



Practical Aspects of UAVs for Geotechnical Project Support

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Assistant Vice President, Geotechnical Engineer

BS in Civil Engineering from University of Maine

MS in Civil Engineering (Geotechnical) from University of Massachusetts Amherst

16 years with WSP (formerly Golder Associates)

Mostly transportation and oil and gas related geotechnical mitigation, specializing in landslides and site investigations

Currently the geotechnical team lead for the Earth and Environment Division of WSP in New England



Randy Post, PE

Assistant Vice President, Geotechnical Engineer

BS and MS in Geological Engineering from University of Arizona

23 Years of Experience, 13 with WSP

Mostly transportation-related geotechnical engineering

Currently focusing on geohazards in transportation (landslides, rockfall, debris flows, etc.)

Southwest Mountain District Geohazards Team Lead, located in Tucson, Arizona



Source: CDOT

Overview

- Photogrammetry vs. Lidar
- Data Collection
- Data Processing
- Data Use and Logistics

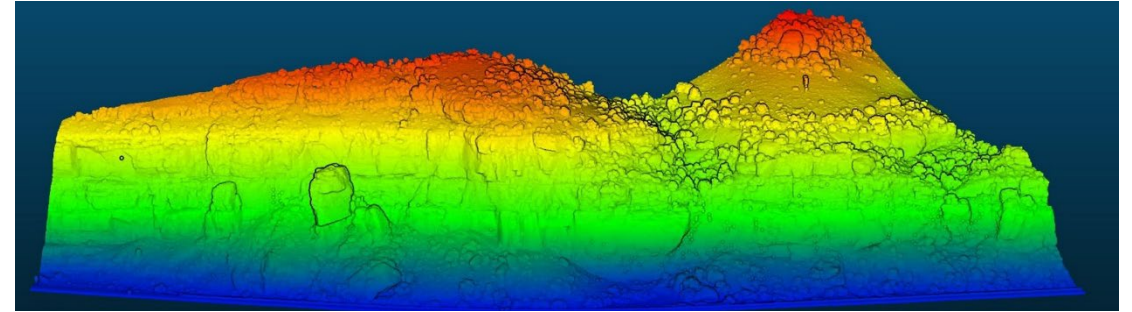
Photogrammetry vs. Lidar

Photogrammetry



- ❑ Can be flown with a \$500 to \$1,000 drone
- ❑ No additional equipment required
- ❑ Affected by vegetation cover
- ❑ Already Full Color Point Clouds and Meshes

Lidar



- ❑ Requires high -payload capacity drone that costs around \$15,000
- ❑ Not enough returns for vegetation removal on lower end scanners (~\$5K range)
- ❑ High -end Scanners with 12+ returns can be over \$100k

Data Collection



A few key points while collecting data:

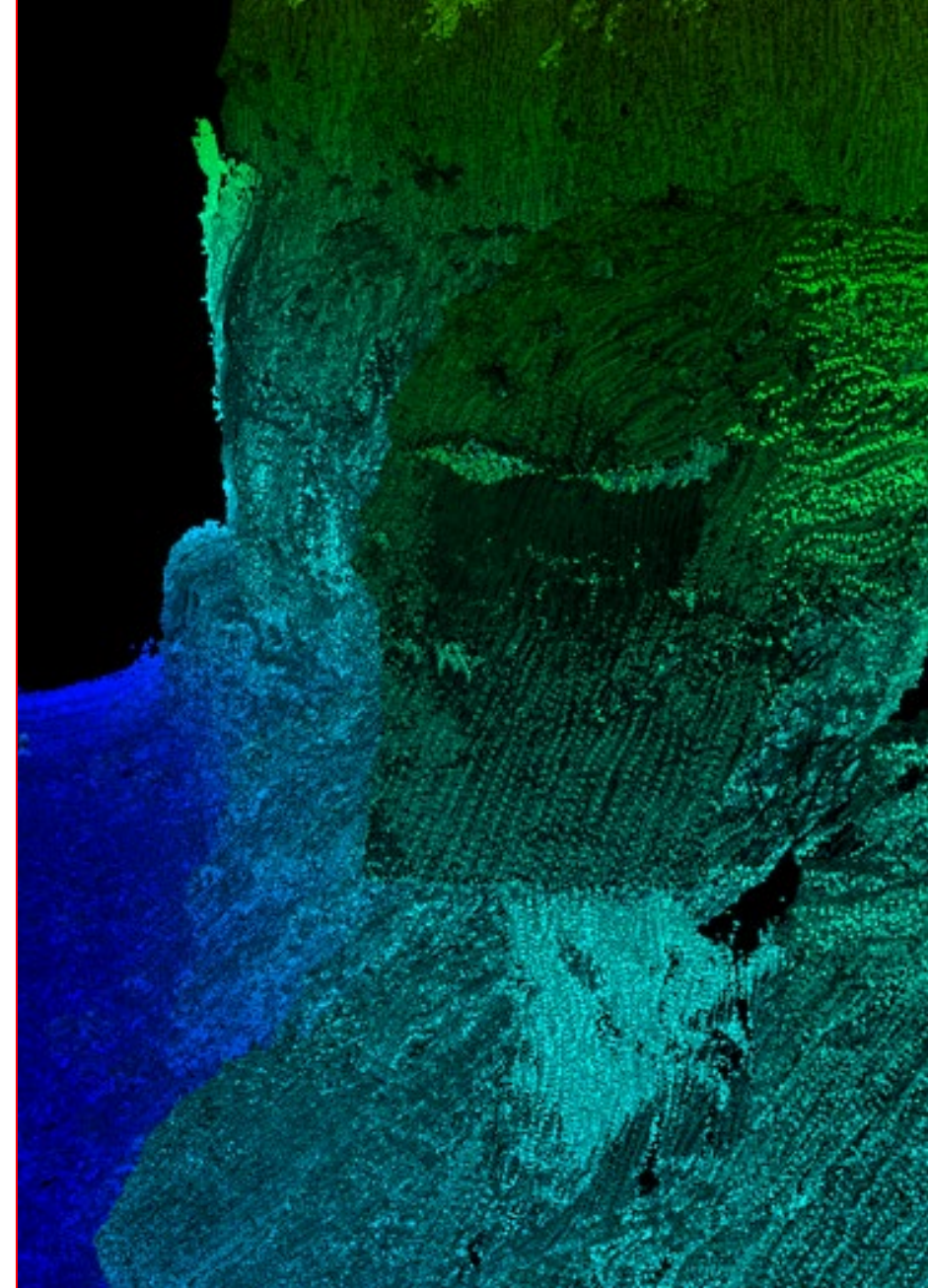
- ☐ Real time kinematics is very helpful to ensure good GPS signal for pre-programmed flights
- ☐ For steep slopes, the lawnmower pattern flights works better than nadir level or manual flight lines
- ☐ Expect a learning curve. Fly and process some data before critical projects!



Specialized Skills for Rough Terrain

Availability of Qualified Vendors/Pilots

Challenges of Developing In-House Pilot and Drone Capabilities





NMDOT US 82 MP 7 Rockslide Repair

Data Processing

Common Processing Software



PhotoScan

3D Modeling and Mapping



esri



Pix -4D vs. ESRI SiteScan

Pix -4D

- ❑ Expensive
- ❑ Requires graphics card
- ❑ Has a cloud processing option
- ❑ We process in the Azure Cloud on a Virtual Machine (VM)

ESRI SiteScan

- ❑ Fully cloud
- ❑ Might be advantageous for DOTs to access with existing ESRI licensing
- ❑ Cloud processing is easier but lacks some of the more advanced processing options

Data Use and Logistics



Data Management

- ✓ One Mission can be several GB
- ✓ Bandwidth for transfer to the cloud
- ✓ File storage
- ✓ Local vs. Remote On -Prem vs. Cloud
- ✓ Challenges of Distributed Teams

ArcGIS Online Interface (AGOL)

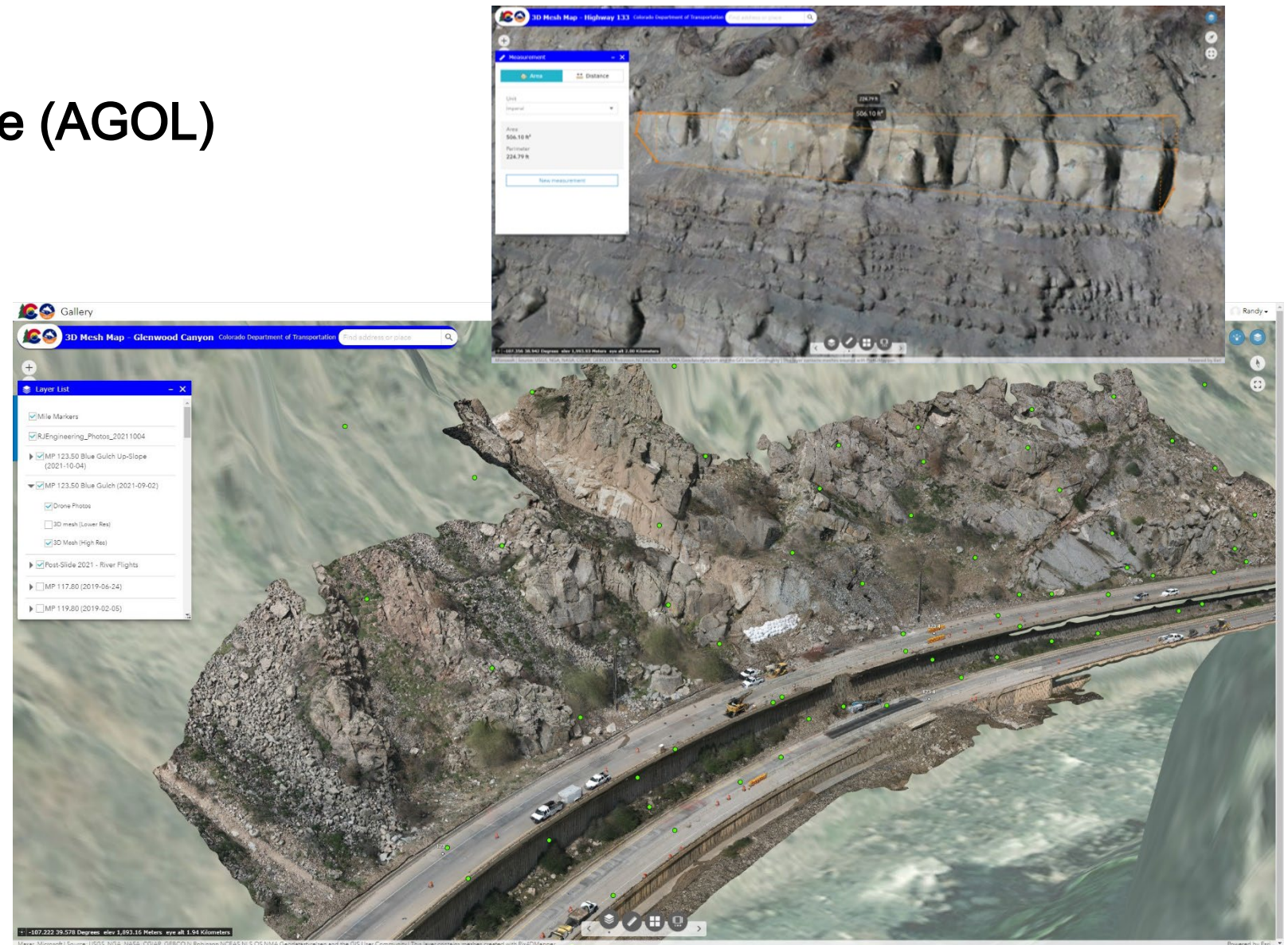
No More Data Silos

Visualization of 3D Meshes

- ✓ Safely view site
- ✓ Measure quantities

Review Photos and Measure

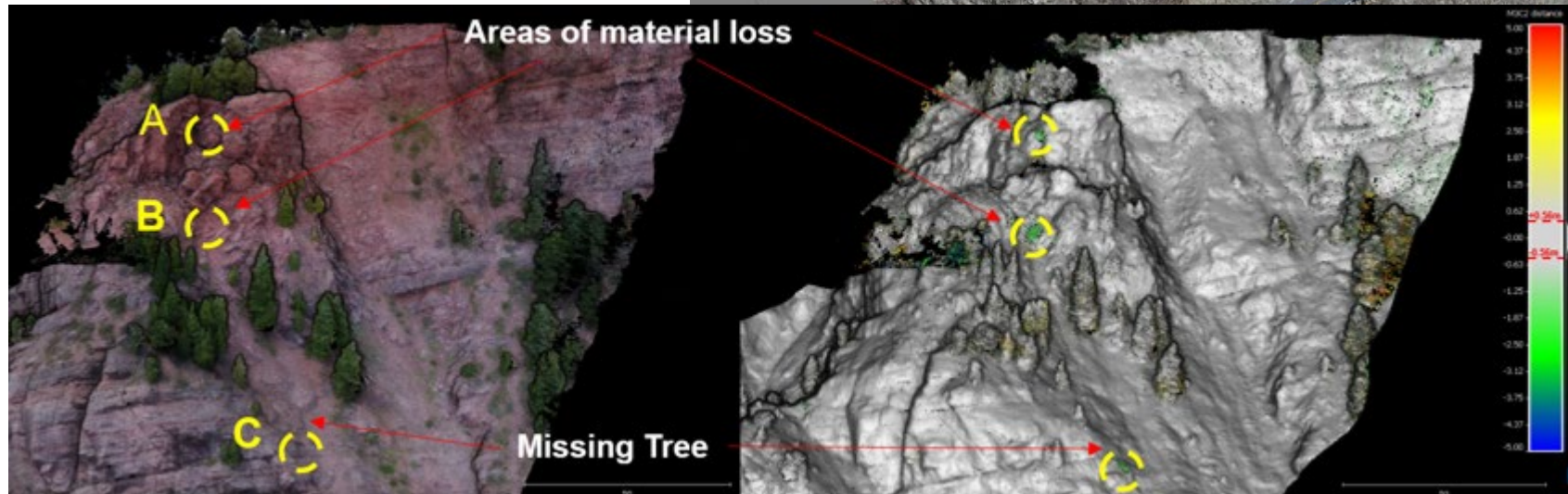
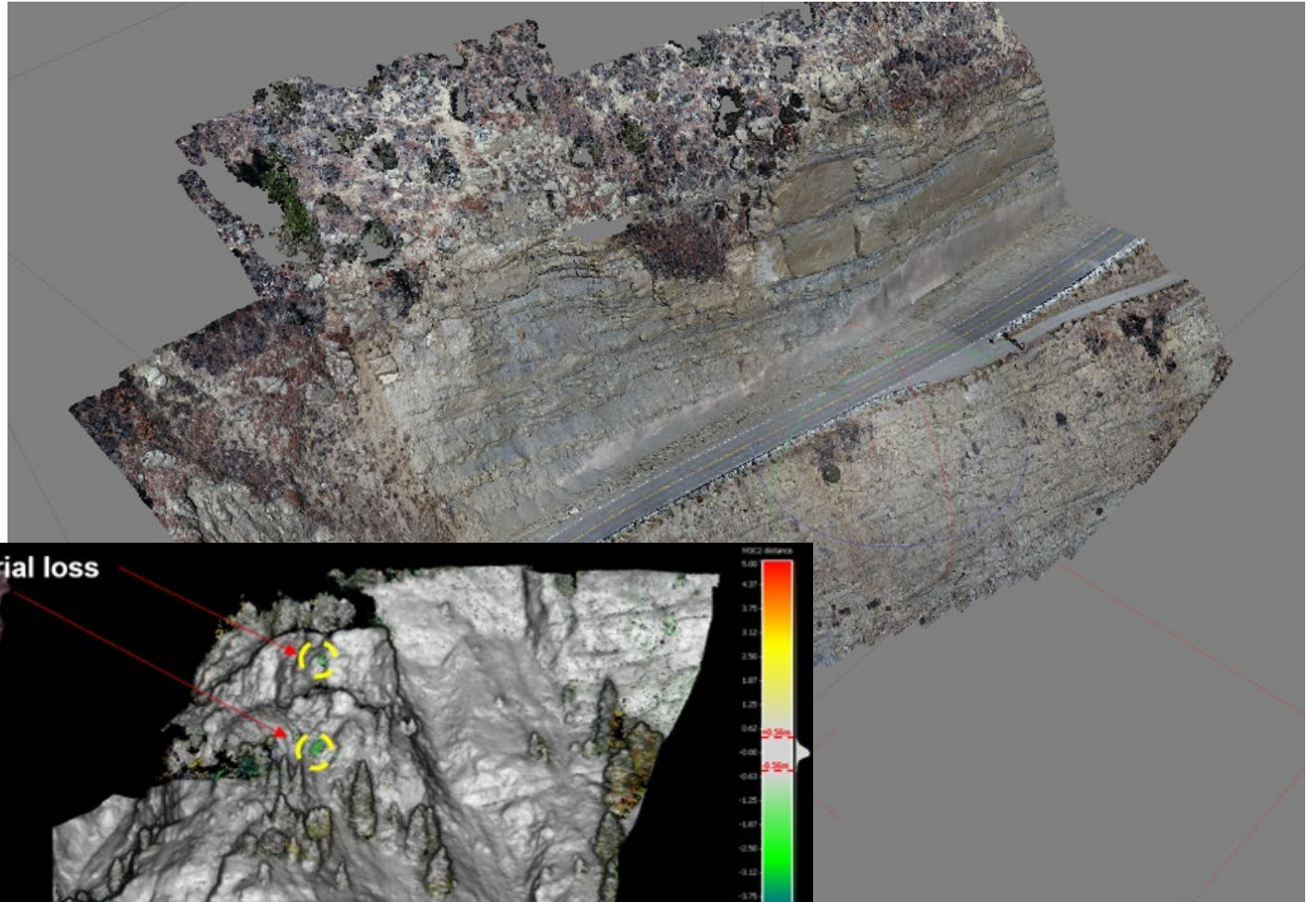
- ✓ Store all or portions of drone mission photos
- ✓ Simple Measurements





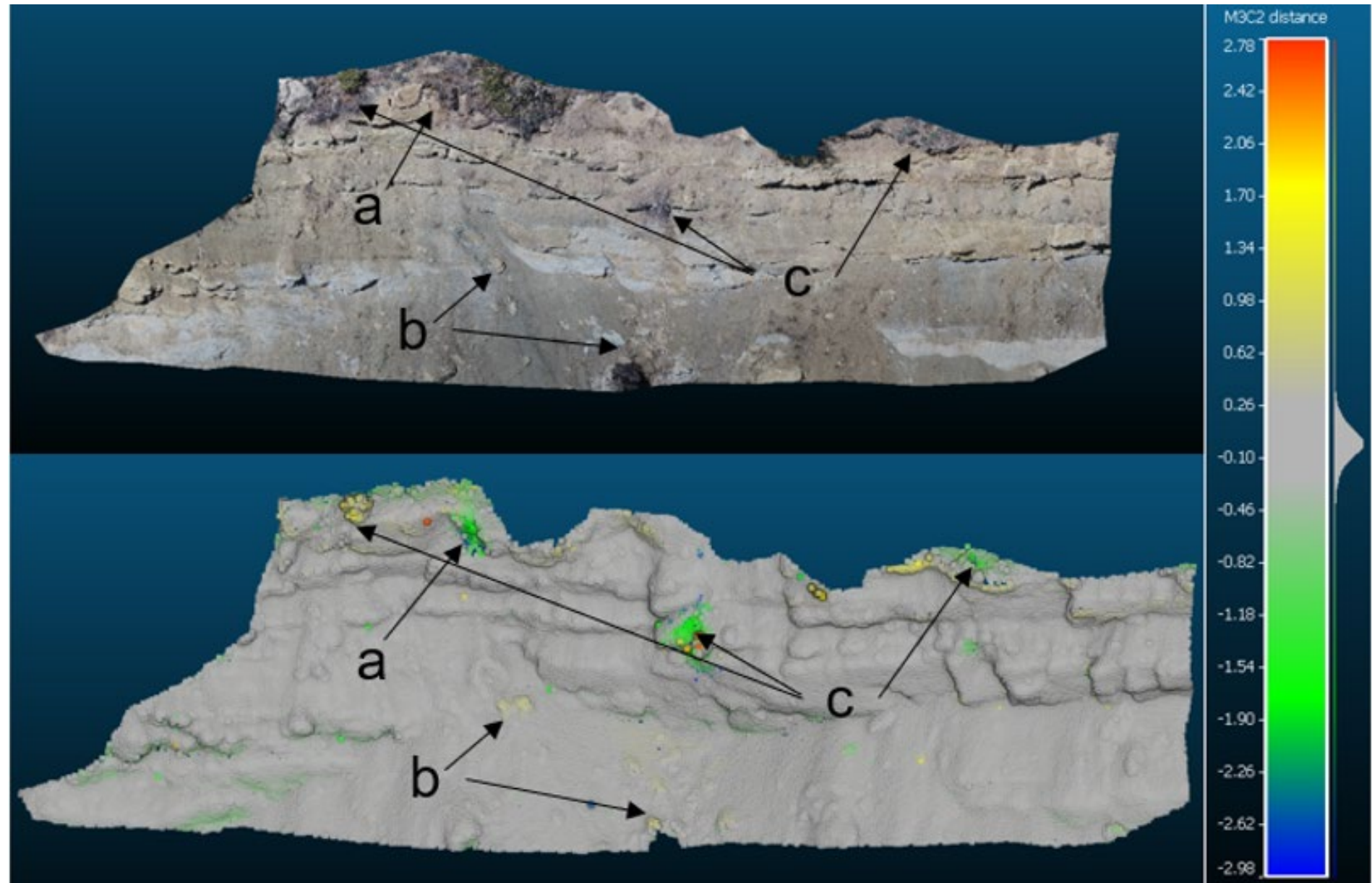
CloudCompare

- ✓ Try OBJ Files
- ✓ You Get What You Pay For

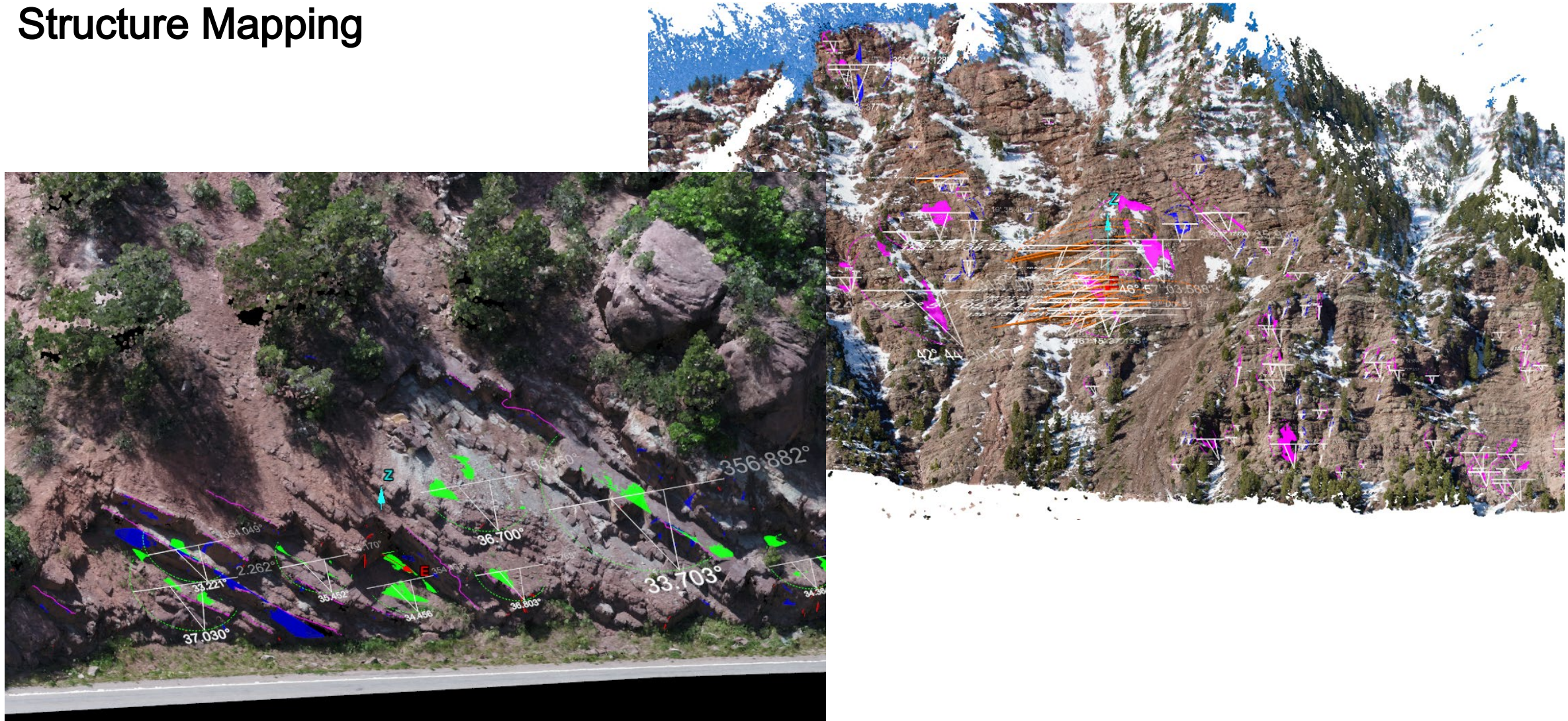


CloudCompare

Change Detection

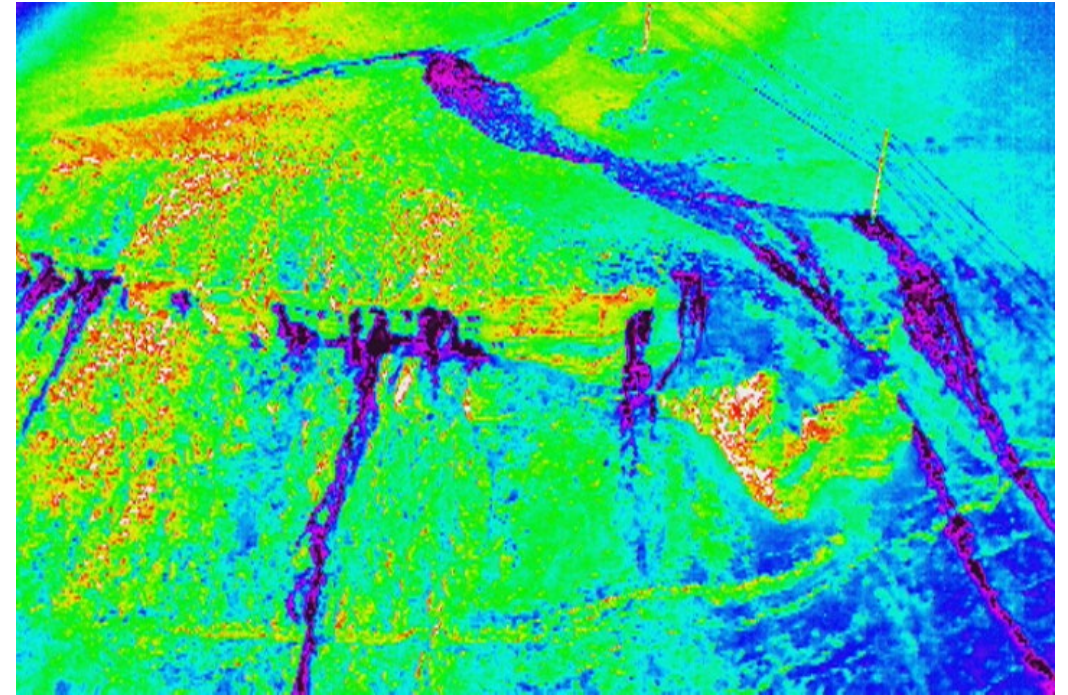


Structure Mapping



Thermal Infrared Imagery

Another Nice Tool in the Toolbox





Thank you

