# Metadata Report

## Project Name
Eastern San Gabriel Mountains Steep Headwater Channel UAV survey (2018)

## Summary
Dataset includes UAV structure-from-motion derived point cloud of steep headwater channels, cliffs, and hillslopes in the headwaters of Day Creek, San Gabriel Mountains, CA (survey conducted in August, 2018). Model spans ~500 x 500 m and was georeferenced to airborne lidar dataset using iterative-closest-point-alignment. Approximate point density of 225 pts/$m^2$.

Bare-earth airborne lidar dataset was used as reference cloud (https://doi.org/10.5069/G9J38QPM). No vegetation filtering or clipping was performed on SfM derived point cloud. M3C2 cloud-to-cloud difference with default parameters yields 1-sigma cloud-to-cloud difference of 0.21 m and 2-sigma cloud-to-cloud difference of 0.78 m:

Accuracy is likely not sufficient for change detection analysis but is sufficient for morphometric analysis (channel geometries, sediment grain size, spatial patterns of soil/colluvial sediment cover).

Link to reference airborne lidar point cloud: (https://doi.org/10.5069/G9J38QPM )

Dataset is complimentary to manuscript below:

Neely, A. B., DiBiase, R. A., Corbett, L. B., Bierman, P. R., & Caffee, M. W. (2019). Bedrock fracture density controls on hillslope erodibility in steep, rocky landscapes with patchy soil cover, southern California, USA. Earth and Planetary Science Letters, 522, 186– 197. https://doi.org/10.1016/j.epsl.2019.06.011

Supplementary files within manuscript in complimentary manuscript contain shapefile outlines of area where bare-bedrock and soil-mantled hillslopes were mapped.

## Personnel

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## Site Information

- Description: Steep hillslopes with bare bedrock cliffs, talus, and colluvial channels sediment deposits
- Objective: Map spatial patterns of bare-bedrock and soil-mantled hillslopes, measure size distribution of coarse-colluvial sediment, and measure width of headwater-colluvial channels
- Site location and structure-from-motion model georeferencing accuracy (below)

Location: Day Creek, Eastern San Gabriel Mountains, CA, USA

Georeferencing accuracy:

- Georeferenced to airborne-lidar point cloud (https://doi.org/10.5069/G9J38QPM )
- M3C2 cloud-to-cloud difference with default parameters
    - 1-sigma cloud-to-cloud difference = 0.21 m
    - 2-sigma cloud-to-cloud difference = 0.78 m

- Site conditions: dry, August, 2018, overhead lighting at ~ noon.

## Survey Results

- Photos recorded with DJI-Mavic Pro at altitudes of ~50 -100 m above ground surface.

- Camera specifications:
    - Lens: FOV 78.8° 26 mm (35 mm format equivalent) f/2.2
    - Sensor: 1/2.3” (CMOS), Effective pixels:12.35 M (Total pixels:12.71M)

- 5 mm focal length, 50 – 100 m above ground surface, pixel resolution ~1.5 – 3 cm/pixel

## Products

- Collection date: 8/15/18
- Coordinate system: UTM zone 11N, NAD83, (epsg 26911)
- Spatial resolution: spatially varies, (mean point density ~225 pts/$m^2$)
- Accuracy reported as cloud-to-cloud difference with lidar point cloud
- Data formats: .laz
- Data processing methods:

- Structure-from-motion rendering performed in AgiSoft Photoscan V1.1
- Photos were geotagged with camera station GPS position from DJI Mavic-Pro internal GPS and elevation corrected using GPS position of launch pad recorded with EOS Arrow 100 (3-D RMS < 1 m).
- Photos not clipped or cropped. Imported to AgiSoft Photoscan as .jpeg
- Alignment performed on “high”, 40000 keypoint matching, 4000 tie point matching, reference preselection with GPS positions of each photo geotag
- Dense cloud constructed on “medium” with “aggressive” depth filtering
- Dense cloud was exported from AgiSoft Photoscan as .las file to CloudCompare where “align” tool was used to fine-scale align structure-from-motion model dense cloud and bare-earth point cloud derived from aerial lidar platform. No vegetation filtering was performed on dense SfM-derived cloud. Cloud-to-cloud difference was computed with M3C2 algorithm with default parameters. Aligned structure-from-motion point cloud was exported as .LAZ file.