OpenTopography

Metadata Report

Project Name   Drone lidar survey of the San Juan Fault, Vancouver Island, September 2022

Summary

In September 2022, drone lidar was acquired over two sites of interest along the San Juan Fault (SJF), southern Vancouver Island, Canada. The data were collected to produce DTMs which will aid current investigations of whether this fault has recently been active. A Riegl MiniVux1-UAV laser scanner and an Applanix APX-20 UAV IMU mounted to a DJI Matrice 600 Pro drone were used to collect the dataset, more information about the platform can be found in (Salomon et al. 2024). A classified point cloud and raster digital terrain models (DTMs) at different scales (50cm and 1m resolution) were produced.

Personnel

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Site Information

- Site description: There are two collection sites, the westernmost is 2 km long by 700 m wide, and the easternmost is 1.7 km long and 700 m wide. The sites are on the southern slopes of an east-west valley with a mixture of mature second-growth forest, clear-cuts and new (third) growth. The forests in this area are mainly Douglas Fir, with some western Red Cedars, Western Hemlocks, and Sitka Spruce.
- Site objective: The main objective in both sites was to capture the surface expression of the San Juan Fault in this area. In the westernmost site, there are several glacial striations (N-S) which potentially cross the fault (E-W) and may provide evidence for recent motion on the SJF. In the easternmost site, there are several drainages running across the fault trace, and may showcase offset drainage.
- Site location (GPS cords and/or map): 48.621, -123.851
- Site conditions: Leaf-on, clear weather with little wind.
- Date/time spent at each site: 1 day of surveying was spent at each site, for a total of 2 days. Approximately 6-7 hours were spent at each site.

Survey Results

- Equipment used: Drone lidar system includes a Riegl MiniVux1-UAV laser scanner, Applanix APX-20 UAV GNSS-inertial measurement unit. Ground control was collected using two Trimble R12 units in a base and rover configuration.
- GPS solutions: local base data was collected by our Trimble R12 base station, which ran for the duration of surveying. The base rinex file was processed using NRCANs Precise Point Positioning tool.
- Errors: Flat surfaces in the point cloud have a scatter of approx. 20 cm.
- Alignments: Alignments of the point clouds was done using the RiPrecision Tool within the RiWorld processing workflow. These alignments make use of collected GCPs as well as attempt to resolve planar differences between individual flight line point clouds.
- Collection methods: The flight plan was created using Map Pilot Pro, the drone was flown along E-W flight lines, with N-S calibration lines at a speed of 5 m/s and at a height above ground of 80 m. Four harlequin-cross style targets were deployed for each site.

Products

- Date of dataset collection: 13-14 September 2022
- Coordinate system of datasets: NAD83(CSRS) / UTM 10N with CGG2013a Ortho Elevations
- Spatial resolution
  - lidar: 130 pts/m^2, 11.97 ground pts/m^2 (point spacing of 0.29 m)
    laser footprint = 6.4 cm at nadir and 9 cm at the swath edges.
  - DTMs: 0.5 m and 1 m
- Accuracy and errors: laser scanner (Riegl MiniVux1-UAV)
    - Accuracy: 15 mm
    - Precision: 10 mm
    - Angle measurement resolution: 0.001°
  - GNSS-IMU RMS Error (Applanix APX-20 UAV)
    - Position: 0.02-0.05 m
    - Velocity: 0.010 m/s
    - Roll & Pitch: 0.015°
    - True Heading: 0.035°

- Data formats
  - lidar: laz
  - DTMs: tif
- Data processing methods: Drone trajectories were processed in POSPac UAV, the smoothed best estimate trajectory was exported with orthometric heights. The lidar was processed using Riegls' RiProcess package. A field of view filter was used to only export data collected within 45 degrees of nadir (90°). The drone trajectories were imported into RiProcess, where turns were removed using the RXP cutter tool. Control objects (points) were added, and the flight lines were aligned using RiPrecision. Once the flight lines were suitably aligned, the data could be exported. The exported point cloud was classified and rasterized using LAStools. More details for the processing methods can be found in (Salomon et al. 2024)

Misc Notes

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Reference:

Salomon, Guy, Theron Finley, Edwin Nissen, R Stephen, and Brian Menounos. 2024. "Mapping Fault Geomorphology with Drone-Based Lidar: Examples from the Canadian Cordillera with Comparisons to Airborne Lidar and Structure-from-Motion." *(Pending)*.