Dynamic Tiling

From Cloud Optimized Datasets to Map Tiles

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Geospatial Engineer @ Developmentseed

COG Tzar

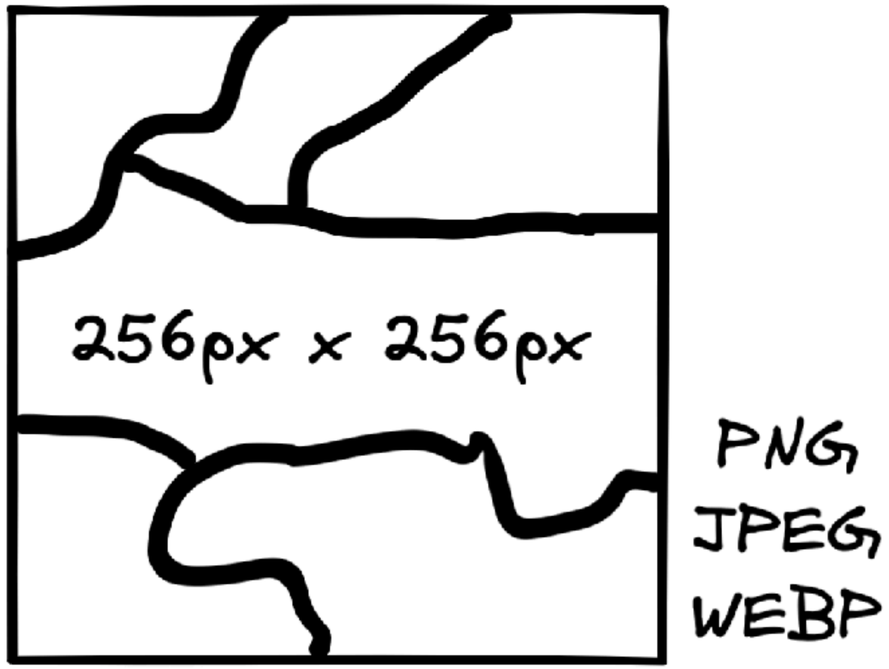
Self-Taught Python dev

Creator of @RemotePixel

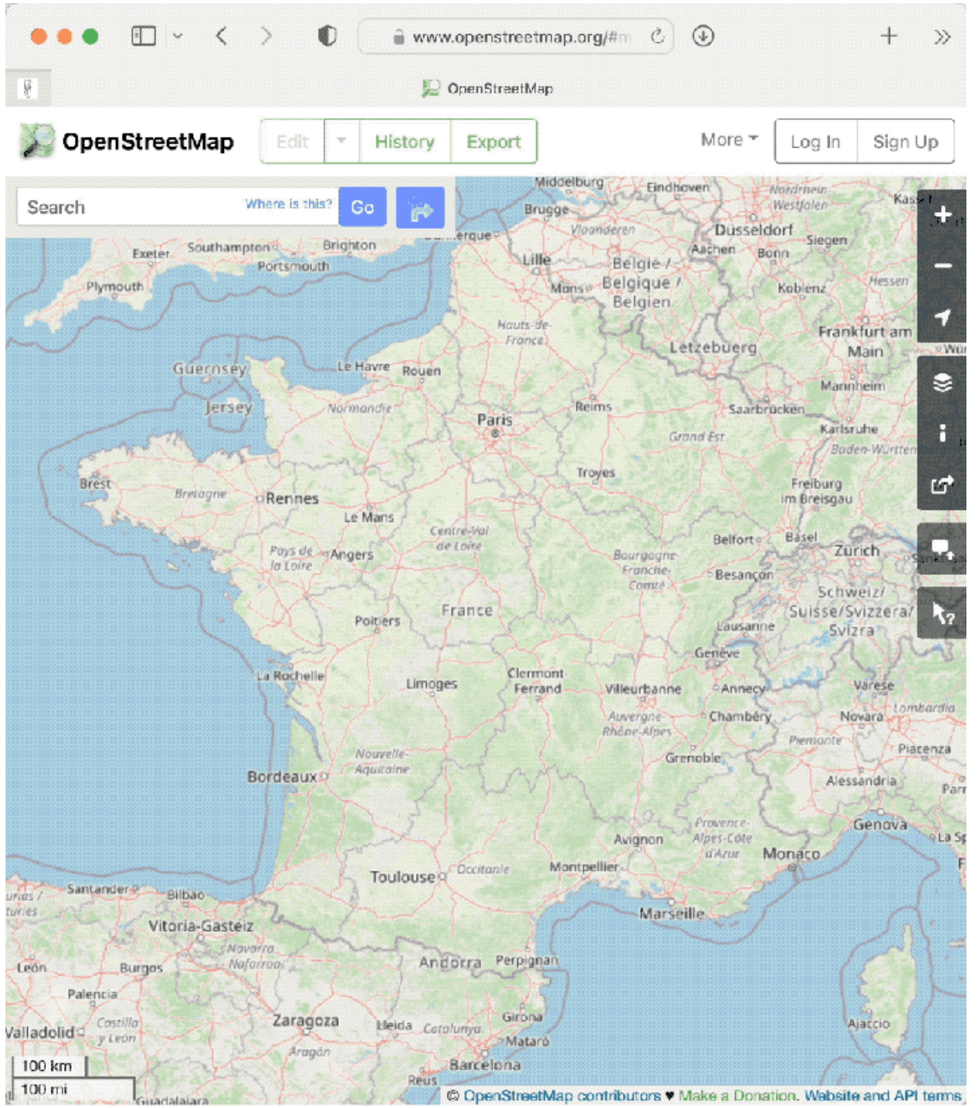
MSc in Earth Sciences

Bike & Coffee

Map Tile (raster)

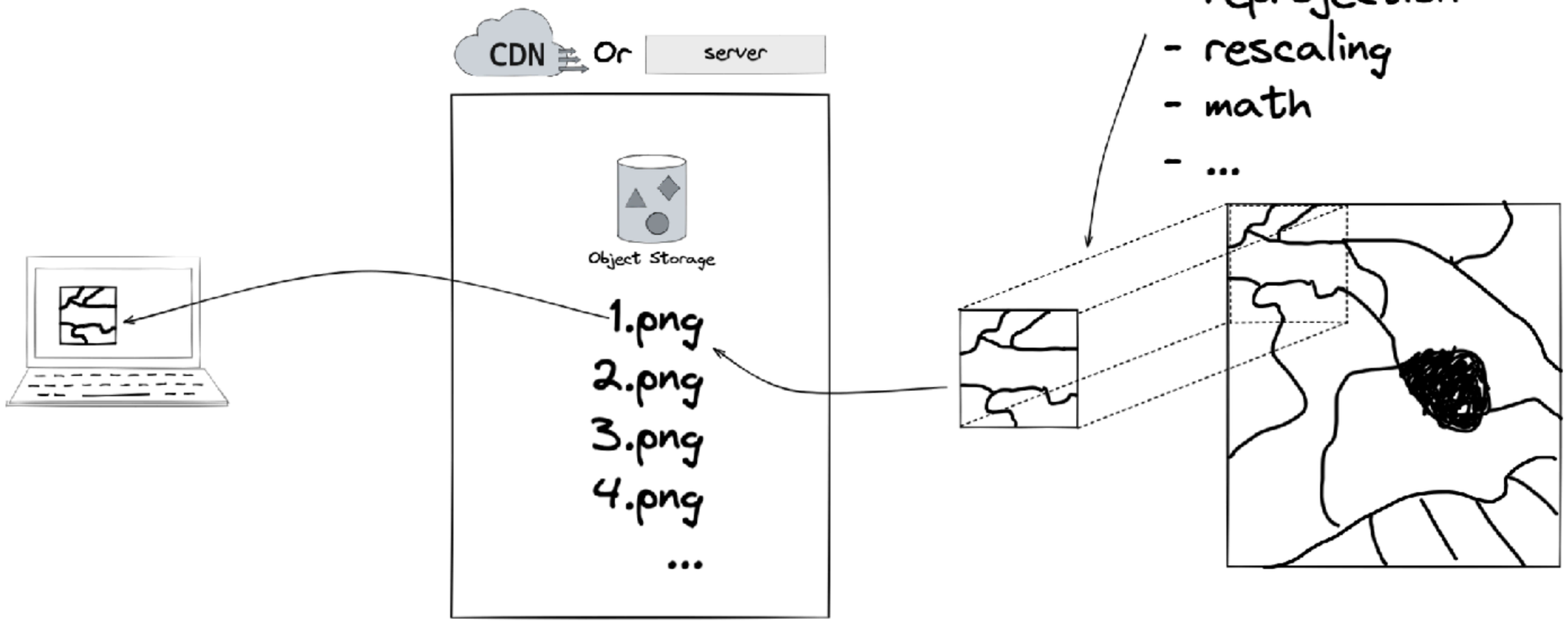


Map Tile (raster)



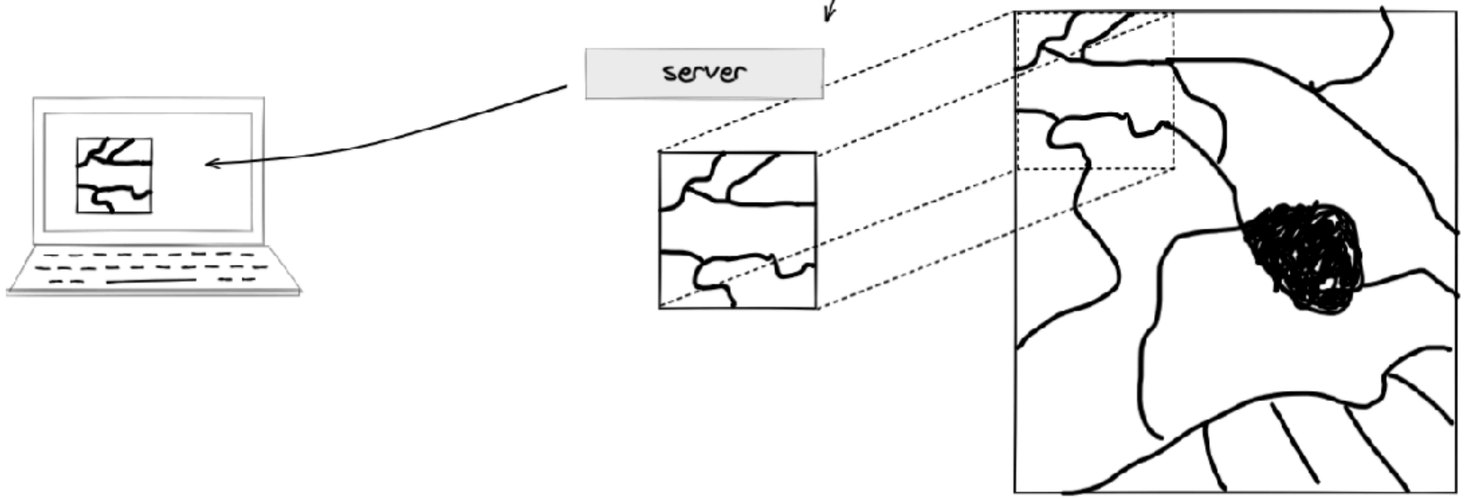
Static vs Dynamic

Static (pre-rendered)

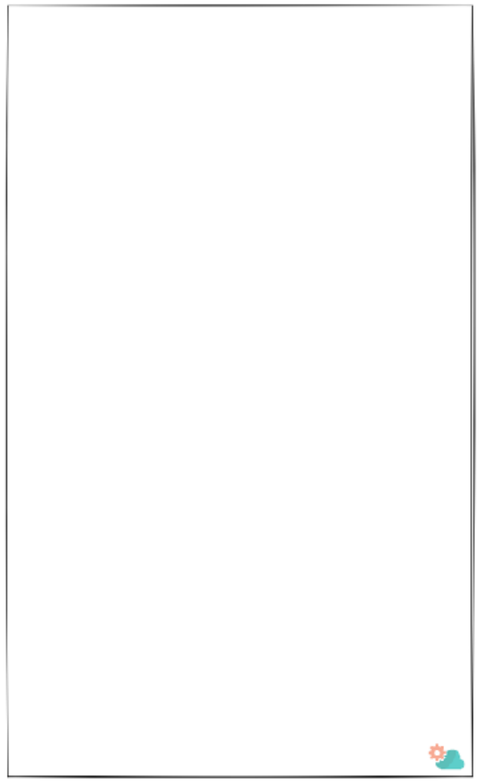


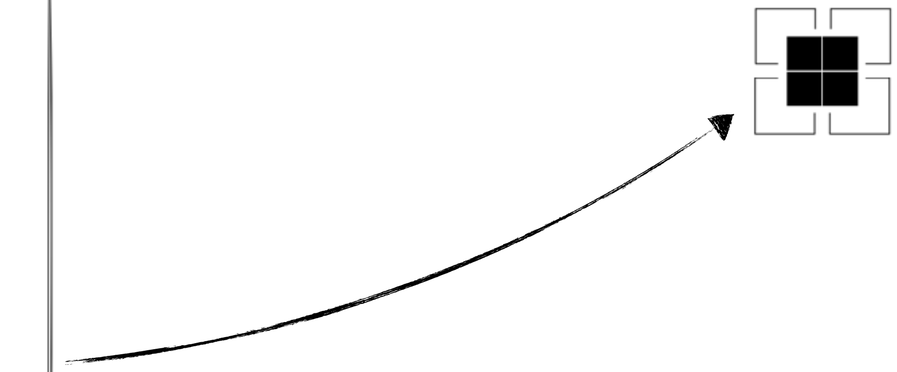
Dynamic
(rendering on-demand)

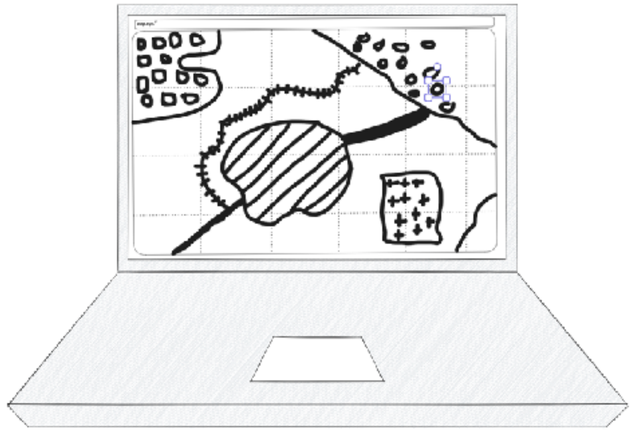
Processing:
- reprojection
- rescaling
- math
- ...

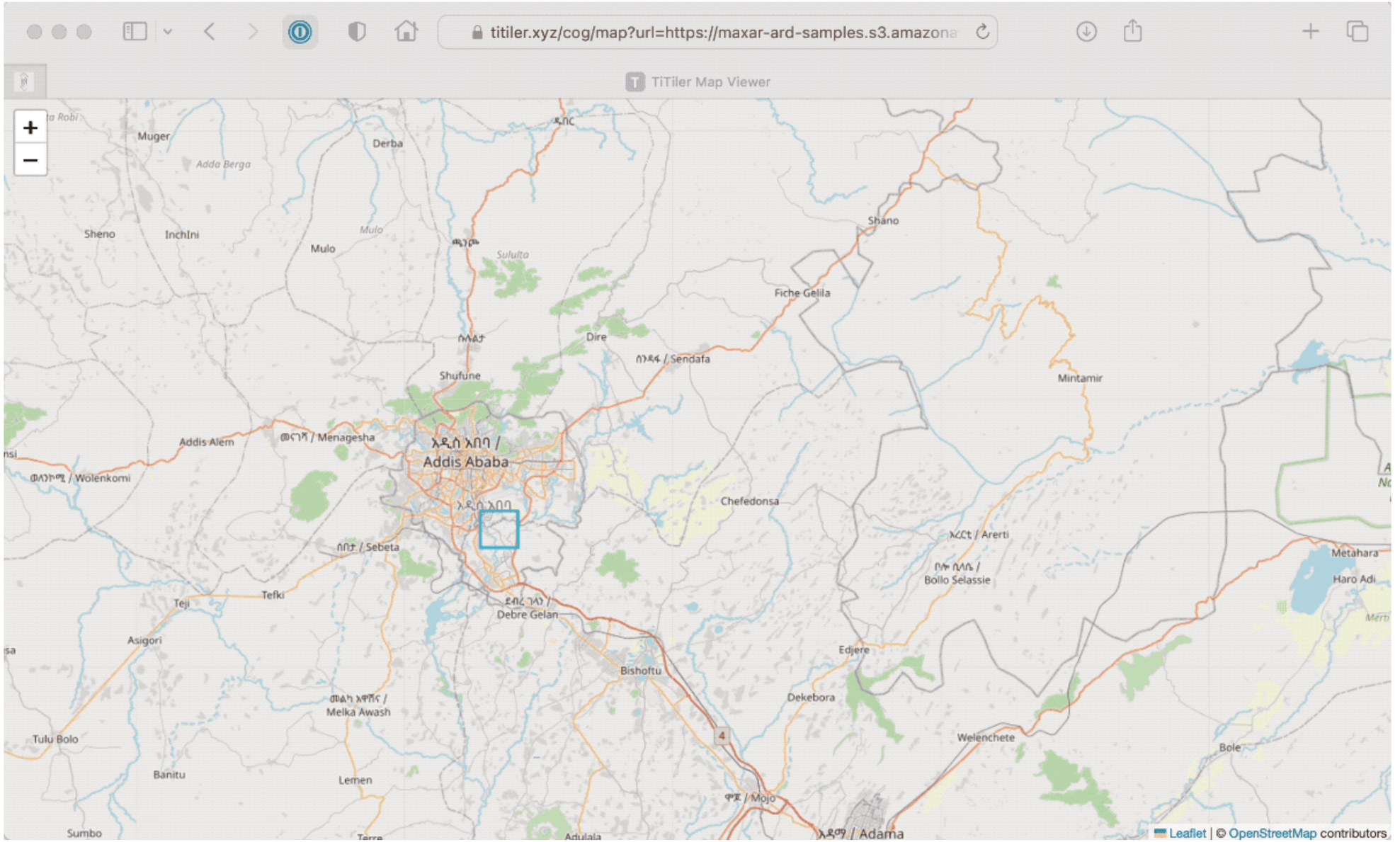


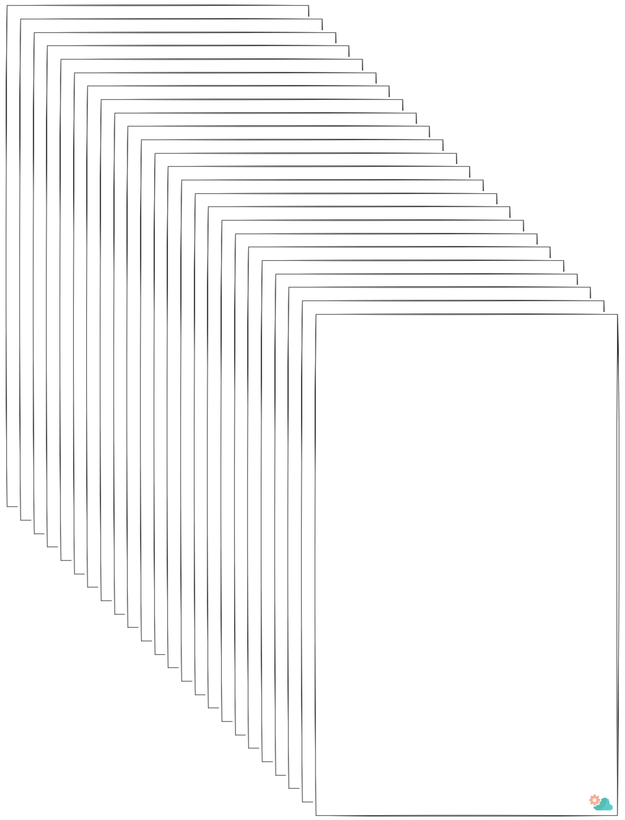
How To:
- Read the data (blocks)
- Reproject the data
- Apply post-process (rescaling / color correction / algorithm)
- Encode array to image buffer





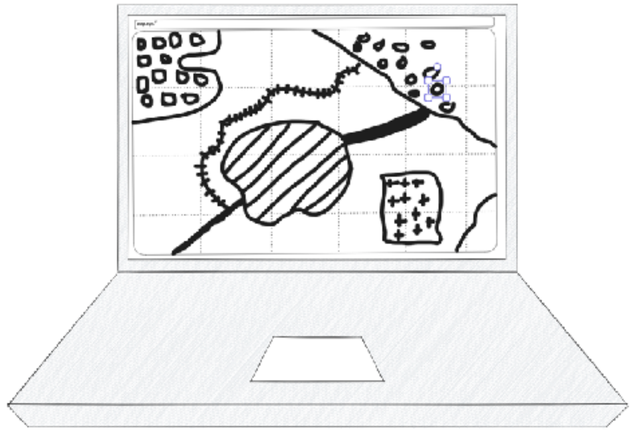


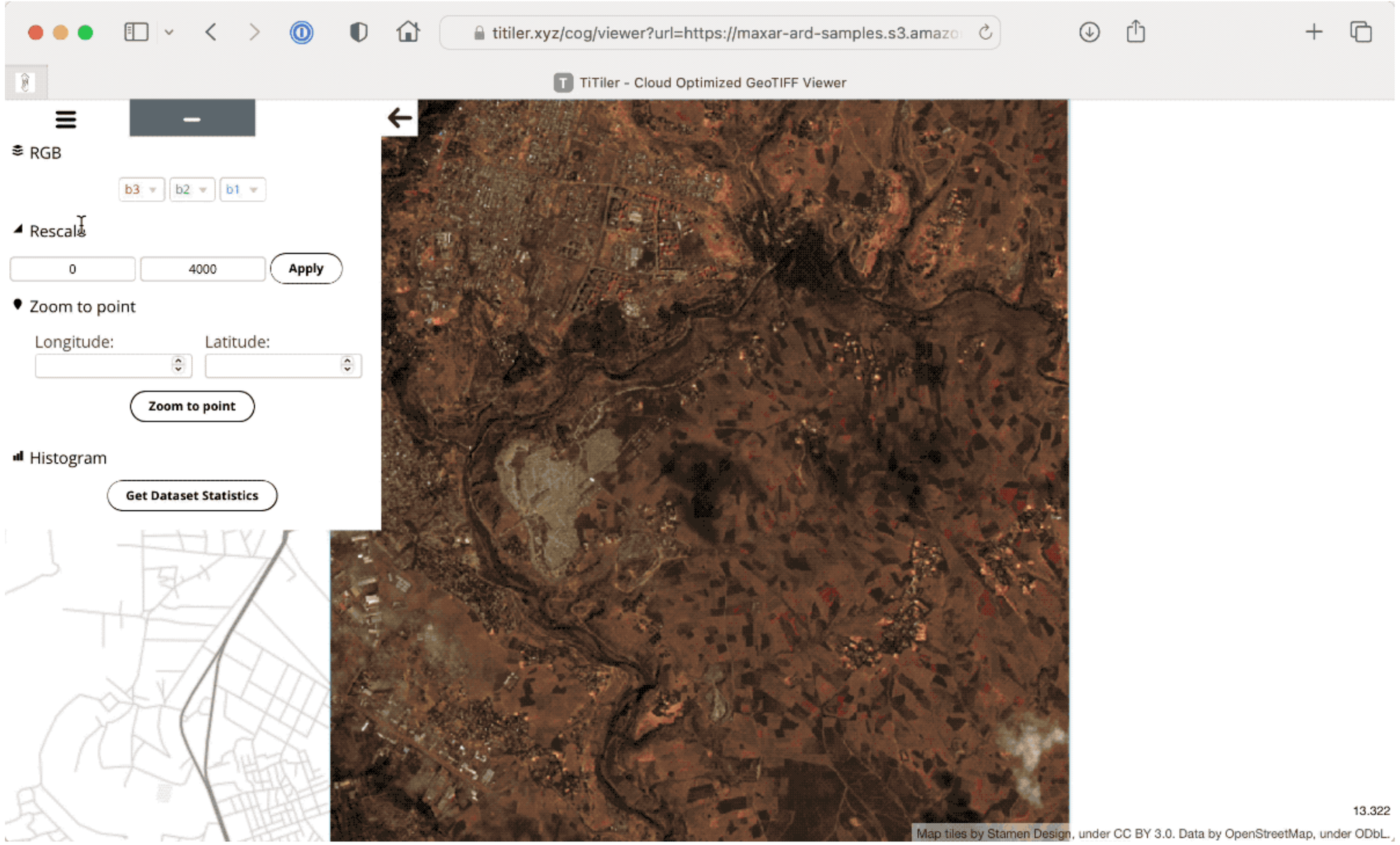

titiler.xyz/cog/map?url=https://maxar-ard-samples.s3.amazona
TiTiler Map Viewer
Muger
Derba
Adda Berga
Sheno
Inchini
Mulo
Shano
Fiche Gelila
Dire
Shufune
Addis Alem
Addis Ababa
Chefedonsa
Mintamir
Sebeta
Debre Gelan
Teji
Tefki
Asigori
Bishoftu
Dekebora
Welenchete
Bole
Metahara
Haro Adi
Bollo Selassie
Arerti
Tulu Bolo
Banitu
Lemen
Mojo
Adama
Leaflet | © OpenStreetMap contributors

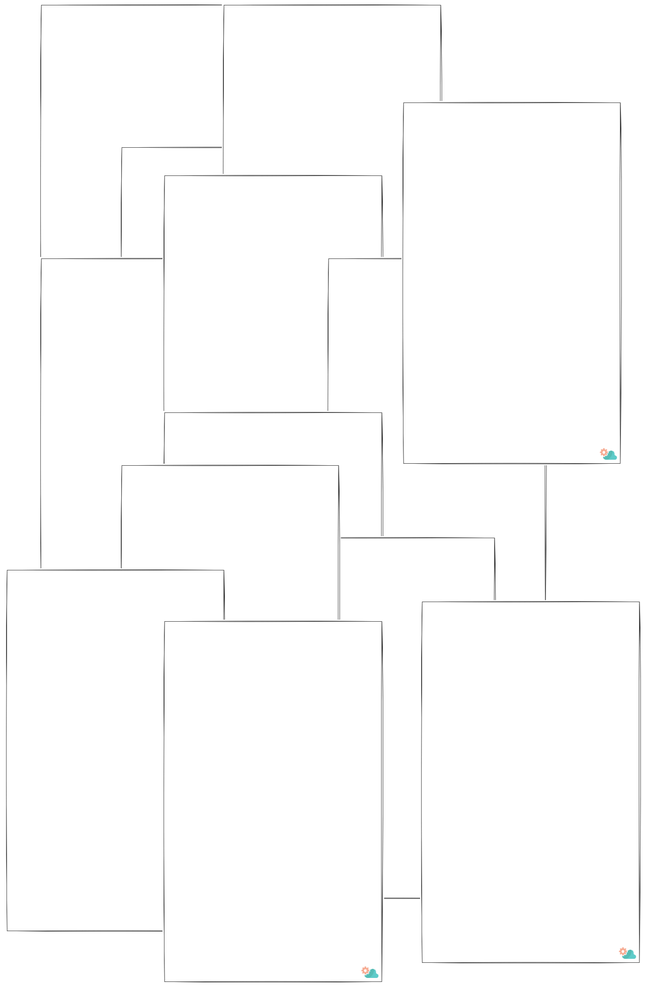


?

Multiple bands

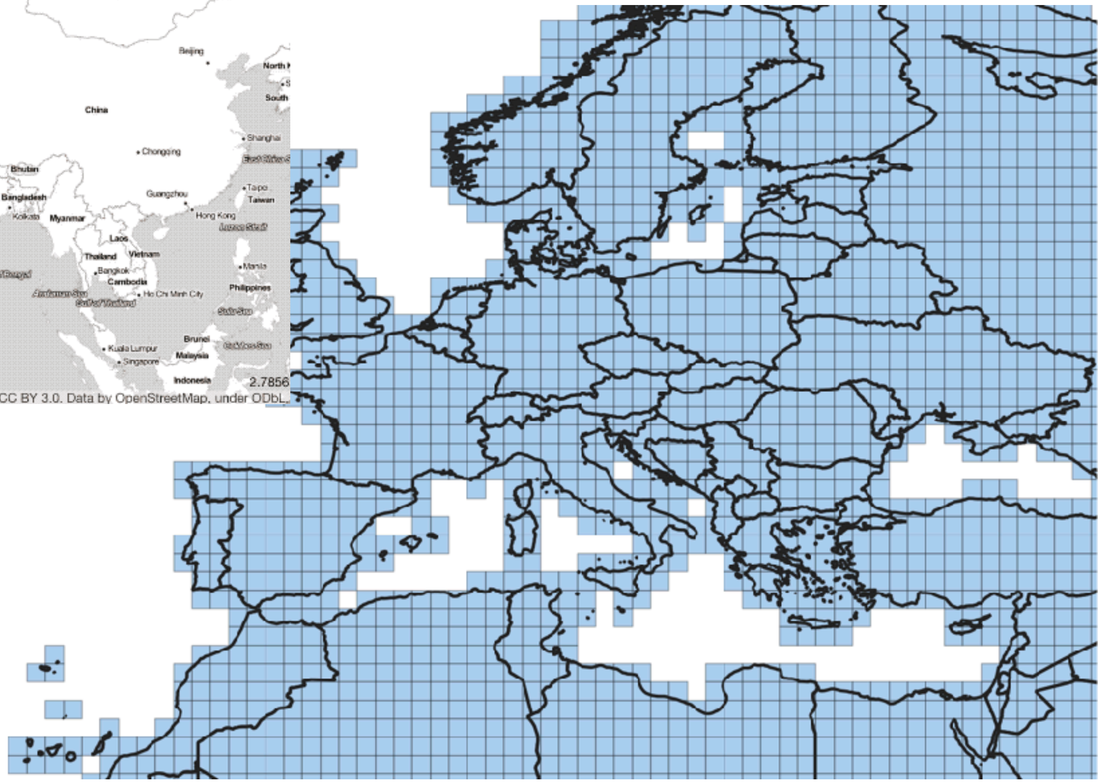



titiler.xyz/cog/viewer?url=https://maxar-ard-samples.s3.amazo
TiTiler - Cloud Optimized GeoTIFF Viewer
RGB
b3
b2
b1
Rescale
0
4000
Apply
Zoom to point
Longitude:
Latitude:
Zoom to point
Histogram
Get Dataset Statistics
13.322
Map tiles by Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

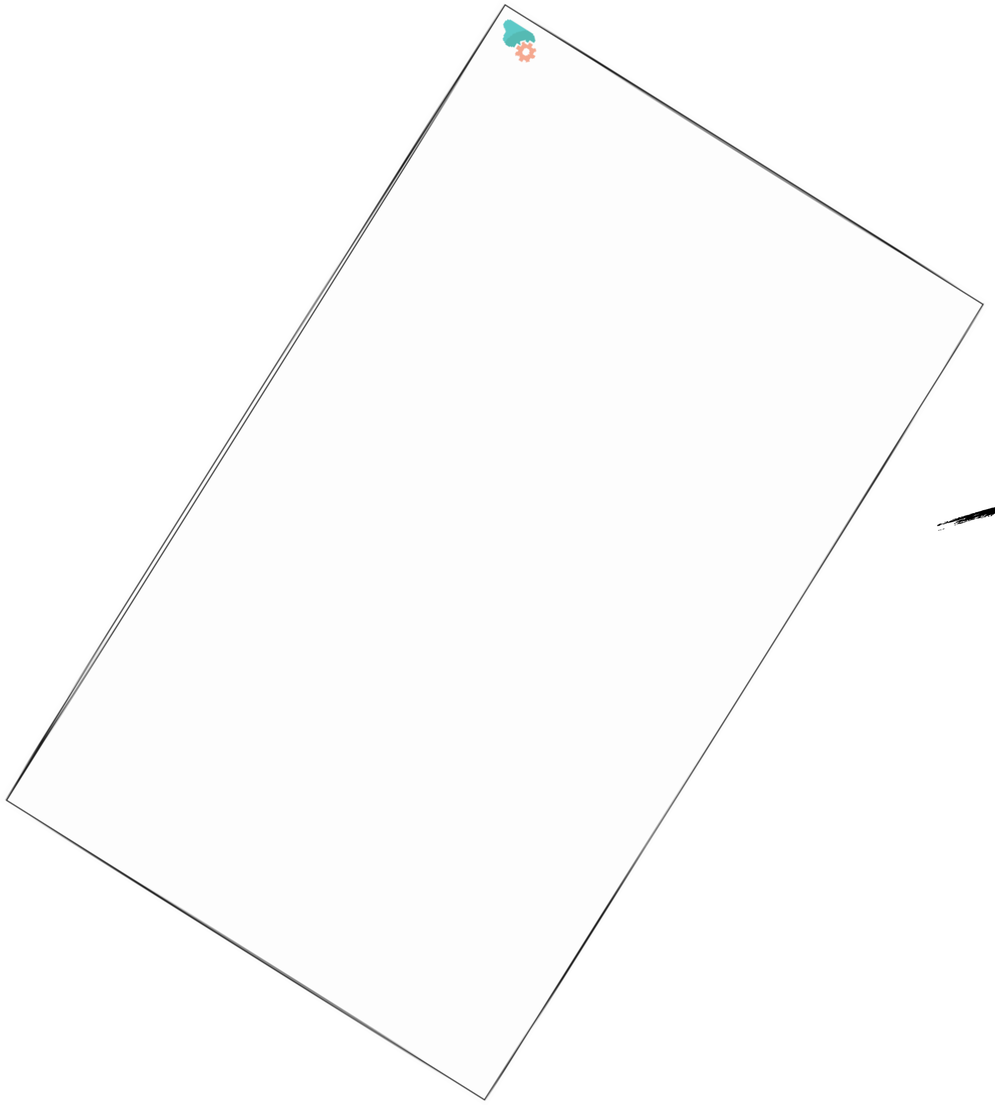


?

Multiple datasets

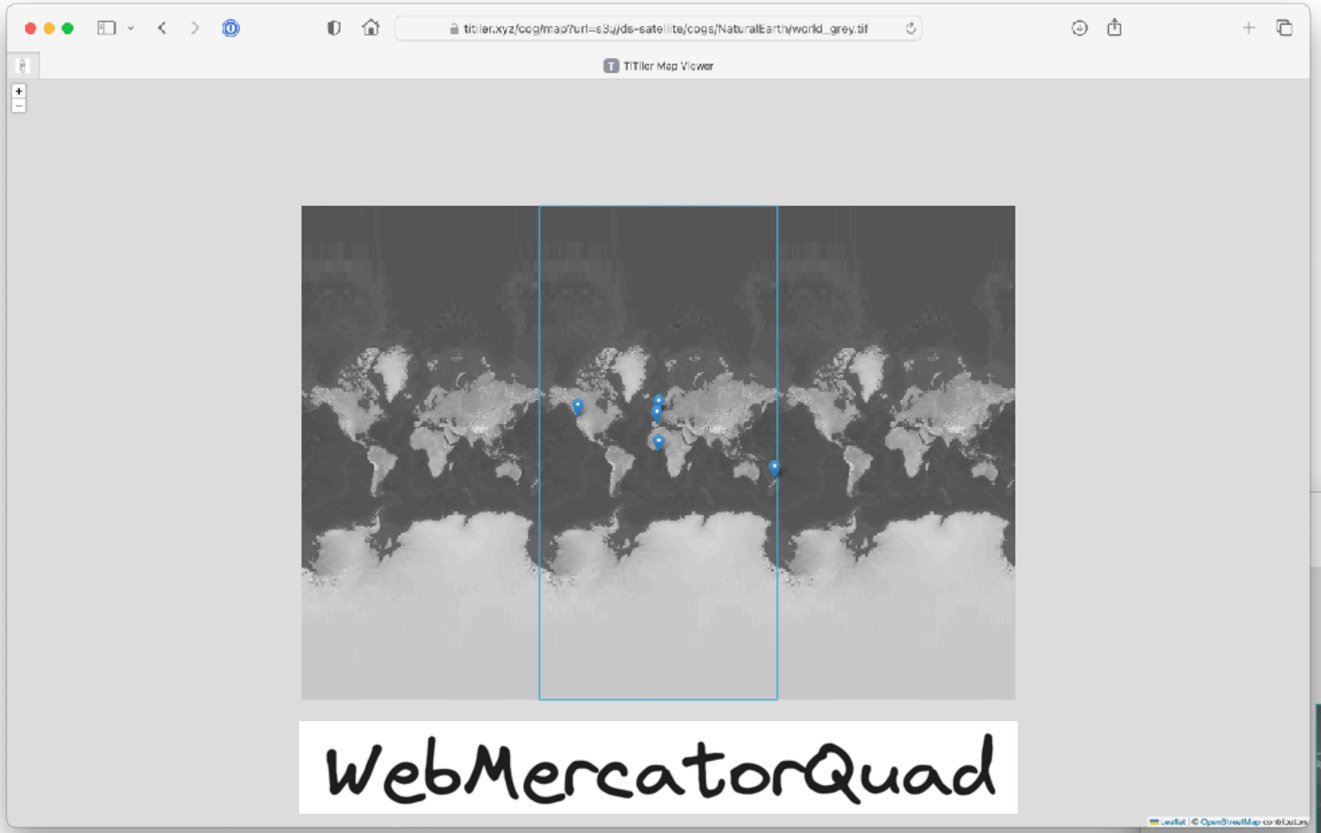


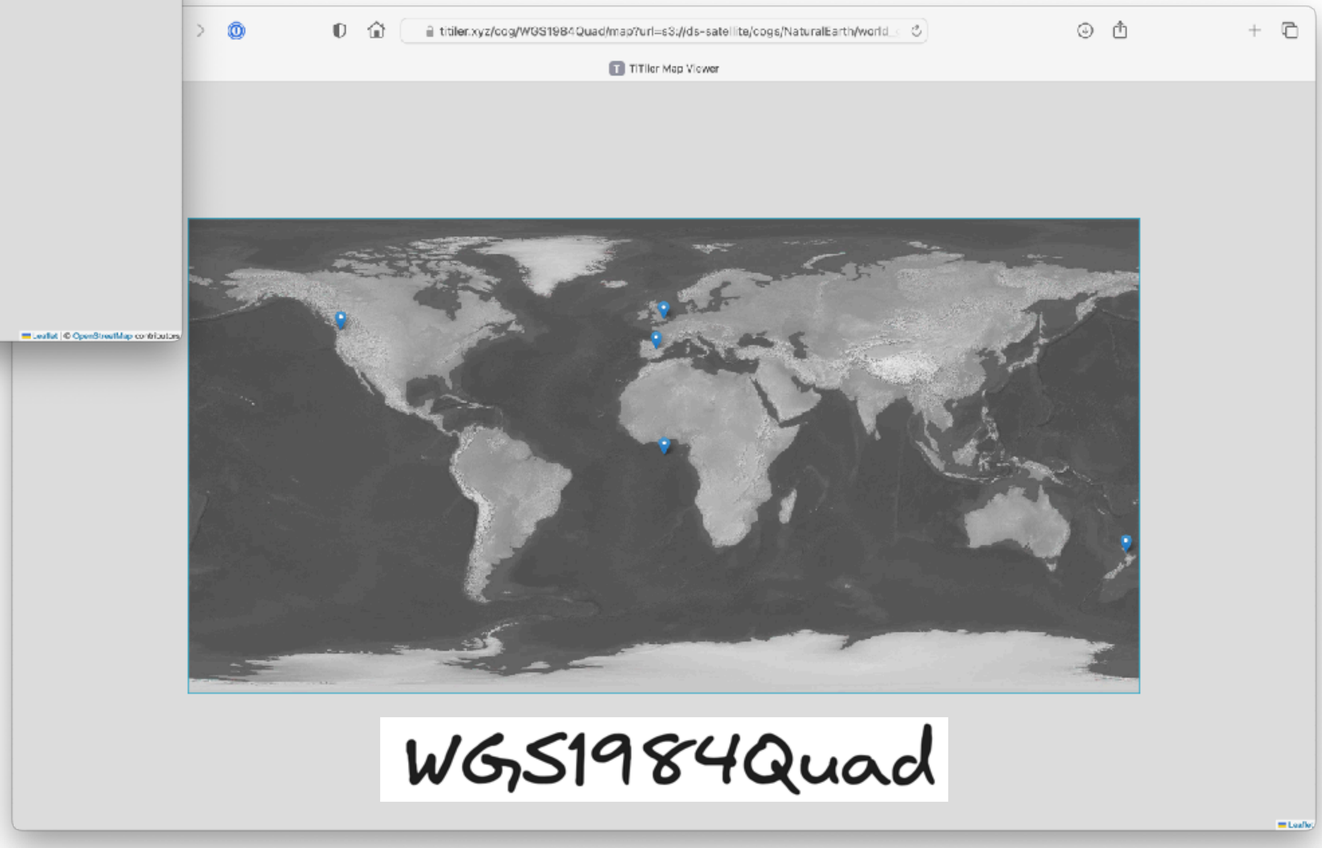
https://registry.opendata.aws/copernicus-dem/

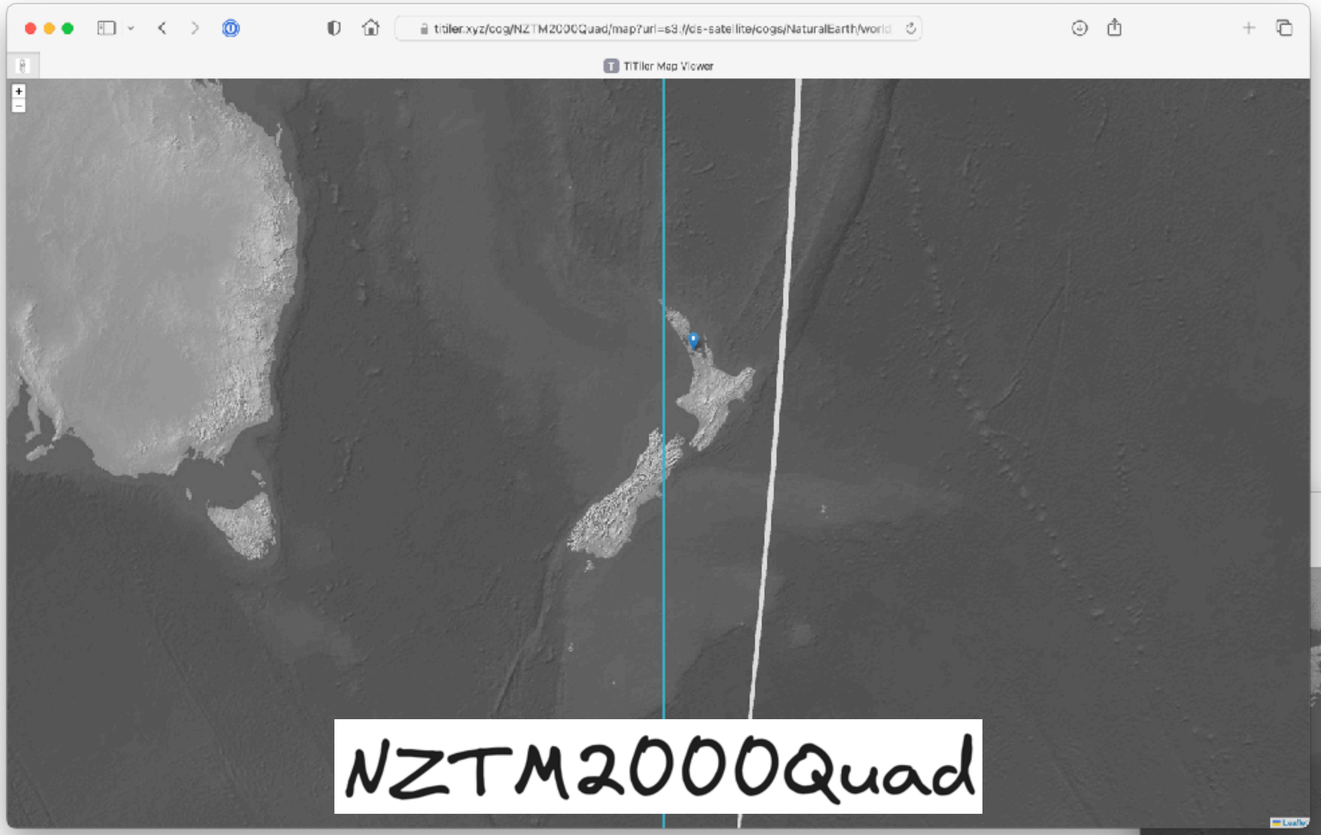


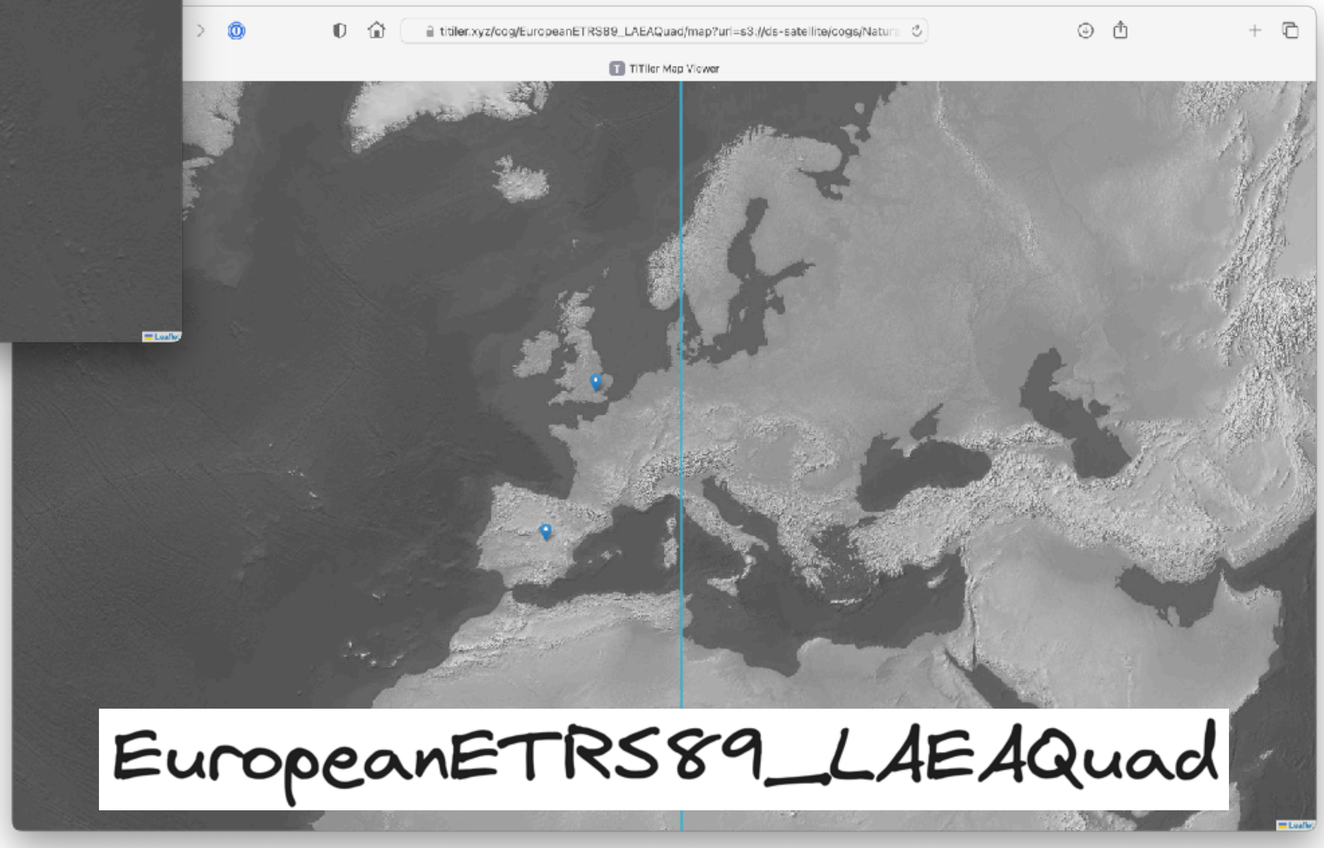
?

Projection


titiler.xyz/cog/map?url=s3://ds-satellite/cogs/NaturalEarth/world_grey.tif
TiTiler Map Viewer
WebMercatorQuad


titiler.xyz/cog/WGS1984Quad/map?url=s3://ds-satellite/cogs/NaturalEarth/world...
TiTiler Map Viewer
WGS1984Quad

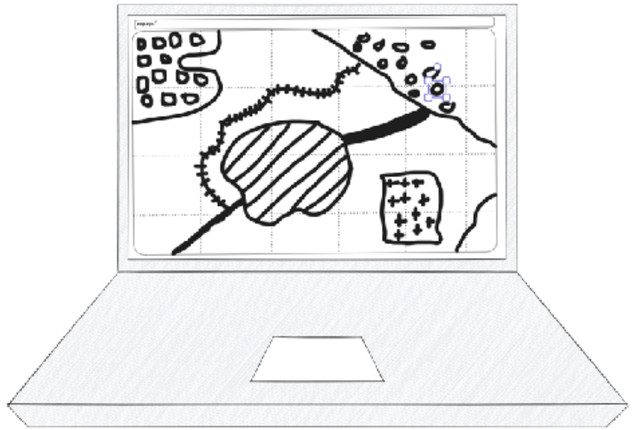

titiler.xyz/cog/NZTM2000Quad/map?url=s3://cis-satellite/cogs/NaturalEarth/world
TiTiler Map Viewer
NZTM2000Quad


titiler.xyz/cog/EuropeanETRS89_LAEAQuad/map?url=s3://cis-satellite/cogs/Natura
TiTiler Map Viewer
EuropeanETRS89_LAEAQuad

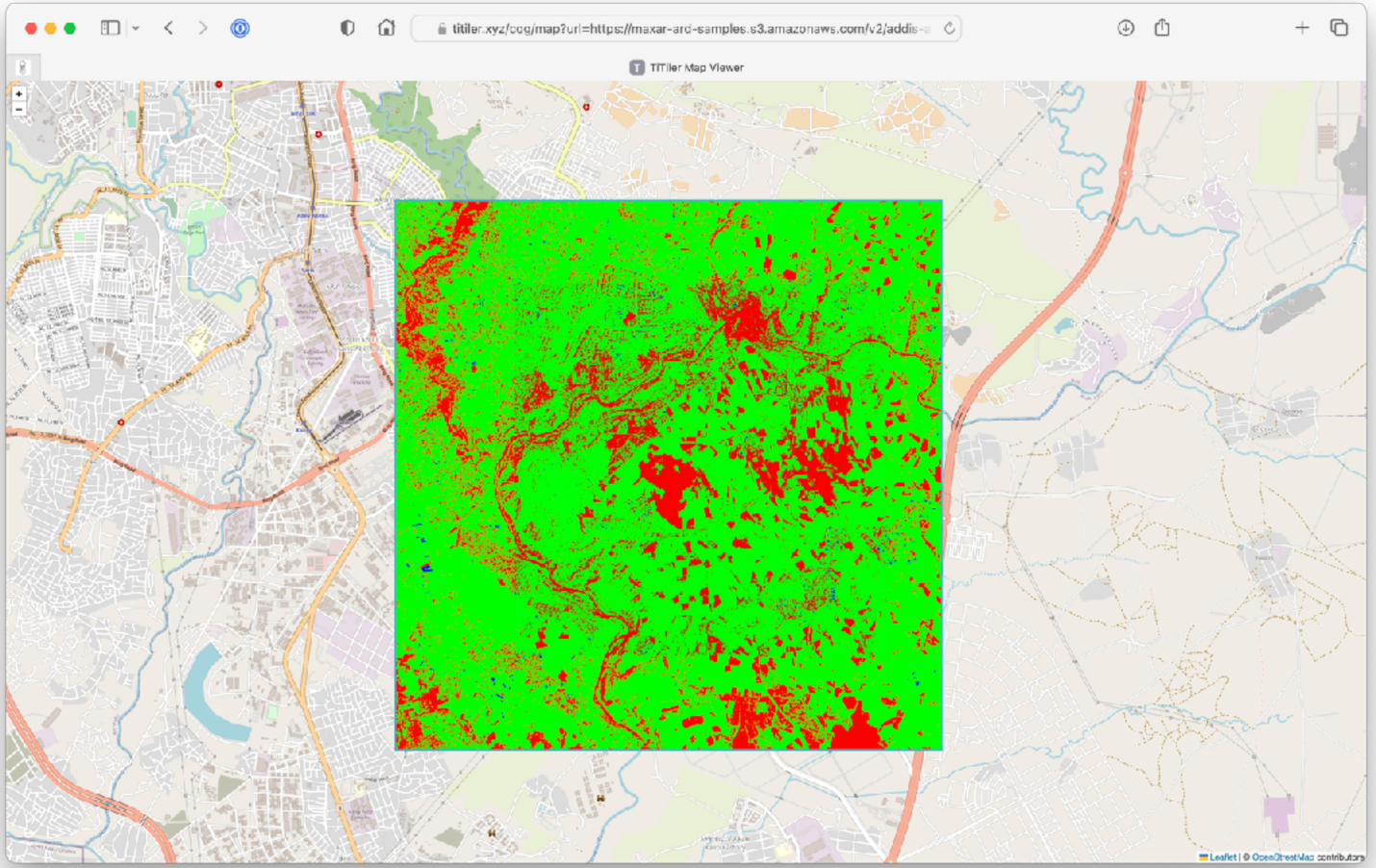
0	3000	3001	2988
0	0	2985	3002
0	0	3100	2989
0	0	2999	3010
0	0	2996	3008
0	2900	2987	3000

?

Data type
float/int/cplx

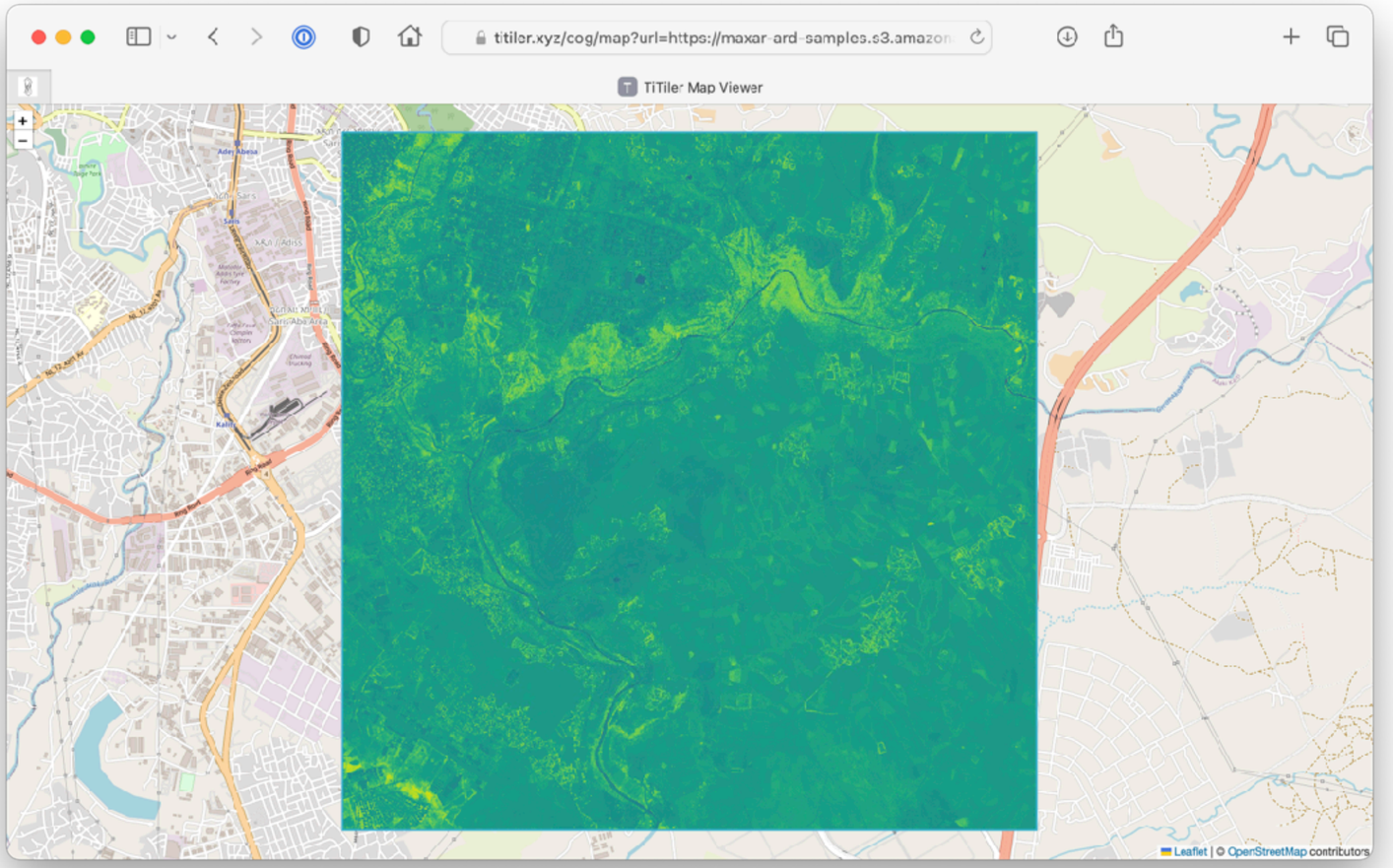


```
colormap=[
    [
        [0,1000] ,[255,0,0,255]
    ],
    [
        [1000,3000], [0,255,0,255]
    ],
    [
        [3000,20000], [0,0,255,255]
    ]
]
```



Link

```
expression=(b4-b3)/(b4+b3)
rescale=-1,1
colormap_name=viridis
```



Link

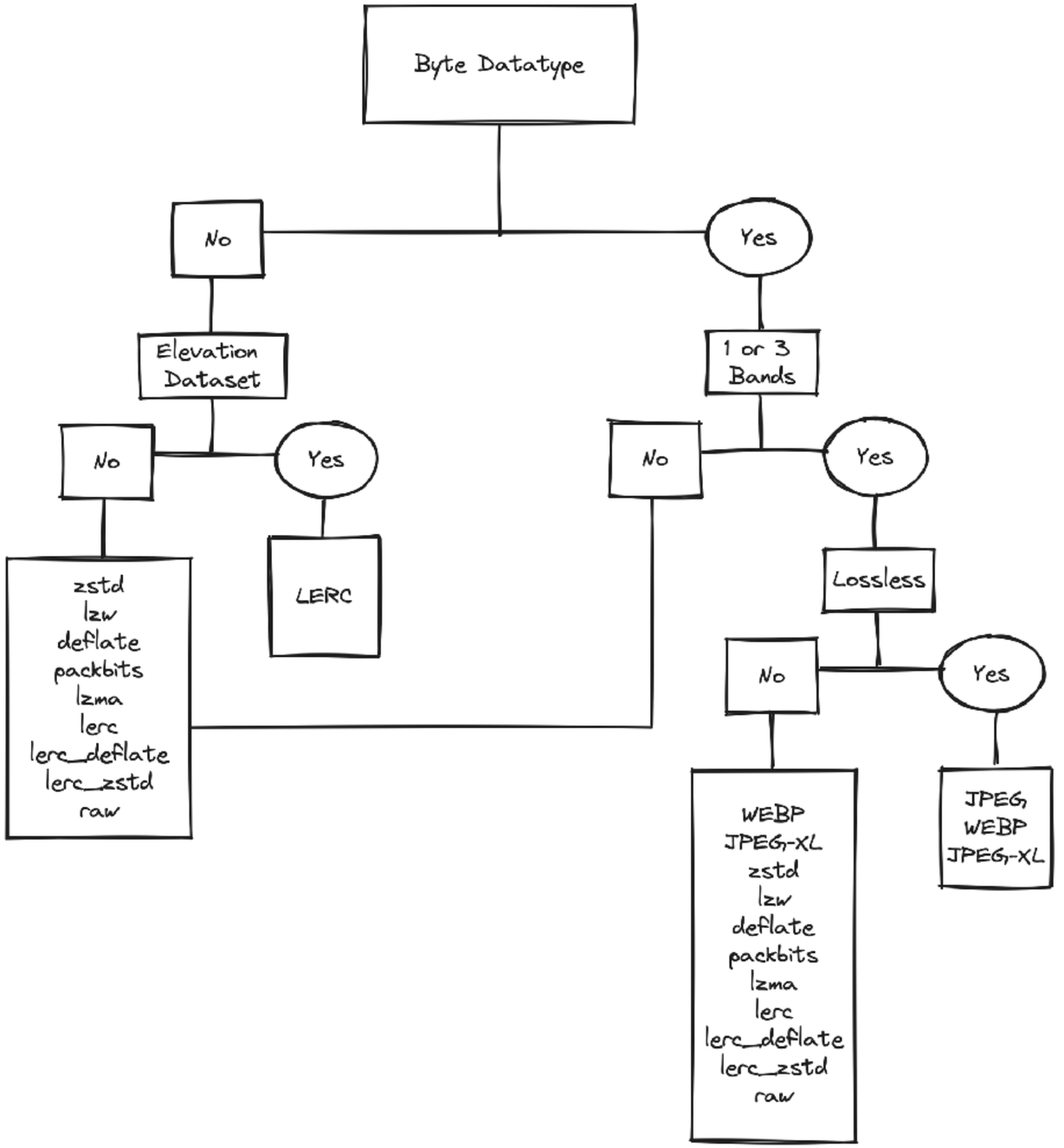
With Dynamic Tiling Users can:

- Select bands
- Select output projection (TileMatrixSet)
- Select output format (jpeg/png/tiff/numpyTile, ...)
- Apply band math and/or more complexes processing
- Access pixel values from the raw data

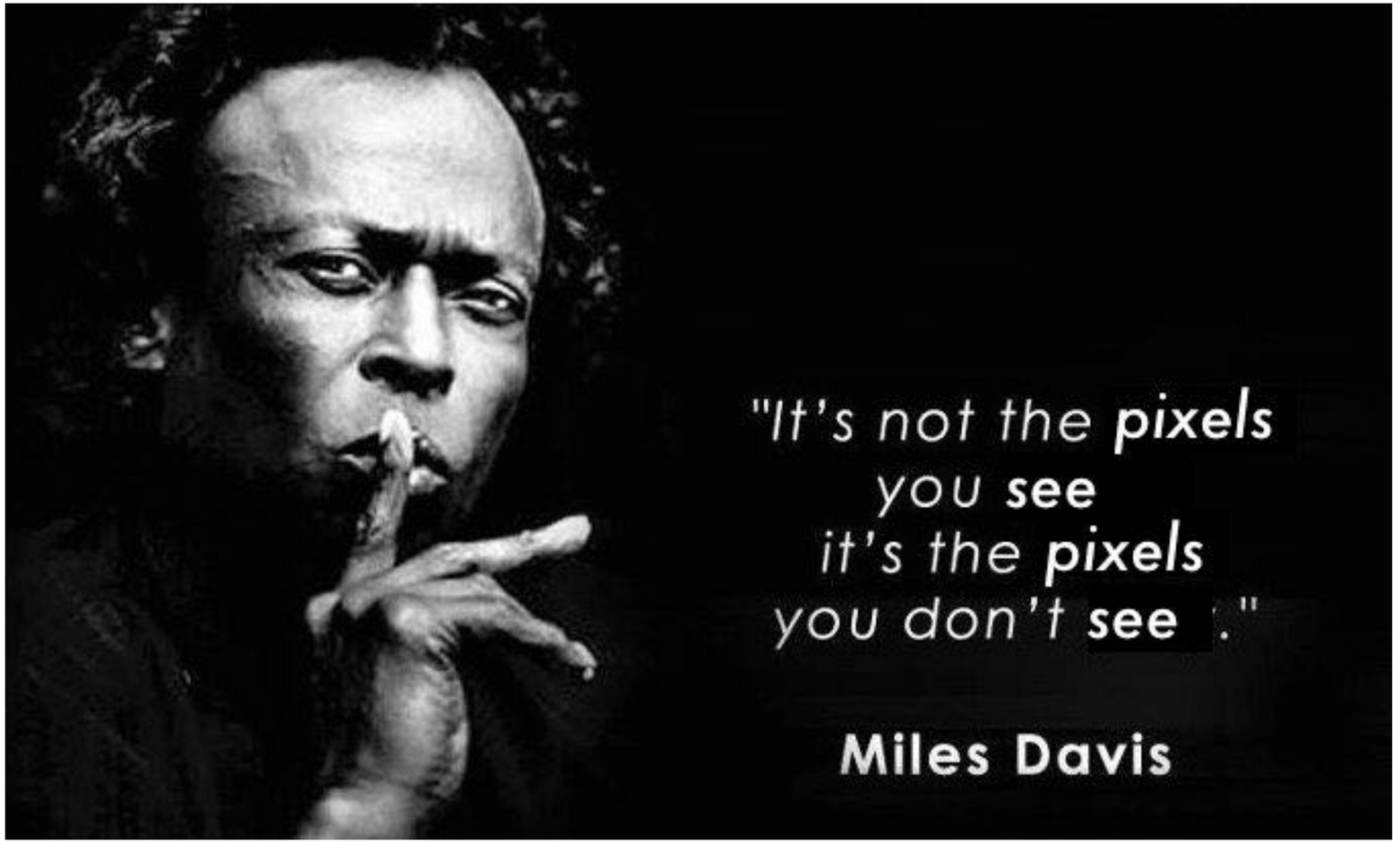
...

Optimized Cloud Optimized Dataset

Compression

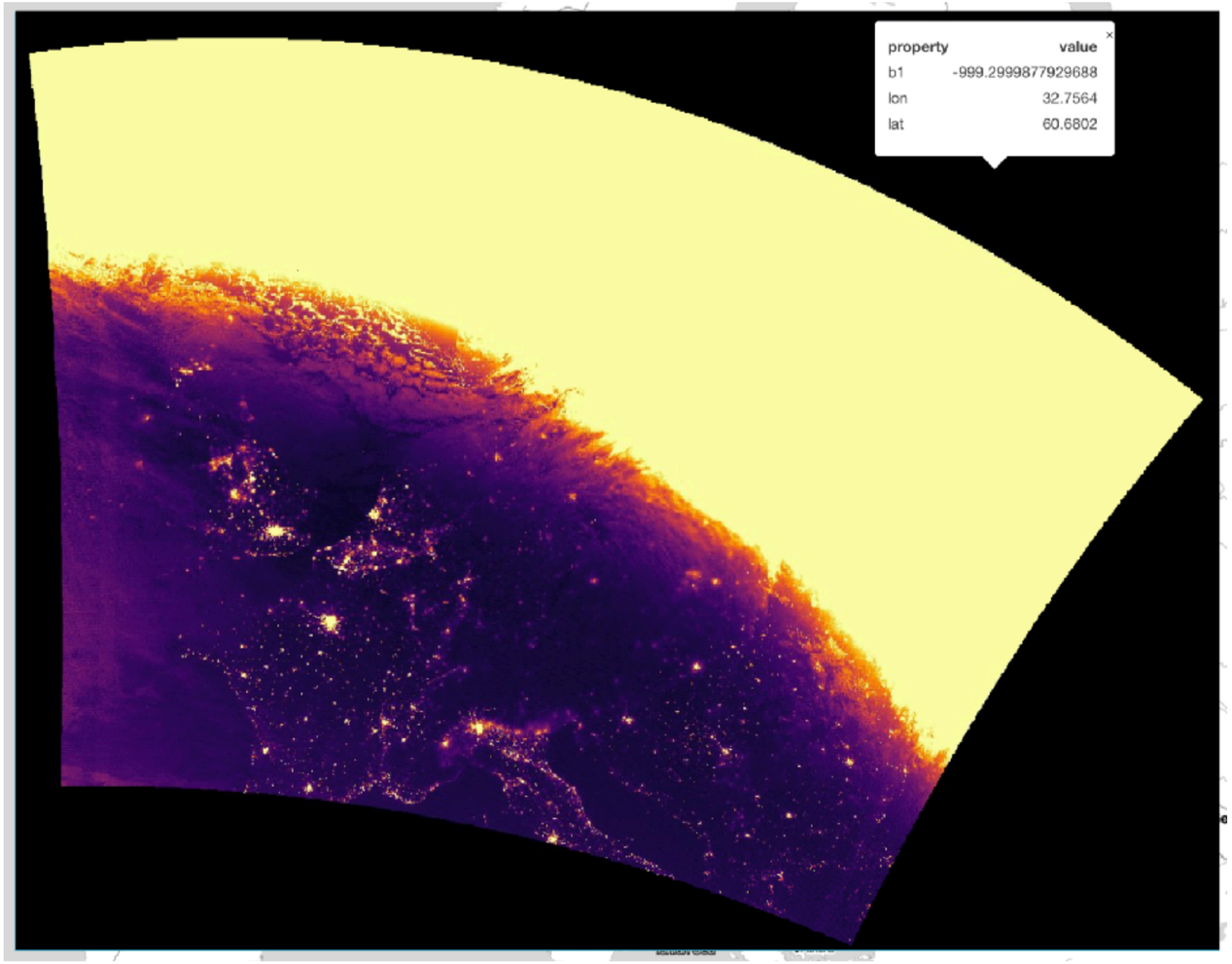


nodata / alpha / mask

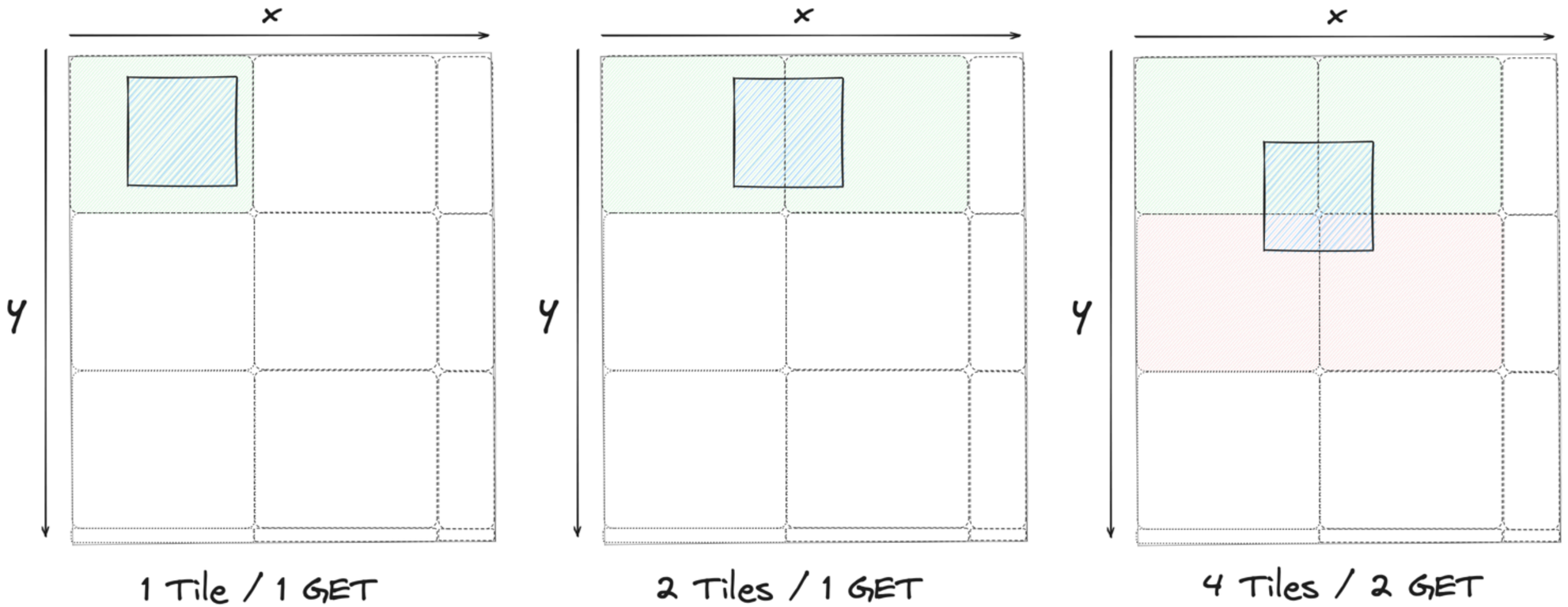


https://github.com/mapbox/nodata

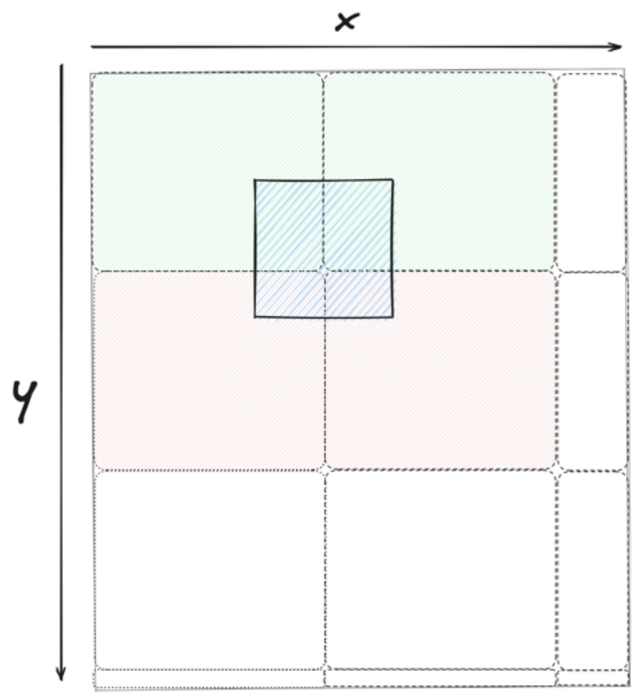
nodata / alpha / mask



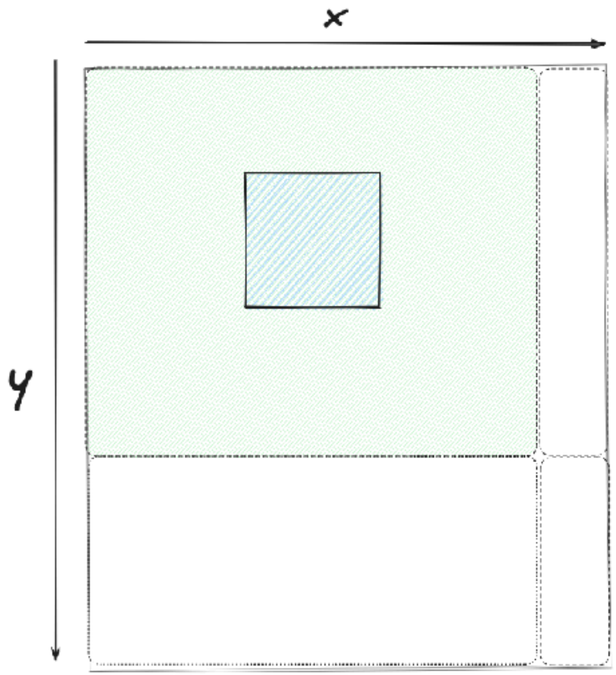
TileSize and GET Requests



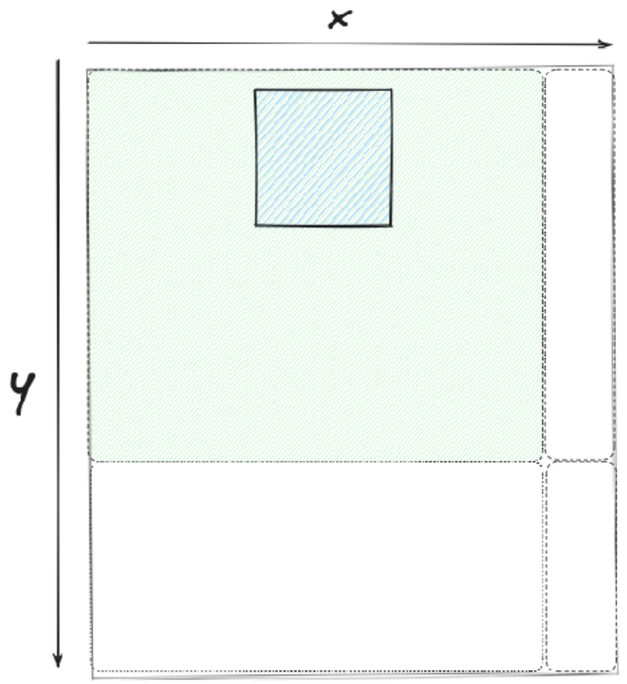
TileSize and GET Requests



4 Tiles / 2 GET



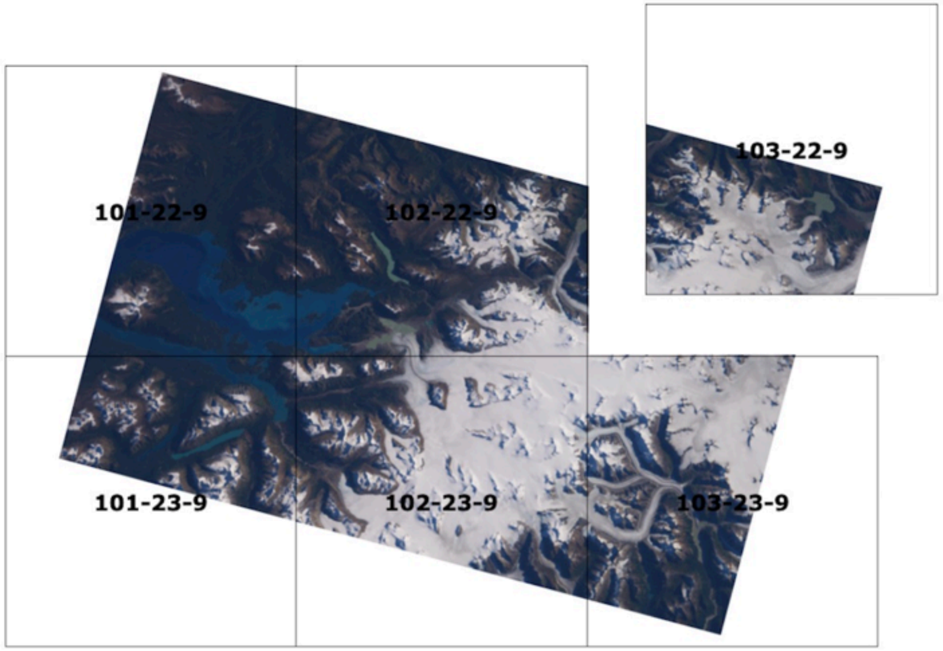
1 Tile / 1 GET



1 Tile / 1 GET

Tools

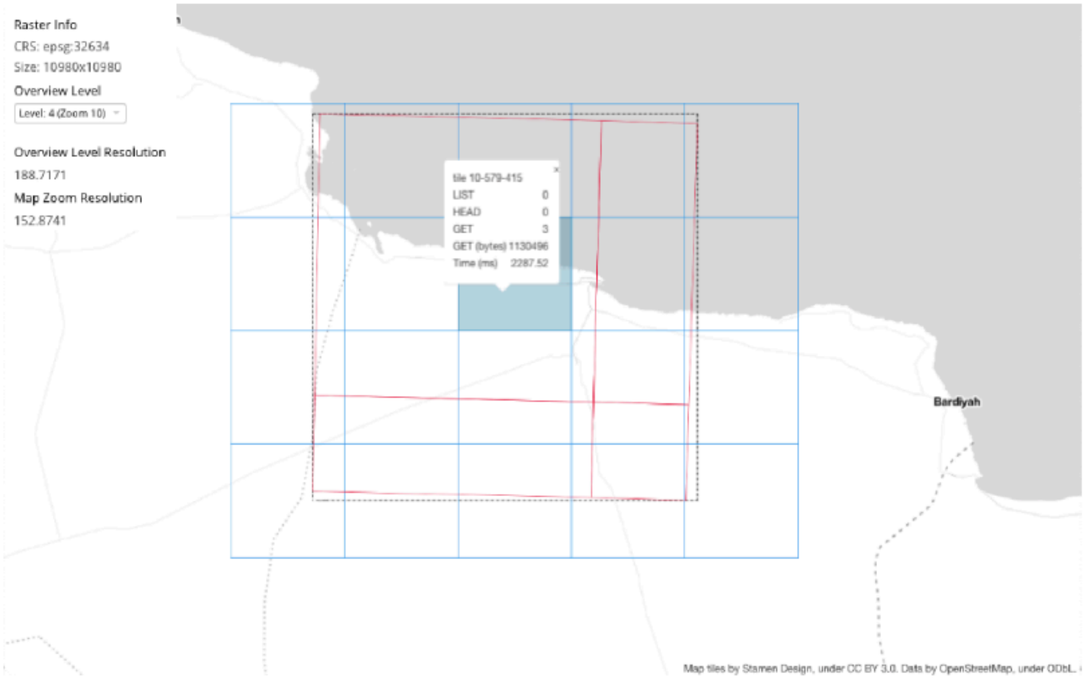
https://github.com/cogeotiff/rio-tiler



User friendly Rasterio plugin to read raster datasets.

CI passing | codecov 92% | pypi package v5.0.0 | conda | conda-forge v5.0.0 | downloads 17k/month | license BSD-3-Clause | launch binder

https://github.com/developmentseed/tilebench



Inspect HEAD/LIST/GET requests within Rasterio

CI passing | codecov 93% | pypi package v0.10.0 | downloads 241/month | license MIT

https://github.com/stac-utils/titiler-pgstac

TiTiler ❤ PgSTAC

Connect PgSTAC and TiTiler.

https://github.com/developmentseed/titiler

A modern dynamic tile server built on top of FastAPI and Rasterio/GDAL.

CI passing | codecov 91% | pypi package v0.11.7 | license MIT | launch binder | docker hub latest

Ping Me!

@_VincentS_
@cogeotiff
@developmentseed

Join the team & make a better planet.
https://developmentseed.org/careers

eoAPI - The Earth Observation API

2023-06-28, 13:35–13:40, UBT ~~D / N115~~ - Second Floor
C / N110

TiPg: a Simple and Fast OGC Features and Tiles API for PostGIS.

2023-06-28, 15:00–15:30 Mirusha

RGB + Alpha
s3://noaa-eri-pds/2023_California/20230206a_RGB/20230206aC1173645w332530n.tif

Multi Spectral (RGB + Nir)
https://maxar-ard-samples.s3.amazonaws.com/v2/addis-ababa/37/033311333031/2014-01-29/105041001000BD00-ms.tif

Dem
s3://copernicus-dem-30m/Copernicus_DSM_COG_10_S90_00_E161_00_DEM/Copernicus_DSM_COG_10_S90_00_E161_00_DEM.tif

Huge
https://storage.googleapis.com/cfo-public/vegetation/California-Vegetation-CanopyBaseHeight-2016-Summer-00010m.tif