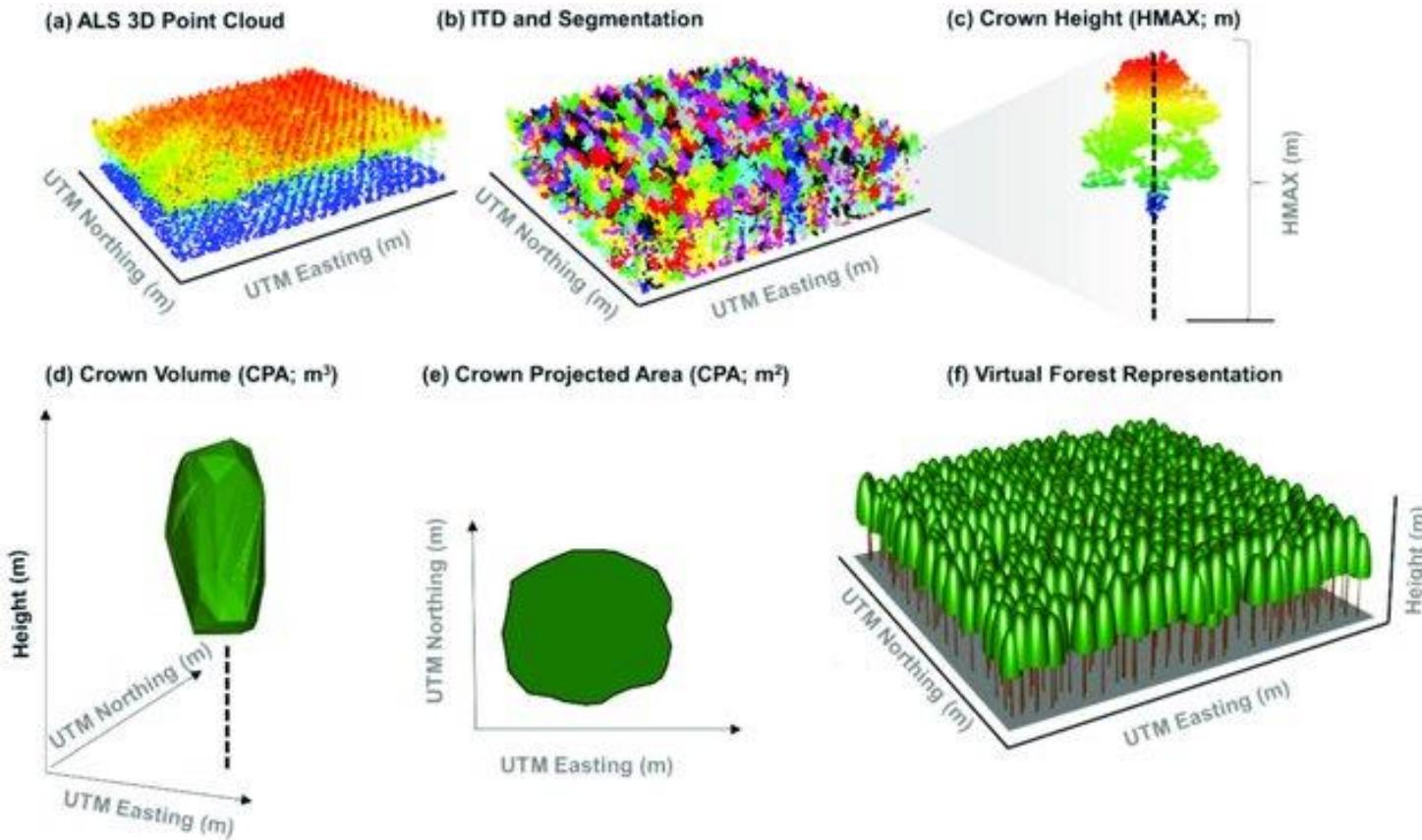


Lidar (pt2)
GEOG 457/657
Alex Bevington

Review

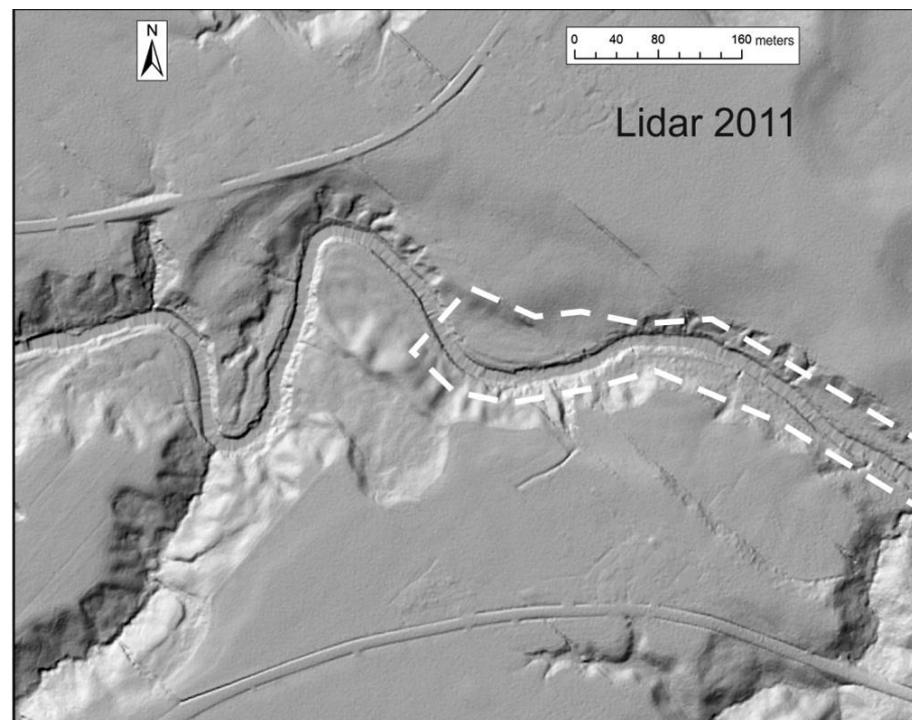
Forest structure



Individual Tree Attribute Estimation and Uniformity Assessment in Fast-Growing Eucalyptus spp. Forest Plantations Using Lidar and Linear Mixed-Effects Models

Landslides

The 2016 landslide at Saint-Luc-de-Vincennes, Quebec:
geotechnical and morphological analysis of a combined
flowslide and spread. Tremblay-Auger et al.



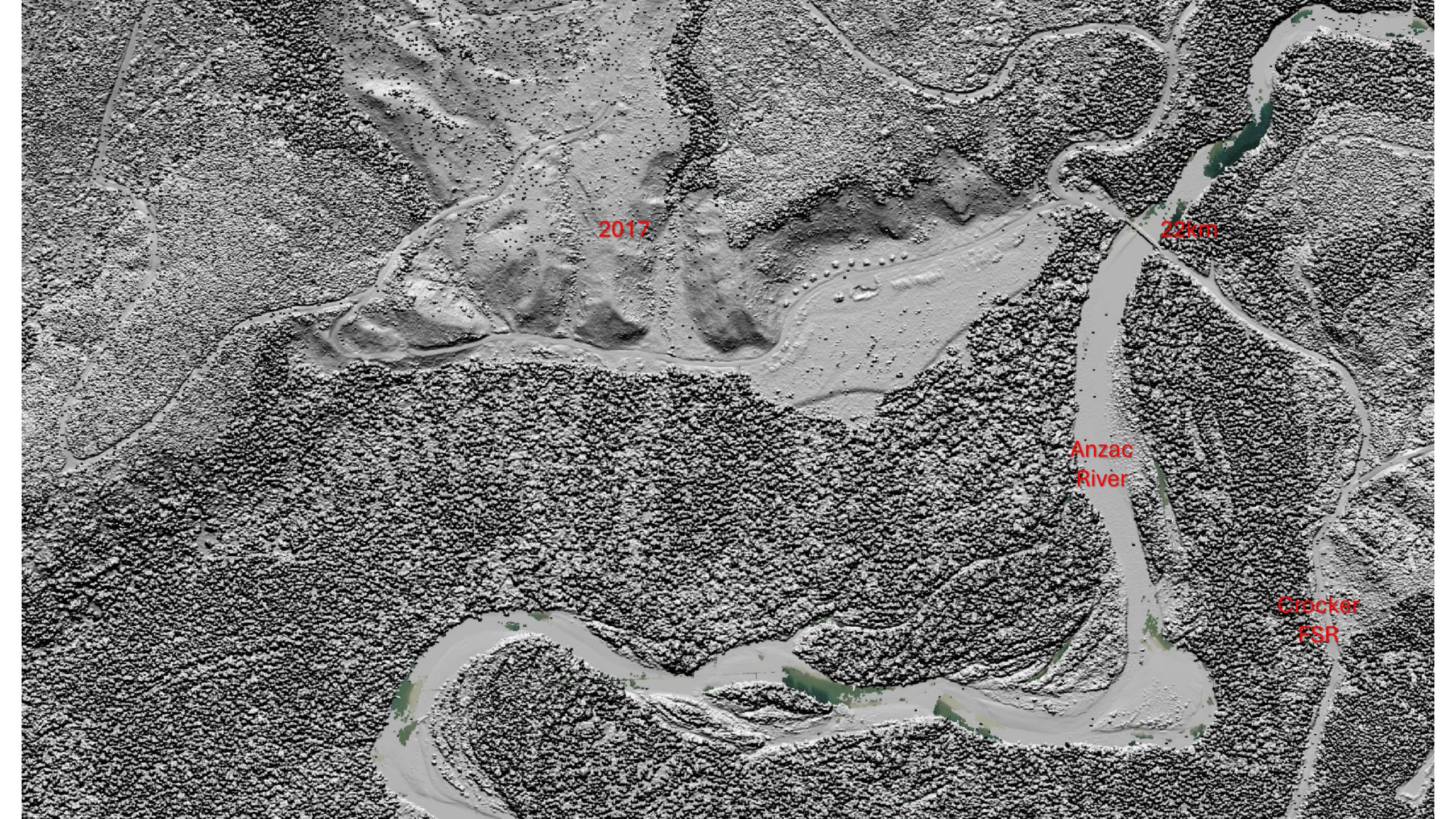


2017

22km

Anzac
River

Crocker
FSR

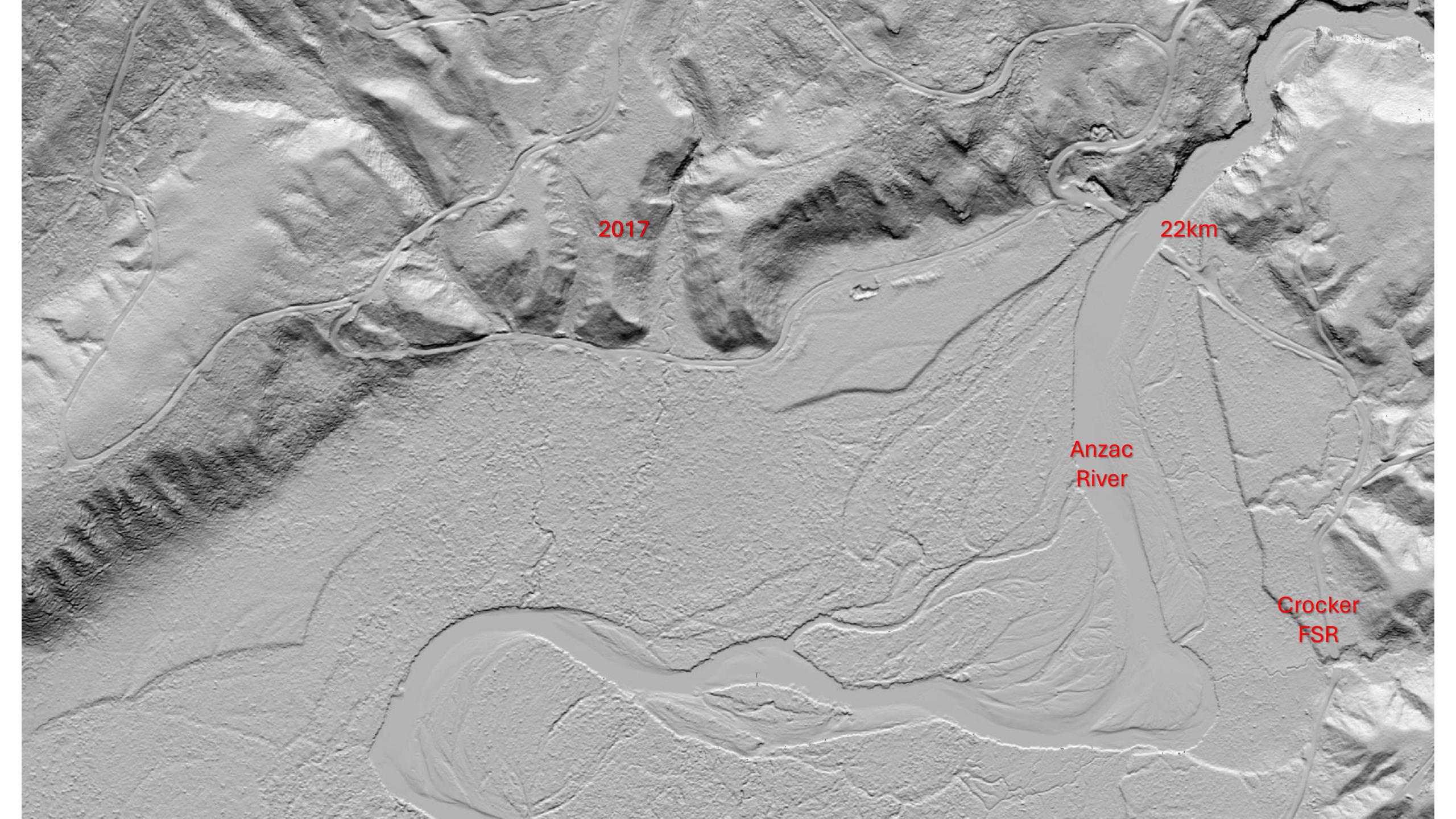


2017

22km

Anzac
River

Crocker
FSR



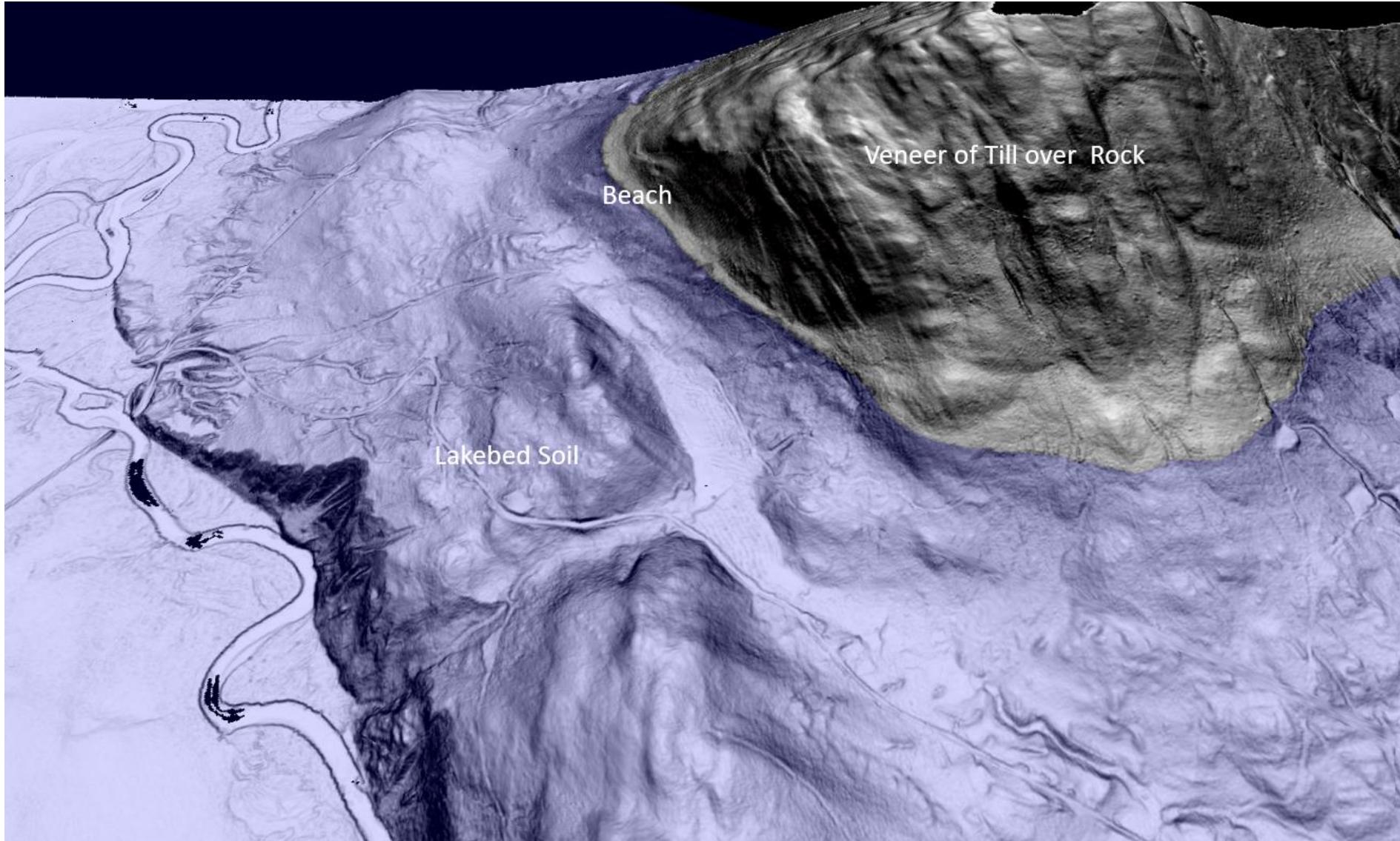
2017

22km

Anzac
River

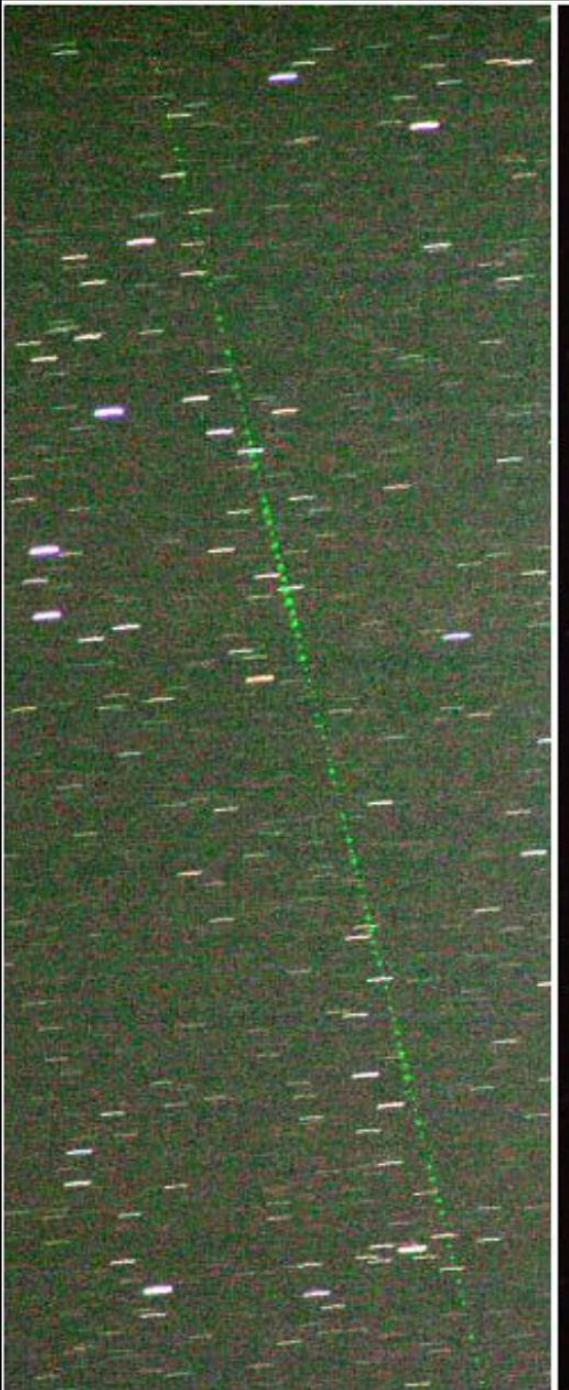
Crocker
FSR

Surficial geology



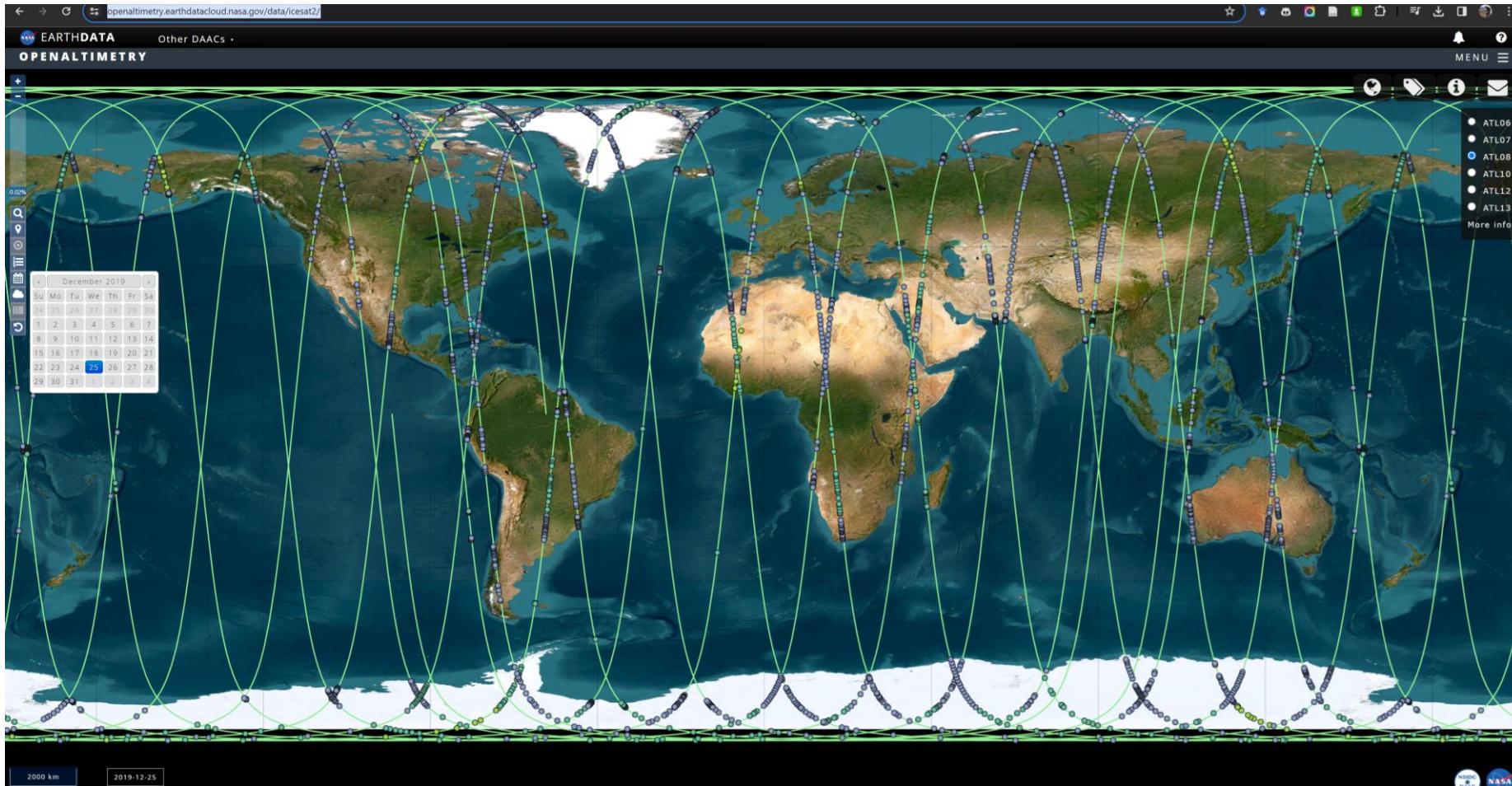
Spaceborne Lidar

- **Geoscience Laser Altimeter System (GLAS)** *2003-2010, 180-day repeat*
 - Onboard ICESat satellite
 - Full waveform
 - ~70 m footprint every 170 m (40 pulses per second)
 - 532 nm/1064 nm
 - ~70 m
 - Global ($\pm 86^\circ$ N/S latitude)
- **Advanced Topographic Laser Altimeter System (ATLAS)** *2018-present, 91-day repeat*
 - Onboard ICESat-2 satellite
 - Discrete returns
 - ~14 m footprint every 70 cm (10,000 pulses per second)
 - 532 nm
 - Global ($\pm 88^\circ$ N/S latitude)
- **Global Ecosystem Dynamics Investigation (GEDI)** *2018-2023, non-standard repeat*
 - Onboard International Space Station
 - Full waveform
 - ~25 m footprint every 60 m
 - 1064 nm
 - Near-Global ($\pm 51.6^\circ$ N/S latitude)



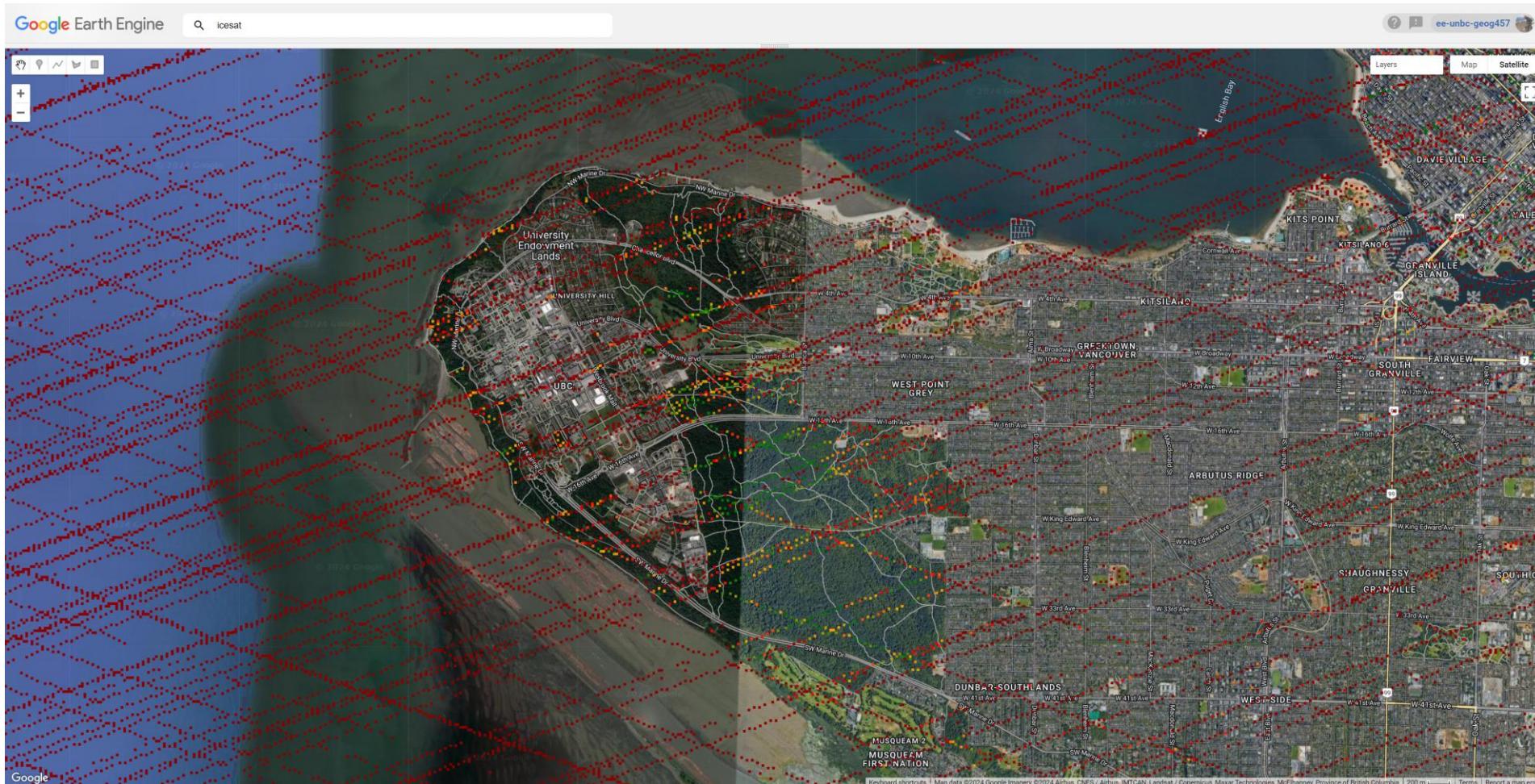
These time-lapse pictures show pulses emitted from the GLAS laser, photographed relative to the star field from the ground using a high-resolution digital camera in the Mojave Desert, California (left) and Santa Rosa, New Mexico (right). The movement of the satellite against the star field during the multiple second exposure is clear. Comparison of onboard laser pointing information and spot geolocation from photographs like this example allows calibration/verification of the GLAS precision attitude determination system. Credit: J. Marcos Sirota, Claudia C. Carabajal, and David K. Mostofi, ICESat Mission Team

ATLAS (ICESat-2 satellite)



<https://openaltimetry.earthdatacloud.nasa.gov/data/icesat2/>

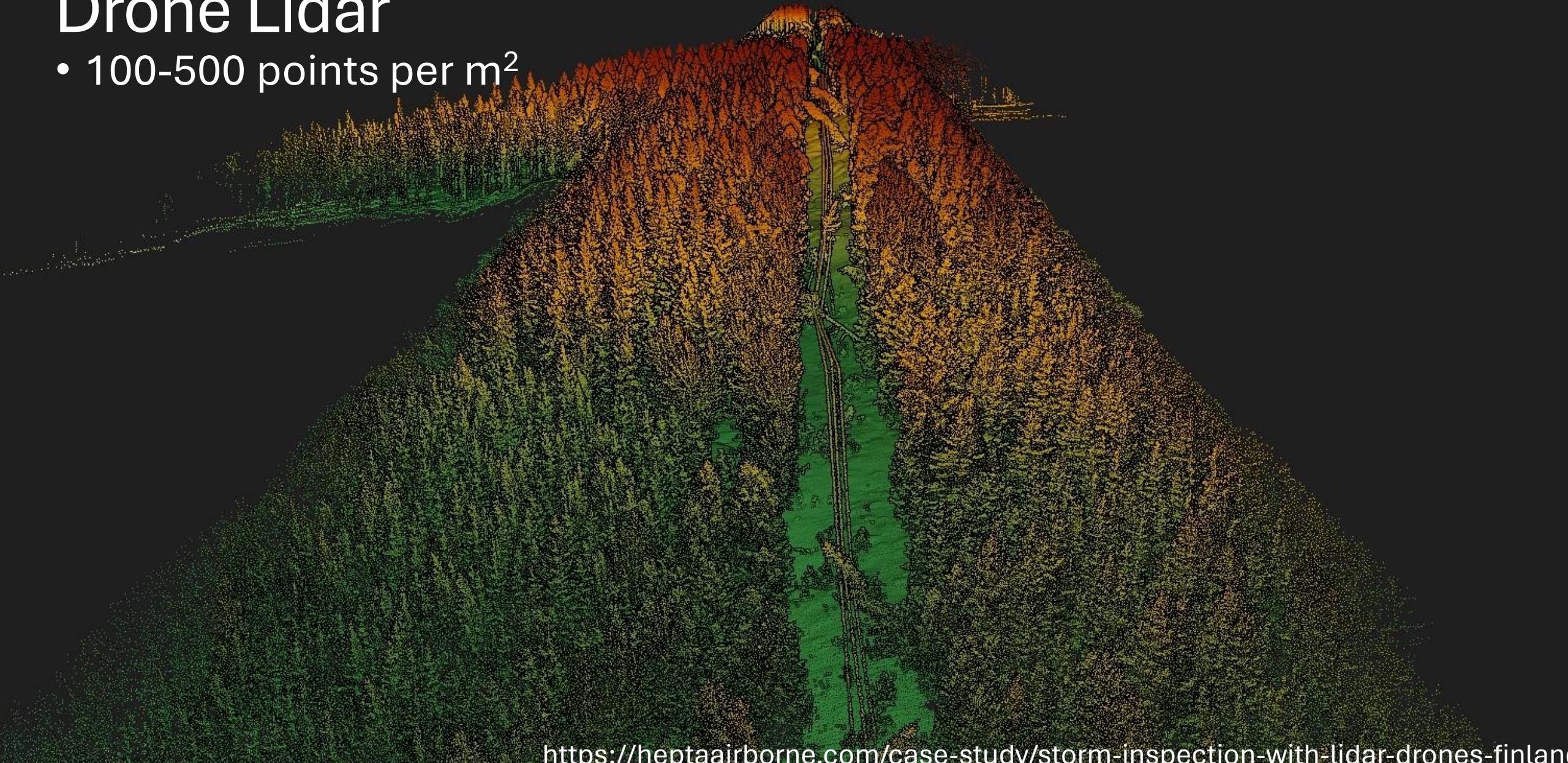
GEDI (ISS)



<https://code.earthengine.google.com/835ada1b8c73b53987cd76c5b5c1088a>

Drone Lidar

- 100-500 points per m²



Terrestrial scanner



Stationary



Handheld



Mobile / SLAM

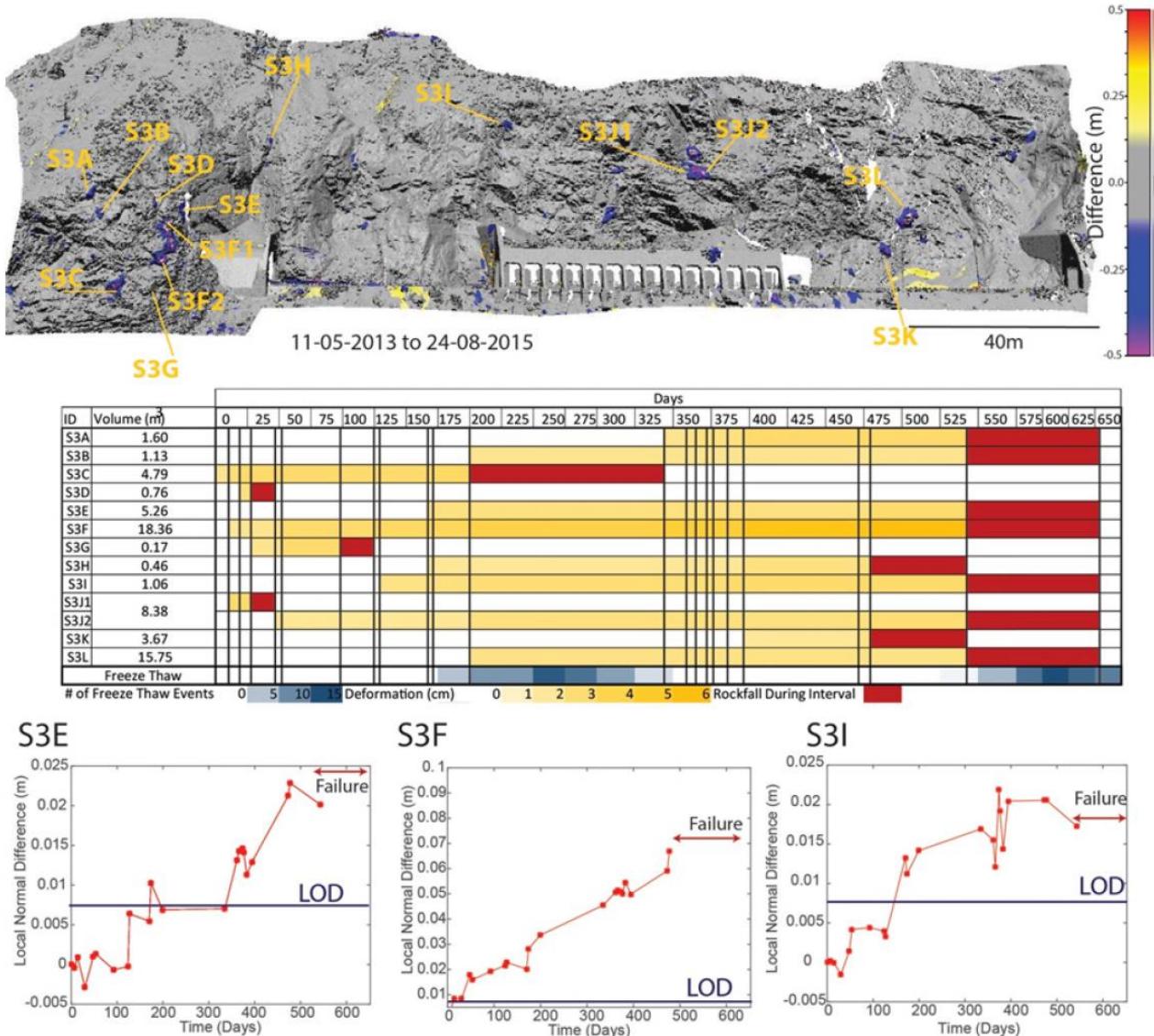
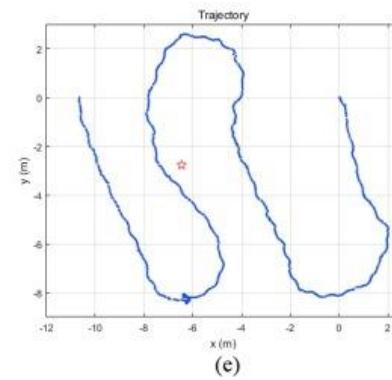
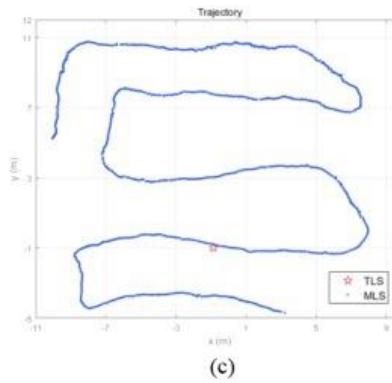
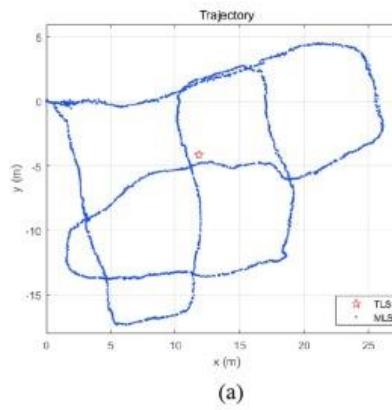


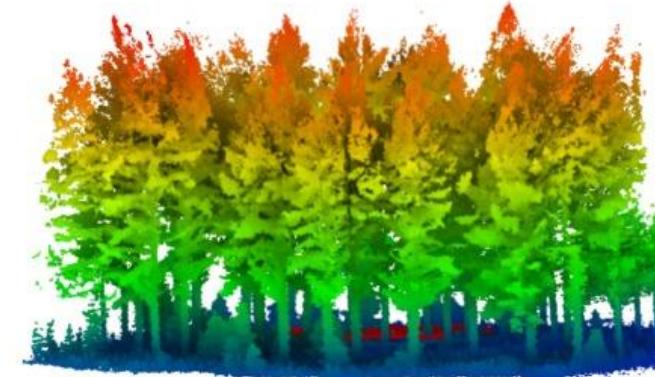
Figure 5. Top: Point cloud of Section 3 showing areas of rock slope failure between 11-05-2013 and 24-08-2015. Middle: Dynamic table illustrating the duration and intensity of deformation for each failure and number of freeze-thaw cycles. Bottom, representative deformation time series for identified failures S3E, S3F and S3I.



(b)



(d)



(f)

SLAM-aided forest plot mapping combining terrestrial and mobile laser scanning. Shao et al. 2020.

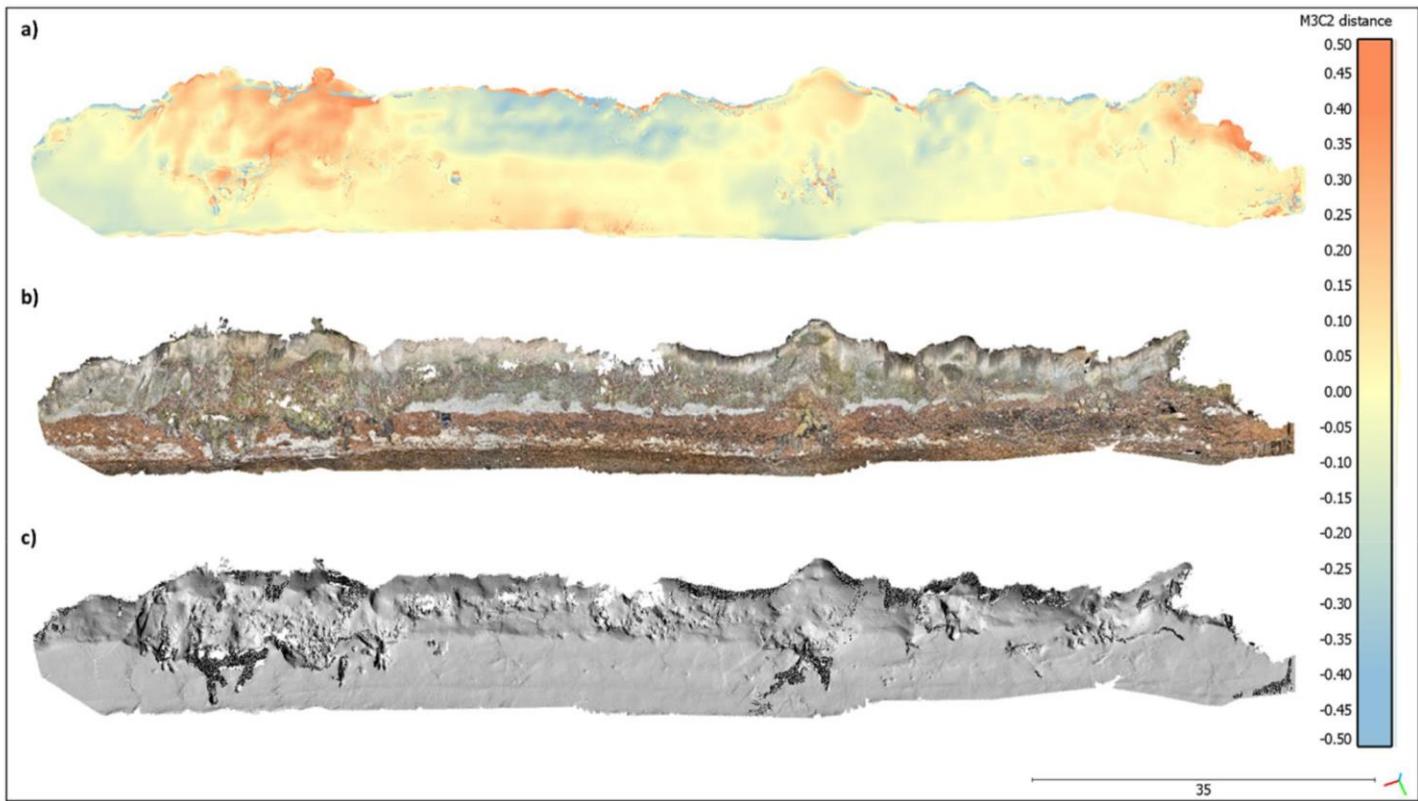
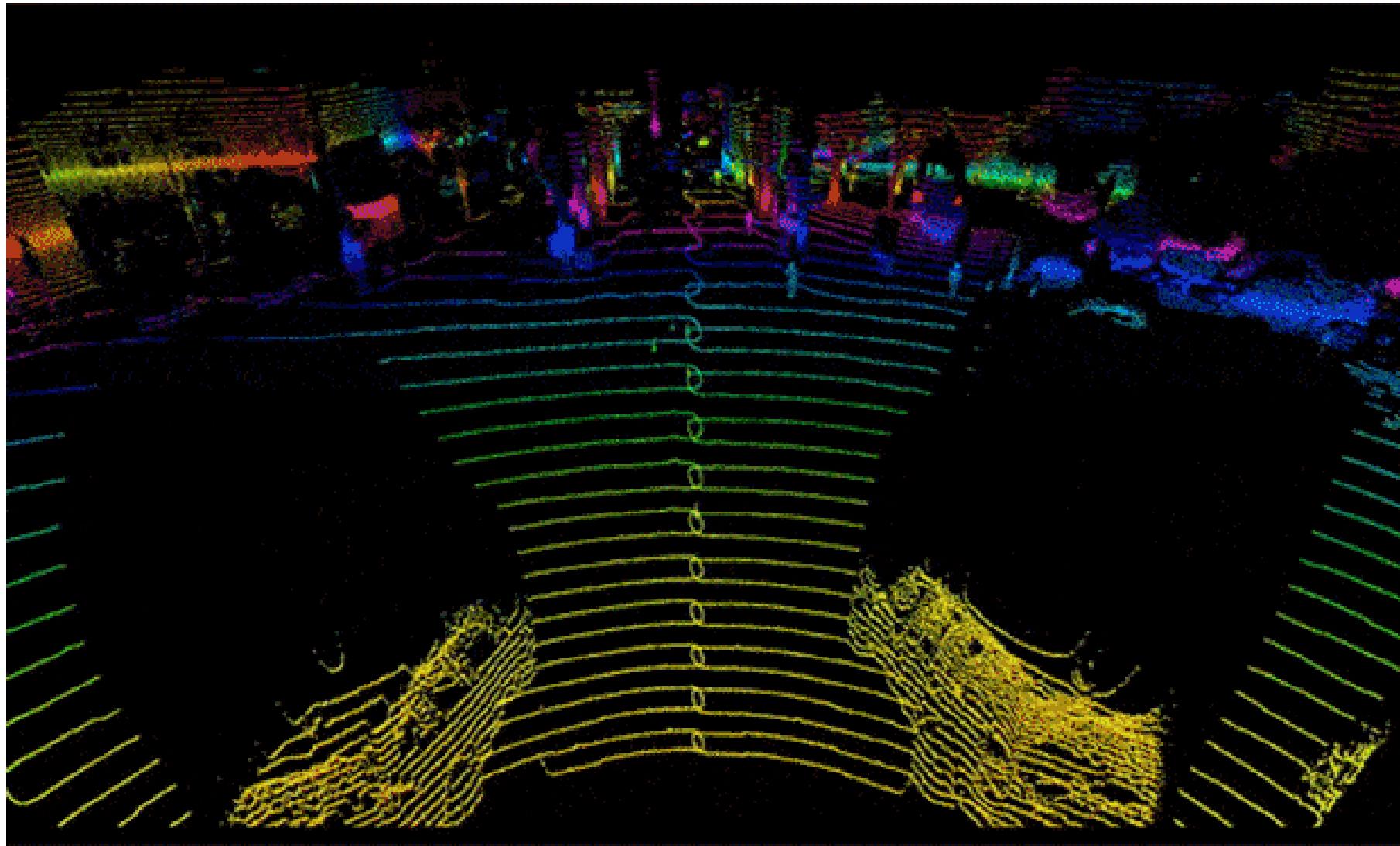


Figure 4. M3C2 distances in meter between SfM MVS reference point cloud and iPhone point cloud, fine registration error RMS: 0.052 m computed on 5 million points with a theoretical overlap: 75%, point clouds subsampled to 0.05 m minimal nominal spacing between points with normal directions and projection diameter calculated at 1.33 m for each point (a), textured iPhone LiDAR model of the cliff (b) iPhone LiDAR hillshade model of the cliff (c). Scale bar in bottom right indicates 35 m.



DIY Lidar

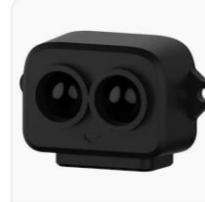
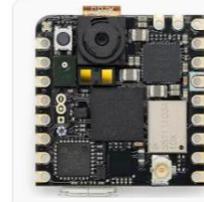
Google arduino lidar sensor

X |

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