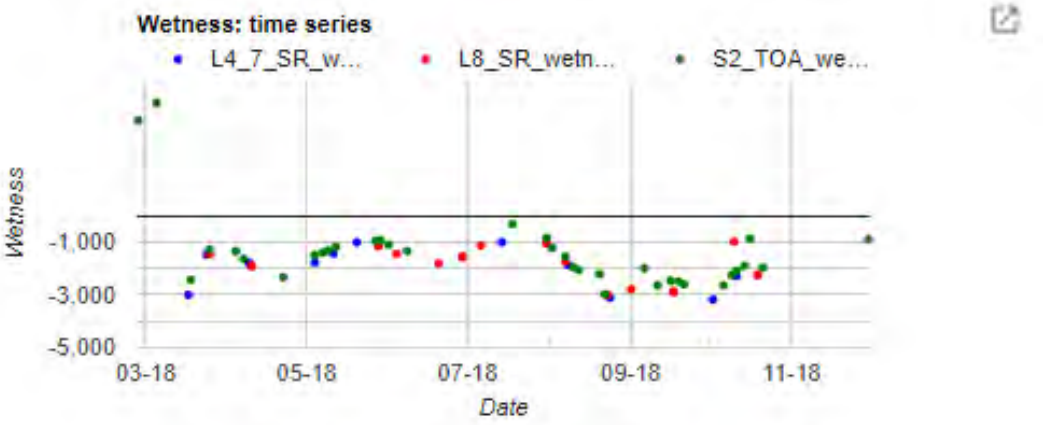
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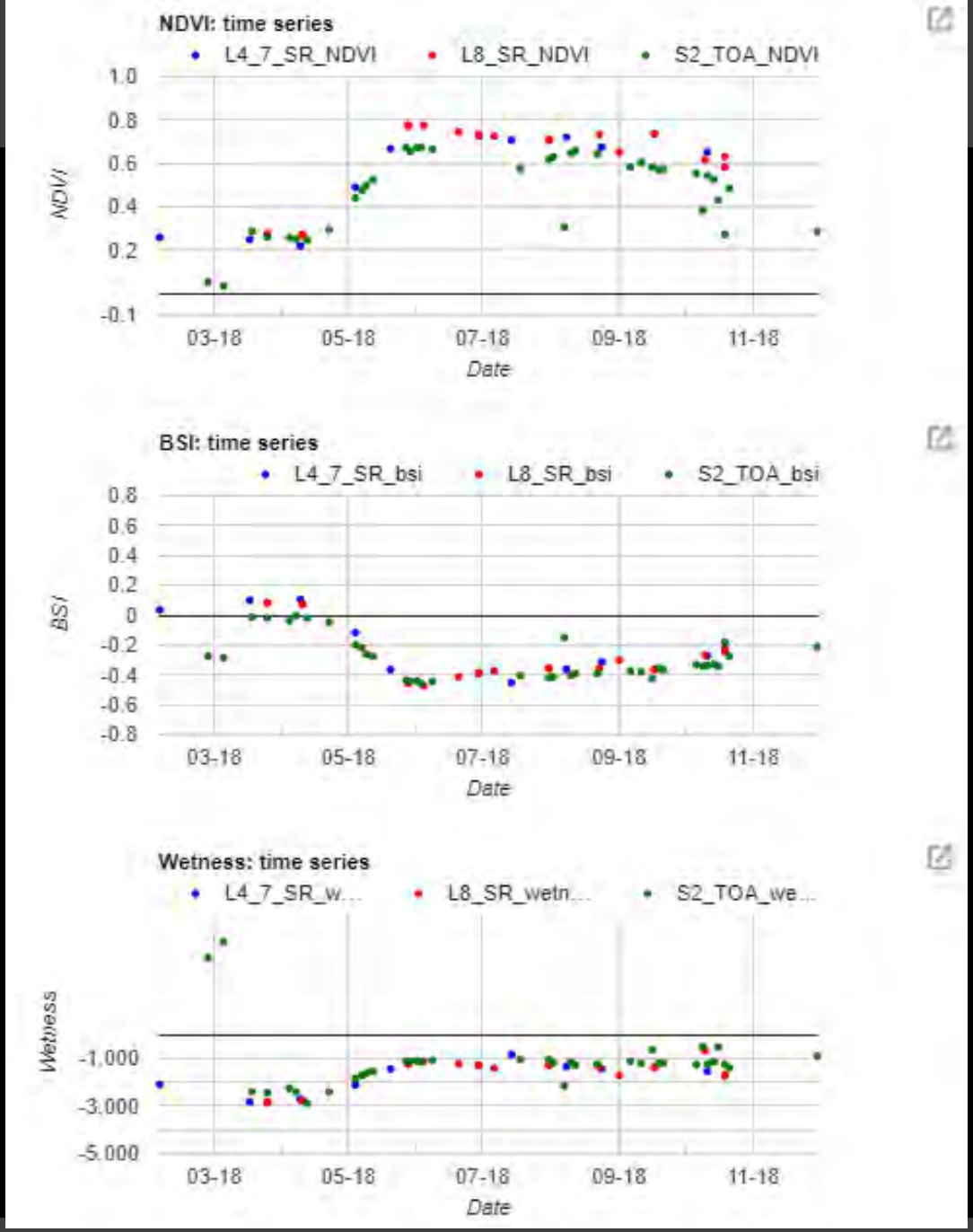
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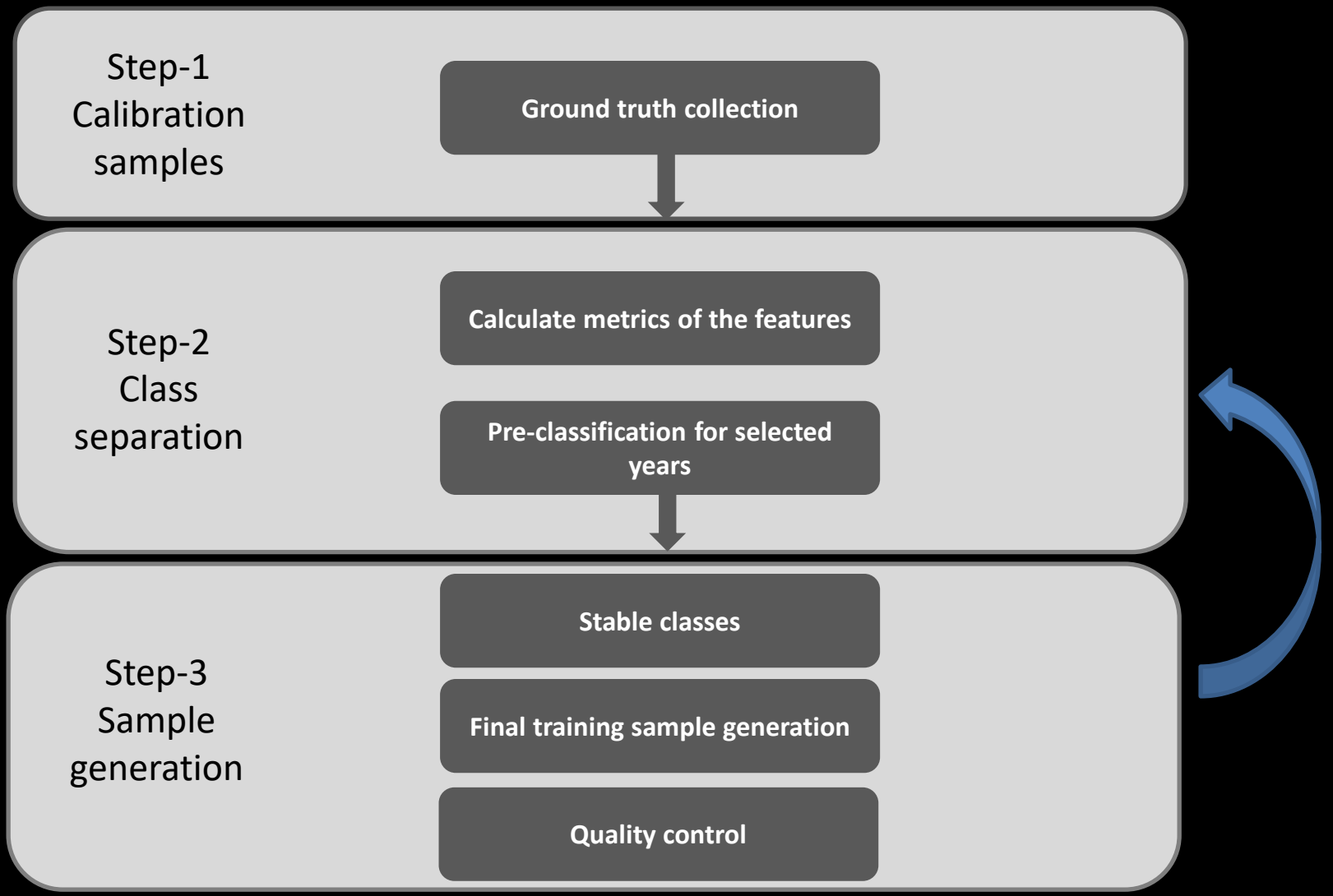
Training data generation



Approach

Step-1: Single-year analyses

- Image metrics
- Training data generation
- Random forest classifier

Approach

Step-2: Annual mapping

- Generate annual maps

Approach

Step-3: Change detection

- Combination of single-year classifications
- Rule-based for each class
- Post-classification processing (e.g., MMU; masking)

What is Earth Engine?

- "Google Earth Engine is a cloud-based platform for planetary-scale geospatial analysis" Gorelick et al. 2017

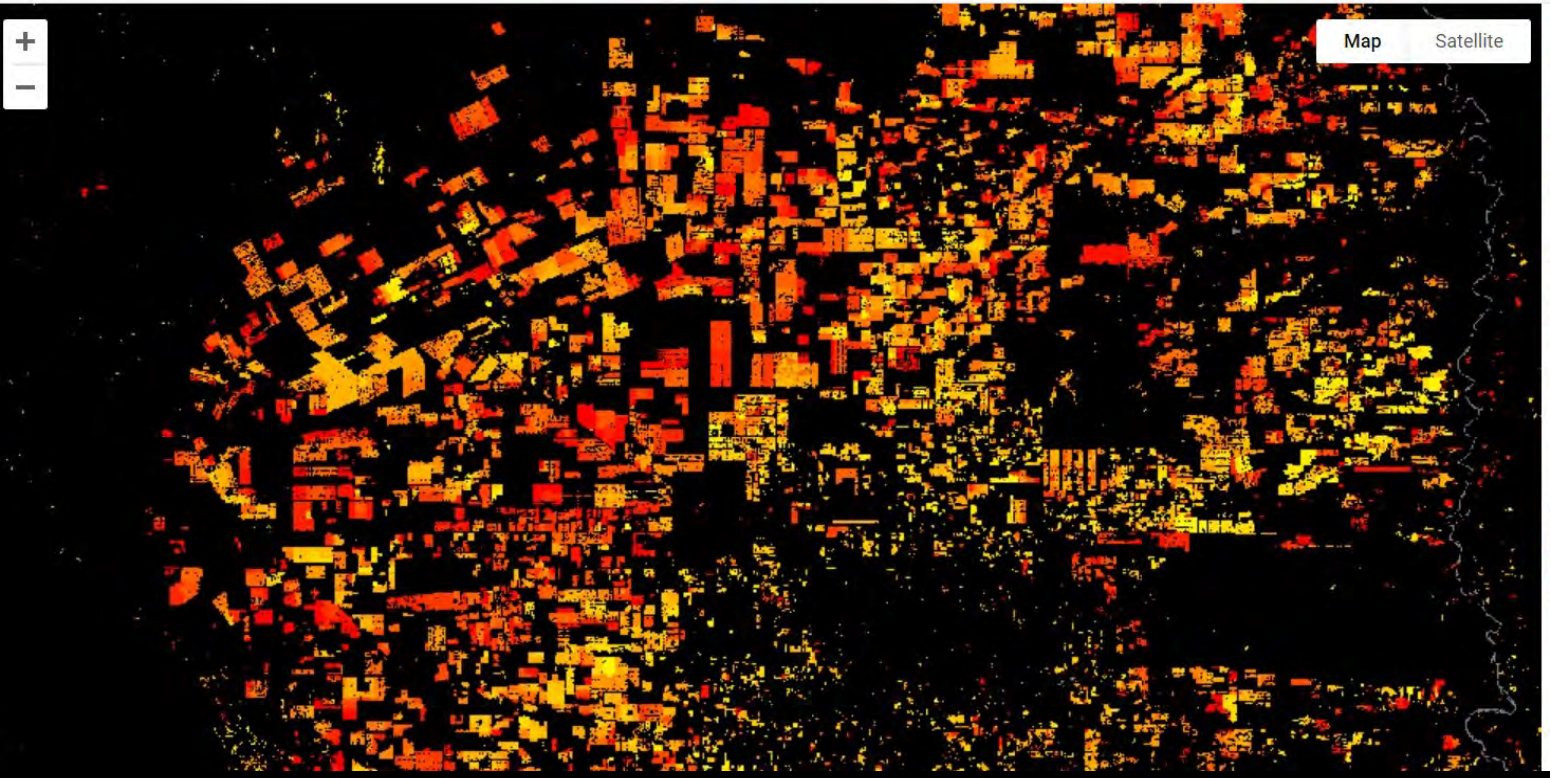
Data catalog

- Satellite imagery
- Geographical
- Climate
- Demographic
- Vector

>200 public datasets
> 5 million images
> 4000 new images per day
> 5 petabytes of data

Earth Engine Apps

Search places



Global Forest Change

Results from analysis of Landsat images charac
forest extent and change.

For more information

Science paper by Hansen, Potapov, M
Hancher et al.

View Different Layers

Year of Loss

Legend

- 2016
- ...
- 2000
- No loss
- Water or no data

Opacity 1

Visit Example Locatio

What GEE can do?

- Get imagery
- Imagery analysis (spatial; temporal)
- Statistics
- Animations

Courtesy: Donchyts

How to use Google Earth Engine?

JavaScript

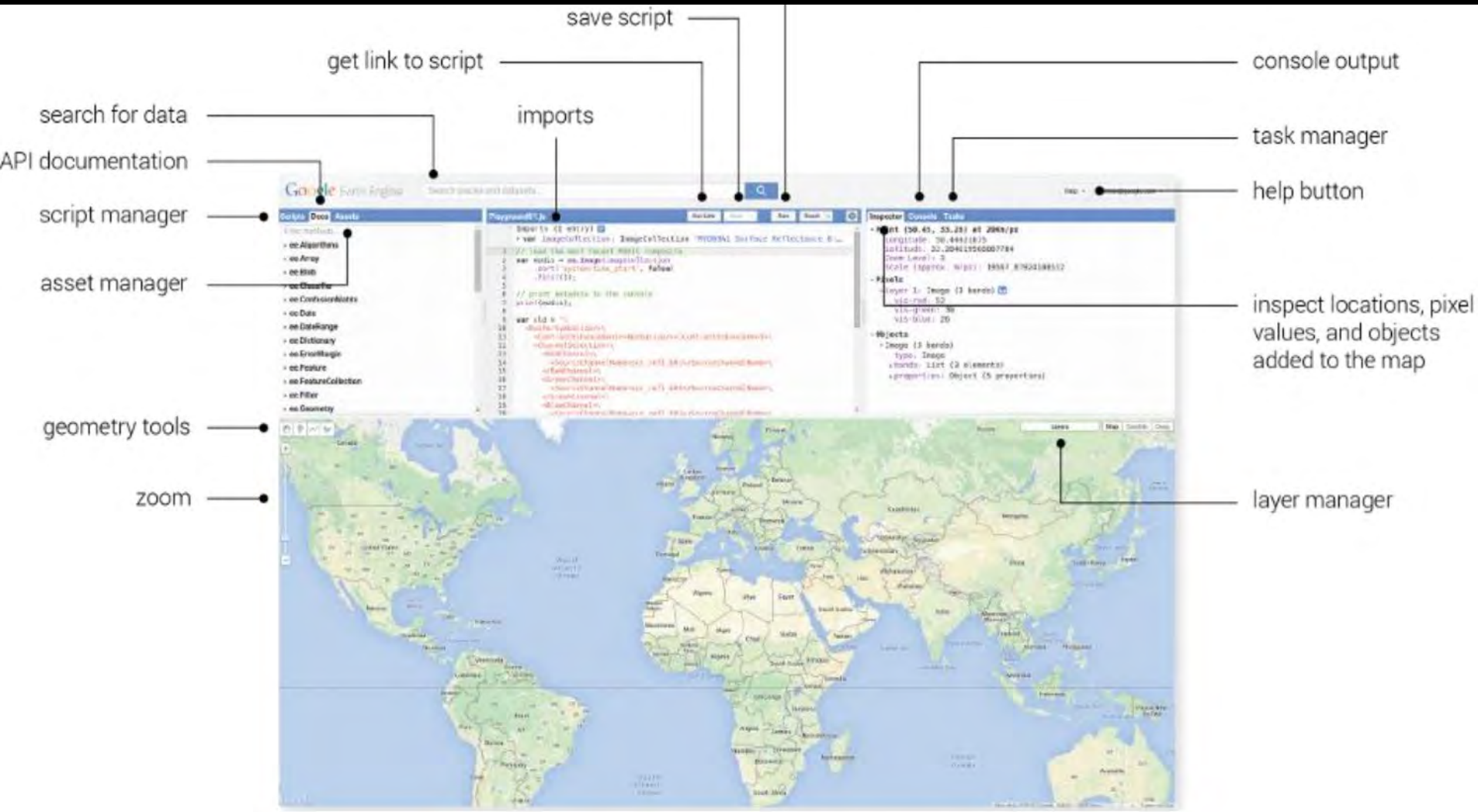
Interactive JavaScript using the Code Editor, the open source JavaScript library in Node.js (learn more about Earth Engine in Node.js), or Earth Engine Apps.

Python

The open source Python library running in Colab, your Python environment, or App Engine (learn more about Earth Engine powered App Engine apps).

REST

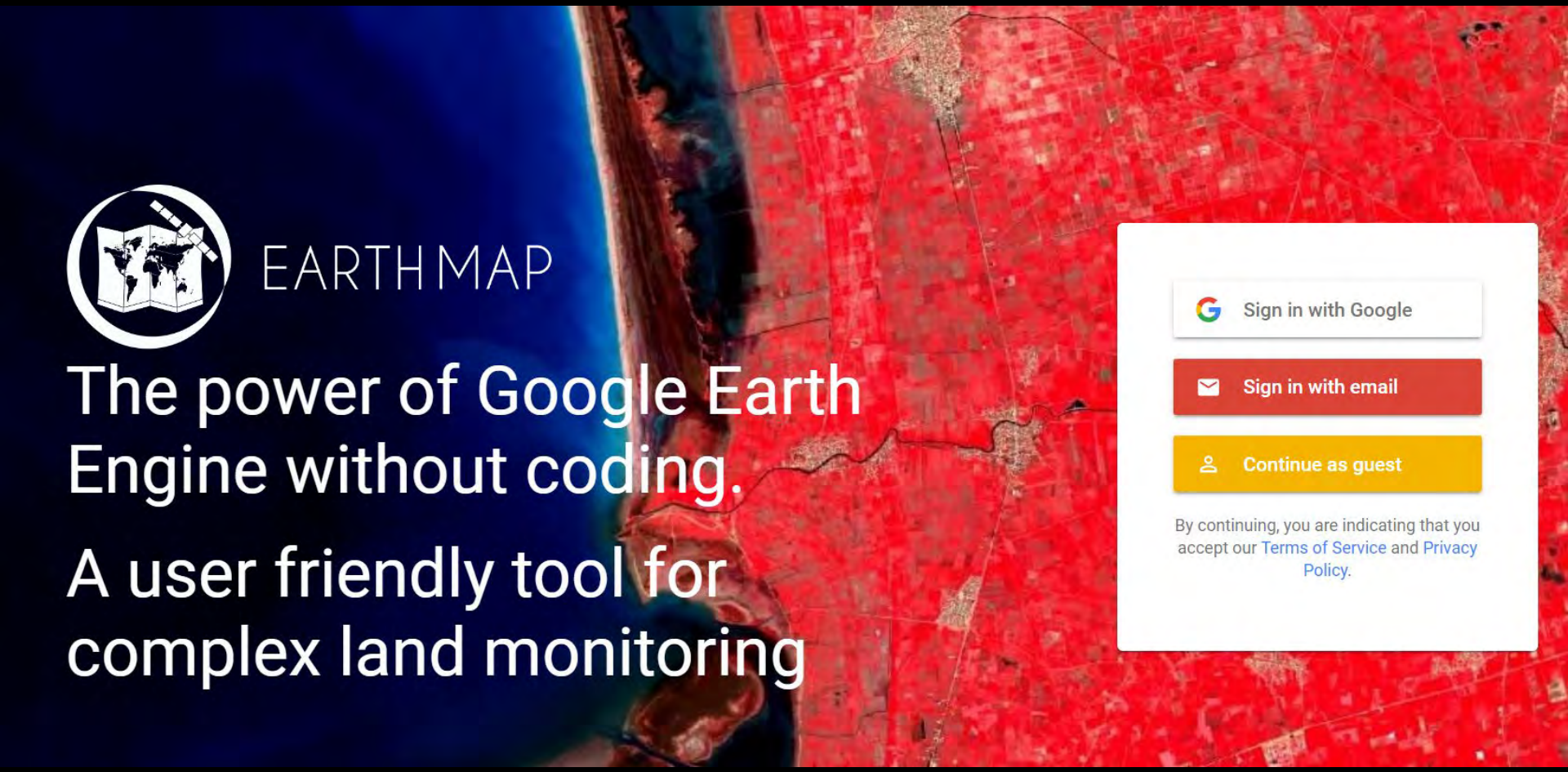
Authenticated HTTP requests (learn more about the Earth Engine REST API). The REST API contains new and advanced features that may not be suitable for all users. If you are new to Earth Engine, please get started with the JavaScript guide.


save script
get link to script
console output
search for data
imports
task manager
API documentation
help button
script manager
asset manager
inspect locations, pixel values, and objects added to the map
geometry tools
zoom
layer manager

Advantages

- Analysis-ready data available
- Processing power (computation engine)
- Interactive development platforms
- Save and share work routines
- Community support

Third-party App



2022 Geo for Good Summit

Geo for Good Summit

Our Geo for Good Summit is an annual conference intended for nonprofits, scientists and other changemakers who want to leverage technology and use mapping tools (such as Google Earth, Earth Engine, Environmental Insights Explorer, and My Maps) for positive impact in the world.

This year, we are planning to return to an in-person format, but with plenty of online, livestream and virtual elements to allow people not there in-person to connect and learn.

When: October 4-6, 2022
Where: Mountain View, CA, USA (with virtual events too!)

The application deadline to attend the summit in person has already passed, but you can still register to attend virtually.

YouTube

geo for good 2021

FILTERS

Open search filters

Geo for Good 2021 : What's New in Earth Engine?

965 views • Streamed 9 months ago

Google Earth

A look at year's worth of developments in Earth Engine: new features and partner accomplishments, and a big focus on making ...

CC

Let’s start!

https://code.earthengine.google.com/?accept_repo=users/hyinhe/AG_abandonment