Earth observation, NRMM and wildfires

20th April – 9am

Christopher Evangelides & Georgie Vaughan

Christopher Evangelides – GIS & EO Consultant

Geospatial Data Scientist with advanced capacity in handling big spatial datasets using Python, R and SQL. Experienced in manipulating hyperspectral satellite imagery to assess revegetation dynamics in burnt areas.

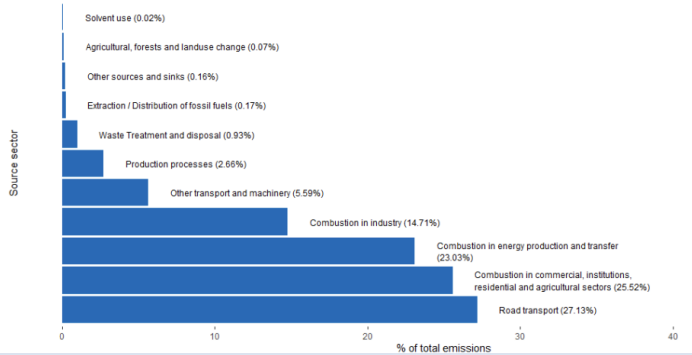
Georgie Vaughan – Data Scientist

Data Scientist combining academic and industrial approaches to Machine Learning and Automation in the sustainability sector.

UK National Atmospheric Emissions Inventory (NAEI)

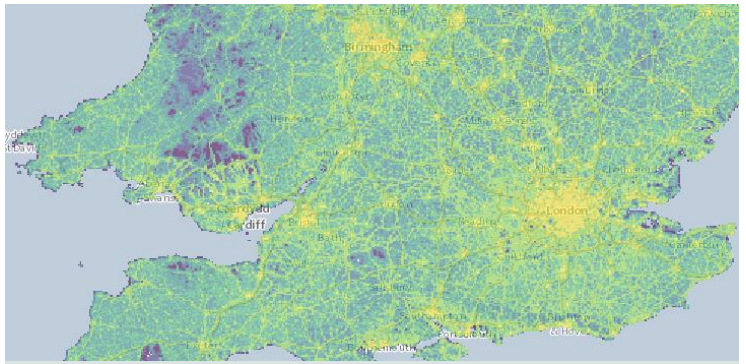
National Atmospheric Emissions Inventory

What is it?



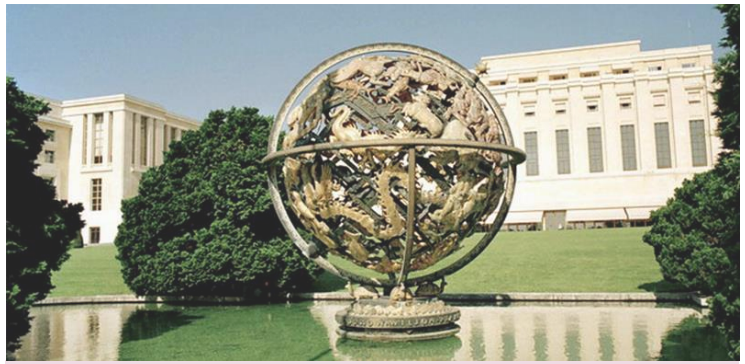
- The reference for air emissions and provides annual estimates for a wide range of important pollutants including air quality pollutants, GHGs, pollutants contributing to acid deposition and photochemical pollution, persistent organic pollutants and other toxic pollutants such as heavy metals.

Spatial Data Team



- Spatially disaggregate emissions from the national inventory on an annual basis. NAEI 2021 to be published in June.
- Update time-series back to 2005.
- Develop 1x1 km interactive maps that can be queried for further analysis (e.g. emission totals export – csv and/or shp).

Reporting



- Emissions maps are a crucial evidence base supporting a variety of Government policy support work.
- They are used to compile, and report gridded emissions to the UNECE and Convention on Long Range Transboundary Air Pollution (CLRTAP).

RICARDO

Today’s topics

ML Project on NRMM detection

NAEI & Climate TRACE

Fire mapping (Georgie Vaughan)

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Non-Road Mobile Machinery detection in high resolution satellite imagery

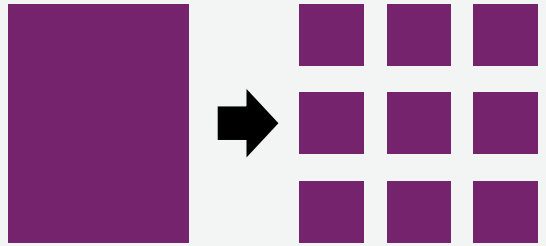
Danni Harnett, Christopher Evangelides, Santosh Bhattarai

Acquire labelled satellite imagery from **xView**

Acquire satellite imagery for model testing (**Skysat constellation** & **Google Earth**)

Develop python algorithm to extract ***only*** NRMM images from the xView dataset

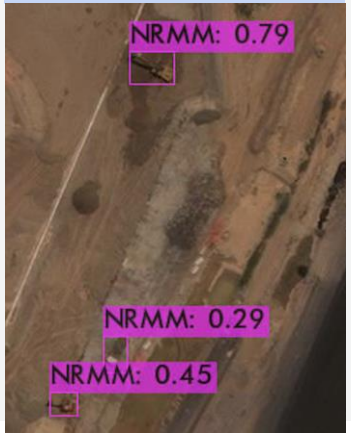
Image Augmentation



Train **12** YOLOV4 models with different model configurations

(Network size, Learning rate & Annotation levels)

Model Testing



Non-Road Mobile Machinery detection in high resolution satellite imagery

Danni Harnett, Christopher Evangelides, Santosh Bhattarai

Google Earth Imagery:

Zoomed out

Zoomed in

Non-Road Mobile Machinery detection in high resolution satellite imagery

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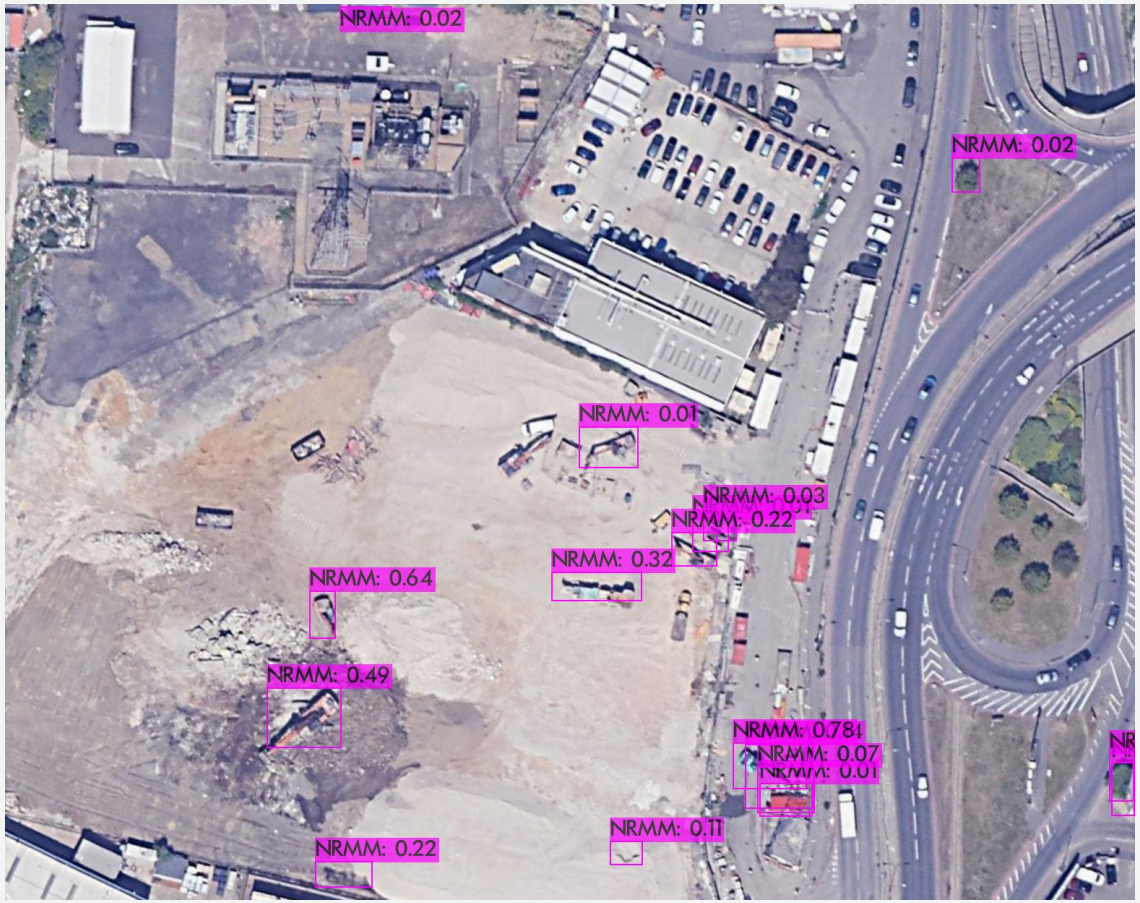


Non-Road Mobile Machinery detection in high resolution satellite imagery

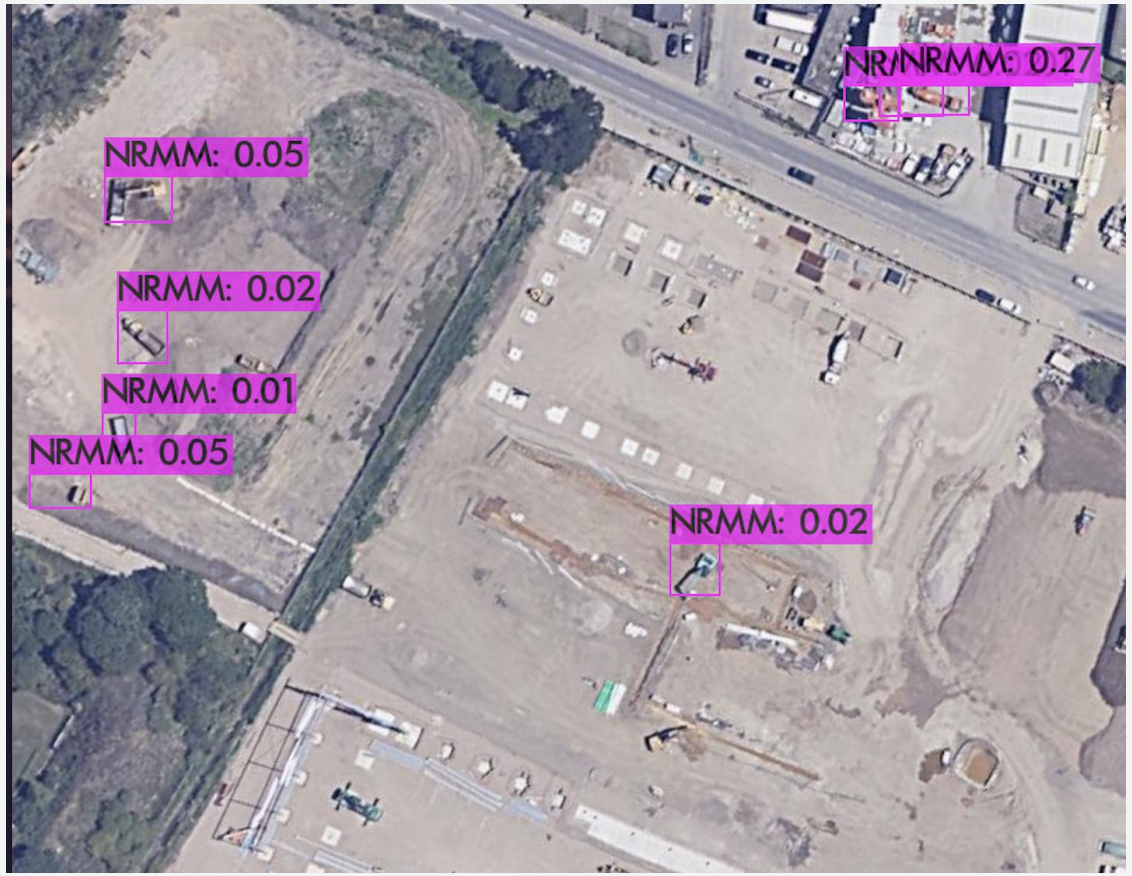
Danni Harnett, Christopher Evangelides, Santosh Bhattarai

Summary

- This model presents itself as a good *starting point* for NRMM detection

Future work

- Train a larger model
- Re-train the model with more training data
  - Hand annotate high & low resolution imagery
- Automate NRMM Detection counting



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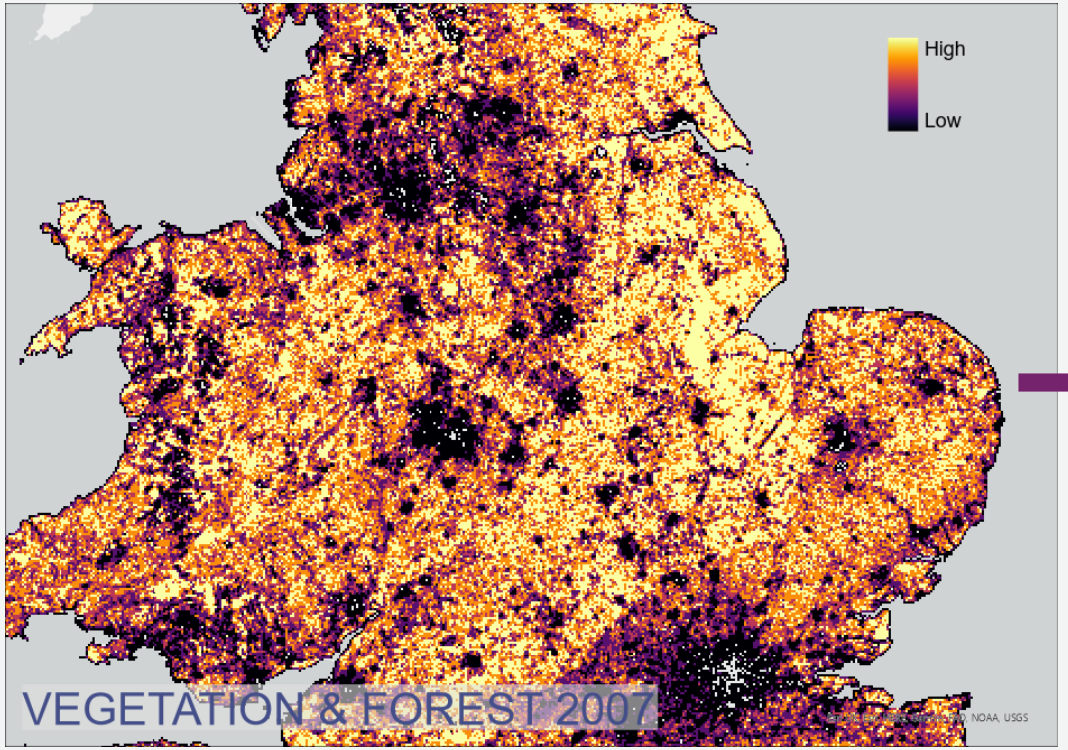
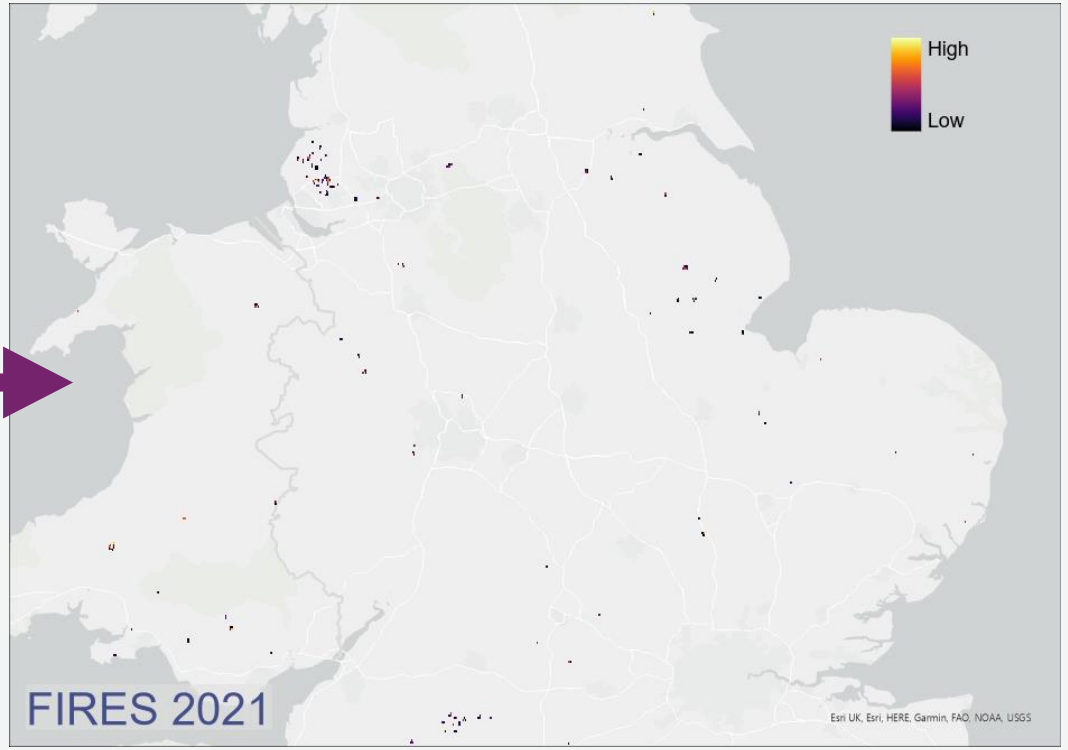
NAEI & Climate TRACE

Fire mapping (Georgie Vaughan)

Fires emissions update in the NAEI





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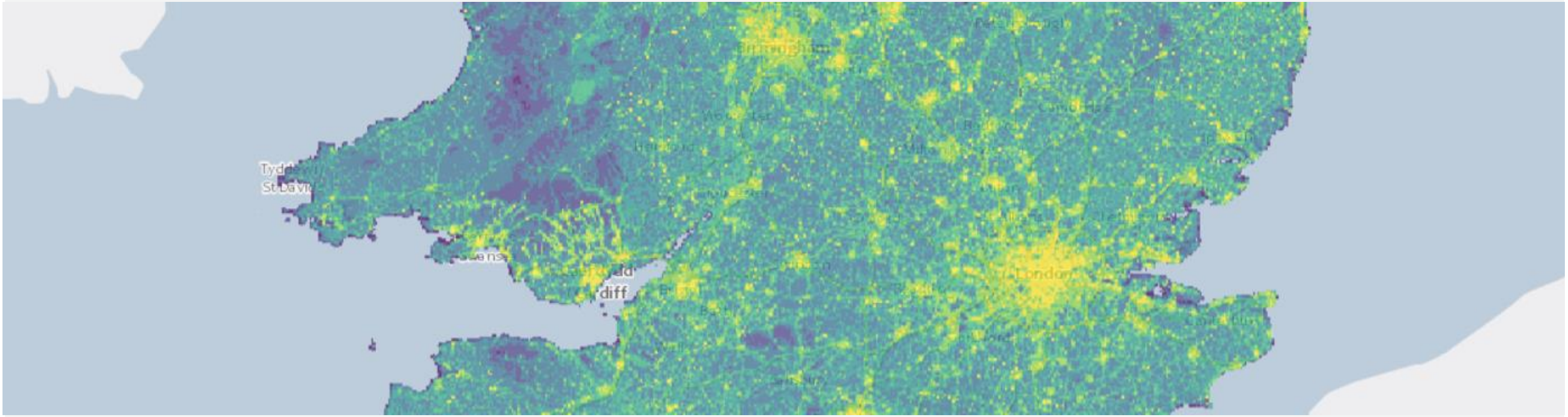
Fire mapping (Georgie Vaughan)

Fires emissions update in the NAEI

We aim to create an automated process of mapping fires from biomass across the UK by calculating the Fire Detection Index from multispectral satellite imagery.

This will give us more accurate fire size estimates, and allow for more accurate mapping.



$$Fire\ Detection\ Index = \frac{B12}{B8A\ * B9}$$

Download satelite data → Calculate Fire Index → Extract hotspots and remove background values → Create and apply mask of image specific non burnable areas eg. clouds → Apply mask of constant non-burnable areas eg. water bodies → Fill in gaps between hotspots → Export locations of fires

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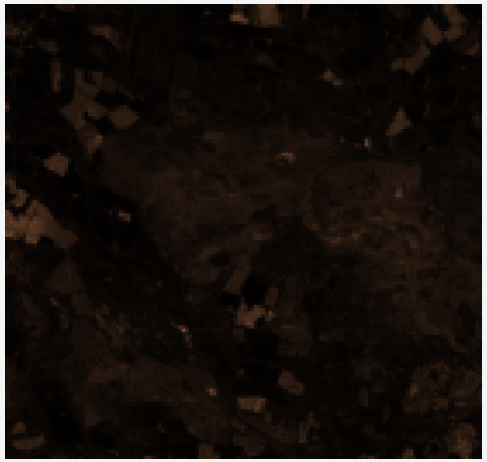

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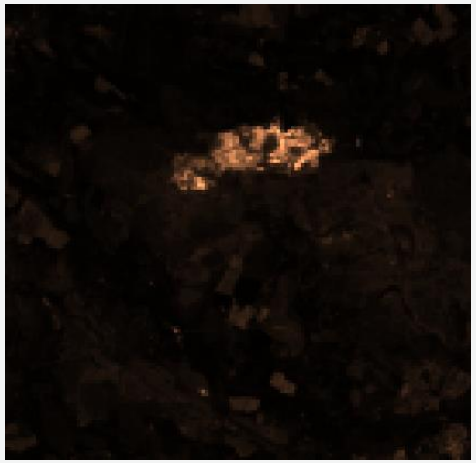

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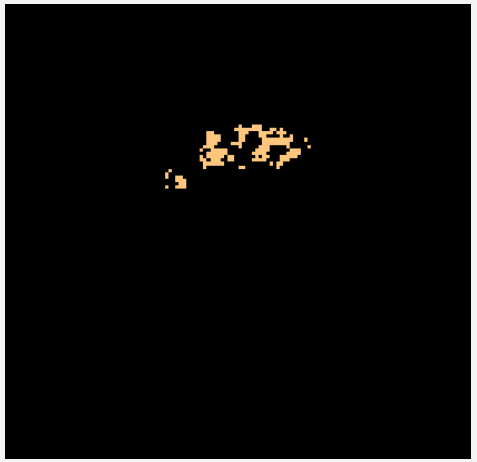

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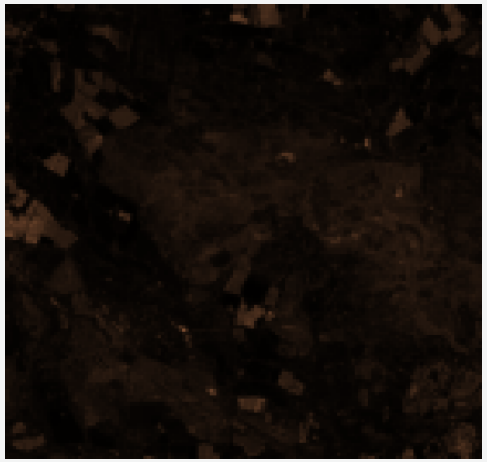

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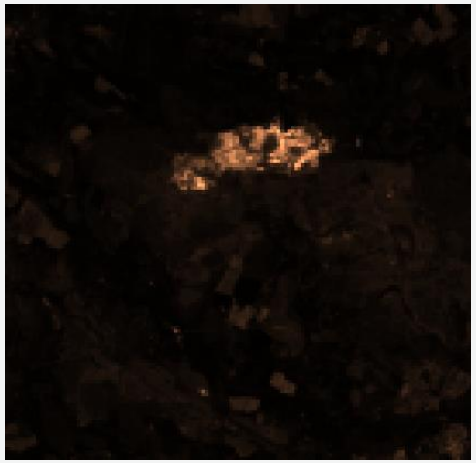

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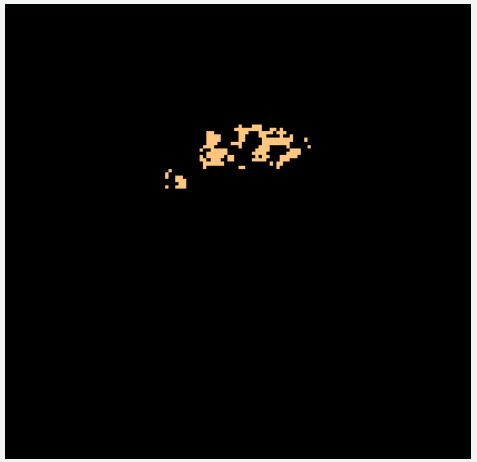

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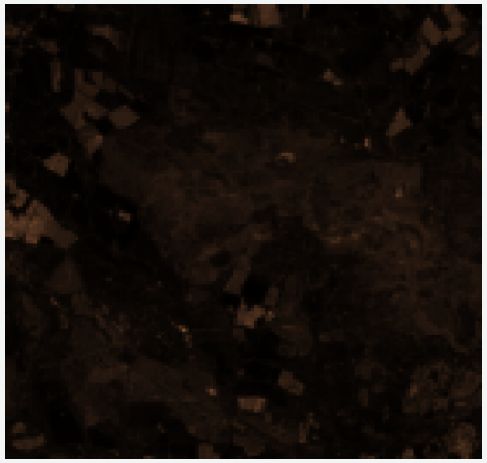

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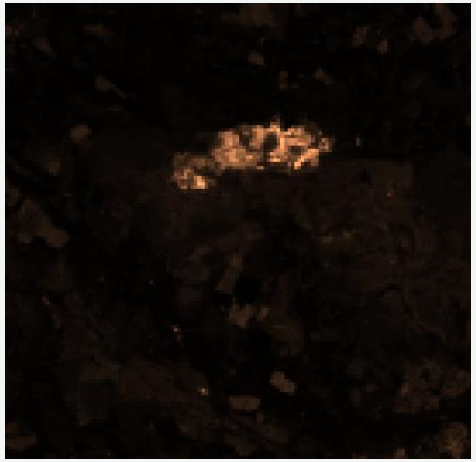

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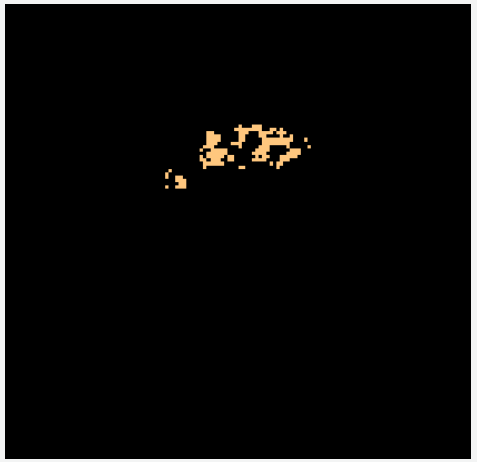

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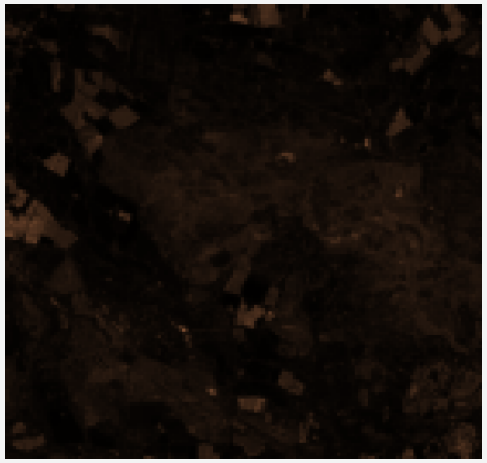

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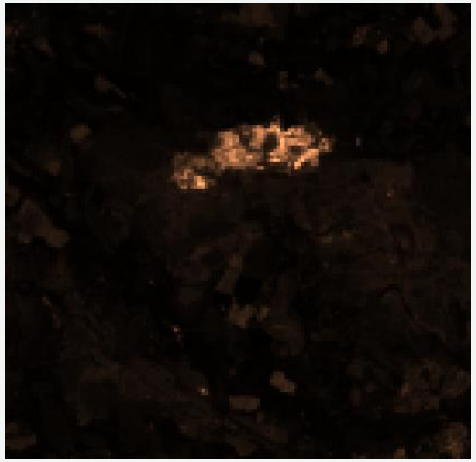

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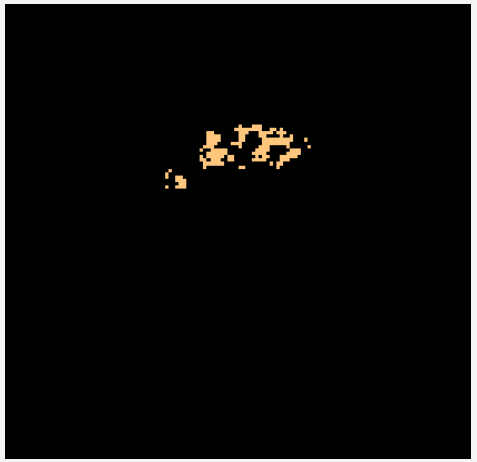

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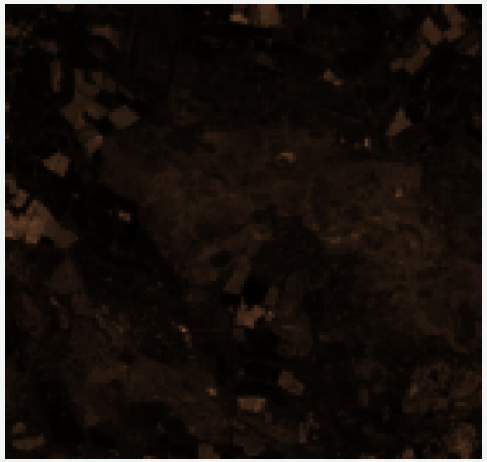

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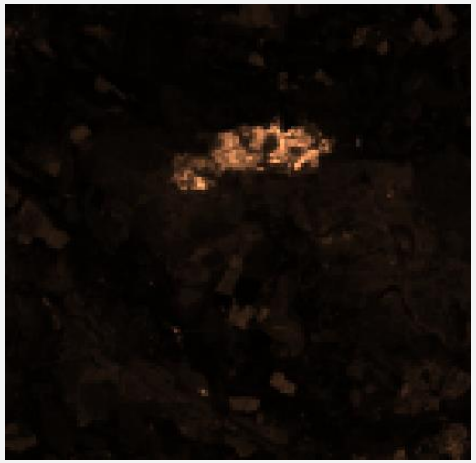

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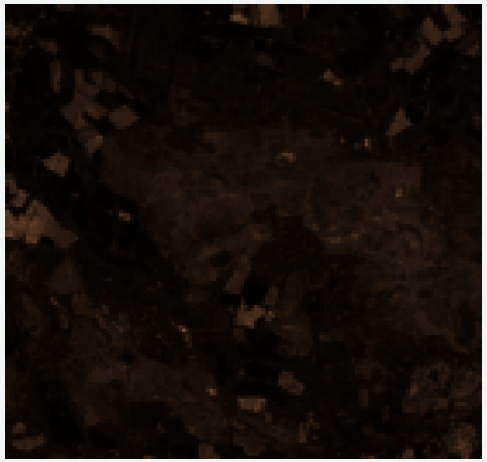

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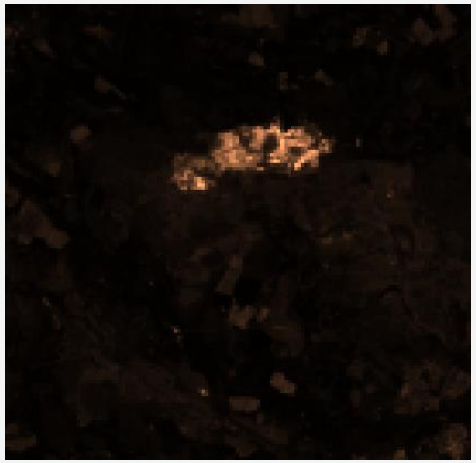

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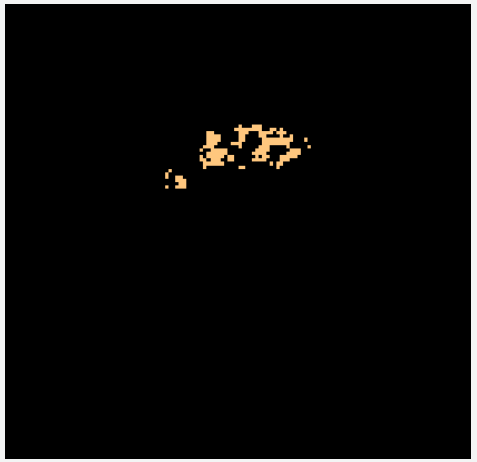

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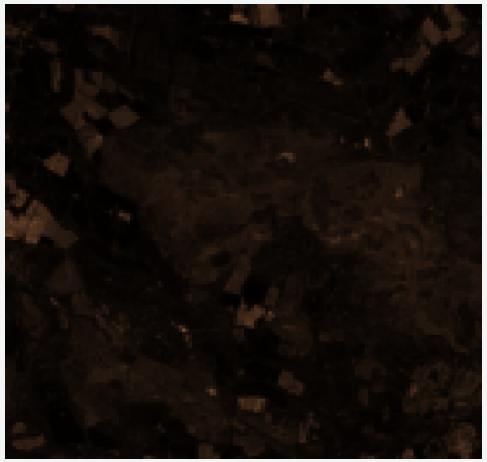

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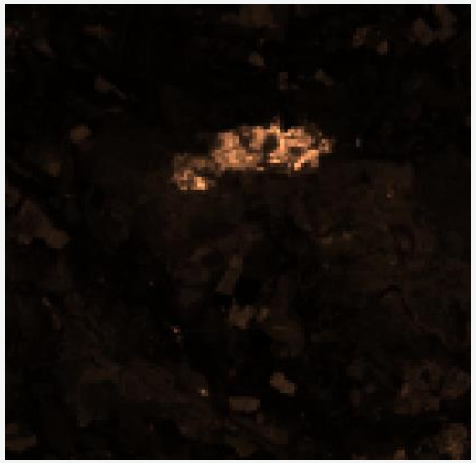

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Thank you for listening, and see you next year :)