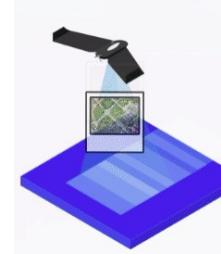


OpenDroneMap



ONLINE

FOSS4U: Free and Open Source for Uncrewed Aerial Systems

Stephen Mather, Executive Director

FOSS4G Asia

2022 November 27

Agenda

- o Background
- o Hands-On: Start Processing
- o Outputs
- o Using ODM
- o Learning Resources
- o Hands-On: Exercises

Background

About Me

Stephen (Steve) Mather

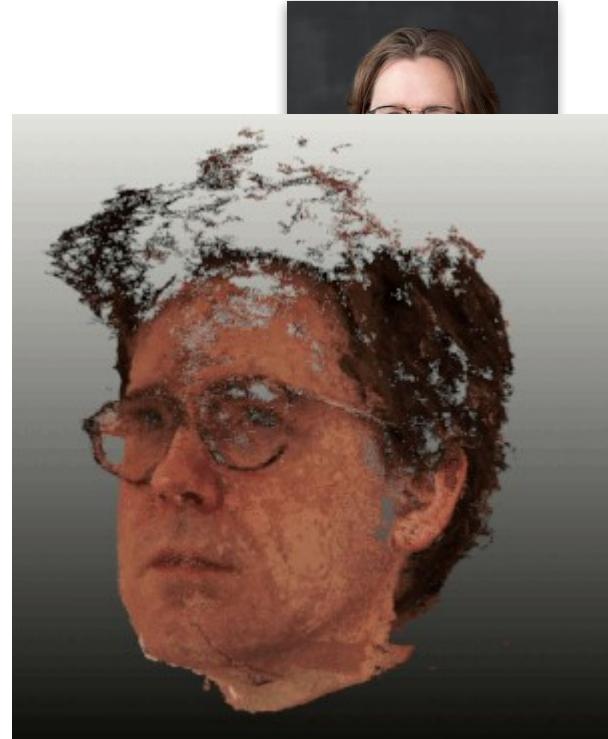
- OpenDroneMap Ecosystem co-founder (with Piero Toffanin)
- Specialize in large-scale elevation model creation from photogrammetry
- Writing:
 - Co-Author of the PostGIS Cookbook
 - Blog at <https://smathermather.com>
- Certified Remote Pilot (US FAA Part 107)



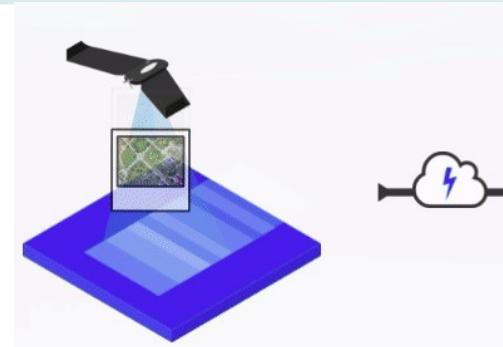
About Me

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- Specialize in large-scale elevation model creation from photogrammetry
- Writing:
 - Co-Author of the PostGIS Cookbook
 - Blog at <https://smathermather.com>
- Certified Remote Pilot (US FAA Part 107)



What is ODM?



- Free and open-source toolkit for photogrammetry from UAS imagery and other camera data
- Georeferenced 2D and 3D outputs
 - Orthophoto, DSM, DTM
 - Point Cloud, Textured Mesh
- Used globally by 10s of thousands of users across sectors private, public, and charitable/NGO sectors
- Begun in 2014, significant improvements 2018-2021
 - Output Quality
 - Features
 - Usability

GIF via WebODM.net

Why Open Source?

Accessible to orgs and programs with limited budgets

- Close source solutions can be as much as \$300+/mo -OR- ~\$5000 one-time
- **ODM is \$0* (free forever)**

But *equally more important*:

- **Control** over your toolchain (change if you want)
- Shoulders of giants: many contributors, **collective wisdom**
- Core software is a public goods
- **Transparency** leads to greater
 - Quality
 - Security

*You can pay for certain parts, but not required.



ODM History

- End of 2013 - Began as a joke on Geohipster
- End of 2014 - Funded, organized FOSS project with multiple contributors
 - Announced at State of the Map US 2014
 - Incubated quietly at FOSS4G Korea
 - Formal release, FOSS4G Portland
 - 2015-2018 – Quietly expanded and refined
 - 2018-2021 – Significant UI / feature improvements; wider adoption
 - Today – active community of international users, contributors



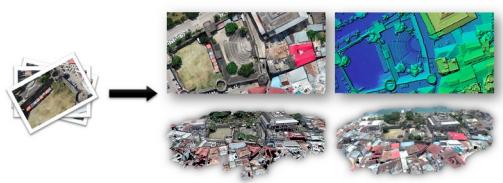
ODM Goals

- Humanitarian
- Ecology, conservation
- Research
- Data for the public good

What is ODM?



- Photogrammetry tool for general existing conditions datasets
 - Orthophoto
 - Elevation Models
 - LiDAR-like point clouds
- Digital Twin Creator

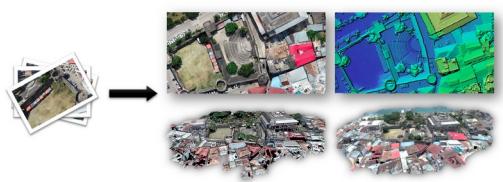


What is ODM?

Existing conditions

- Hinkley Reservation (park), near Cleveland, Ohio, USA
- Needed better terrain model than available from existing lidar datasets





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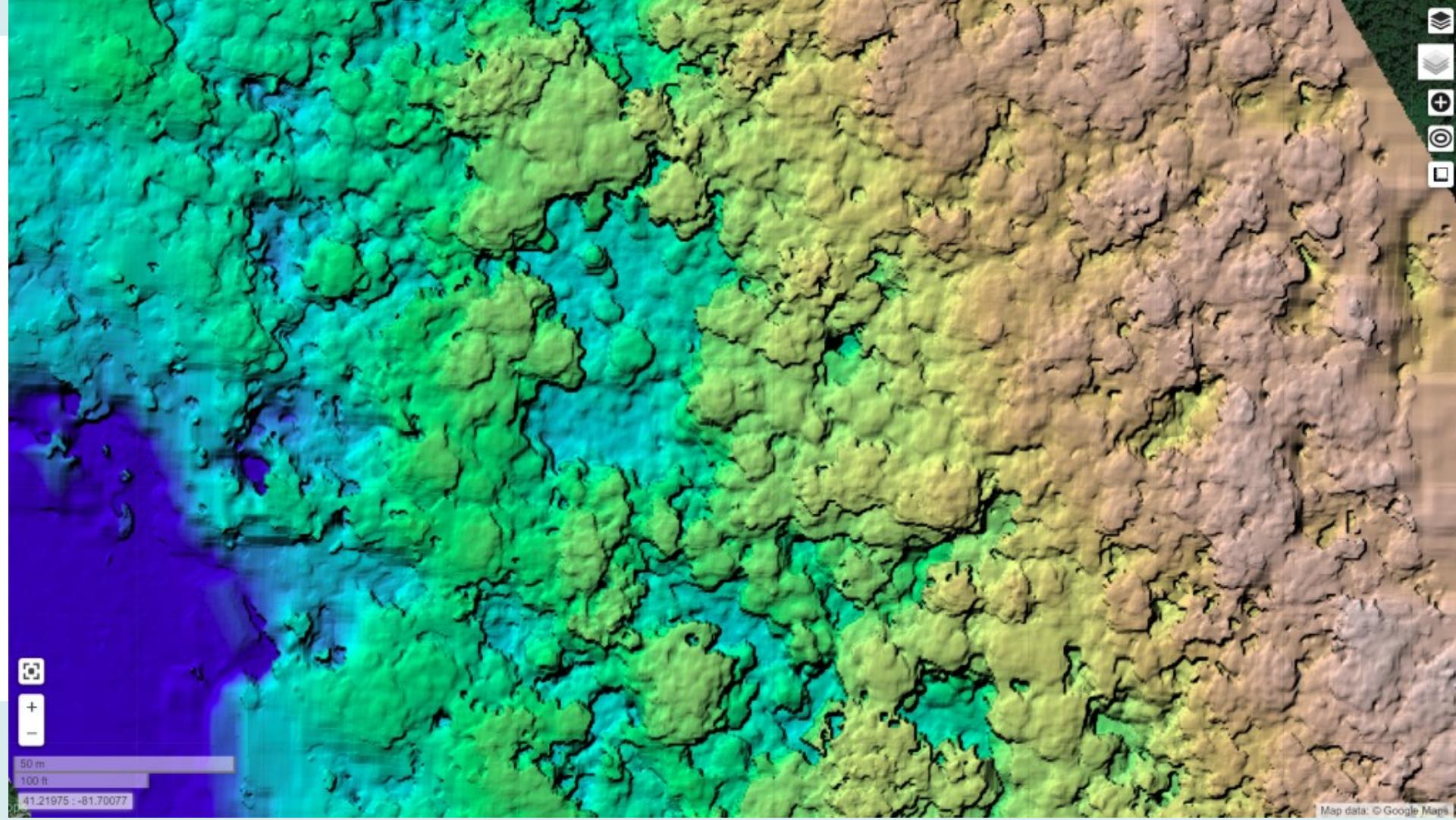


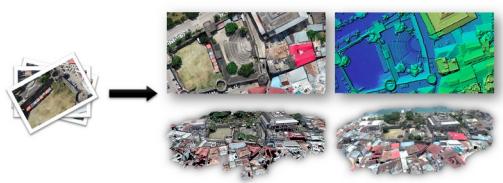
50 m

100 ft

41.22033 : -81.70354

Map data: © Google Maps

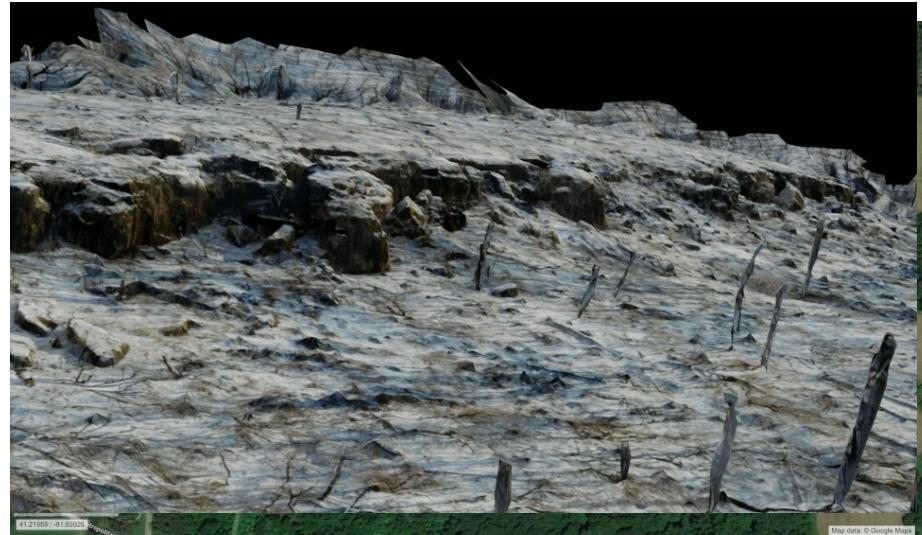


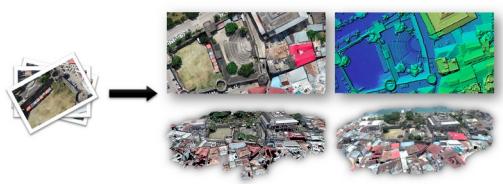


What is ODM?

Existing conditions

- Hinkley Reservation (park), near Cleveland, Ohio, USA
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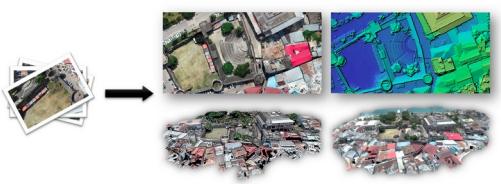


What is ODM?

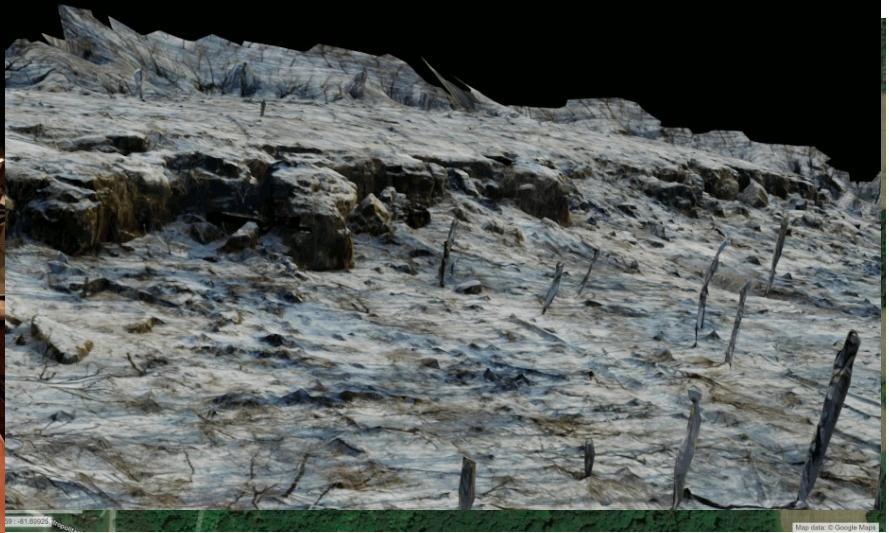
Existing conditions

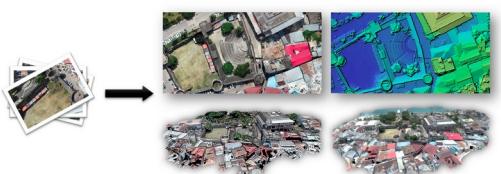
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- Needed better terrain model than available from existing lidar datasets





What is ODM?



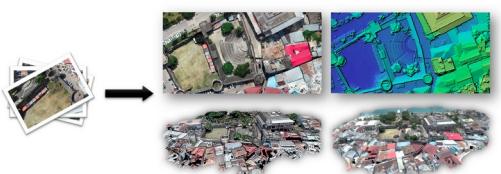


What is ODM?

Digital twins

- Building facade, Oberlin, Ohio

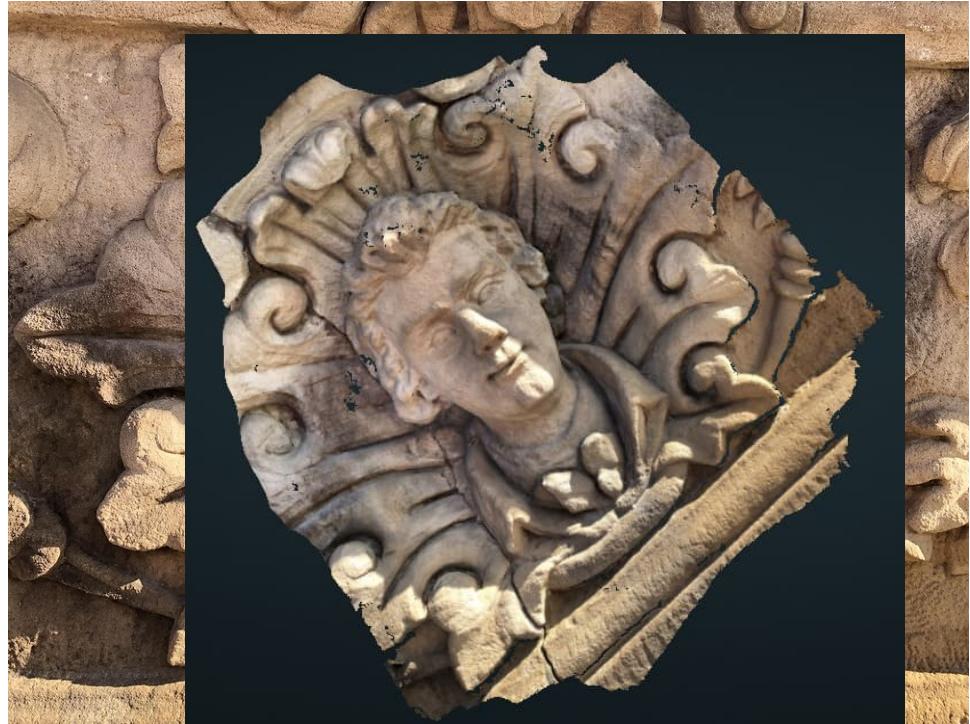




What is ODM?

Digital twins

- Building facade, Oberlin, Ohio





What is ODM?

Digital twins

- Building facade, Oberlin, Ohio



ODM™



What is ODM?

Digital twins

- Fictional digital twins

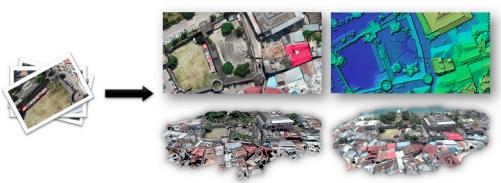




What is ODM?

Digital twins

- Dr. Charles Ritzler
- Cleveland Metroparks Zoo
- Project Goals: Test new method, using 3D photogrammetry, to quantify usable space in both small and large primate habitats, and compare results to that of Browning and Maple (2019)



What is ODM?

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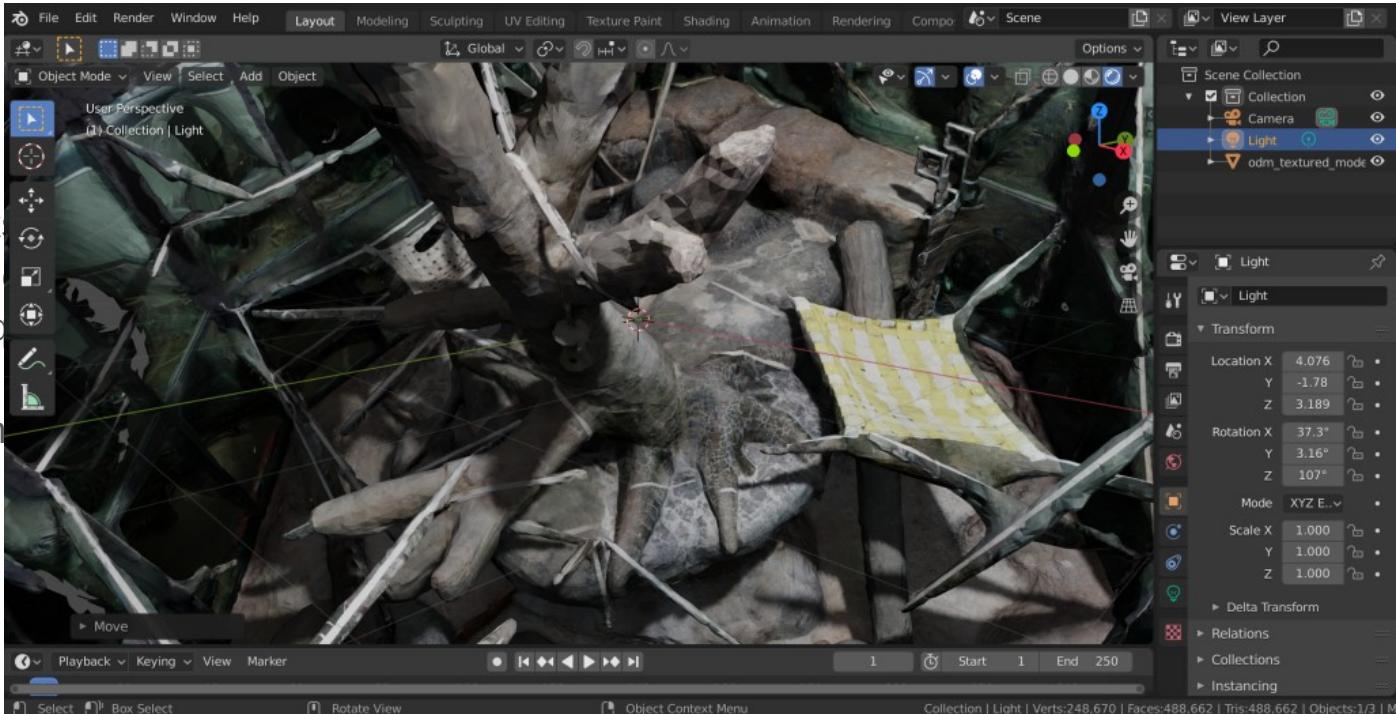




What is ODM?

Digital twins

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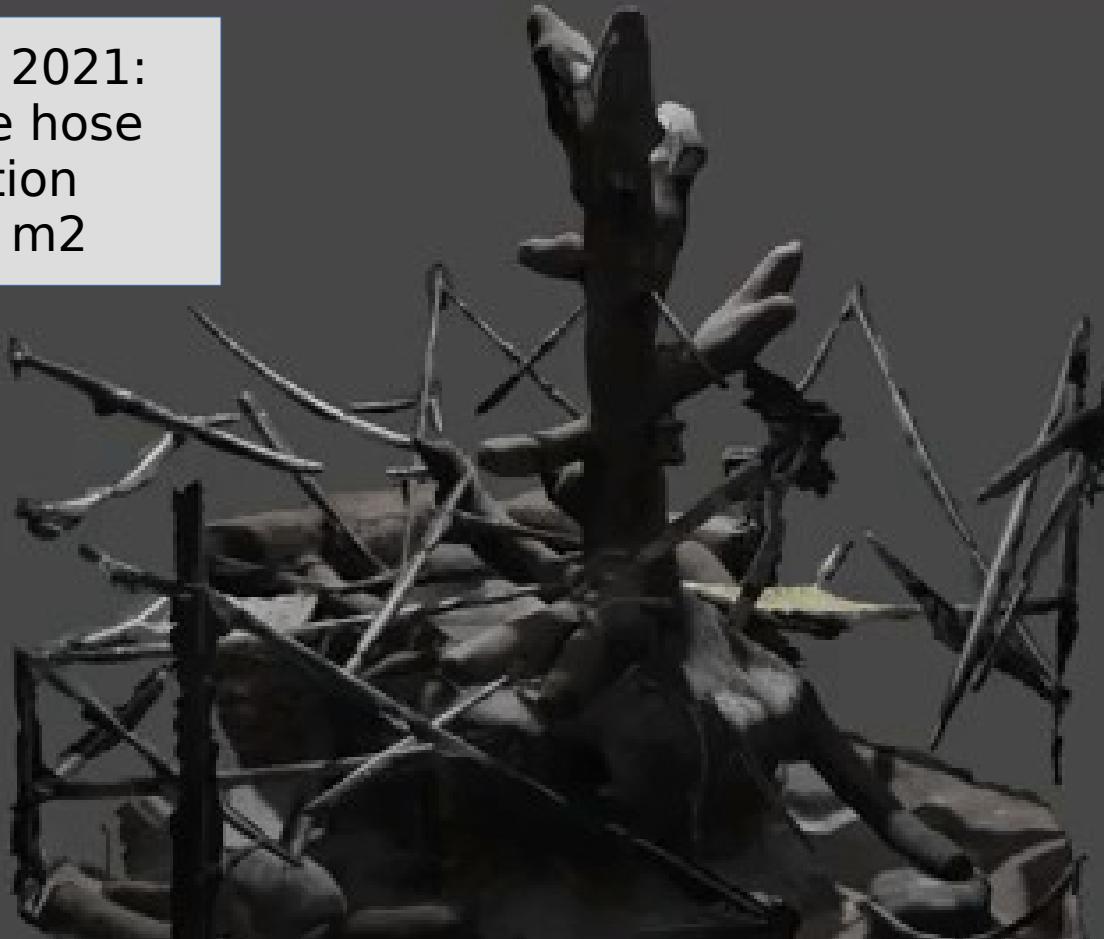
What is ODM?



June 2020: Pre-
fire hose addition
 2755 m^2



January 2021:
Post-fire hose
addition
2824 m²



Hands-On: Part A Start Processing

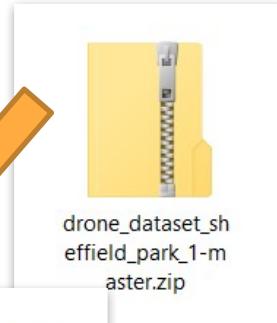
Download Sample Data

- https://github.com/pierotofy/drone_dataset_sheffield_park_1/tree/master
- <https://tinyurl.com/sheffield-bb>

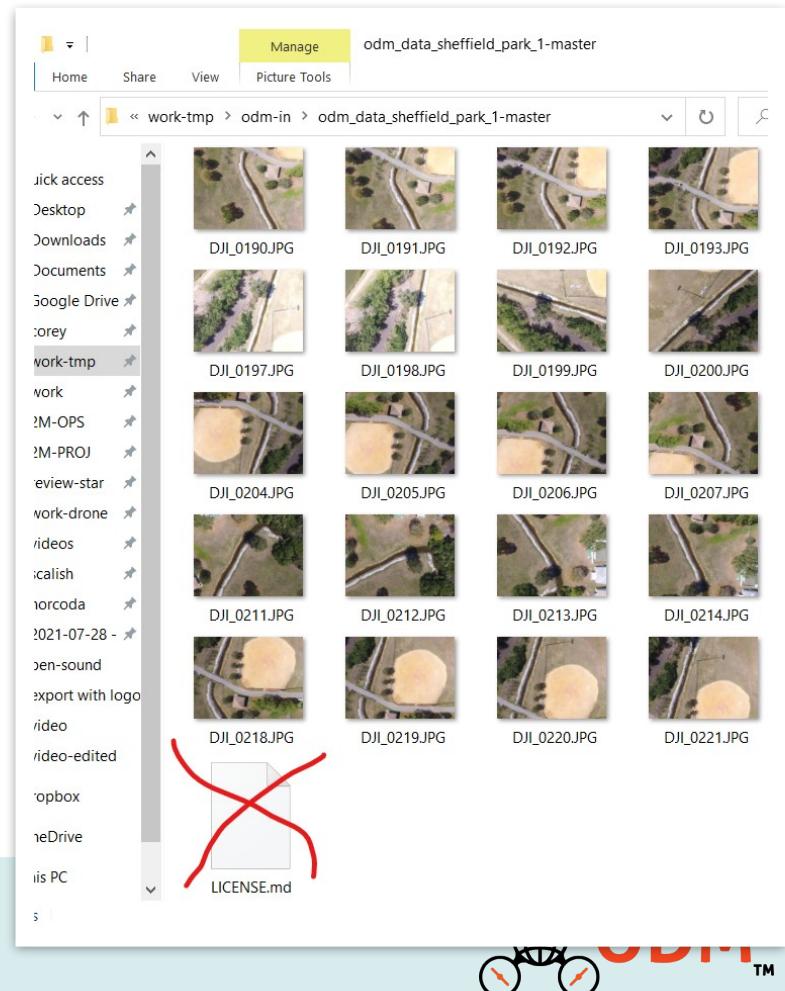
A screenshot of a GitHub repository page for `pierotofy / drone_dataset_sheffield_park_1`. The page shows a list of files uploaded by `pierotofy`, all added via upload. A green 'Code' button with a downward arrow is highlighted with a red circle. An orange arrow points from this button to the 'Clone or download' section of the right-hand sidebar.

A screenshot of the GitHub 'Clone or download' sidebar. It includes options for 'Clone with SSH' and 'Use HTTPS'. A red circle highlights the blue 'Download ZIP' button. An orange arrow points from the 'Code' button on the previous screenshot to this 'Download ZIP' button.

Unzip Files



Remove LICENSE.md file



Open crankyserver.com

- Point your browser to:
 - <https://crankyserver.com>
 - Username:
 - FOSS4G_Asia
 - Password:
 - FOSS4G_Asia_2023_Seoul+Geo+BBQ+Soju

Open crankyserver.com

The image shows a screenshot of the WebODM Lightning web application. On the left is a sidebar with navigation links: Dashboard, Diagnostic, Lightning Network, GCP Interface, Processing Nodes, and Administration. The main area is titled "First Project" and shows "2 Tasks". At the top right of the main area is a blue button labeled "+ Add Project", which is circled in red. Below this, there are three buttons: "Select Images and GCP", "Import", and "View Map". A large orange arrow points from the bottom left towards the "+ Add Project" button. In the bottom right corner, a modal dialog box is open with the title "New Project". It has fields for "Name" (containing "Your Surname Here") and "Description (optional)". At the bottom right of the dialog is a blue button labeled "+ Create Project", which is also circled in red.

Add Images

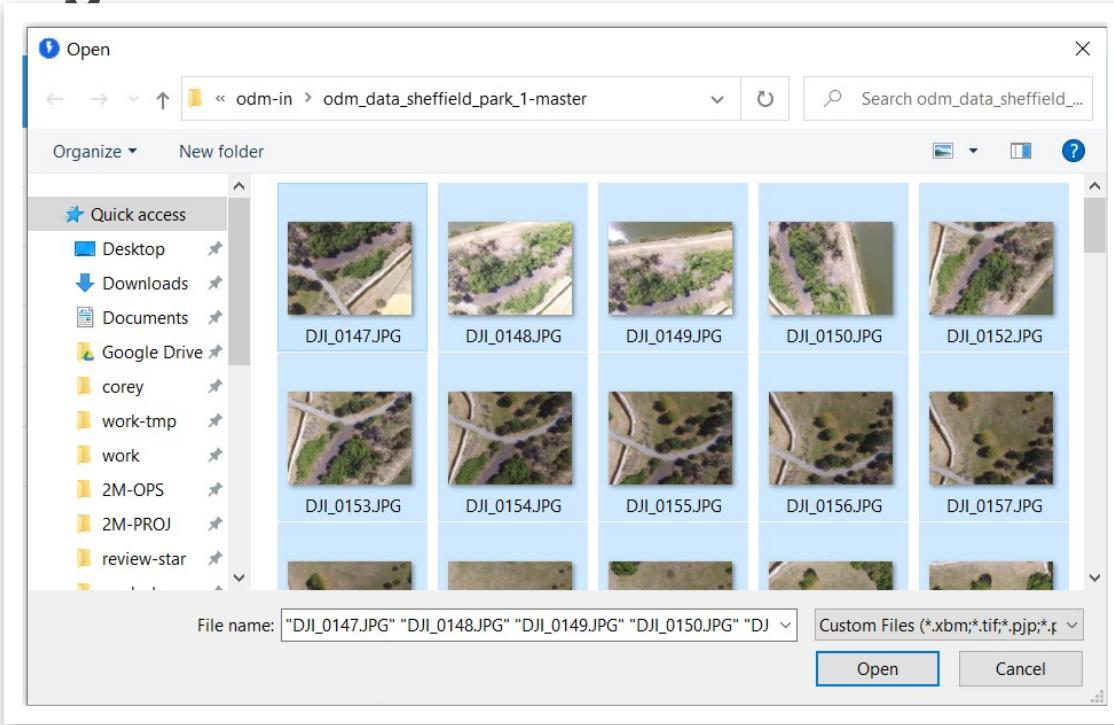
The screenshot shows the WebODM Lightning interface. On the left is a sidebar with icons for Dashboard, Diagnostic, Lightning Network, GCP Interface, Processing Nodes, and Administration. The main area displays three projects:

- UC DroneCamp 2021**: Includes an **Edit** button and a red circle highlighting the **Select Images and GCP** button.
- Test A**: Includes an **12 Tasks** button and an **Edit** button.
- First Project**: Includes an **Edit** button and a **Select Images and GCP** button.

At the top right of the main area are **Add Project**, **Import**, and **View Map** buttons.

Add Images

(No Ground Control Points, today)



Set Configuration

UC DroneCamp 2021

[Edit](#)

77 files selected. Please check these additional options:

Name

Processing Node

Options

Resize Images 2048 px

[Cancel](#) [Review](#)

Set Configuration

77 files selected. Please check these additional options:

Name	Sample Dataset
Processing Node	Auto
Options	DSM + DTM
Resize Images	<input type="text" value="px"/> px <ul style="list-style-type: none">(Custom)DefaultHigh ResolutionFast OrthophotoDSM + DTMForestPoint of InterestBuildings3D ModelVolume Analysis

Edit ▾

Cancel **Review**



Set Configuration

77 files selected. Please check these additional options:

Name	Sample Dataset
Processing Node	Auto
Options	DSM + DTM Edit
Resize Images	No No

A red arrow points from the text "Please check these additional options:" to the "No" dropdown menu for "Resize Images".

Cancel Review

Start Processing

77 files selected. Please check these additional options:

Name Sample Dataset

Processing Node Auto

Options DSM + DTM ▾ Edit

Resize Images No ▾

77 files selected. Please check these additional options:

Name Sample Dataset

Processing Node Auto

Options dsm:true, dtm:true

Resize Images No ▾

Cancel

Start Processing

Processing Status

UC DroneCamp 2021

1 Tasks ▾ Edit

Sample Dataset 77 -- : -- : --

Uploading images to processing node

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

Task Output: On Off

Cancel Delete

The status bar at the bottom left shows: FOSS4G ASIA

A red circle highlights the "Uploading images to processing node" message, and a red arrow points from the status bar to the "On" button.

Running

UC DroneCamp 2021

☰ 1 Tasks ▾ [Edit](#)

[Select Images and GCP](#) [Import](#) [View Map](#)

[Sample Dataset](#) 77 00:00:22 Running

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

```
2021-07-26 10:34:40,377 INFO: Extracting EXIF for DJI_0158.JPG
2021-07-26 10:34:40,435 INFO: Extracting EXIF for DJI_0170.JPG
2021-07-26 10:34:40,489 INFO: Extracting EXIF for DJI_0208.JPG
2021-07-26 10:34:40,544 INFO: Extracting EXIF for DJI_0176.JPG
2021-07-26 10:34:40,602 INFO: Extracting EXIF for DJI_0213.JPG
2021-07-26 10:34:40,658 INFO: Extracting EXIF for DJI_0185.JPG
2021-07-26 10:34:40,718 INFO: Extracting EXIF for DJI_0156.JPG
2021-07-26 10:34:40,775 INFO: Extracting EXIF for DJI_0149.JPG
[INFO]    running /code/SuperBuild/install/bin/opensfm/bin/opensfm detect_features "/var/www/data/eat...
```

[Download](#) [More](#)

[Cancel](#) [Delete](#)

Outputs

2D Ortho

Dashboard - WebODM Lightning

File View Tools Help

WebODM Lightning

+ Add Project

Dashboard Diagnostic Lightning Network GCP Interface Processing Nodes Administration

UC DroneCamp 2021

1 Tasks Edit

Sample Dataset 77 00:16:14 Completed Task Output: On Off

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

Download Assets View Map View 3D Model Restart Delete Edit

Test A

12 Tasks Edit

Select Images and GCP Import View Map

First Project

Edit

Select Images and GCP Import View Map

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

Download Assets View Map View 3D Model Restart Delete Edit

Test A

12 Tasks Edit

Select Images and GCP Import View Map

First Project

Edit

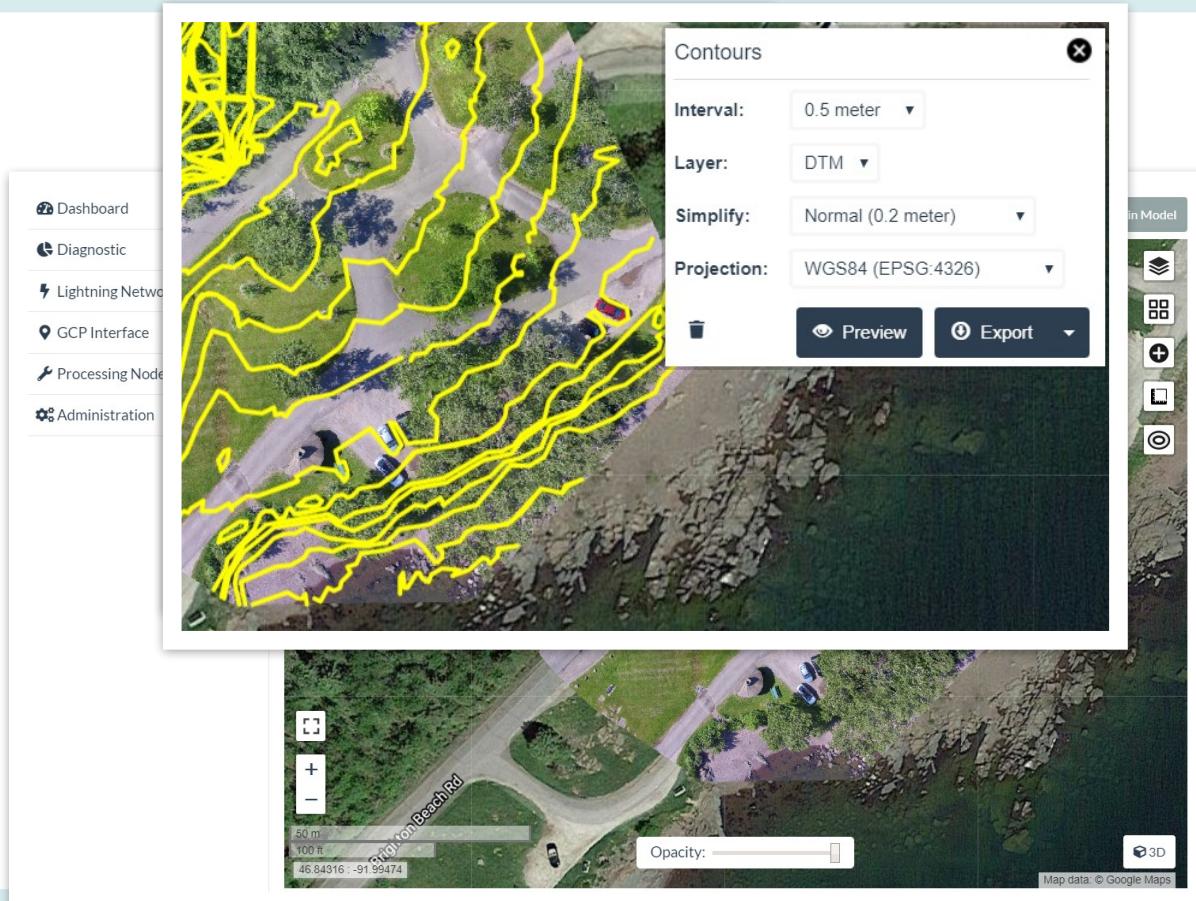
Select Images and GCP Import View Map

2D Orthophoto

- Overlay on Google Map, OpenStreetMap, etc
- Measurements (linear, area, volume)
- Contour Lines

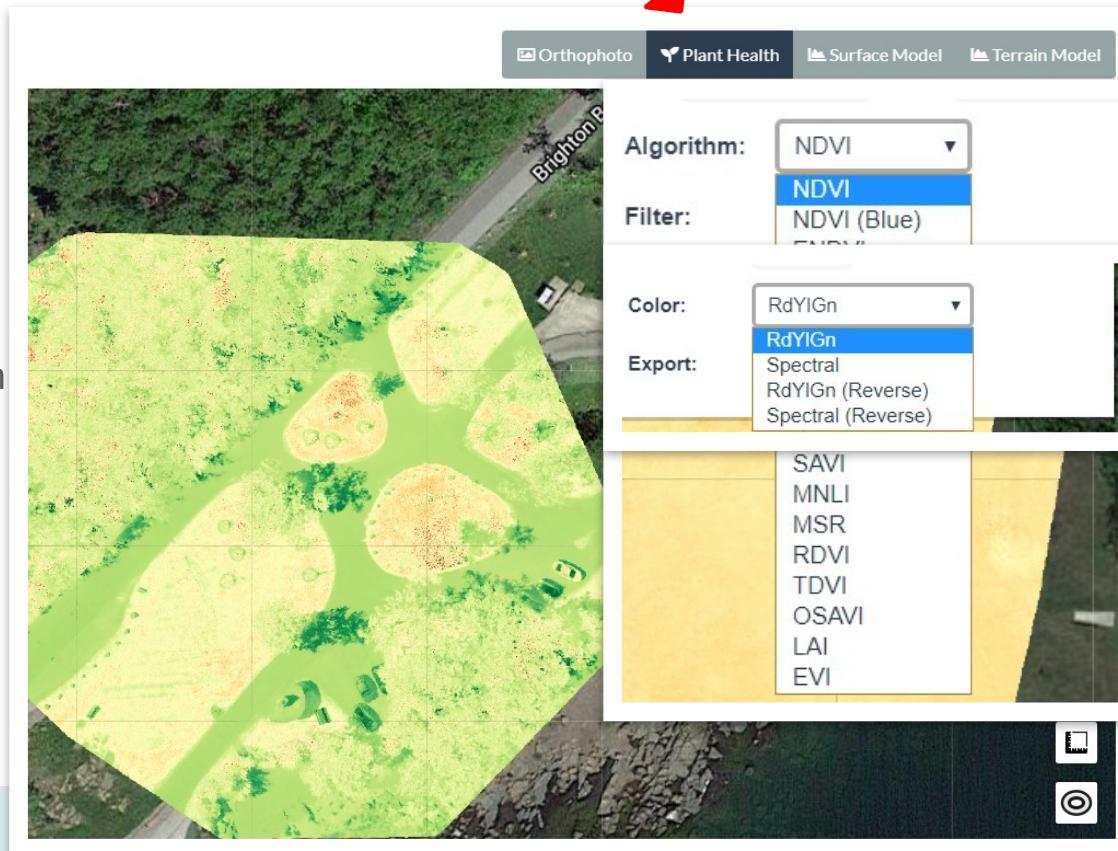
✉ QGIS/ArcGIS

✉ Object detection/counting via FieldMapR, rastervision.io



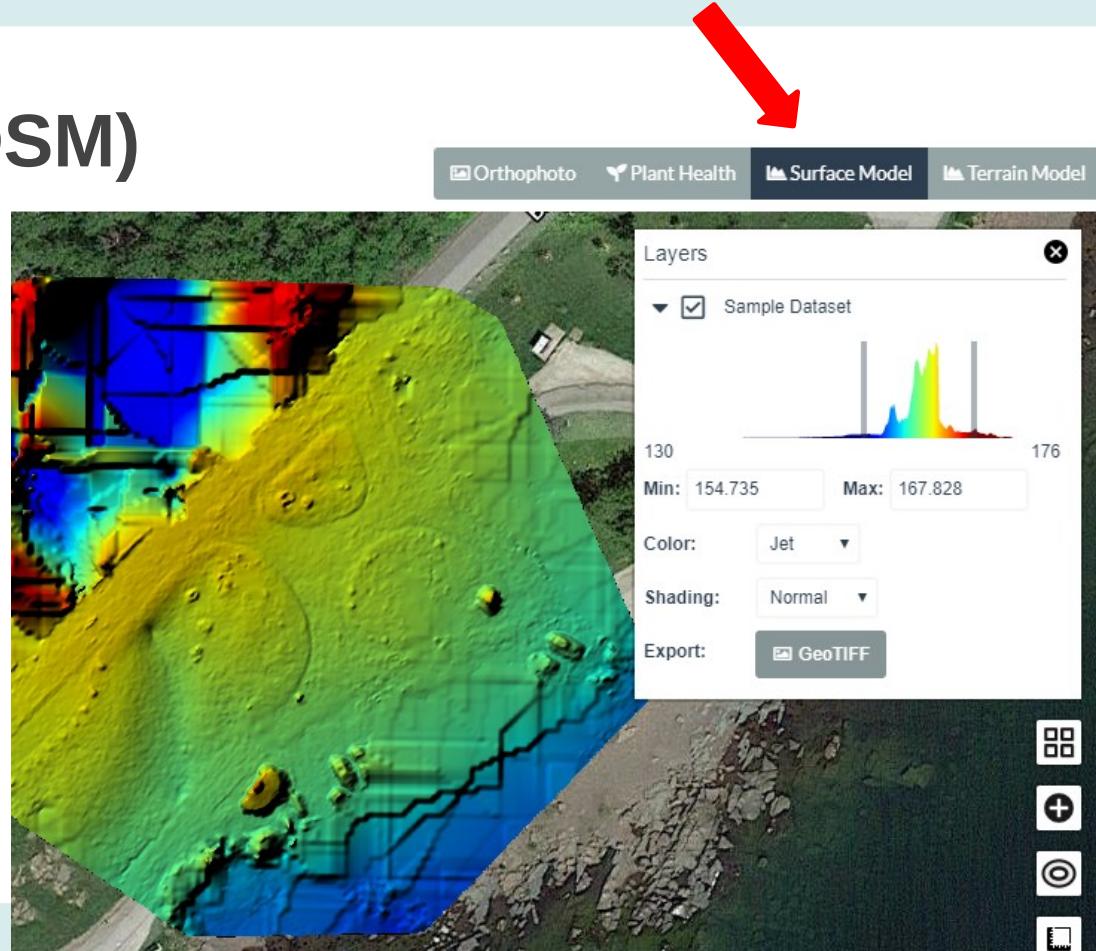
Plant Health Index

- Images from multi-spectral cameras (Micasense, Sentera, etc)
- Wavelengths beyond visible spectrum
- Algorithms:
NDVI, RDVI, GLI, SAVI, more



2D Surface Model (DSM)

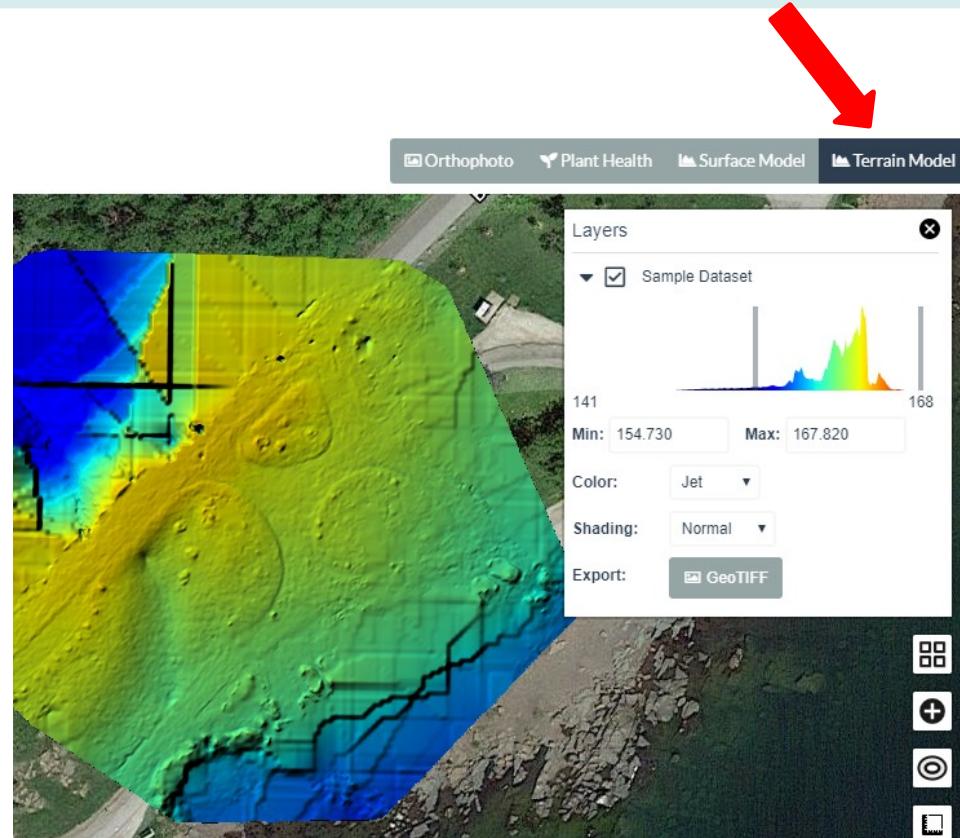
- Highlights surface altitude
- Adjustable color ramps
- Export GeoTIFF



2D Terrain Model (DTM)

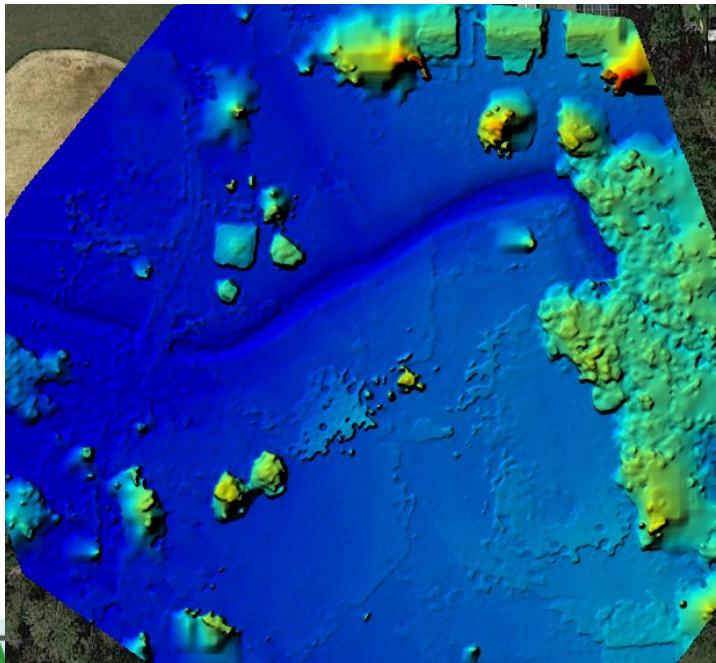
“The DSM without the trees and buildings”

- Uses point classification to remove objects from the surface model
- Ground (terrain) profile
- Contour lines

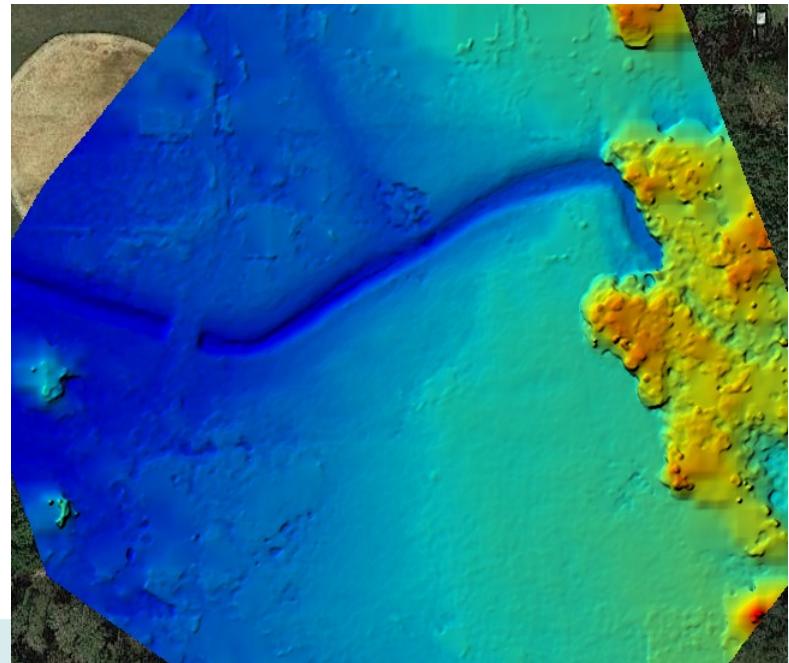


2D Terrain Model (DTM)

DSM



DTM



3D Model

Dashboard - WebODM Lightning

File View Tools Help

WebODM Lightning

+ Add Project

- Dashboard
- Diagnostic
- Lightning Network
- GCP Interface
- Processing Nodes
- Administration

UC DroneCamp 2021

1 Tasks Edit

Sample Dataset

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

77 00:16:14 Completed Task Output: On Off

Download Assets View Map View 3D Model Restart Delete Edit

Test A

12 Tasks Edit

Select Images and GCP Import View Map

First Project

Edit

Select Images and GCP Import View Map

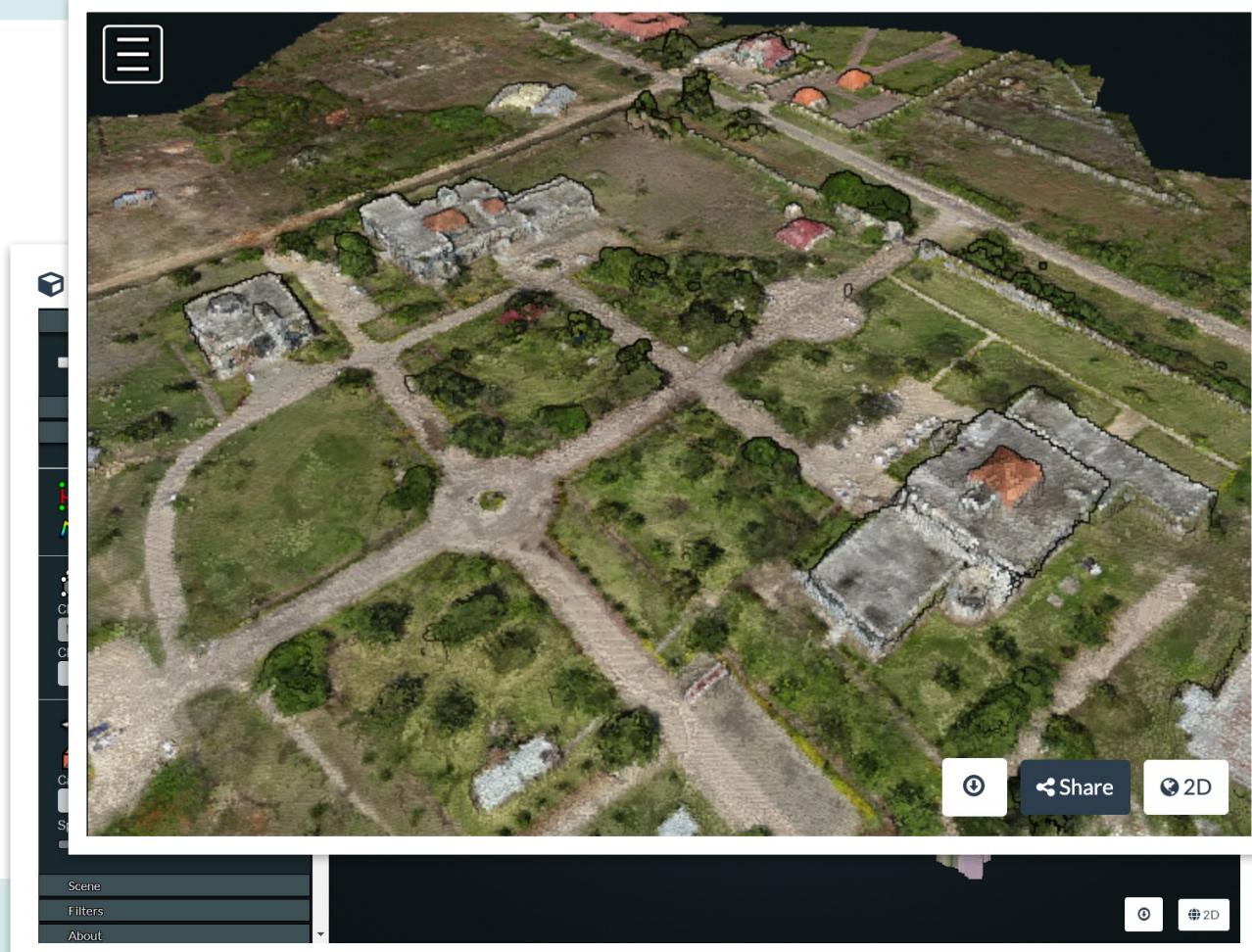


Point Cloud

- Individual points
- X, Y, Z
- Measurements

✉️ CloudCompare
for analysis

Image: opendronemap.org

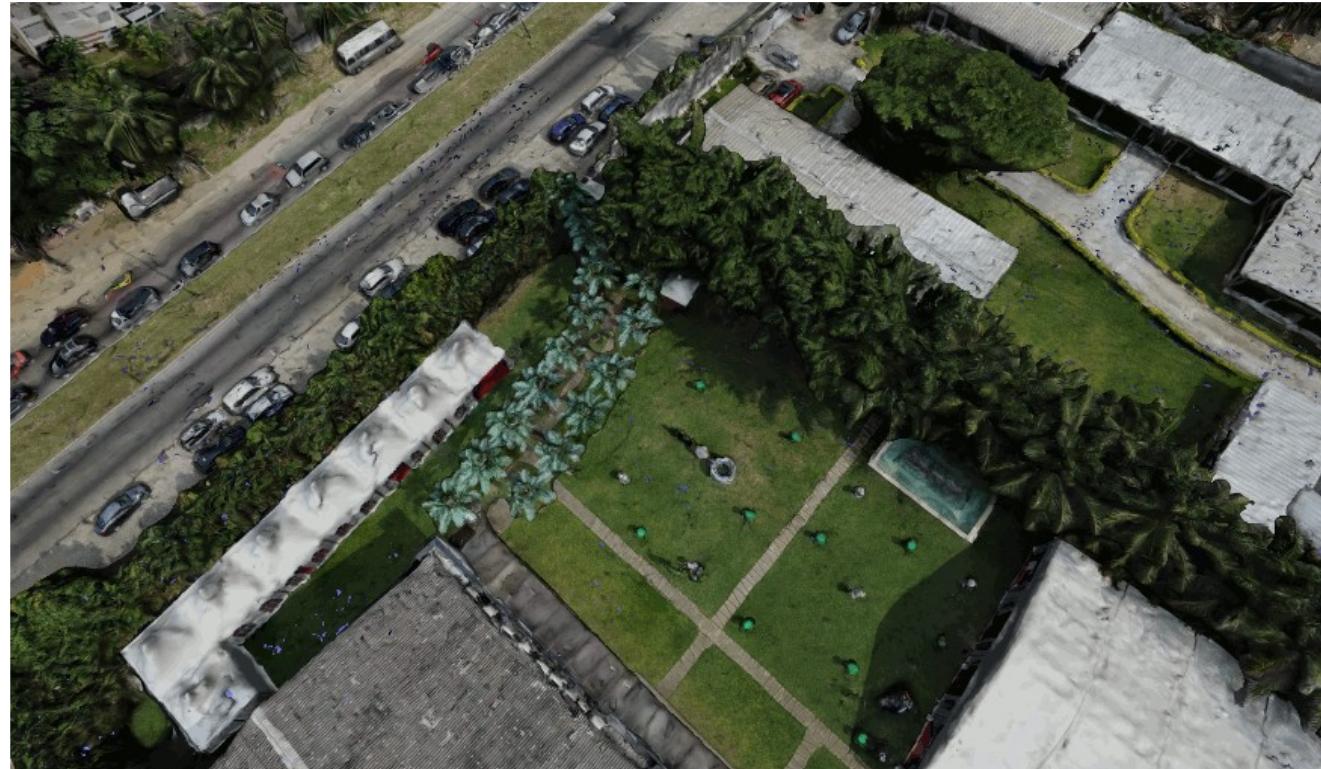


Textured Model

- Identify surface triangles
- Point Cloud -> Surface Mesh

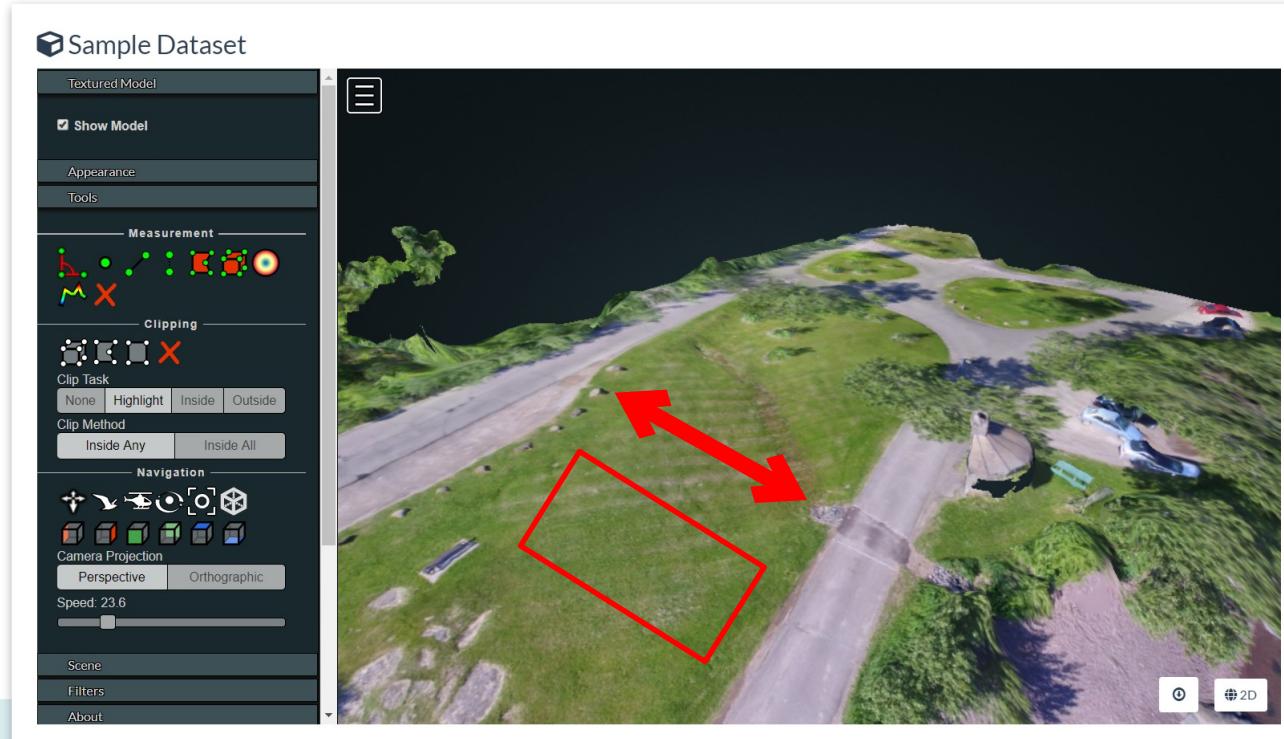
- ✉ Sketchfab, et al for sharing
- ✉ CAD, Blender
- ✉ 3D print

Image: opendronemap.org



3D Measurements

- Linear
- Area
- Angle
- Height
- Height Profile
- Volume



Download

- Orthophoto (GeoTIFF)
- Terrain Model / DTM (GeoTIFF)
- Surface Model / DSM (GeoTIFF)
- 3D Point Cloud (.laz)
- 3D Textured Model (.obj)
- Camera Parameters
- Quality Report
- Everything (all.zip)

The screenshot shows the WebODM Lightning interface. On the left is a sidebar with links: Dashboard, Diagnostic, Lightning Network, GCP Interface, Processing Nodes, and Administration. The main area displays two projects:

- UC DroneCamp 2021**: Created on 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Status: Completed. Buttons: Download Assets, View Map, View 3D Model, Restart, Delete.
- First Project**: Tasks: 1. Buttons: Select Images and GCP, Import, View Map.

A large red arrow points to the "Download Assets" button for the "First Project".

Using ODM

Supported Systems

- Windows 10 (Docker, or native)
- Ubuntu Linux (Docker, or native)
- MacOS
- 16+ GB RAM (more is better)
- 50+ GB Disk (more is better)

Ways to Use ODM

- WebODM – most common
 - Manual (free)
 - or, Installer (\$)
- WebODM Lightning – easiest
 - Process on Lightning servers (\$)
- Command Line ODM
- API (NodeODM)
- LiveODM (USB or DVD) (\$)
- Portable OpenStreetMap (POSM)

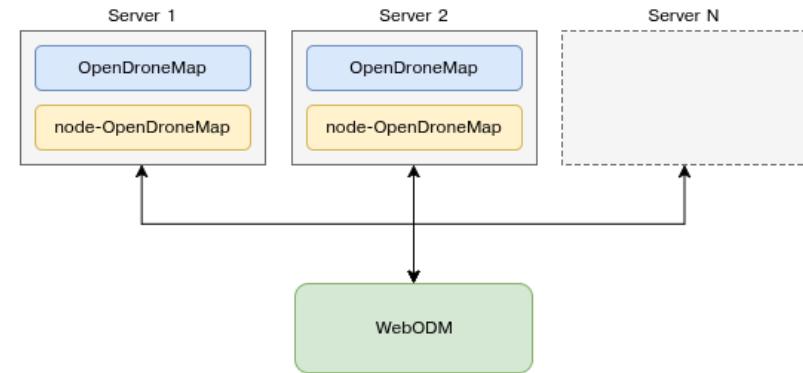


Image: opendronemap.org

Common Problems

- Many paths to get started with ODM.
 - Where to start?
 - All require some work
- Jumping in with a large dataset (start small!)
- System resources
 - Machine spec
 - Docker allocations
- Processing is hung (or is it?)
- Processing failed, but not sure why
- Output quality vs. expectation

Large Datasets

- Split/Merge
- ClusterODM

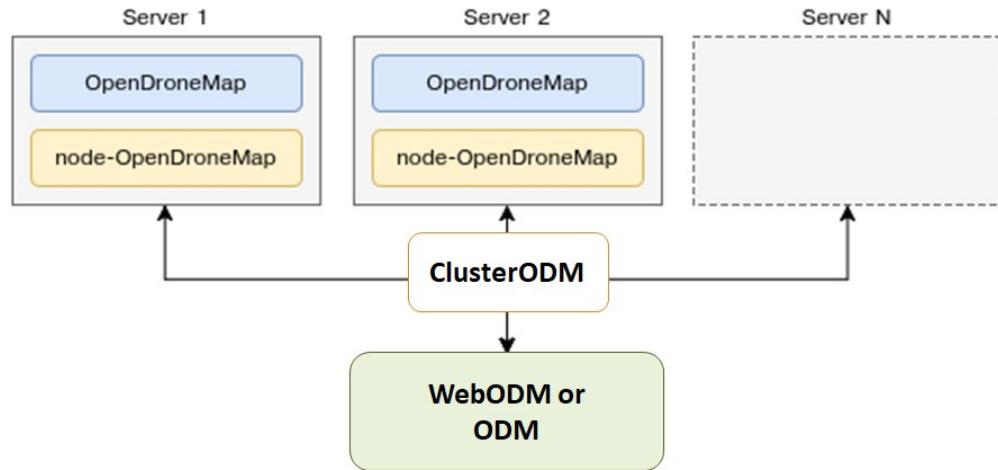
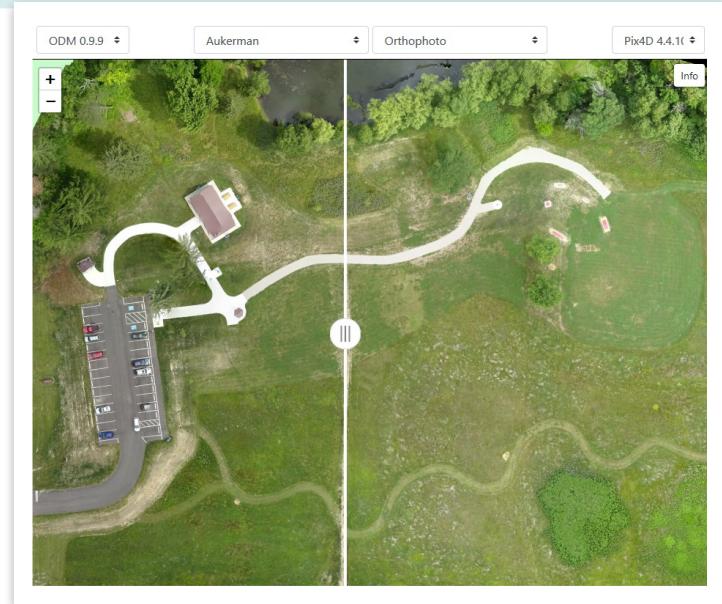


Image: opendronemap.org

Output Quality

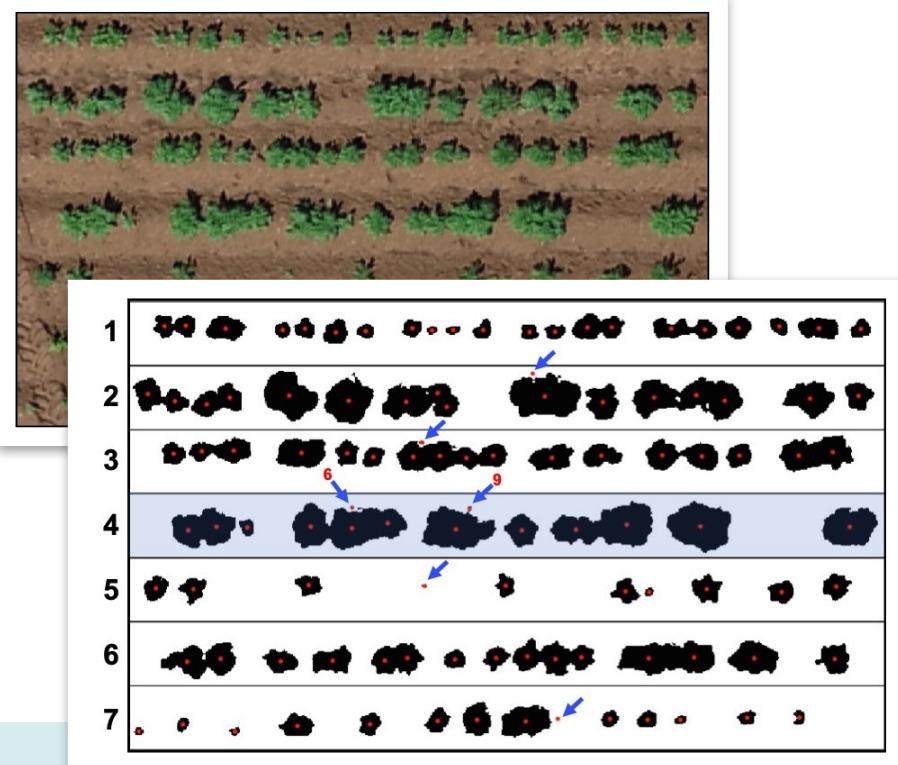
- Comparable to commercial products
- Commercial output quality can be better with:
 - Default settings
 - Poor flight coverage
- ODM produces comparable quality with:
 - Sometimes with default settings
 - Often with tuned settings
 - Good flight coverage (overlap, multiple POV)



<https://opendronemap.github.io/UAVArena/>

Object Detection, Counting, Analysis

- Documented workflows using external tools (not within ODM)
- FIELDimageR
 - “A Tool to Analyze Orthomosaic Images From Agricultural Field Trials in R”
 - <https://www.opendronemap.org/fieldimager/>
- rastervision.io



Summary

Output Summary

- 2D outputs
 - Orthophoto
 - Terrain/Surface Models
 - Plant Health
- 3D outputs
 - Point cloud
 - Textured mesh

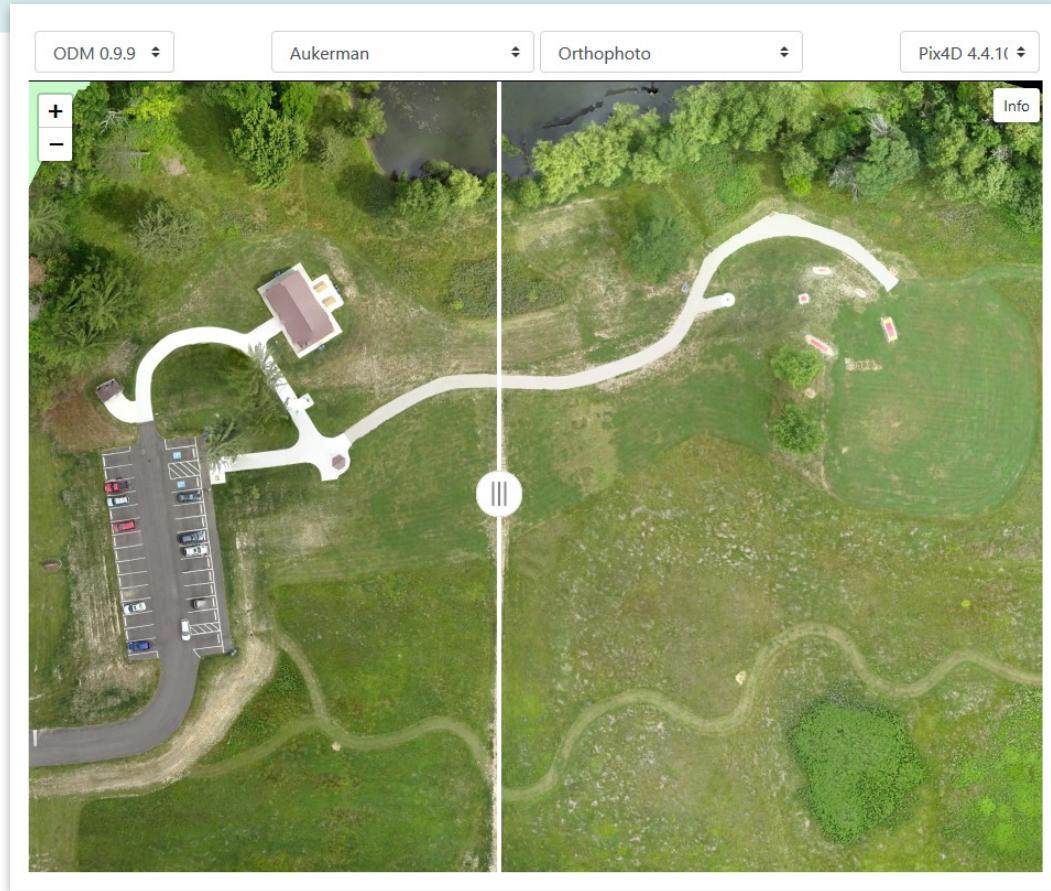
ODM Summary

- ODM is Open Source, with benefits in
 - Cost
 - Control
 - Community
 - Infrastructure
- Output quality is comp

Learning More

UAV Arena

- Compare Outputs
 - ODM
 - Pix4D
 - DroneDeploy
 - Agisoft Metashape
 - DroneMapper



ODM Docs

<https://docs.opendronemap.org>

- Installation and Getting Started
- Tutorials
- Options and Flags
- OpenDroneMap Outputs
- Ground Control Points
- Splitting Large Datasets
- Additional References
- Flying Tips
- Multispectral Support
- How To Request Features
- How To Contribute

ODM Book

<https://odmbook.com>
~\$30



Community Forum

<https://community.opendronemap.org>

OpenDroneMap

This is the community forum of [OpenDroneMap](#). Ask questions, discuss new features and meet fellow mappers. If you want to request a new channel, just [request a new community space](#).

Want to create a new channel? Just [request a new community space](#).

[all categories](#) [Categories](#) [Latest](#) [New \(93\)](#) [Unread \(24\)](#) [Top](#)

Online (2): A B

Category	Topics	Lastest
The Hangar New to the forum? Come say hi! Introductions Events Off Topic	58 2 unread 3 new	 What may cause this sc... WebODM
ODM Use this category to post questions about usage, features, or anything else ODM related.	288 1 unread 22 new	 ★Let's Get Stuff Funded [Quadratic Funding] The Hangar
WebODM Questions and discussions related to WebODM. Use this category to ask questions or propose new features.	797 10 unread 45 new	 ClusterODM with HAHO The Hangar
ClusterODM An area to discuss use of ClusterODM	6 1 new	 Image is deformed? WebODM
NodeMICMAC	3	 WebODM lightning to local WebODM to view 3D model doesn't work WebODM

I can't generate orthophoto and dtm with GCPs

Hubertus_Paetow 5d

It seems that you try to process a small object where GCPs are not very useful. I processed your dataset using the 3d-object-preset without a problem. Here is the result shown as a textured 3d-model.

Task of 2020-06-06T05:06:53.101Z



2   ... 

Vande93 5d

Hi Hubertus and thank you. I've tried also with a larger dataset, but the result was the same. With all datasets that I've used, I've obtained textured and scaled 3d models, the only problem is in the raster files, the dtm and orthophoto... and I don't know why because the GCP file is correctly read. So do you think that

5 7h

3 13h

Hands-On: Part B

Working with Outputs

WebODM vs. WebODM Lightning

- WebODM
 - Install for free
 - Process locally for free
- WebODM Lightning
 - Commercial service
 - Install for free
 - Process in the cloud (\$)

Still Running?

Sample Dataset

77 00:05:37 Running

Created on: 7/26/2021, 6:28:41 AM

Processing Node: Lightning (auto)

Options: dsm: true, dtm: true

```
2021-07-26 10:39:24,867 DEBUG: Undistorting image DJI_0206.JPG
2021-07-26 10:39:25,543 DEBUG: Undistorting image DJI_0224.JPG
[INFO]    running /code/SuperBuild/install/bin/opensfm/bin/opensfm export_visualsfm --points "/var/www/data/eabd93a0-e184-4f3c-83d2-0a2a2a2a2a2a"
[INFO]    Finished opensfm stage
[INFO]    Running openmvs stage
[INFO]    running /code/SuperBuild/install/bin/opensfm/bin/opensfm export_openmvs "/var/www/data/eabd93a0-e184-4f3c-83d2-0a2a2a2a2a2a"
[INFO]    Running dense reconstruction. This might take a while.
[INFO]    Estimating depthmaps
[INFO]    running /code/SuperBuild/install/bin/OpenMVS/DensifyPointCloud "/var/www/data/eabd93a0-e184-4f3c-83d2-0a2a2a2a2a2a"
```

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[Cancel](#) [Delete](#)

Finished

Today, Speed > Quality

The screenshot shows the WebODM Lightning interface with a sidebar menu and a main dashboard area displaying three completed projects.

Left Sidebar:

- Dashboard
- Diagnostic
- Lightning Network
- GCP Interface
- Processing Nodes
- Administration

Main Dashboard Area:

- UC DroneCamp 2021:** Created on: 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Status: Completed. Buttons: Download Assets, View Map, View 3D Model, Restart, Delete (highlighted with a red arrow).
- First Project A:** 12 Tasks. Buttons: Select Images and GCP, Import, View Map.
- First Project B:** 12 Tasks. Buttons: Select Images and GCP, Import, View Map.

Top Right: Add Project, Select Images and GCP, Import, View Map.

Exercises – 2D Orthophoto

The screenshot shows the WebODM Lightning software interface. On the left is a sidebar with icons for Dashboard, Diagnostic, Lightning Network, GCP Interface, Processing Nodes, and Administration. The main area displays three project cards:

- UC DroneCamp 2021**: Status: Completed (green bar). Created on: 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Buttons: Download Assets, View Map, View 3D Model, Restart, Delete, Edit.
- Test A**: Status: In Progress (yellow bar). Created on: 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Buttons: Select Images and GCP, Import, View Map, Edit.
- First Project**: Status: In Progress (yellow bar). Created on: 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Buttons: Select Images and GCP, Import, View Map, Edit.

A large red arrow points to the "Edit" button for the "Test A" project card.

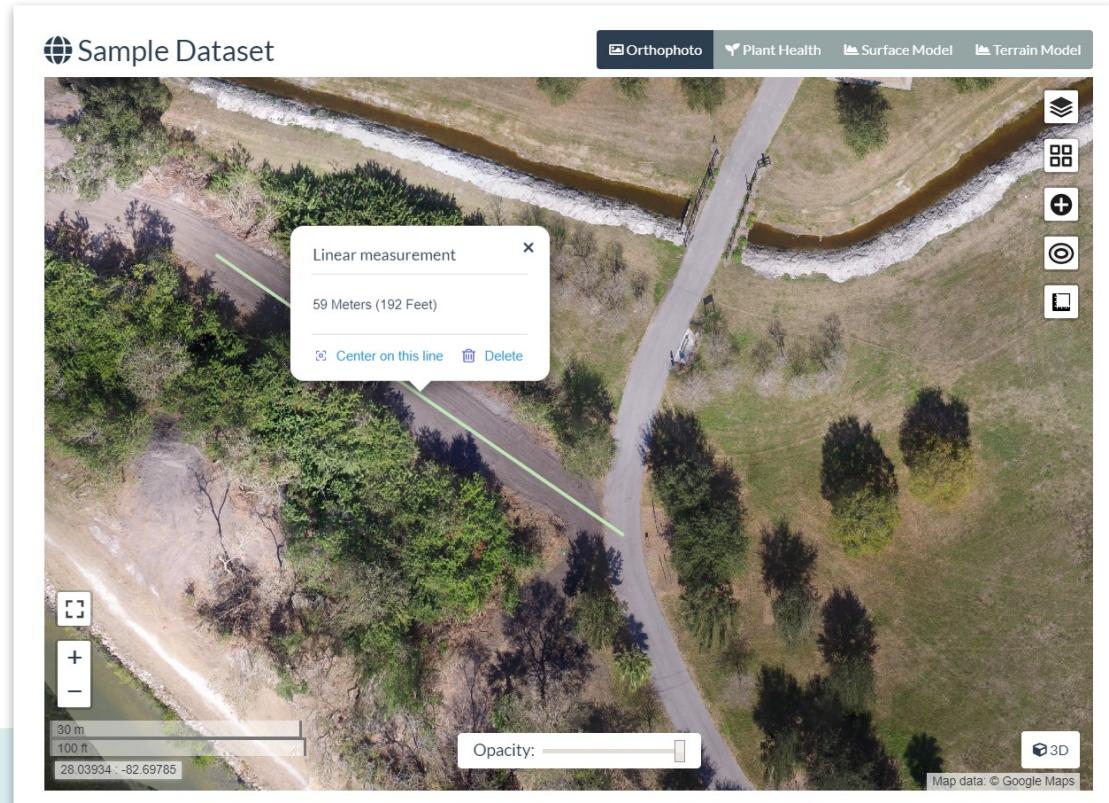
#1 – Orthophoto - Navigate

- A. Click+hold = move map
- B. Scroll wheel = zoom in/out
- C. Map controls +/- = zoom
- D. Map control square = full screen
- E. Top buttons:
 - A. Ortho
 - B. Plant Health
 - C. Surface Model
 - D. Terrain Model



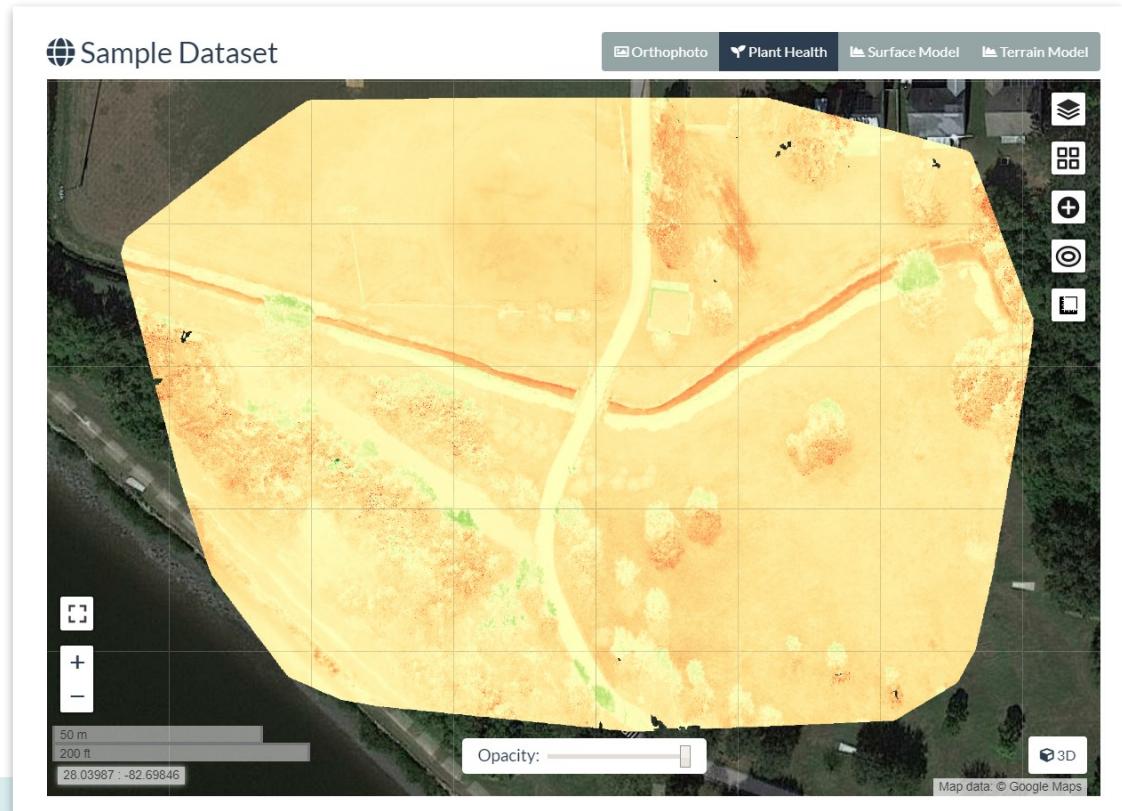
#2 – Orthophoto - Measure

- A. Click ruler (5th on right)
- B. Create new measurement
- C. Click 2 points on map
- D. Click “Finish measurement”
- E. View calculations in white balloon
- F. Close balloon with “x”
- G. Click ruler again, new measurement
- H. Click 4 points on map to make a box, click “Finish”
- I. View calculations
- J. Click “Delete” to remove it



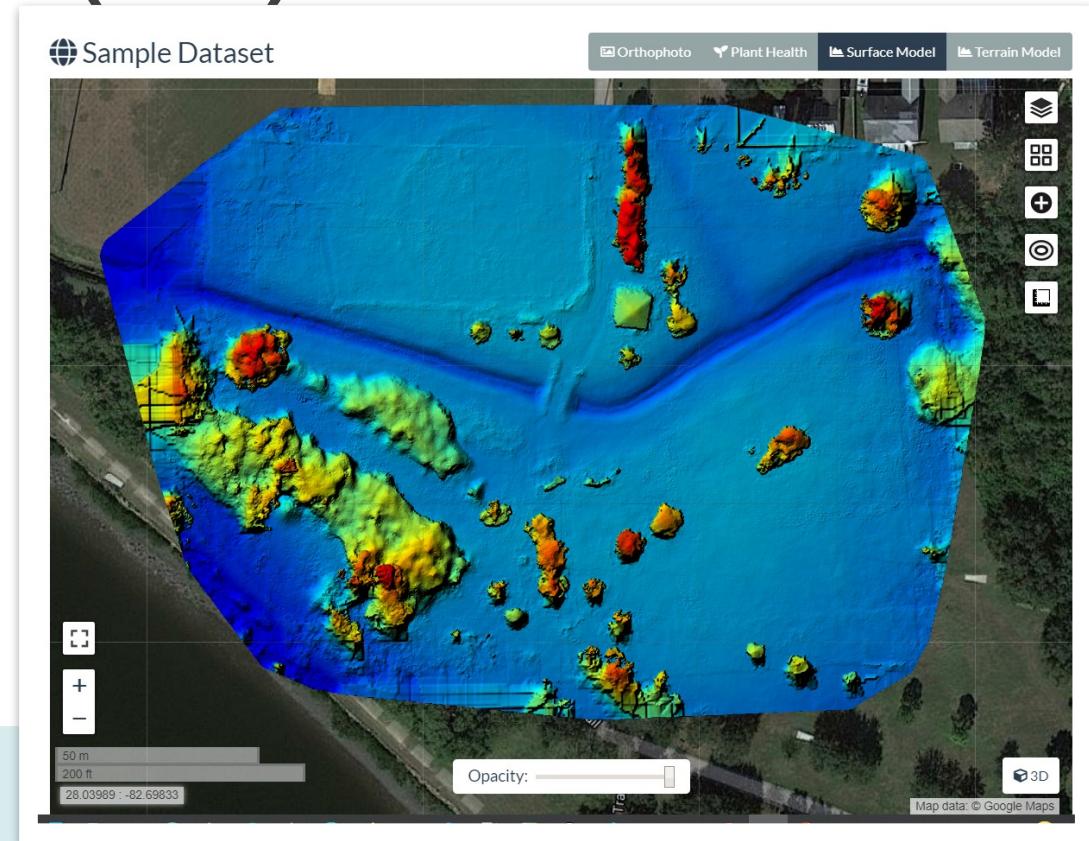
#3 – Plant Health

- A. 2nd Top Button: Plant Health
- B. Note color differences in different grassy areas
- C. Click top right “layers” icon
- D. View “Algorithm” options
- E. View “Color” options
- F. Drag min/max bars
- G. Export GeoTIFF



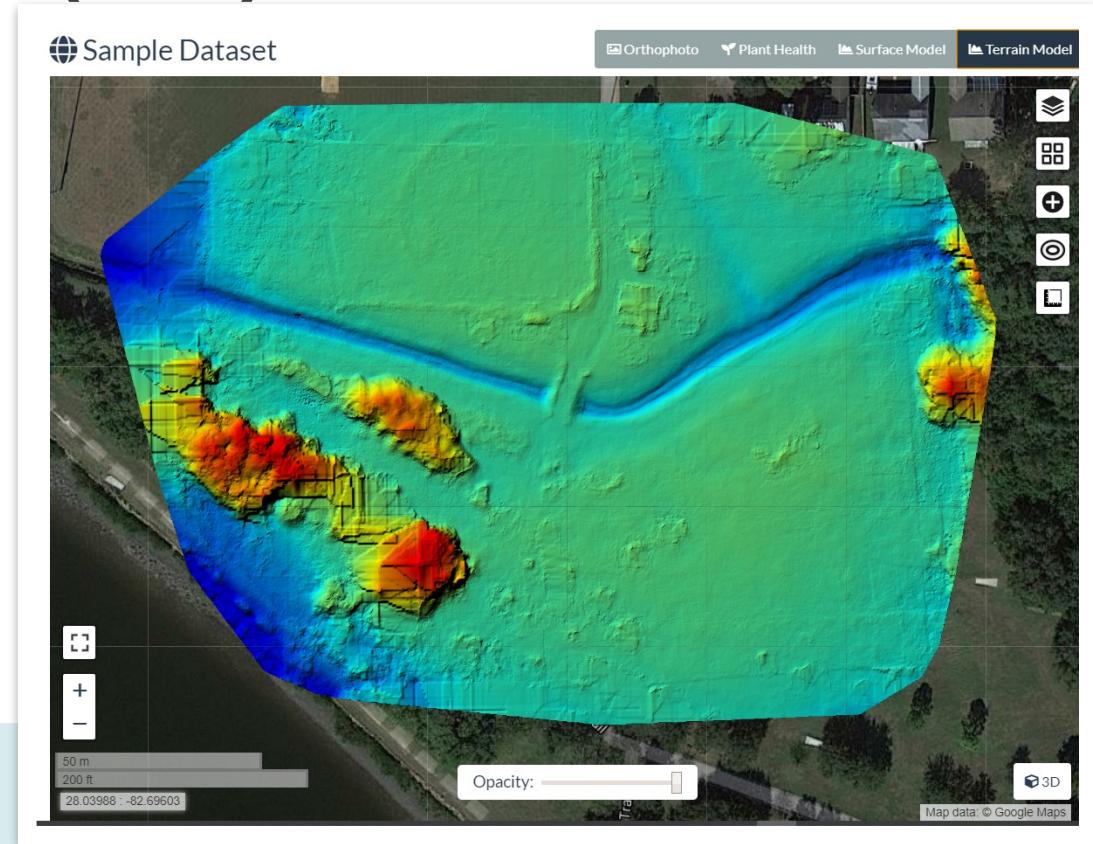
#4 – Surface Model (DSM)

- A. 3rd Top Button: Surface Model
- B. Wait for calc/load
- C. Note color varies by altitude
- D. Click top right “layers” icon
- E. View “Color” options
- F. Drag min/max bars
- G. Wait for refresh
- H. Export GeoTIFF



#5 – Terrain Model (DTM)

- A. 4th Top Button: Terrain Model
- B. Wait for calc/load
- C. Note color varies by altitude
- D. Click top right “layers” icon
- E. View “Color” options
- F. Drag min/max bars
- G. Wait for refresh
- H. Export GeoTIFF

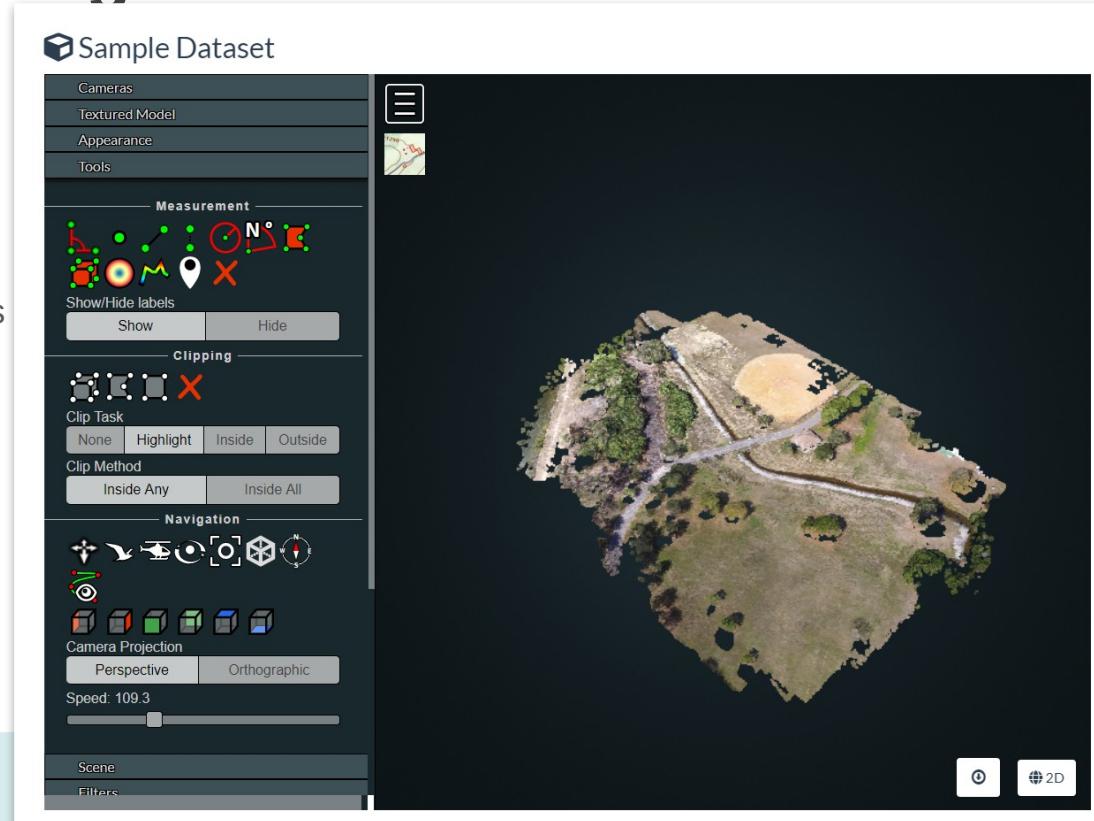


Exercises – 3D Model

The screenshot displays the WebODM Lightning software interface. On the left, a 3D terrain model of a field is shown, overlaid with a color-coded elevation or lightning strike density map. The model includes a grid and a north arrow. A red arrow points from the bottom right towards the 3D model. On the right, a task history list is visible, showing a single entry for a task named "set" completed on 7/26/2021 at 6:28:41 AM. The task details include a log message "mode: Lightning (auto)", parameters "l: true, dtm: true", and a timestamp "00:16:14". Below the task list are three smaller task cards, each with a "Select Images and GCP" button, an "Import" button, and a "View Map" button. The top navigation bar includes "File", "View", "Tools", and "Help" menus, along with tabs for "Orthophoto", "Plant Health", "Surface Model", and "Terrain Model". The title bar shows "Dashboard - WebODM Lightning".

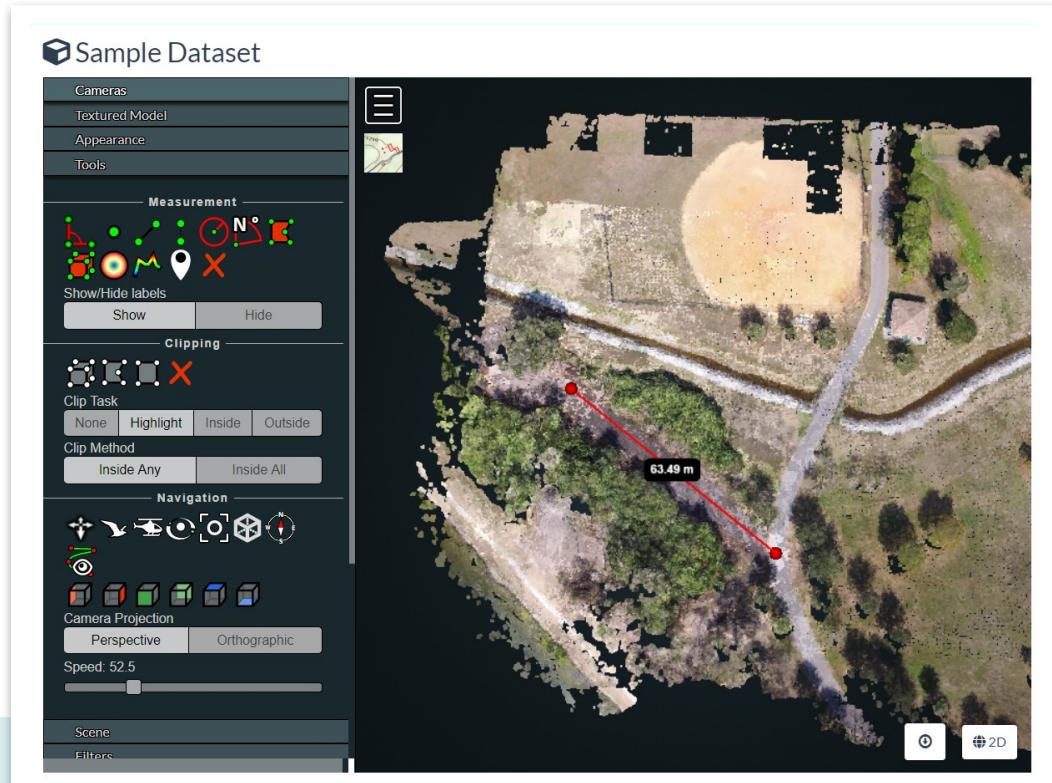
#6 – 3D Model - Navigate

- A. Left click+drag = rotate model
- B. Right click+drag = move model
- C. Scroll wheel = zoom in/out
- D. Top left (3 bars) button = collapse tools
- E. Top left (map) button = show model location
- F. Tools
 - A. Measure
 - B. Navigation
- G. Appearance
- H. Scene



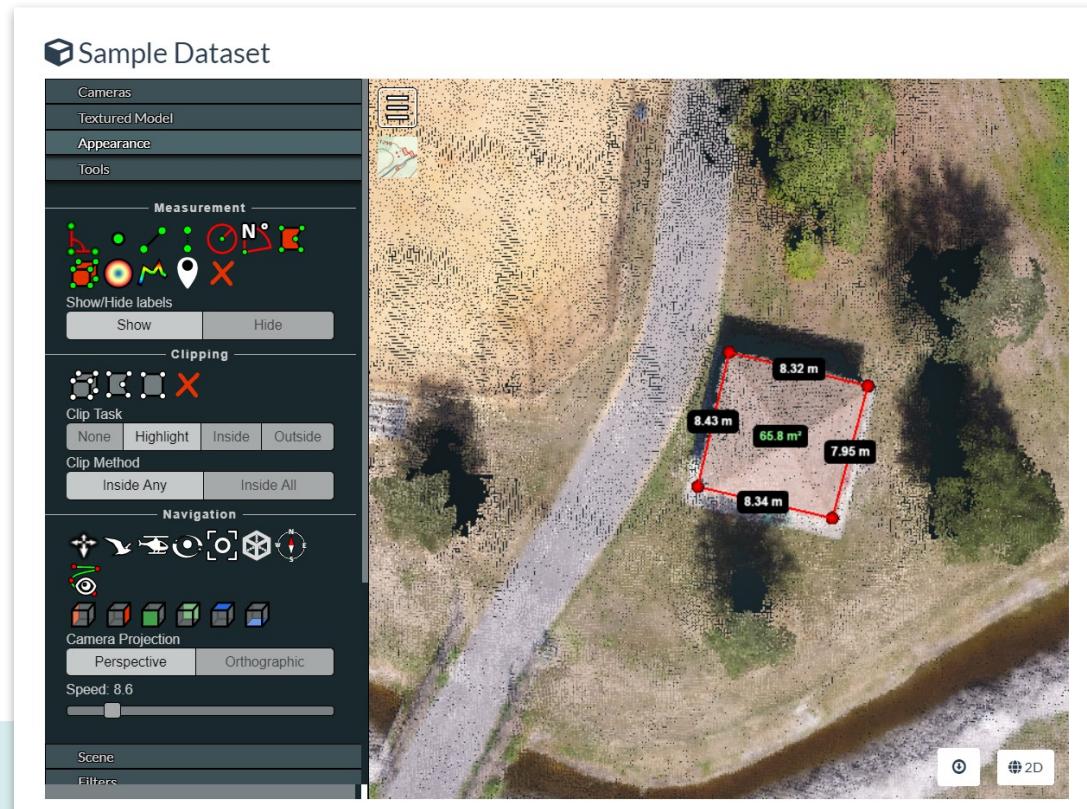
#7 – 3D Model – Measure (Linear)

- A. Adjust the model so you can see
- B. Click 3rd Measurement tool (angled line)
- C. LEFT click 2 points on the map
- D. Now RIGHT click the last point to finish
- E. View measured distance (m)
- F. Click red “X” in measurement tools, to delete



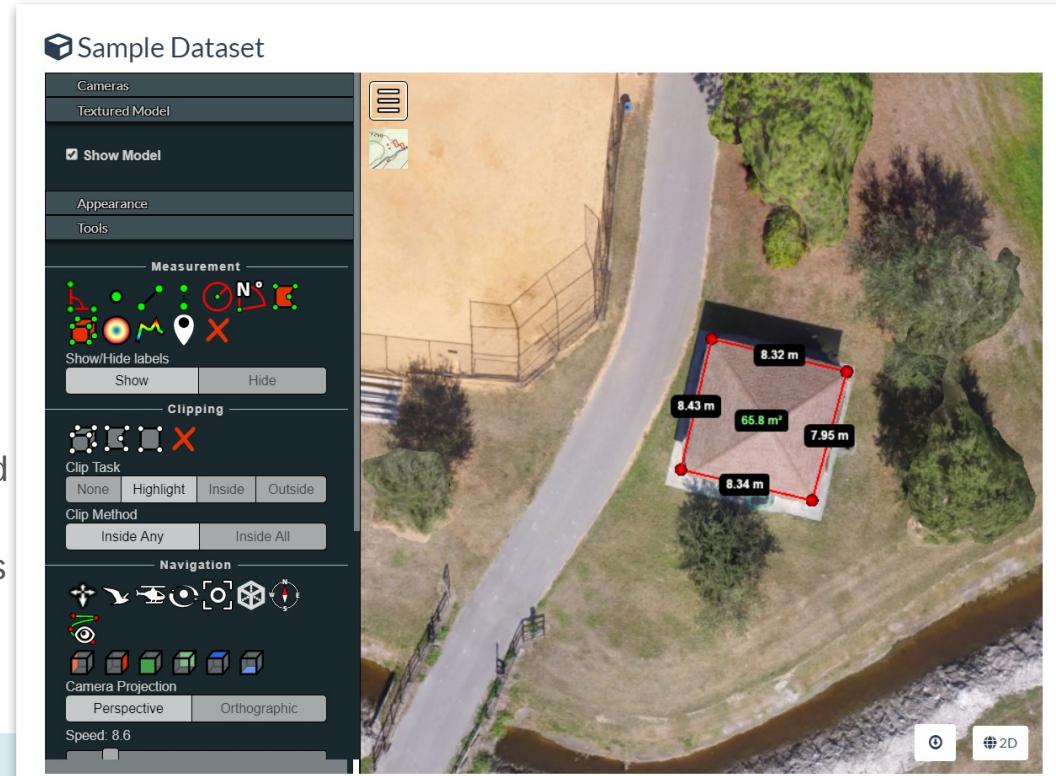
#8 – 3D Model – Measure (Area)

- A. Adjust the model so you can see
- B. Click top right Measurement tool (red box)
- C. LEFT click 4 points on the map
- D. Now RIGHT click the last point to finish
- E. View measured distances (white)
- F. View measured area (green)



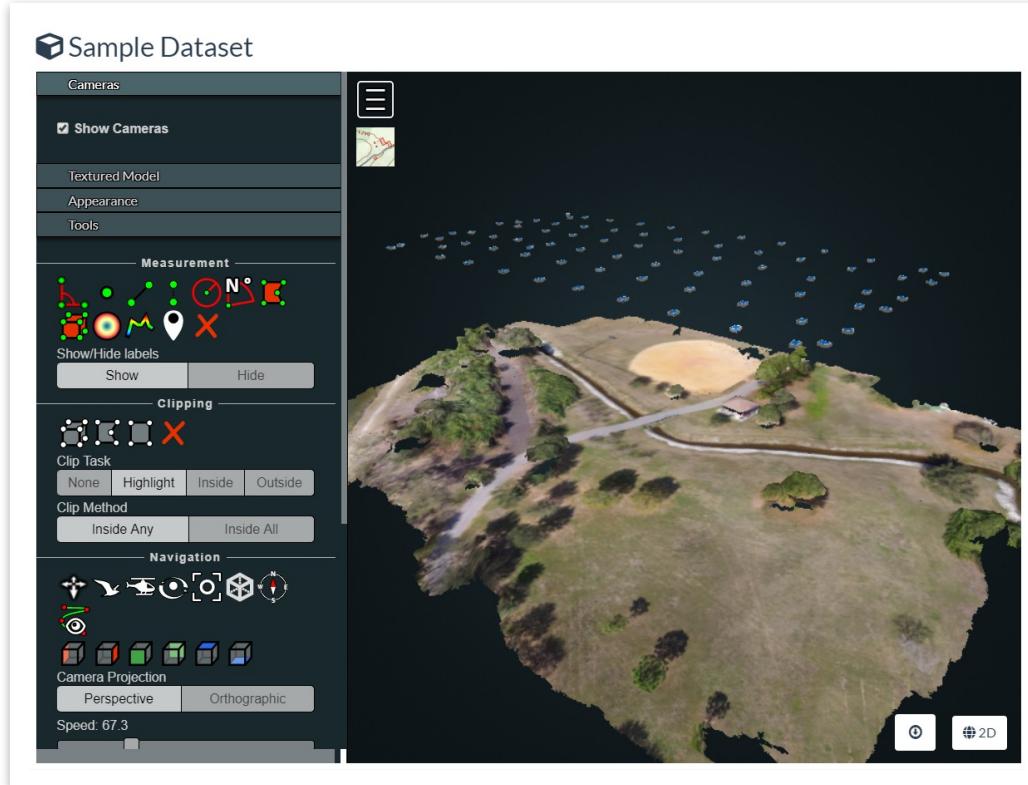
#9 – View Textured Model

- A. Find “Textured Model” near the top of the tool menu
- B. Click to expand, then click “Show Model”
- C. Wait a few seconds
- D. View how the scene becomes more detailed, holes are filled
- E. Uncheck and check the box to turn off, and on
- F. Move the model around to view other parts
- G. Edges of model = lots of error
Interior of model = better precision

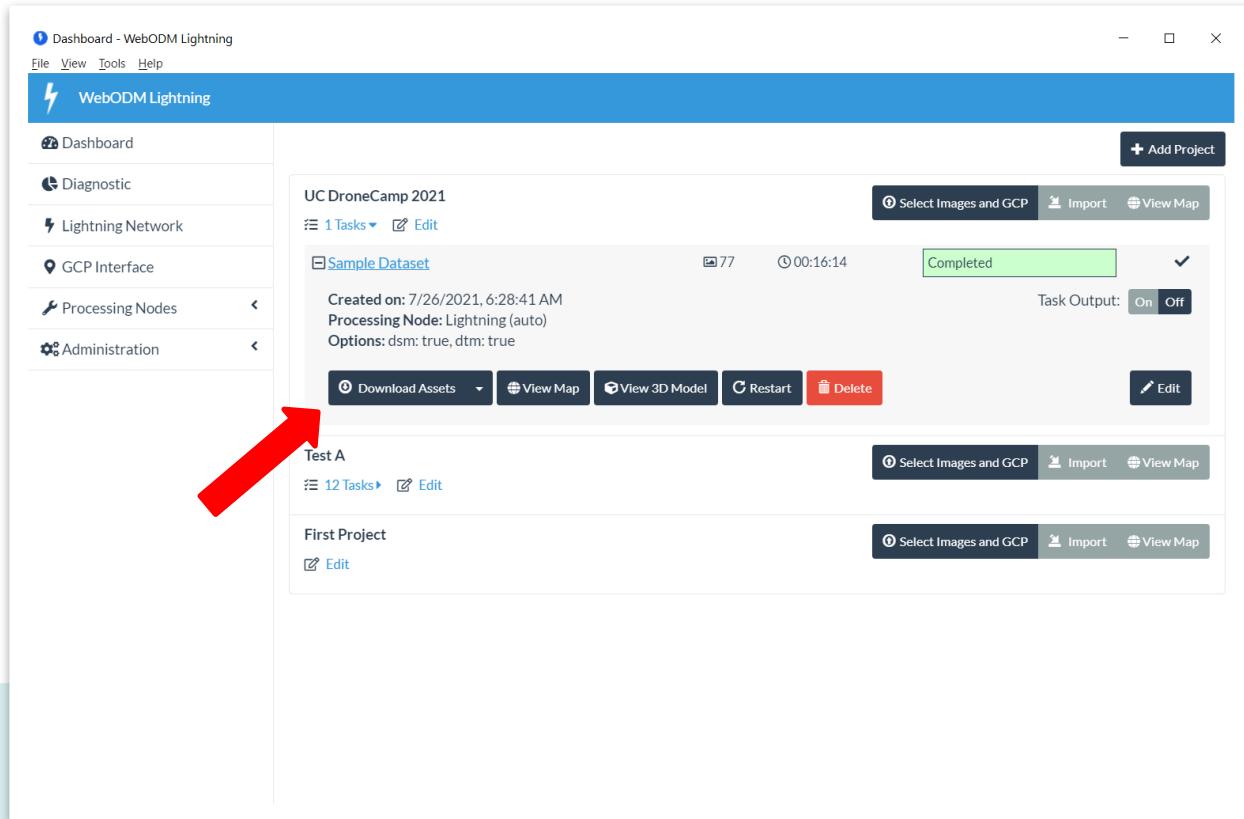


#10 – View Cameras

- A. Find “Cameras” near the top of the tool menu
- B. Click to expand, then click “Show Cameras”
- C. Zoom out (scroll) until you see the blue squares floating above the scene
- D. Note positions, angles of cameras
- E. Click one camera to see the photo from that position



Exercises – Download



The screenshot shows the WebODM Lightning dashboard interface. On the left, a sidebar menu includes: Dashboard, Diagnostic, Lightning Network, GCP Interface, Processing Nodes (with a dropdown arrow), and Administration. The main content area displays three projects:

- UC DroneCamp 2021**: Created on 7/26/2021, 6:28:41 AM. Processing Node: Lightning (auto). Options: dsm: true, dtm: true. Status: Completed (green bar). Task Output: Off. Buttons: Download Assets (dropdown), View Map, View 3D Model, Restart, Delete, Edit.
- Test A**: 12 Tasks. Buttons: Select Images and GCP, Import, View Map.
- First Project**: Buttons: Select Images and GCP, Import, View Map.

A large red arrow points from the bottom left towards the "Download Assets" button for the first project.

#11 – Download Specific Outputs

UC DroneCamp 2021

1 Tasks ▾ Edit

Sample Dataset

Created on: 7/26/2021, 6:28:41 AM
Processing Node: Lightning (auto)
Options: dsm: true, dtm: true

77 00:16:14 Completed Task Output: On Off

Download Assets View Map View 3D Model Restart Delete Edit

Orthophoto (GeoTIFF)
Terrain Model (GeoTIFF)
Surface Model (GeoTIFF)
Point Cloud (LAZ)
Textured Model
Camera Parameters
Camera Shots (GeoJSON)
All Assets

Select Images and GCP Import View Map

Select Images and GCP Import View Map

#12 – Download All

UC DroneCamp 2021

1 Tasks ▾ Edit

Sample Dataset

77

00:16:14

Select Images and GCP

Completed

Created on: 7/26/2021, 6:28:41 AM

Processing Node: Lightning (auto)

Options: dsm: true, dtm: true

Download Assets

View Map

View 3D Model

Restart

Delete

Orthophoto (GeoTIFF)

Terrain Model (GeoTIFF)

Surface Model (GeoTIFF)

Point Cloud (LAZ)

Textured Model

Camera Parameters

Camera Shots (GeoJSON)

All Assets

Select Images and GCP

Import

coords.txt	7/26/2021 6:34 AM
odm_georeferenced_model.boundary.json	7/26/2021 6:47 AM
odm_georeferenced_model.bounds.geojson	7/26/2021 6:47 AM
odm_georeferenced_model.bounds.gpkg	7/26/2021 6:47 AM
odm_georeferenced_model.info.json	7/26/2021 6:49 AM
odm_georeferenced_model.laz	7/26/2021 6:47 AM
odm_georeferenced_model.summary.json	7/26/2021 6:47 AM
odm_georeferencing_model_geo.txt	7/26/2021 6:34 AM
proj.txt	7/26/2021 6:34 AM

all.zip

dsm_tiles	File folder
dtm_tiles	File folder
entwine_pointcloud	File folder
odm_dem	File folder
odm_georeferencing	File folder
odm_orthophoto	File folder
odm_report	File folder
odm_texturing	File folder
orthophoto_tiles	File folder
cameras.json	JSON File
images.json	JSON File

odm_orthophoto.tif

odm_textured_model.conf
odm_textured_model.mtl
odm_textured_model.obj
odm_textured_model_geo.mtl
odm_textured_model_geo.obj
odm_textured_model_material0000_map_Kd.png
odm_textured_model_material0001_map_Kd.png
odm_textured_model_material0002_map_Kd.png
odm_textured_model_material0003_map_Kd.png
odm_textured_model_material0004_map_Kd.png
odm_textured_model_material0005_map_Kd.png

Contact Me

Stephen.Mather@opendronemap.org

<https://opendronemap.org>

Coupon for 80% off installer:

<https://opendronemap.org/webodm/download/#installer>

Then for coupon code, use the email address you used to register for this conference, but:
replace "@" with underscore "_" and dots with dashes "-"

e.g. **Stephen.Mather@opendronemap.org** would become
Stephen-Mather_opendronemap.org

This material is based on presentations by:

Corey Snipes – Two Mile Heavy Industries
Piero Toffanin - ODM, UAV4GEO

*Screenshots and interface images by Corey Snipes
or Stephen Mather, unless otherwise noted*

<https://github.com/opendronemap/presentations>

Thank You!

