OpenTopography

Metadata Report

Project Name

"Panola Mtn Research Watershed outcrop survey, Georgia, USA, July 2021"

Summary

The Bedrock Critical Zone Network (NSF #2012353) research team conducted field studies at the Panola Mountain Research Watershed (PMRW) during July 2021 and March 2022. During the July 2021 field studies, we collected drone imagery over the large outcrop within the research watershed to generate photogrammetry-based DEMs and orthoimagery to support high-resolution mapping of microtopography and vegetation characteristics.

Personnel

- PI(s): Sean P Bemis, Virginia Tech; Jorden Hayes, Dickinson College; Steve Holbrook, Virginia Tech

Site Information

- Site description: The PMRW is primarily covered by dense mixed hardwood forest except for a large granitic outcrop that spans from the crest of a hill down a north-facing slope to an ephemeral drainage.
- Site objective: Initial site observations noted pervasive linear microtopographic troughs across the bedrock surface associated with the locations of pegmatitic dikes. Our investigations on the outcrop sought to establish relations between surface and subsurface weathering characteristics and the corresponding controls on vegetation development.
- Site location: The PMRW is within Panola Mountain State Park, ~24 km southeast of Atlanta, GA, USA. Coordinates: 33.627686 N, 84.174669 E
- Site conditions: The survey was conducted under partly cloudy skies and light variable winds. The temperature was ~27° C at 9 am for the start of the survey, increasing to 30° C by the end of the survey at 10:45 am.

Survey Results

- Equipment used: Imagery was collected using a DJI Phantom 4 RTK with onboard D-RTK and an active link to a DJI D-RTK 2 High-Precision GNSS Mobile Station
- GPS solutions: We had poor post-processing accuracy on our ground control points, so we use the direct referencing solution from the RTK-positioned camera coordinates in our shared products.
- Errors
- Survey Statistics:
    - Ground resolution: 1.5 cm/pix
    - Number of images: 1665

- Collection methods: We conducted three individual overlapping surveys at nominal heights above the takeoff point on the outcrop of 30 m, 45 m, and 55 m. Each survey was flown as a pre-planned double-grid flight pattern with the camera facing forward 30° from nadir. Surveys were flown in WGS84 lat/long (EPSG: 4326).

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Products

- Date of dataset collection: July 28, 2021
- Coordinate system of datasets: WGS84 UTM Zone 16N (EPSG: 32616)
- Data processing methods: We processed the drone imagery using Agisoft Metashape v2.2 and the following processing steps (the parameters we used are provided in the 'Processing Parameters' pages below excerpted directly from the project report generated by Metashape).
    - 1) Align Photos
    - 2) Build Point Cloud
    - 3) Build Model
    - 4) At this point, we drew a bounding box polygon following the margins of the flight grid, and used this as a guide to trim the point cloud and 3D model to this extent.
    - 5) Build Orthomosaic
    - 6) Build DEM
    - 7) Export: point cloud, DEM, and orthomosaic
- Products:
    - Point cloud – Panola2021_ptcloud.las
        - Data format: LAS
        - Spatial resolution: 0.1 pts/cm
        - Unclassified
    - Digital elevation model – Panola2021_DEM.tif
        - Data format: GeoTIFF
        - Spatial resolution: 3.1 cm/pix
        - First return model
    - Orthoimage – Panola2021_orthomosaic.tif
        - Data format: GeoTIFF
        - Spatial resolution: 2 cm/pix
- Camera Location Error**:

X error (cm)	Y error (cm)	Z error (cm)	XY error (cm)	Total Error (cm)
0.938683	0.894558	1.57765	1.29667	2.04214

**Average camera location error as determined by Agisoft Metashape

- Tie Points: 6,750,307
- Reprojection error: 0.508 pix

Processing Parameters

General	
Images	1665
Aligned images	1665
Markers	5
Coordinate system	WGS 84 (EPSG::4326)
Rotation angles	Yaw, Pitch, Roll
Shapes	
Polygon	1
Coordinate system	WGS 84 (EPSG::4326)
Tie Points	
Points	6,750,307 of 8,203,911
Point colors	3 bands, uint8
RMS reprojection error	0.127504 (0.50773 pix)
Max reprojection error	1.33644 (13.4934 pix)
Mean key point size	3.31761 pix
Key points	No
Average tie point multiplicity	5.96444
Alignment parameters	
Accuracy	High
Generic preselection	Yes
Reference preselection	Source
Key point limit	100,000
Key point limit per Mpx	1,000
Tie point limit	50,000
Exclude stationary tie points	Yes
Guided image matching	No
Adaptive camera model fitting	Yes
Matching time	52 minutes 38 seconds
Matching memory usage	3.50 GB
Alignment time	1 hours 49 minutes
Alignment memory usage	6.27 GB
Optimization parameters	
Parameters	f, cx, cy, k1-k4, p1, p2
Fit additional corrections	Yes
Adaptive camera model fitting	No
Optimization time	6 minutes 42 seconds
Date created	2022:04:12 14:27:43
Software version	1.8.2.0
File size	924.83 MB
Point Cloud	
Points	189,961,364
Coordinate precision	7.74 mm
Point attributes	
Color	3 bands, uint8
Normal	
Confidence	1 - 255
Point classes	
Created (never classified)	189,961,364
Depth maps generation parameters	
Quality	High

Filtering mode	Disabled
Max neighbors	16
Processing time	1 hours 41 minutes
Memory usage	11.35 GB
Point cloud generation parameters	
Source data	Depth maps
Processing time	5 hours 34 minutes
Memory usage	46.29 GB
Date created	2025:01:31 01:04:16
Software version	2.2.0.19890
File size	3.55 GB
Model	
Faces	45,961,112
Vertices	23,019,983
Vertex colors	3 bands, uint8
Depth maps generation parameters	
Quality	High
Filtering mode	Mild
Max neighbors	16
Processing time	1 hours 43 minutes
Memory usage	11.38 GB
Reconstruction parameters	
Surface type	Arbitrary
Source data	Depth maps
Interpolation	Enabled
Strict volumetric masks	No
Processing time	1 hours 18 minutes
Memory usage	12.69 GB
Date created	2025:01:31 08:47:55
Software version	2.2.0.19890
File size	986.93 MB
DEM	
Size	10,899 x 9,265
Resolution	3.10 cm/pix
Coordinate system	WGS 84 / UTM zone 16N (EPSG::32616)
Reconstruction parameters	
Source data	Point cloud
Interpolation	Disabled
Processing time	1 minutes 7 seconds
Memory usage	310.89 MB
Date created	2025:02:01 08:44:10
Software version	2.2.0.19890
File size	227.52 MB
Orthomosaic	
Size	16,970 x 14,570
Resolution	2.00 cm/pix
Coordinate system	WGS 84 / UTM zone 16N (EPSG::32616)
Colors	3 bands, uint8
Orthophotos	12.82 GB
Reconstruction parameters	
Blending mode	Mosaic
Surface	Model
Enable hole filling	Yes
Enable ghosting filter	No
Processing time	16 hours 10 minutes
Memory usage	3.36 GB

Date created	2025:02:01 05:59:22
Software version	2.2.0.19890
File size	13.05 GB
System	
Software name	Agisoft Metashape Professional
Software version	2.2.0 build 19890
OS	Windows 64 bit
RAM	191.92 GB
CPU	Intel(R) Xeon(R) CPU E5-2630 v4 @ 2.20GHz
GPU(s)	Quadro M4000 Quadro M4000 Quadro M4000 Quadro M4000