

The background of the slide is a landscape photograph. It features a large body of water, likely a reservoir or lake, in the middle ground. A concrete bridge with multiple piers spans across the water in the foreground. To the right, several high-voltage electricity pylons with multiple cross-arms and power lines stretch across the sky. The terrain is hilly and covered with dry, brownish grass. The sky is blue with scattered white clouds.

Rebalance

Earth

Open cloud-native access to Environment Agency DEM data using STAC and COG

Dr Robin Wilson

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Introducing Rebalance Earth

Investing in a world worth living in

Founded in

2023



London-based natural
infrastructure manager

Economic assets depend upon natural assets. When an entire catchment is restored it delivers resilience in energy, food, housing, transport, and water.

Our investment philosophy:
long-term capital can be invested in natural infrastructure
for a more resilient Britain.



EA LiDAR data is great, but...

Defra Survey Data Download

Layers Download

Search

+

-

📍

DTM & DSM
1m resolution
Open Government License

200 km

Download

Select your area

Selected area (draw a polygon)



Draw Polygon



Delete Polygon

Get available tiles

For more information about the Survey data provided here see the [Survey Information Hub](#)

Please see our [FAQs](#) page for help using and downloading survey data

Rebalance

Earth

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Download

The area you have selected is too large to be processed. Please select a smaller area.

For more information about the Survey data provided here see the [Survey Information Hub](#)

Please see our [FAQs](#) page for help using and downloading survey data

[Go back](#)

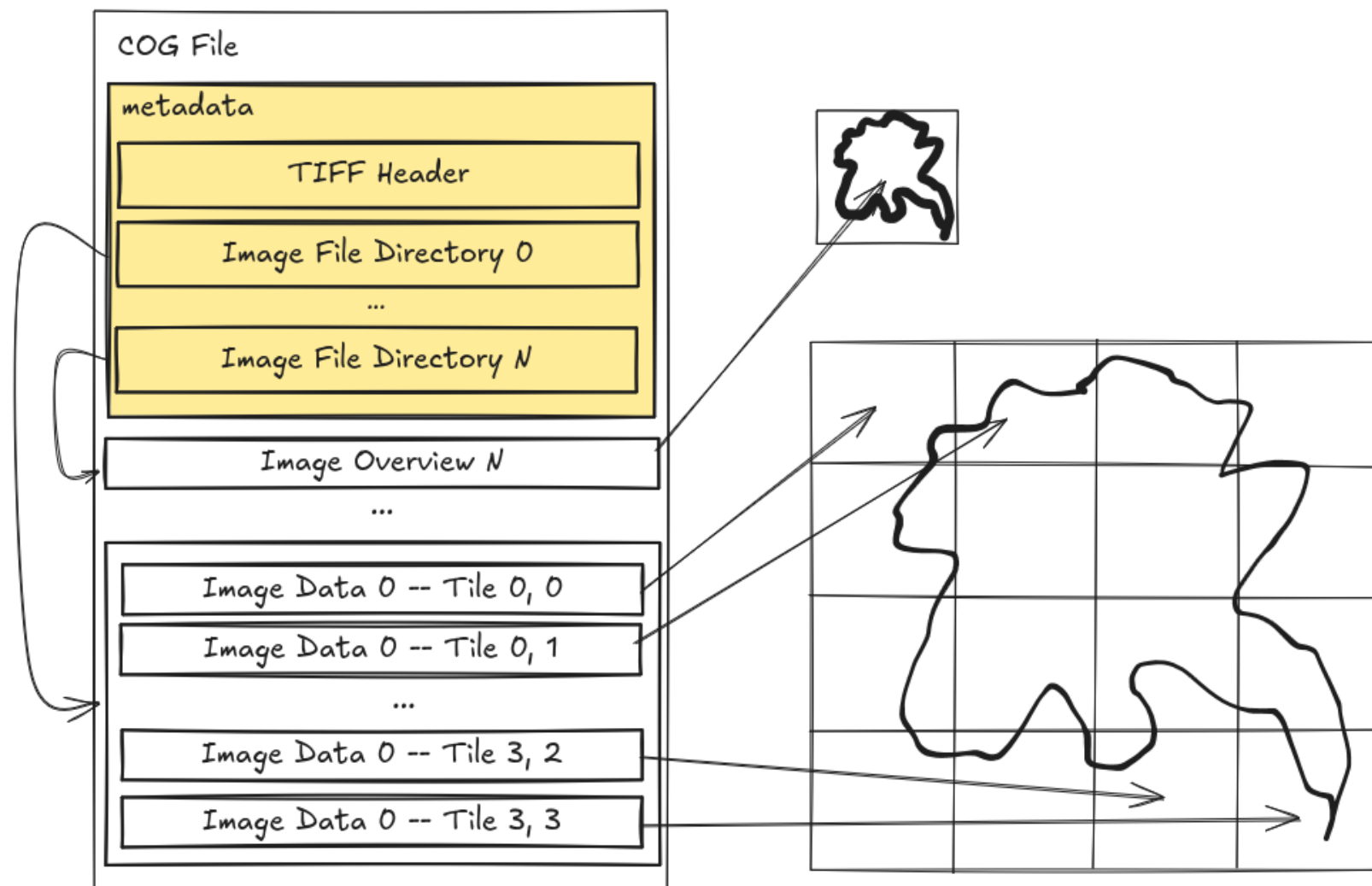
Rebalance

Earth

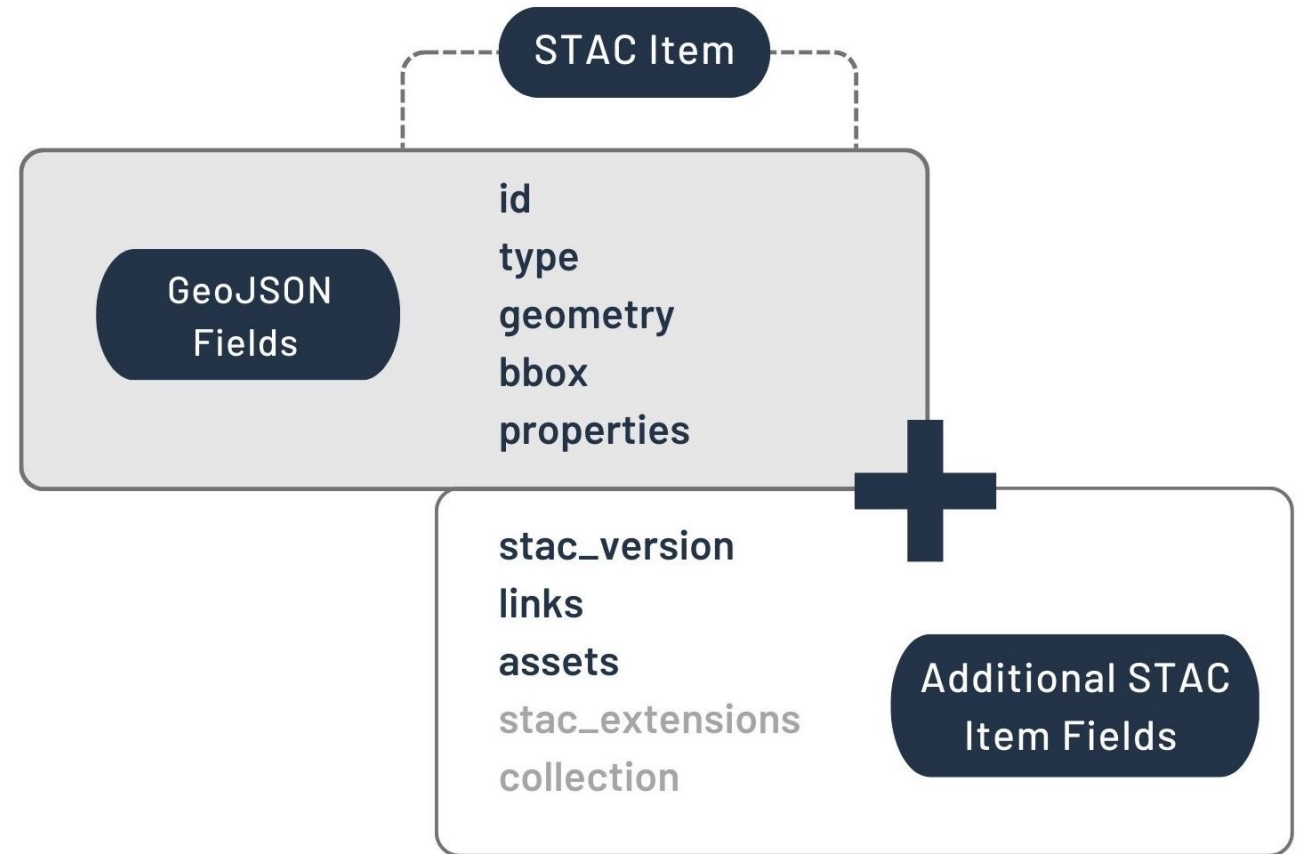
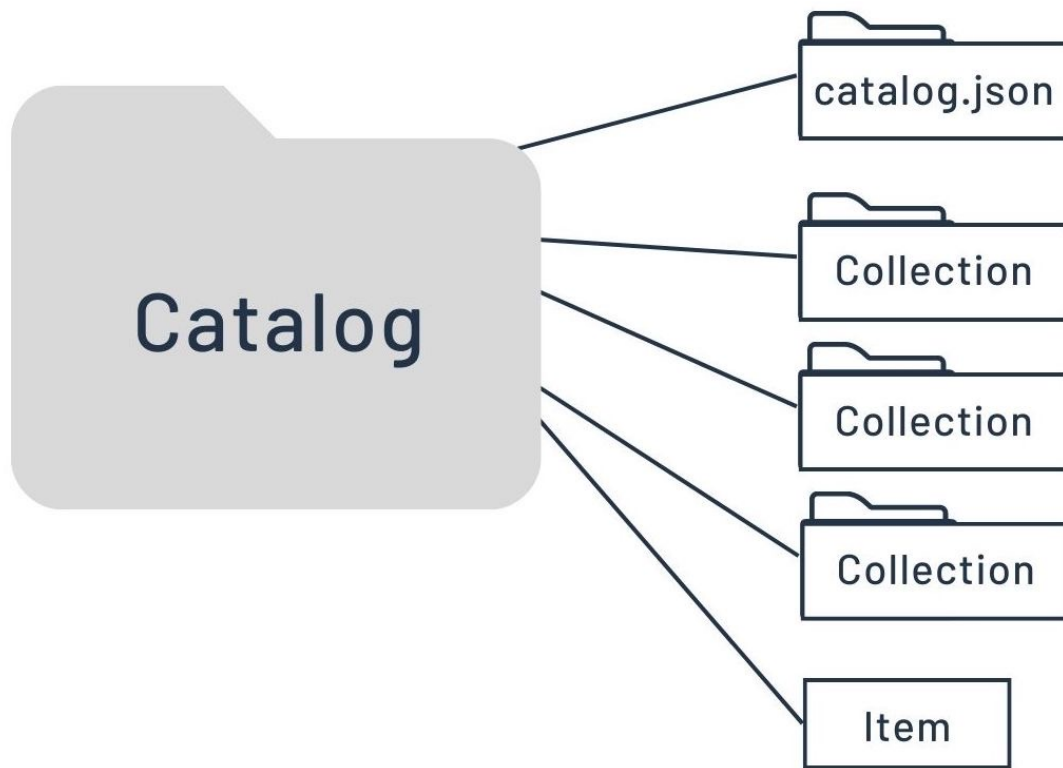
Cloud Optimized GeoTIFF



COG



Spatio-Temporal Asset Catalog



Conversion to COG

```
from rio_cogeo.cogeo import cog_translate
from rio_cogeo.profiles import cog_profiles

cog_translate(
    src,
    dest,
    cog_profiles.get("DEFLATE"),
    overview_resampling="bilinear",
    config={"GDAL_NUM_THREADS": "ALL_CPUS"},
    use_cog_driver=True,
)
```

Compression: DEFLATE vs LERC

```
cog_profiles.get("DEFLATE")
```

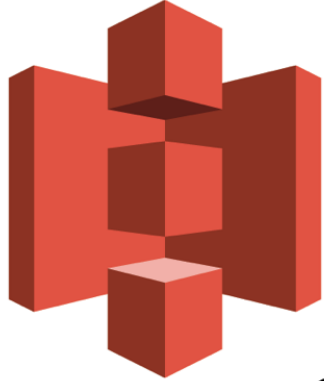
VS

```
profile = cog_profiles.get("lerc_zstd")
profile.update({
    "MAX_Z_ERROR": 0.02
    "MAX_Z_ERROR_OVERVIEW": 0.2
    "ZSTD_LEVEL": 9
})
```

LERC = Limited Error Raster Compression

75MB to 20MB – nearly 4x smaller

Cloud Storage



Amazon S3

Microsoft Azure
Blob Storage



**SOURCE
COOPERATIVE**



Products

★ Featured

Global Fields of The World (FTW)

Sponsored by Taylor Geospatial, the Global Fields of The World (FTW) dataset provides global-scale estimates of agricultural fields for 2024–2025. The dataset includes both model inputs (Sentinel-2–derived median composites in COG and Zarr v3 formats) and outputs (in Zarr, GeoParquet and PMTiles).

Provided by [Fields of The World](#) • Published on 4 Feb 2026

Public

Data.gov Archive

This collection includes BagIt archives of every entry on Data.gov, including API metadata for each dataset.

Provided by [Harvard Library Innovation Lab](#) • Published on 13 Dec 2024

Public

Multi-Temporal Crop Classification with HLS Imagery across CONUS

This dataset contains temporal Harmonized Landsat-Sentinel (HLS) imagery of diverse crop type and land cover classes across the Contiguous United States (CONUS) for the year 2022. The target labels are derived from USDA's Crop Data Layer (CDL). It's primary purpose is for training segmentation geospatial machine learning models. It includes 3,854 chips of 224 x 224 pixel area at 30m spatial resolution.

Provided by [Clark Center for Geospatial Analytics](#) • Published on 10 Aug 2023

Public

crop type

land cover

segmentation

hls

agriculture

Goog

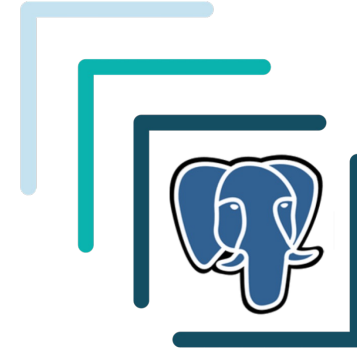
Do we need some other servers?



COG



Web mapping tiles



Database of STAC items

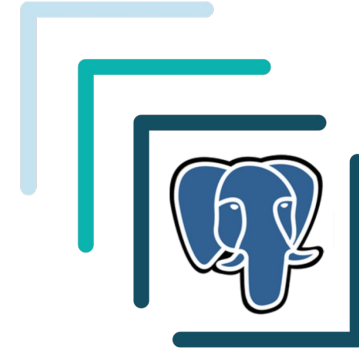


STAC API

Do we need some other servers?



NO!



COG



Web mapping tiles

Database of STAC items



STAC API

Static STAC catalogs

Not really 'Big Data'

Under 6,000 images

<code>ea-lidar-dtm-1m-items.json</code>	15MB
<code>ea-lidar-dtm-1m-items.parquet</code>	0.6MB



Environment Agency LIDAR Composite DTM, 1 m

↑ Up

☆ Favorite

i Source

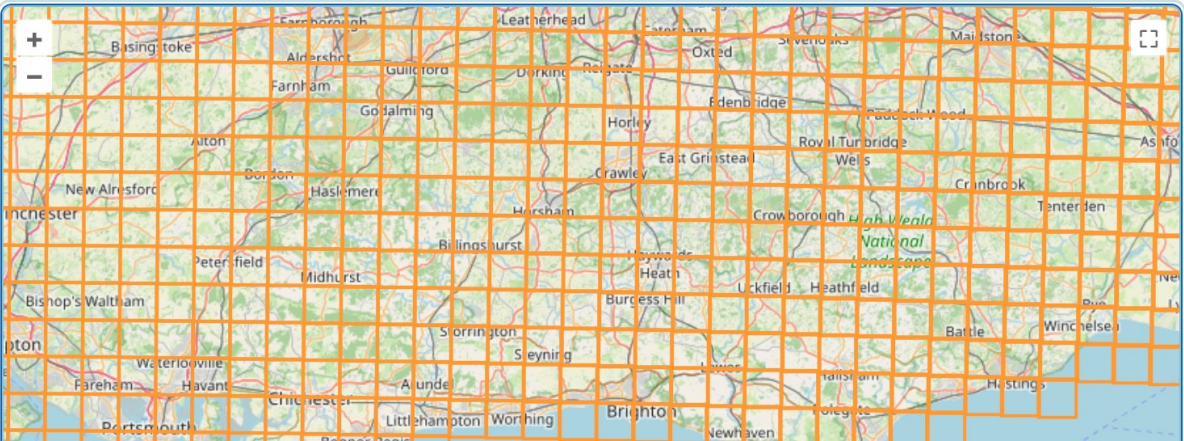
🔗 Share

Description

Digital Terrain Model (bare earth) tiles from the Environment Agency's national LIDAR survey of England, product DTM at 1 m ground sample distance. Elevations are metres above Ordnance Datum Newlyn; tiles are Cloud-Optimized GeoTIFFs on the British National Grid (EPSG:27700), hosted on Source Cooperative.

dtm elevation england environment-agency lidar uk

License OGL-3.0
Temporal Extent 2022-12-31 0:00:00 UTC



Items

🧱 Tiles 📄 List

☰ Show Filters

- NT60ne_DTM_1m

COG

2022-12-31 0:00:00 UTC
- NT60se_DTM_1m

COG

2022-12-31 0:00:00 UTC
- NT60sw_DTM_1m

COG

2022-12-31 0:00:00 UTC
- NT70ne_DTM_1m

COG

2022-12-31 0:00:00 UTC
- NT70nw_DTM_1m

COG

2022-12-31 0:00:00 UTC
- NT70se_DTM_1m

COG

2022-12-31 0:00:00 UTC

STAC Browser

NT70nw_DTM_1m

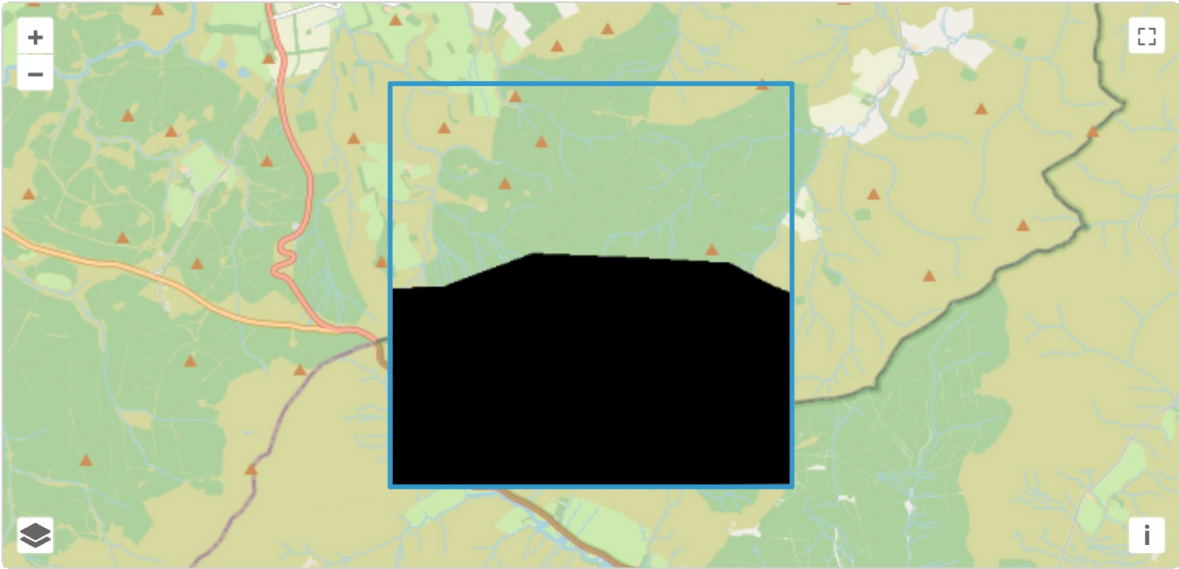
Collection

Up

Favorite

Source

Share



Asset

▼ Digital Terrain Model (1 m)

SHOWN DATA DEM COG

Cloud-Optimized GeoTIFF image

Download Copy URL

Metadata

General

GSD	1 m
Platform	aircraft
Instruments	lidar
Time of Data	2022-12-31 0:00:00 UTC

Ea

Os Grid Tile	NT70nw
--------------	--------

Projection

Code	EPSG:27700
Image Dimensions	5000 × 5000
Transformation Matrix	[1; 0; 370000] [0; -1; 610000] [0; 0; 1]

Accessing STAC from GDAL

Needs GDAL 3.13 or later
(released May 2026)

```
$ gdal raster info GTI:stac_items.parquet
```

```
Driver: GTI/GDAL Raster Tile Index
```

```
Files: none associated
```

```
Size is 539231, 658211
```

```
...
```

```
Pixel Size = (1.0000000000000000,-1.0000000000000000)
```

```
Corner Coordinates:
```

```
Upper Left  ( 131875.000, 664060.000) ( 6d16'42.21"W, 55d47'43.04"N)
```

```
Lower Left  ( 131875.000, 5849.000) ( 5d44' 1.36"W, 49d53'31.34"N)
```

```
...
```

```
Band 1 Block=256x256 Type=Float32, ColorInterp=Gray
```

```
NoData Value=-3.4028235e+38
```

Querying a point in GDAL

Needs GDAL 3.13 or later
(released May 2026)

```
$ gdal raster pixel-info --position-crs EPSG:4326 \
  --position=-1.46267293,50.93497118 \
  GTI:stac_items.parquet
```

→ GeoJSON or CSV including value at point

```
...
"bands": [
  {
    "band_number": 1,
    "raw_value": 12.832000732421875,
    "unscaled_value": 12.832000732421875,
    "files": [
      "\vsicurl\https:\\\\data.source.coop\rebalance-earth\ea-
dem\FZ_DSM\DEFLATE\SU31ne_FZ_DSM_1m.tif"
    ]
  }
]
...
```

Rebalance

Earth

GDAL speed ups

Needs GDAL 3.13 or later
(released May 2026)

```
$ export GDAL_DISABLE_READDIR_ON_OPEN=EMPTY_DIR
```

Increases speed significantly!

1.8s -> 0.7s

```
$ export GDAL_HTTP_MULTIPLEX=YES
```

Also helps a bit

Mosaicing in GDAL

Needs GDAL 3.13 or later
(released May 2026)

```
$ gdal raster clip \  
  --bbox 438000,108000,446000,116000 \  
  GTI:stac_items.parquet output.tif
```

**Approx 10s to extract a 8x8km
chunk over Southampton**

Mosaicing in GDAL

Needs GDAL 3.13 or later
(released May 2026)



Mosaicing in Python



```
import lazycogs

da = lazycogs.open(
    "items.parquet",
    bbox=lonlat_to_bng_bbox(bbox_lonlat),
    crs="EPSG:27700",
    resolution=1.0,
    chunks=chunks)

da = da.squeeze(["band", "time"], drop=True)
```

Viewing on web maps

```
type: "FeatureCollection"
▼ features: [] 5877 items
  ▼ 0: {} 2 keys
    ▼ bbox: [] 4 items
      0: -2.5539572
      1: 55.33779011
      2: -2.47450875
      3: 55.38304747
    ▼ assets: {} 1 key
      ▼ image: {} 1 key
        href: "https://data.source.coop/rebalance-earth/ea-dem/DTM/DEFLATE/NT60ne_DTM_1m.tif"
  ▼ 1: {} 2 keys
    ▼ bbox: [] 4 items
      0: -2.55333006
      1: 55.29286418
      2: -2.47397274
      3: 55.33812182
    ▼ assets: {} 1 key
      ▼ image: {} 1 key
        href: "https://data.source.coop/rebalance-earth/ea-dem/DTM/DEFLATE/NT60se_DTM_1m.tif"
```

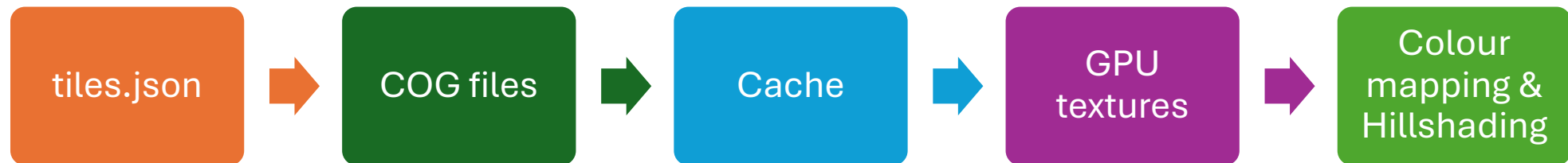
tiles.json
1.5MB rather than 15MB!

Viewing on web maps

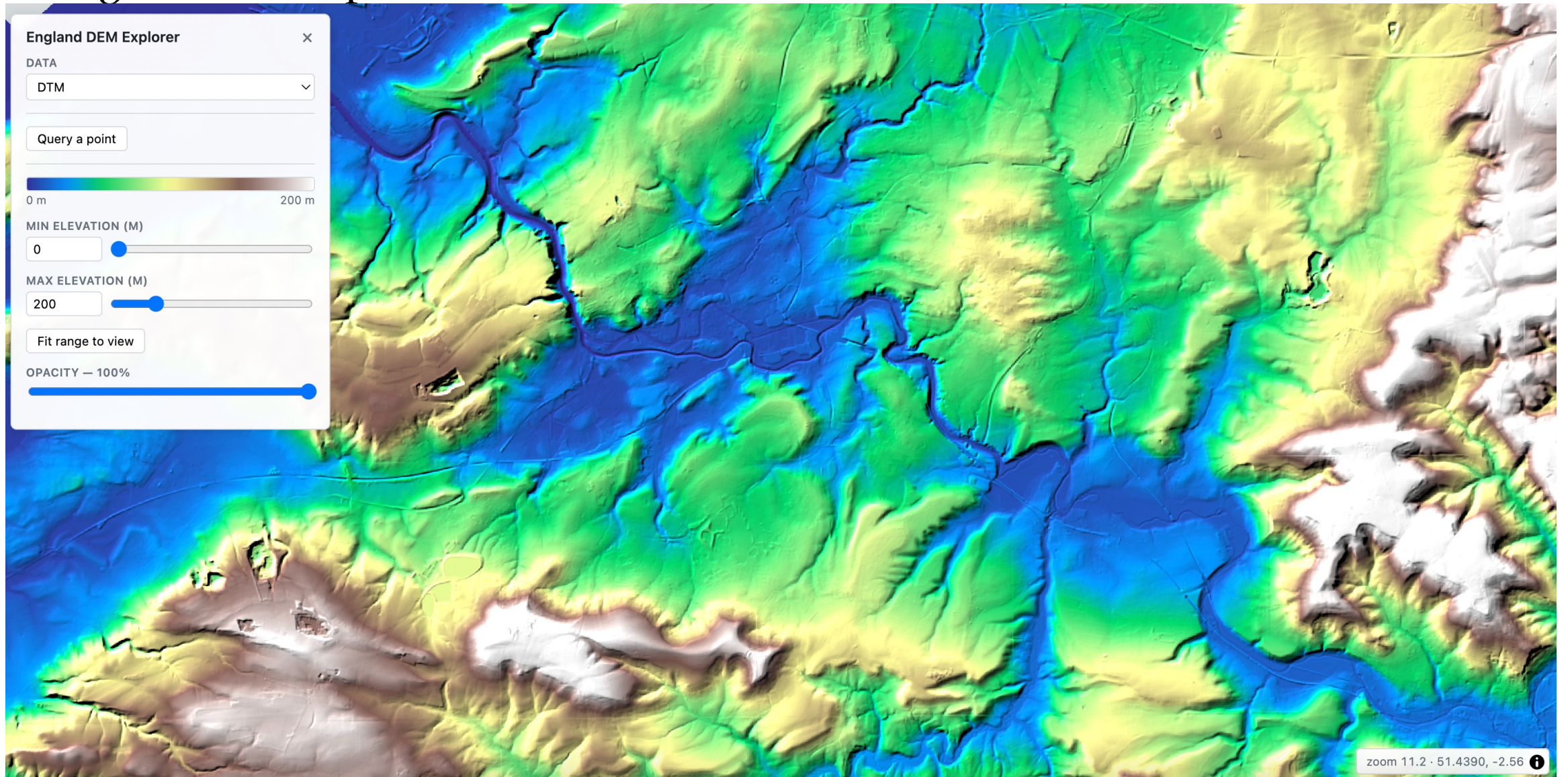


deck.gl-raster

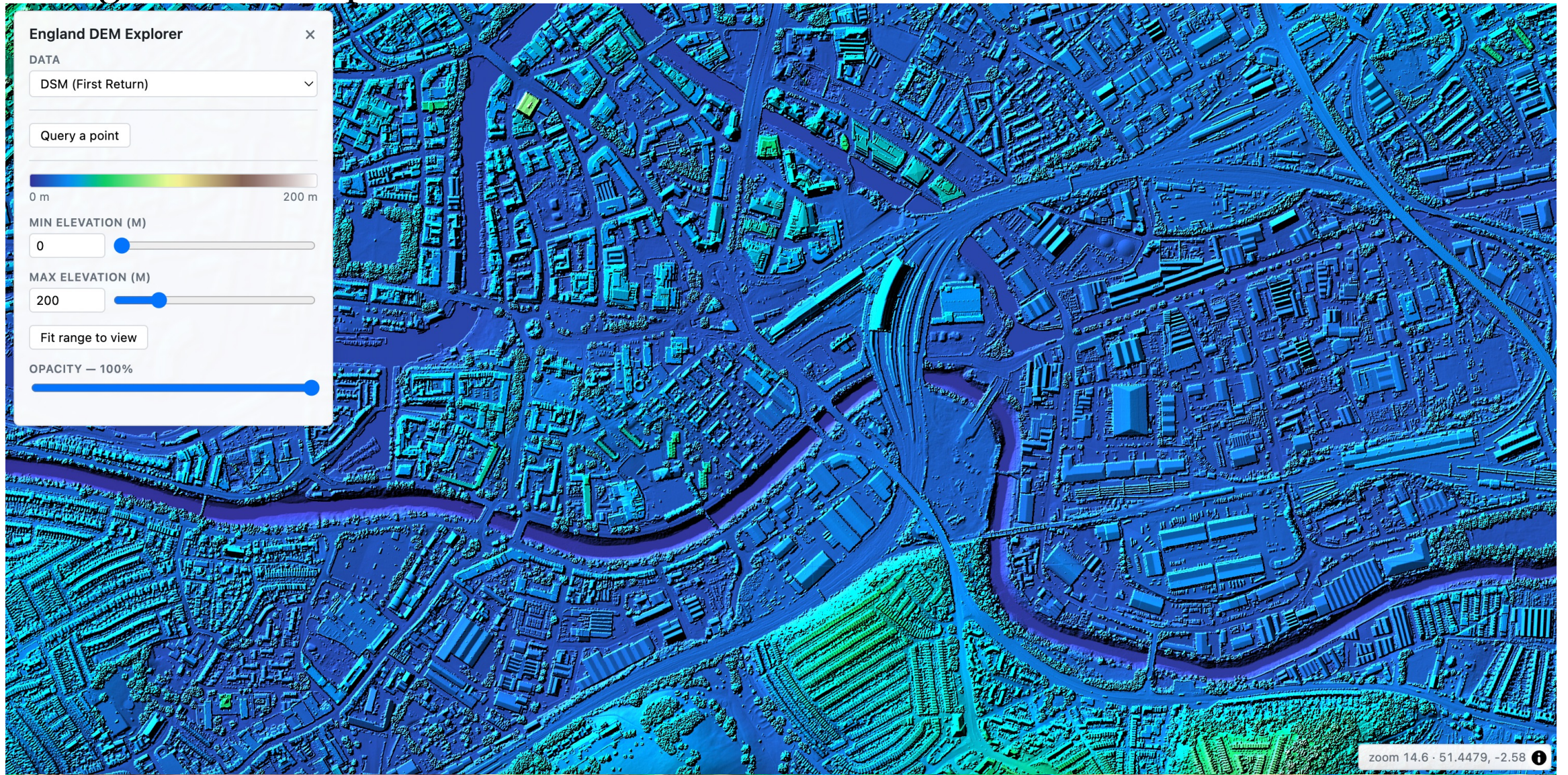
deck.gl-geotiff



Viewing on web maps



Viewing on web maps



Where to find it & potential improvements

source.coop/rebalance-earth/ea-dem

Where to find it & potential improvements

Environment Agency - England LiDAR-derived DEMs

This dataset contains Environment Agency LiDAR-derived Digital Elevation Models for England, both Digital Terrain Models and Digital Surface Models.

These have been taken from the original [National LiDAR Programme data](#), and converted to Cloud Optimized GeoTIFF format with STAC catalogues. The original data is released under the Open Government License, which allows redistribution with attribution, and this conversion is also released under the Open Government License.

See the README file below for more information.

Contents

root

> DTM

> FZ_DSM

> webmap

catalog.json

713 B

Download

Copy

DTM_DEFLATE_tiles.json

1.53 MB

Download

Copy

DTM_LERC_tiles.json

1.51 MB

Download

Copy

ea-lidar-dtm-1m-items.json

14.45 MB

Download

Copy

Details

Visibility	Unlisted
Owner	R Rebalance Earth
Created	31 Jul 2026
Last Updated	1 Oct 2026

Analytics

28 DAYS

DOWNLOADS

30,070

DATA SERVED

24 GB

COUNTRIES

2

28-DAY DOWNLOADS



Where to find it & potential improvements

README

Cloud-Native Environment Agency LiDAR DEMs for England

This dataset consists of cloud-native versions of the Environment Agency LiDAR DEMs (DTMs and First Return DSMs) for England, in Cloud Optimized GeoTIFF (COG) format with STAC catalogs. You can use the STAC catalog from GDAL, Python or any other tool, or view the live webmap [here](#).

Source

This data is all taken from the [Environment Agency National LiDAR Programme dataset](#) which was released under the Open Government License, which allows redistribution. The data has been converted and processed by Robin Wilson at [Rebalance Earth](#), and this conversion is also released under the Open Government License.

Files and Folders

- DTM/
 - DEFLATE/ - COG format files for the EA Digital Terrain Model, with DEFLATE compression
 - LERC/ - COG format files for the EA Digital Terrain Model, with LERC compression (with a compression accuracy of 2cm vertically for the full data, and 20cm for the overviews)
- FZ_DSM/
 - DEFLATE/ - COG format files for the EA First Return Digital Surface Model, with DEFLATE compression. Note: LERC files are not available for the DSM
- webmap/ - A static webapp that displays the DTM and DSM tiles live on a web map. [This link](#) will open the webmap page itself.
- catalog.json - Overall STAC catalog, which links to the DSM and DTM collections
- ea-lidar-dtm-1m-items.json - STAC items for the DTM product in JSON format
- ea-lidar-dtm-1m-items.parquet - STAC items for the DTM product in STAC GeoParquet format

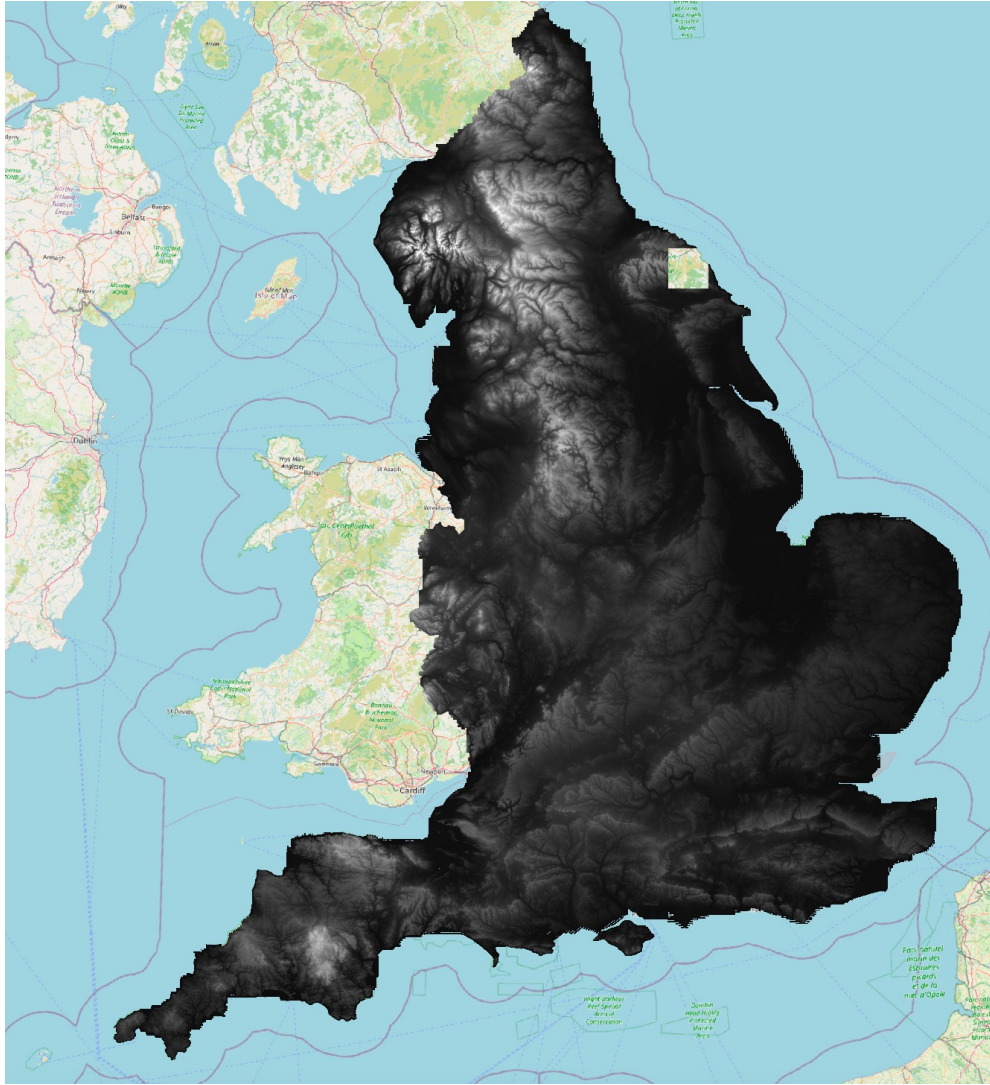
Where to find it & potential improvements

source.coop/rebalance-earth/ea-dem

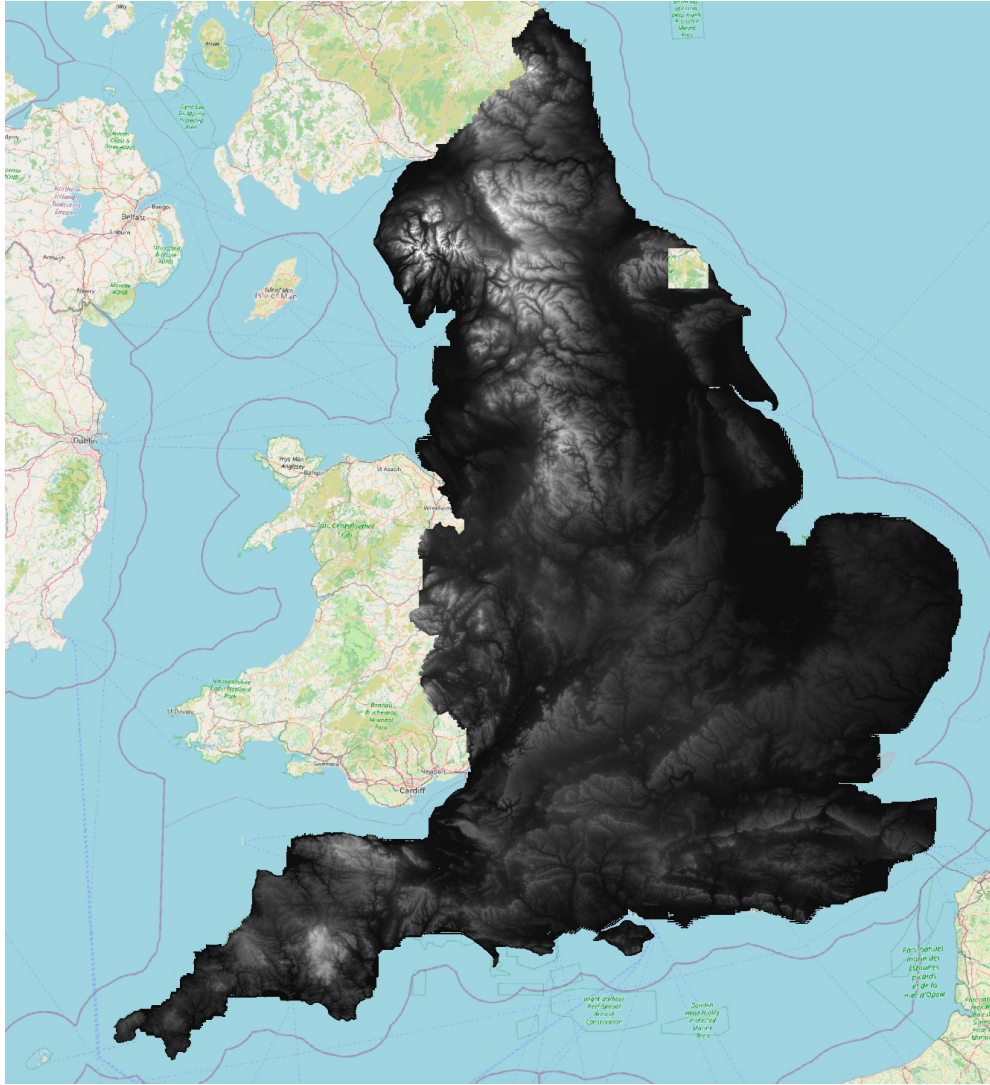
Potential Improvements:

- Add Last Return DSM
- Add LERC-compressed option for DSM
- Merge tiles (maybe?)
- Pre-generate whole country overviews

One last thing...



One last thing...





Find the data at
source.coop/rebalance-earth/ea-dem

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Thank You

Dr Robin Wilson | robin.wilson@rebalance.earth