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Comparison of DJI Zenmuse L1 and Riegl miniVUX-3 UAV data for DTM generation in the forestry area for archaeological purposes

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Presentation content

- Motivation
- Analysed sensors
- Study area
- Results
- Conclusion



Motivation

- Growing popularity and availability of laser scanners dedicated for UAVs
- Differences in accuracy and 3D reconstruction between the laser scanners for UAVs
- Different software used for data processing, and also ground filtration
- Growing popularity of UAVs and laser scanning in archaeology



Comparison of DJI Zenmuse L1 and Riegl miniVUX-3 UAV data for DTM generation in the forestry area for archaeological purposes

Sensors



<https://flystore.pl/>

DJI Zenmuse L1



<https://www.riegl.co.uk/>

Riegl miniVUX-3UAV



Sensors

Scanner	miniVUX-3UAV	Zenmuse L1
Type	Line (rot. mirror)	Risley prism
Scan angle	360	70.4
Scan frequency	max 200 000 pts/s	max 480 000 pts/s
Number of echoes	5	3
Range (80% reflectivity)	330 m	450 m
Accuracy	1,5 cm (50m AGL)	3 cm (100 m AGL)
Footprint (AGL 100 m)	16 cm x 5 cm	60 cm x 20 cm*

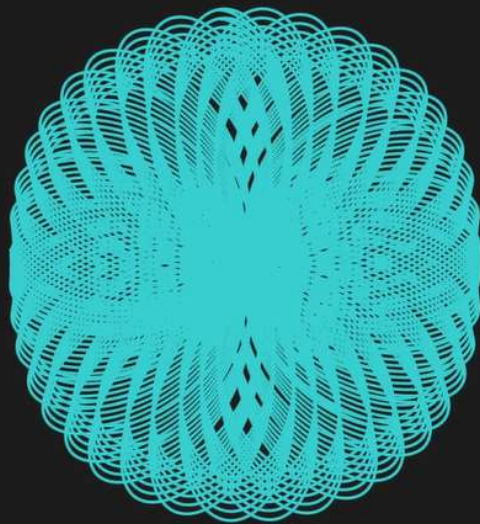


Sensors

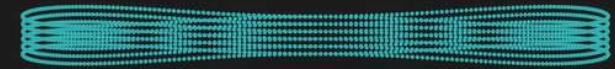
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Scanning patterns in DJI L1



non-repetitive

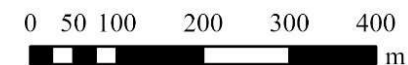
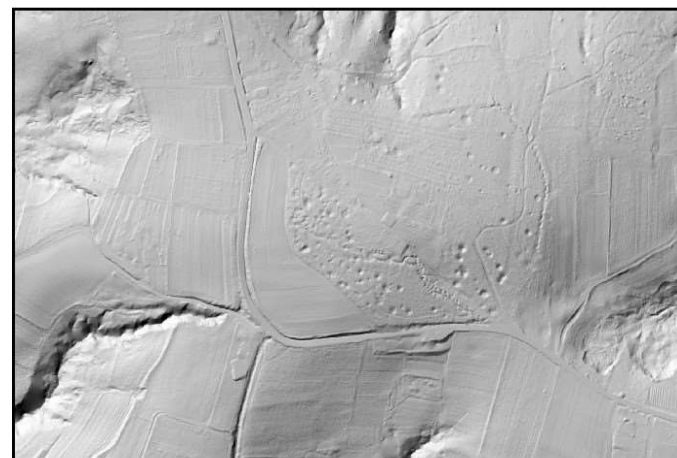
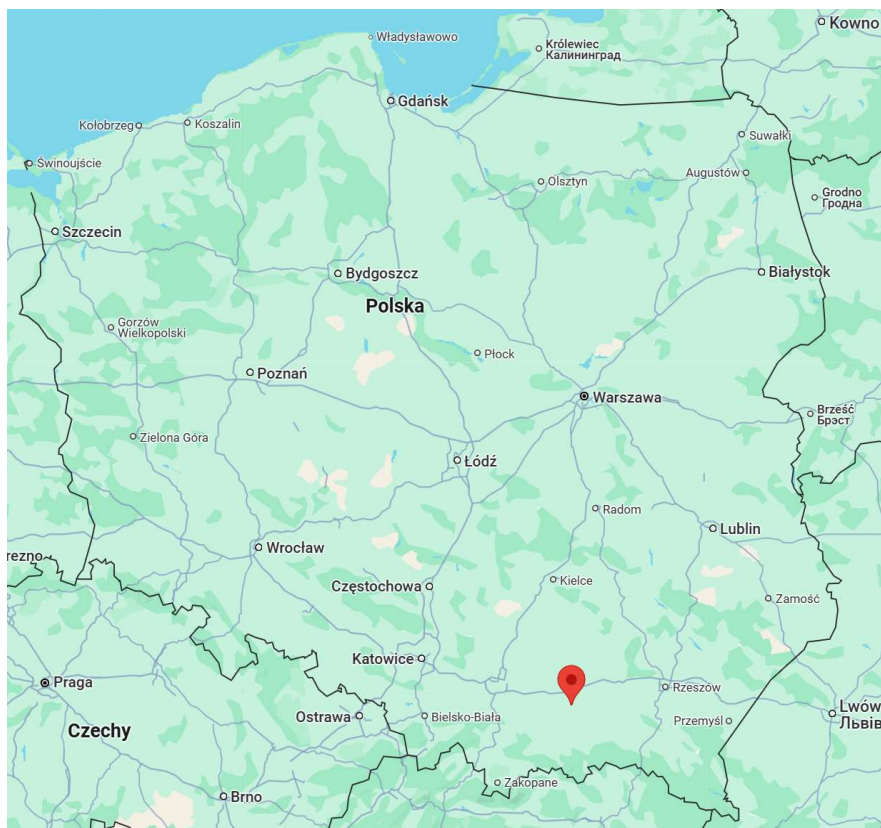


repetitive



Study area

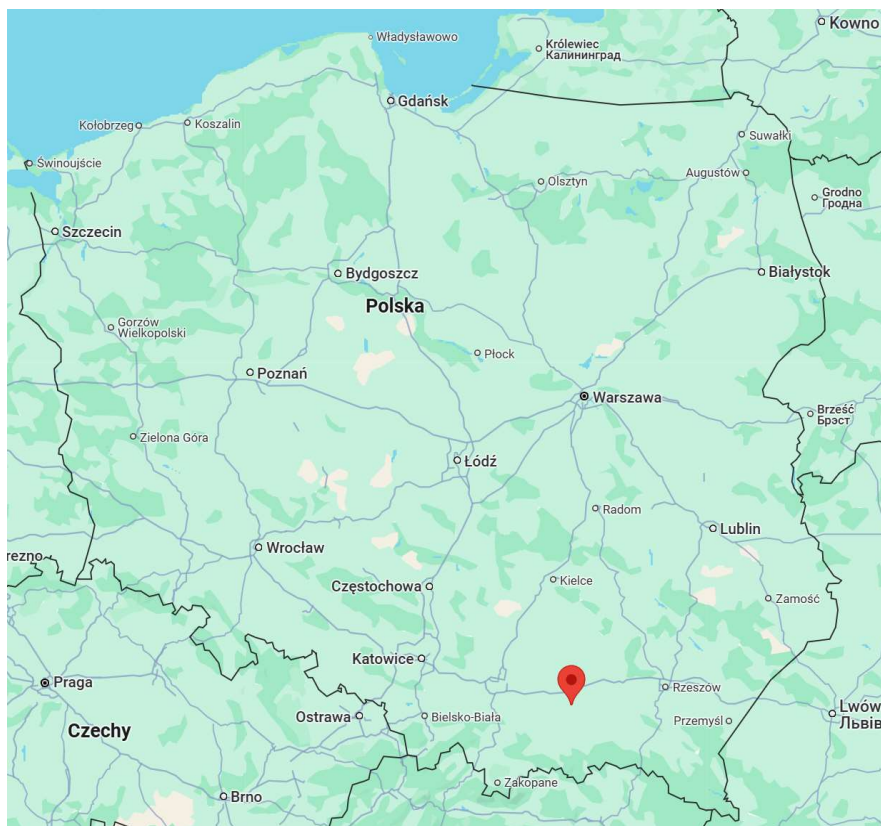
➤ Dąbrówka Szczepanowska, 22 March 2024





Study area

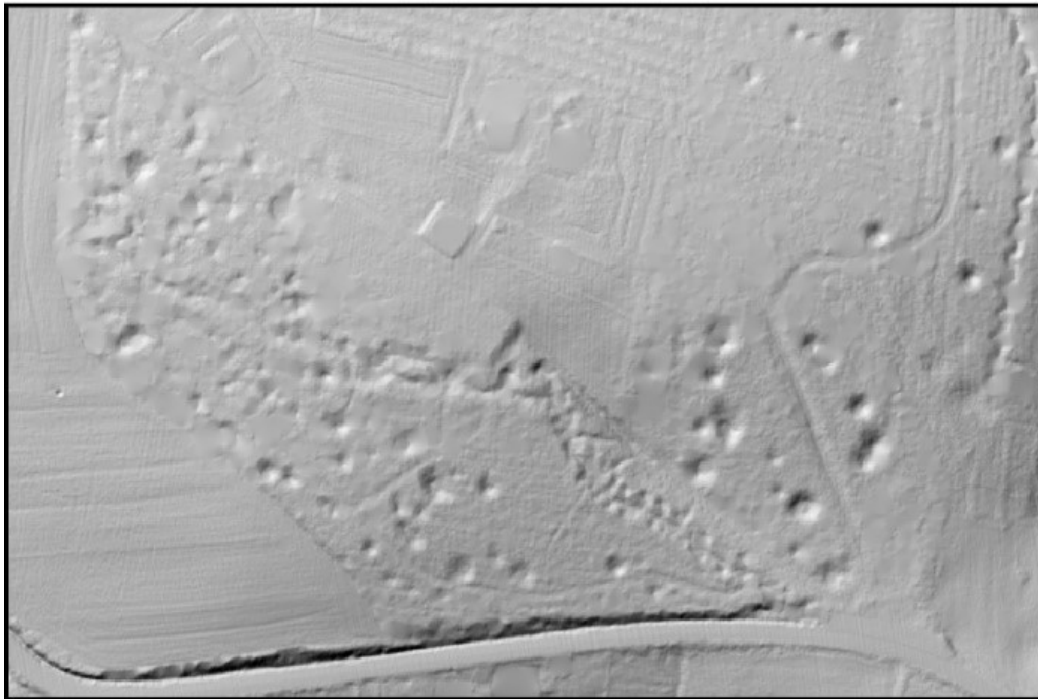
➤ Dąbrówka Szczepanowska, 22 March 2024



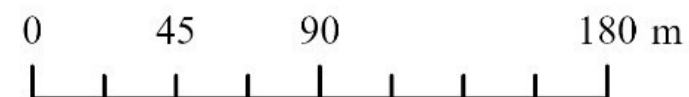
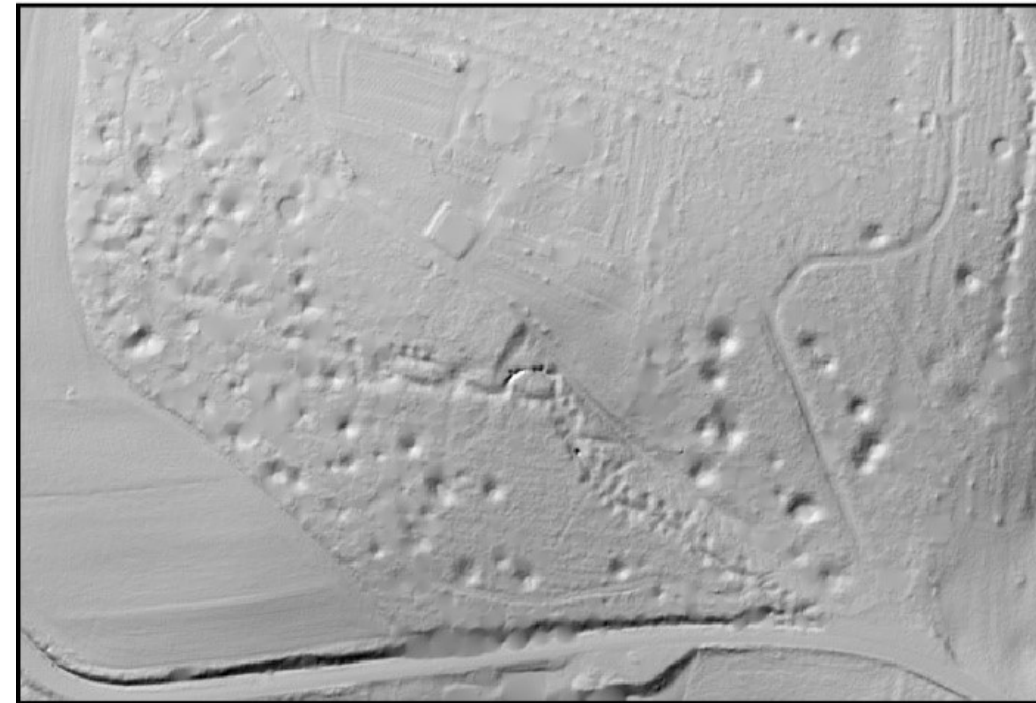


Study area – available ALS data in repository (4 pts/m²)

a) ALS 2011

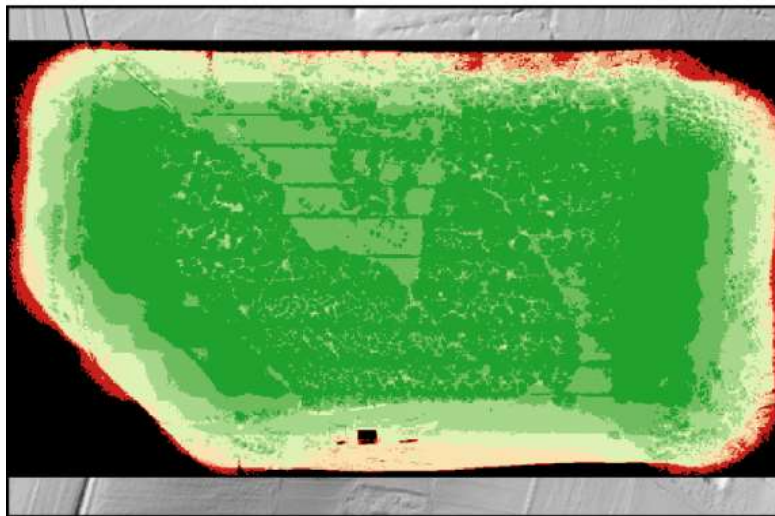


b) ALS 2023

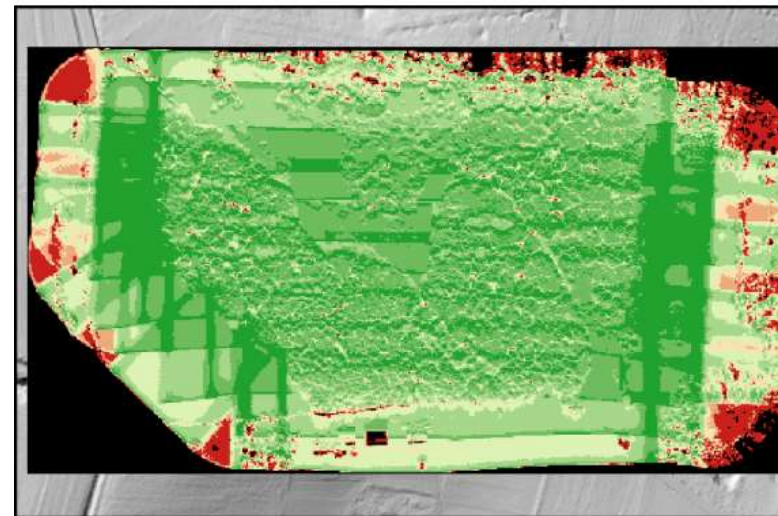




Results: DJI L1 total point density

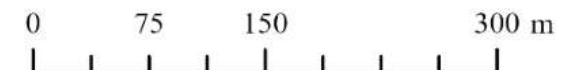
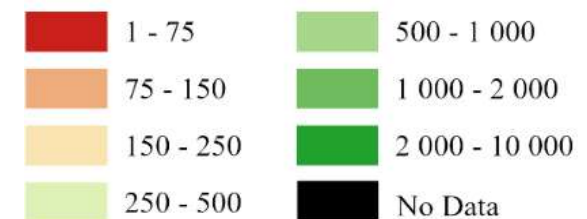


DJI L1: non-repetitive



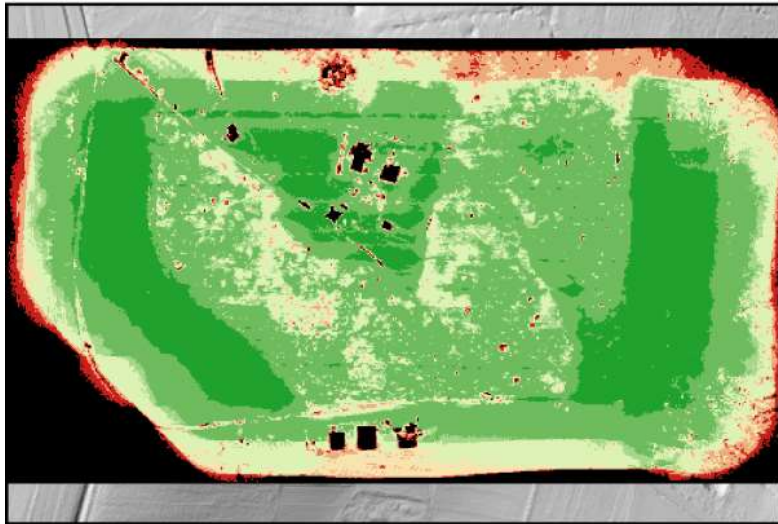
DJI L1: repetitive

Point density (pts/m²):

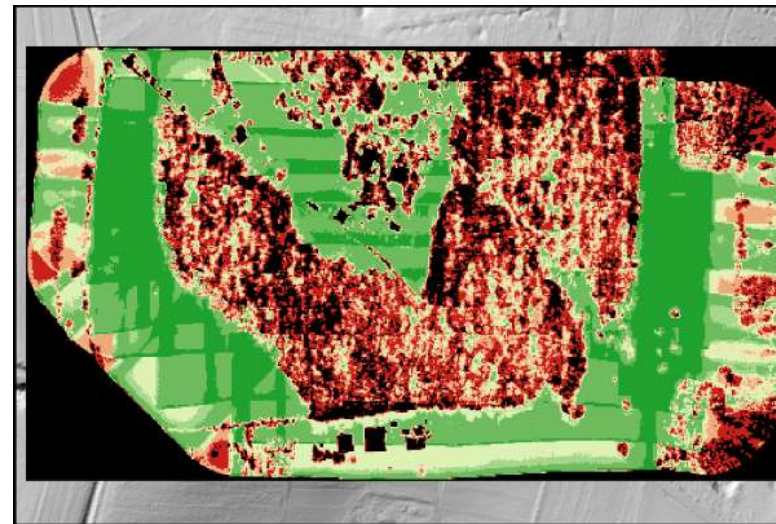




Results: DJI L1 ground point density

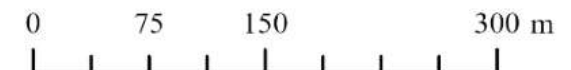


DJI L1: non-repetitive



DJI L1: repetitive

Point density (pts/m²):



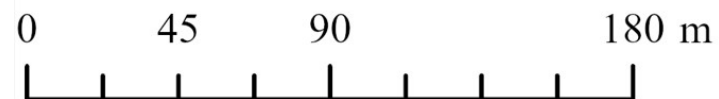


Results

DJI L1: non-repetitive

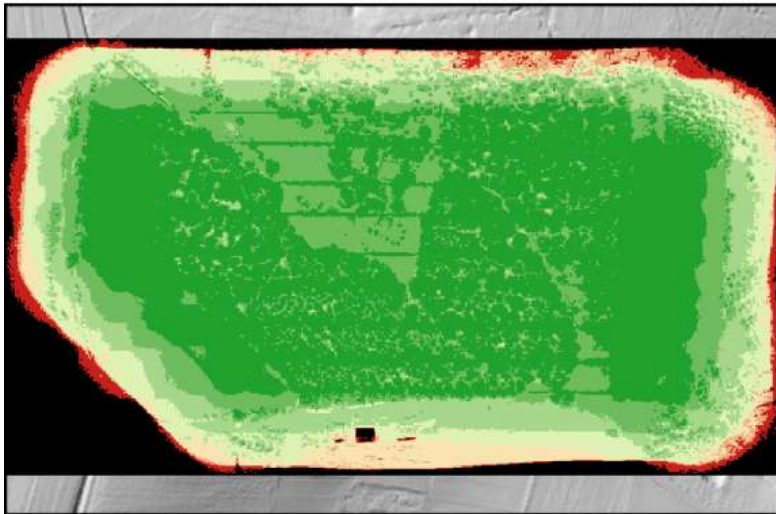


DJI L1: repetitive

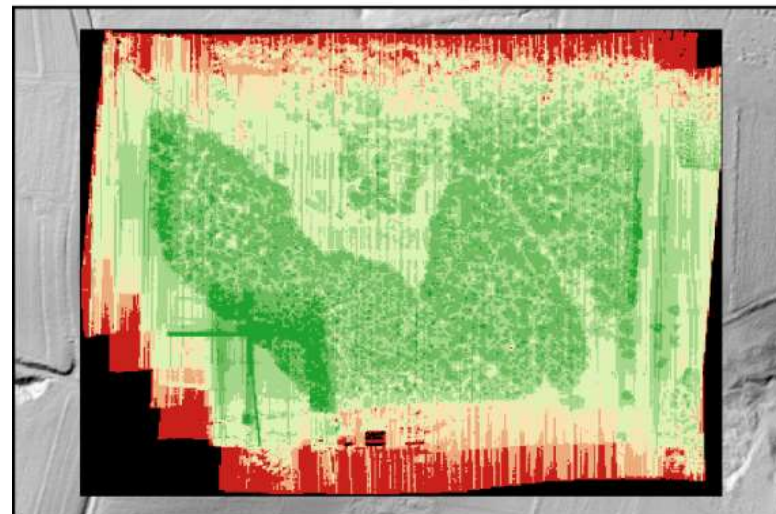




Results: DJI L1 vs MiniVUX-3 UAV total point density

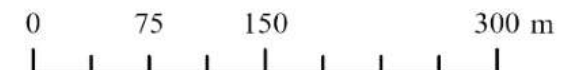
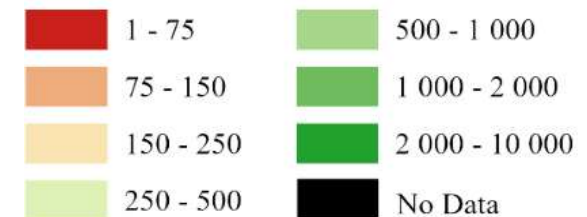


DJI L1: non-repetitive



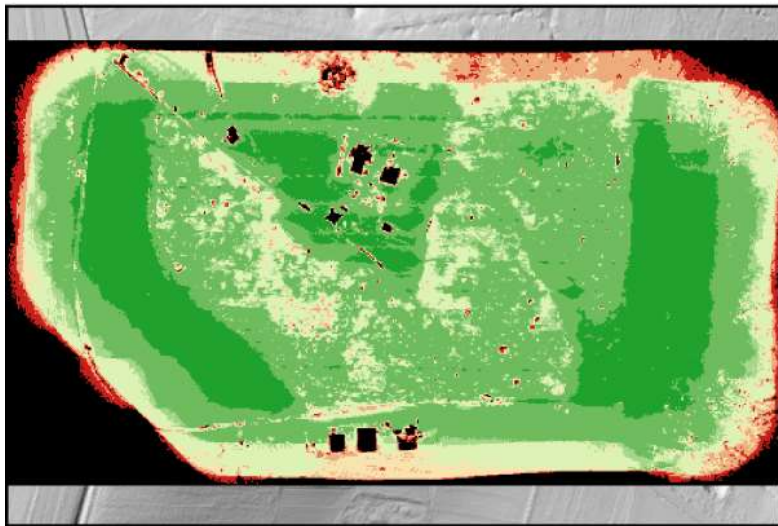
MiniVUX-3 UAV

Point density (pts/m²):

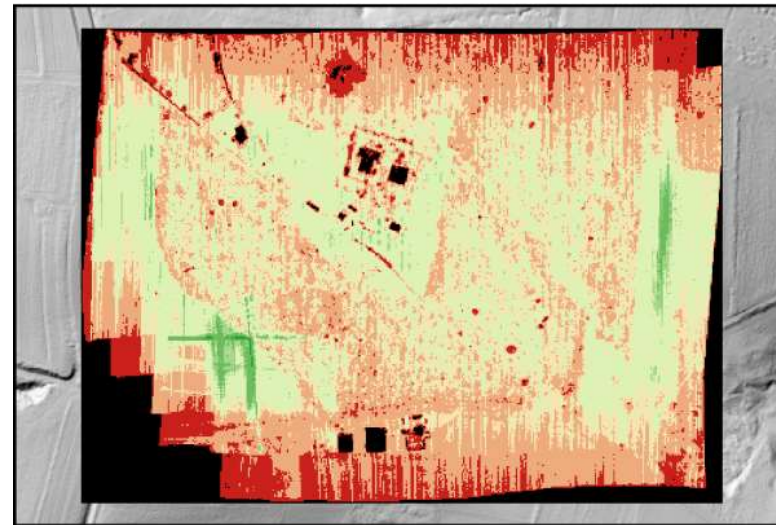




Results: DJI L1 vs MiniVUX-3 UAV ground point density

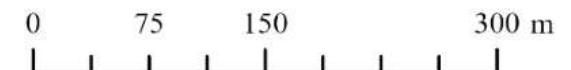
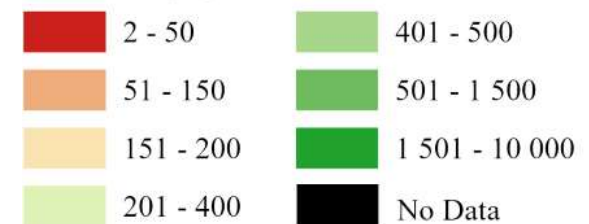


DJI L1: non-repetitive



MiniVUX-3 UAV

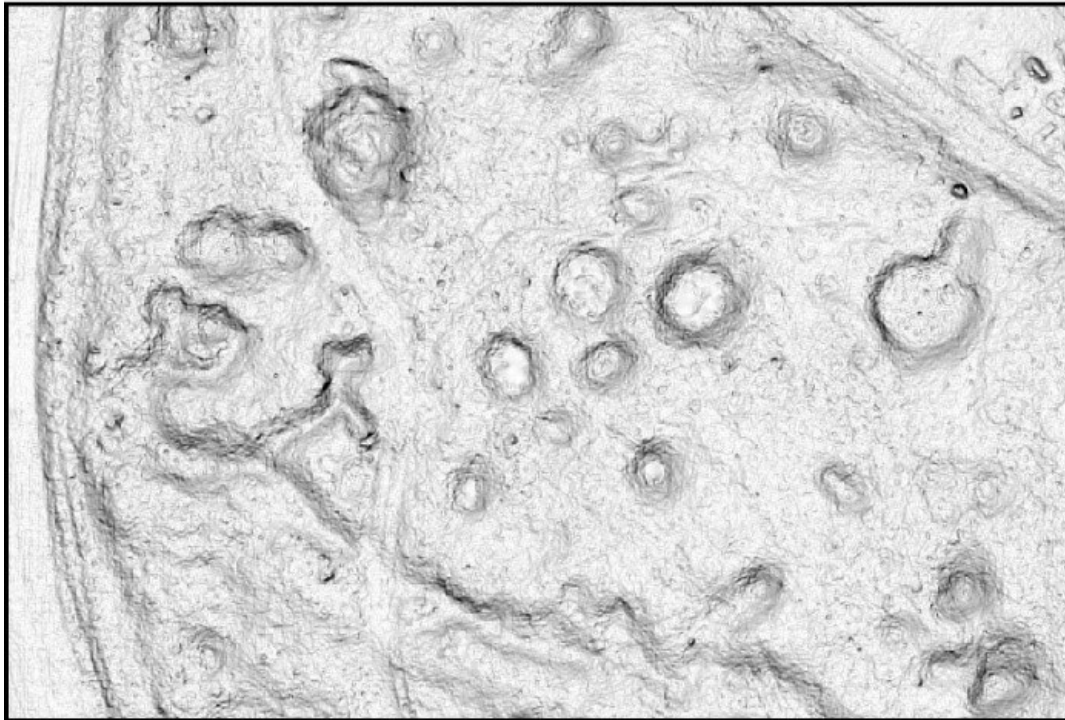
Point density (pts/m²):



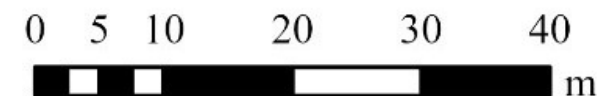
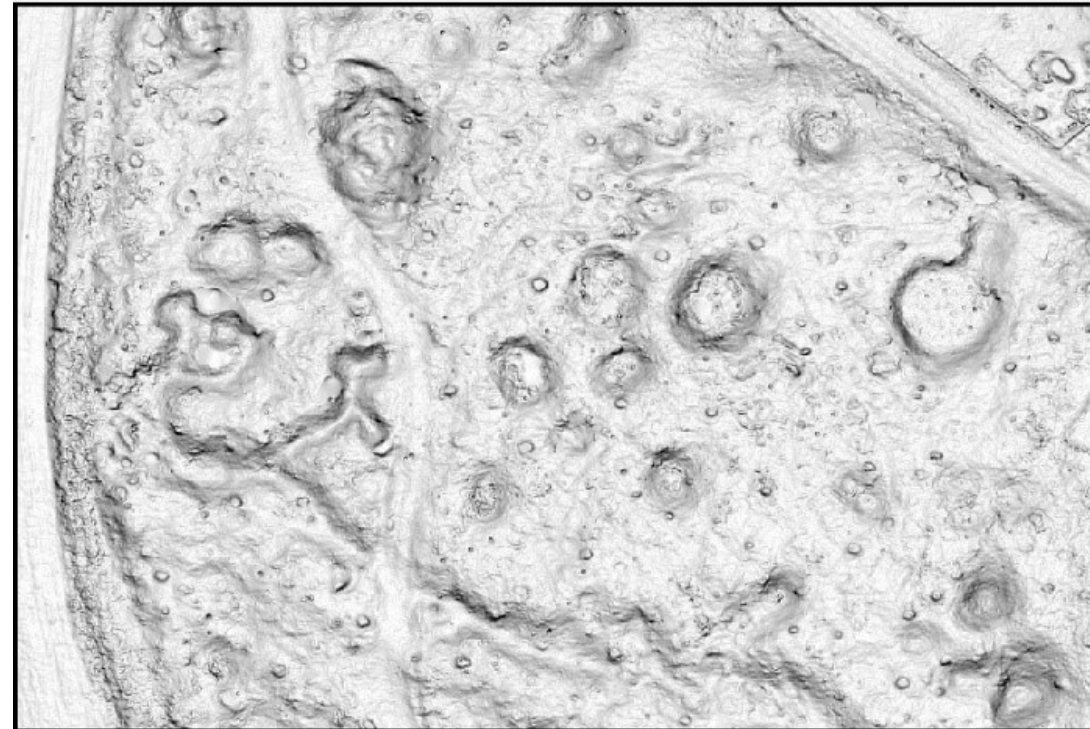


Results

MiniVUX-3 UAV



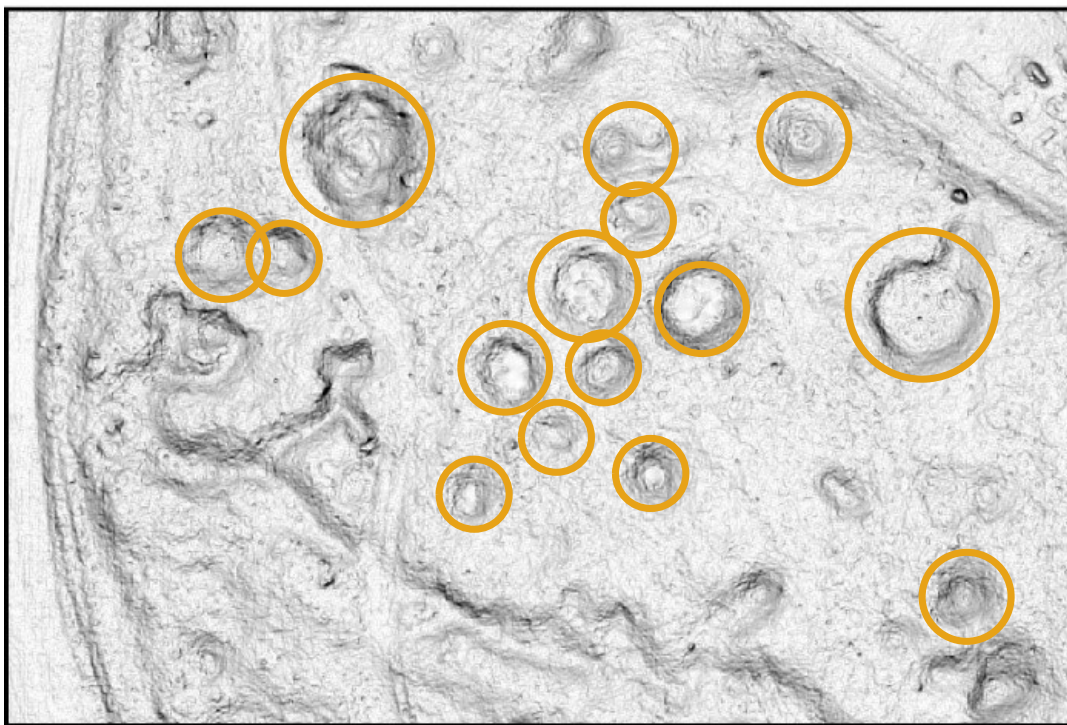
DJI L1: non-repetitive



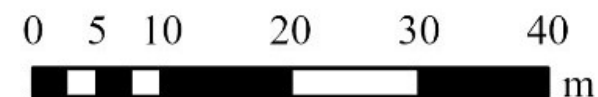
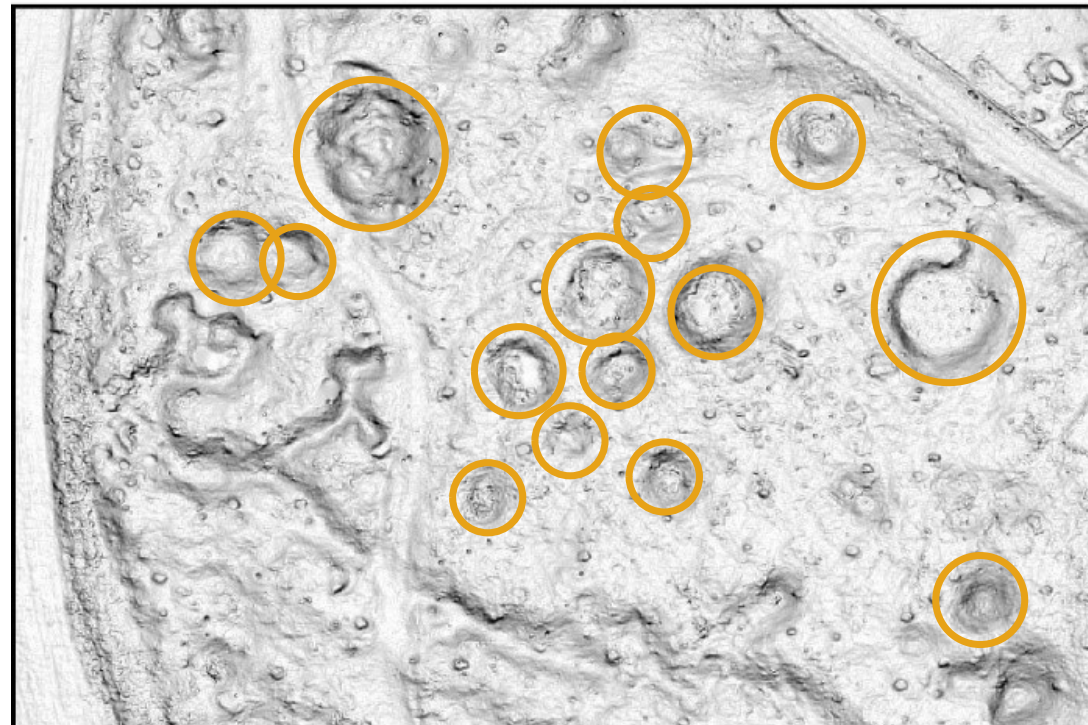


Results

MiniVUX-3 UAV



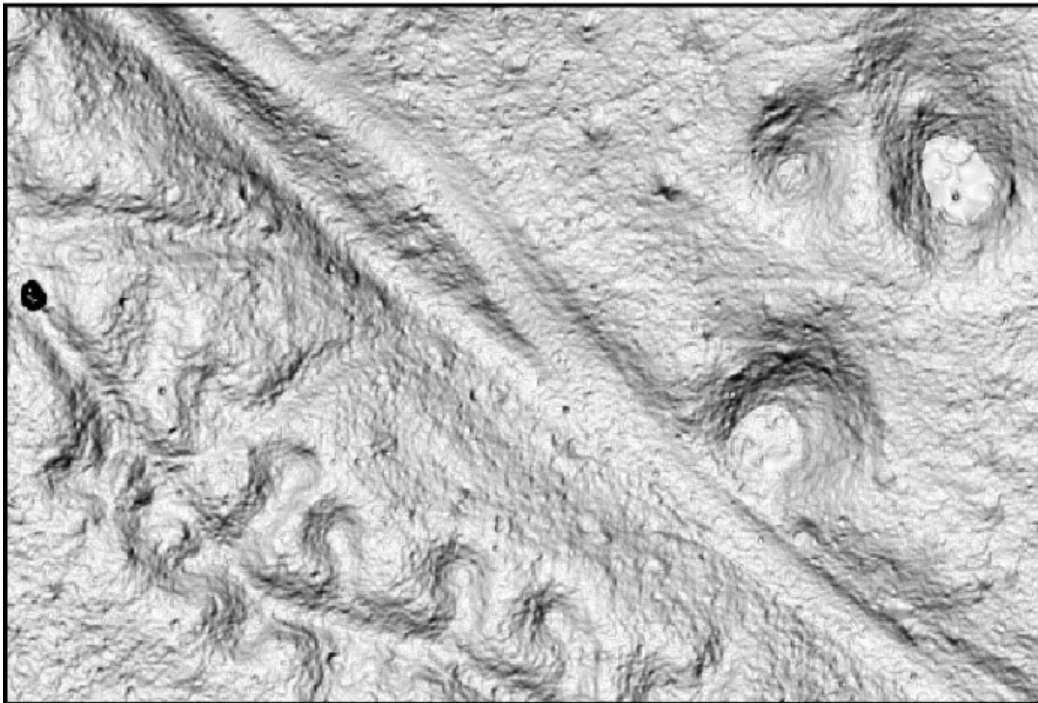
DJI L1: non-repetitive



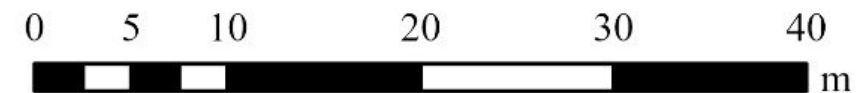
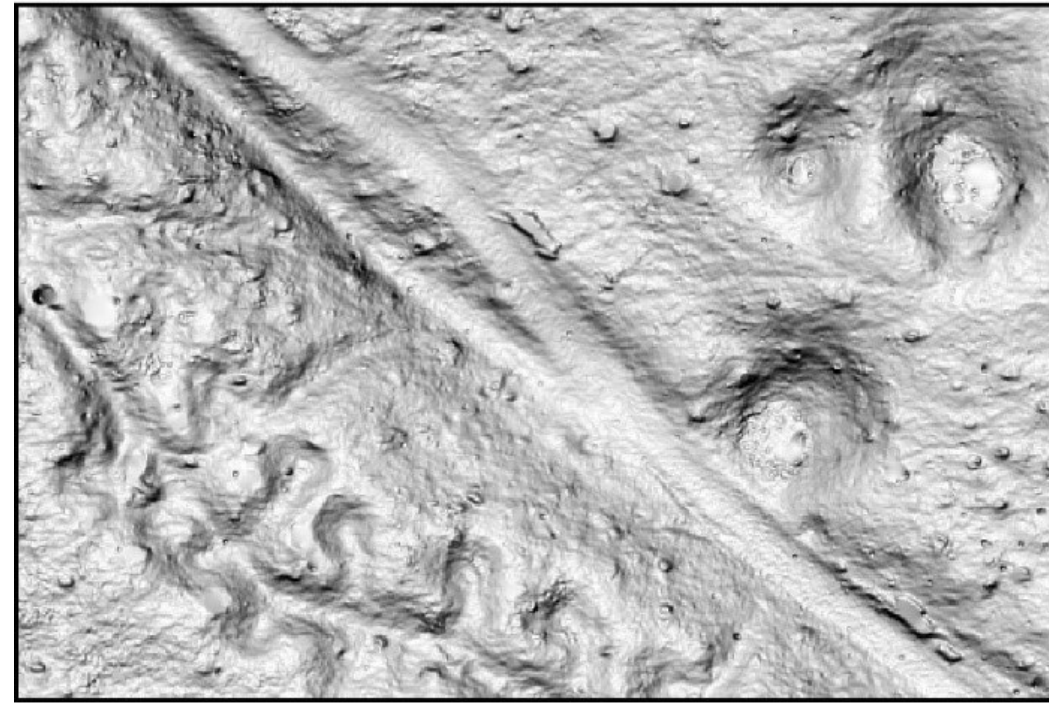


Results

MiniVUX-3 UAV



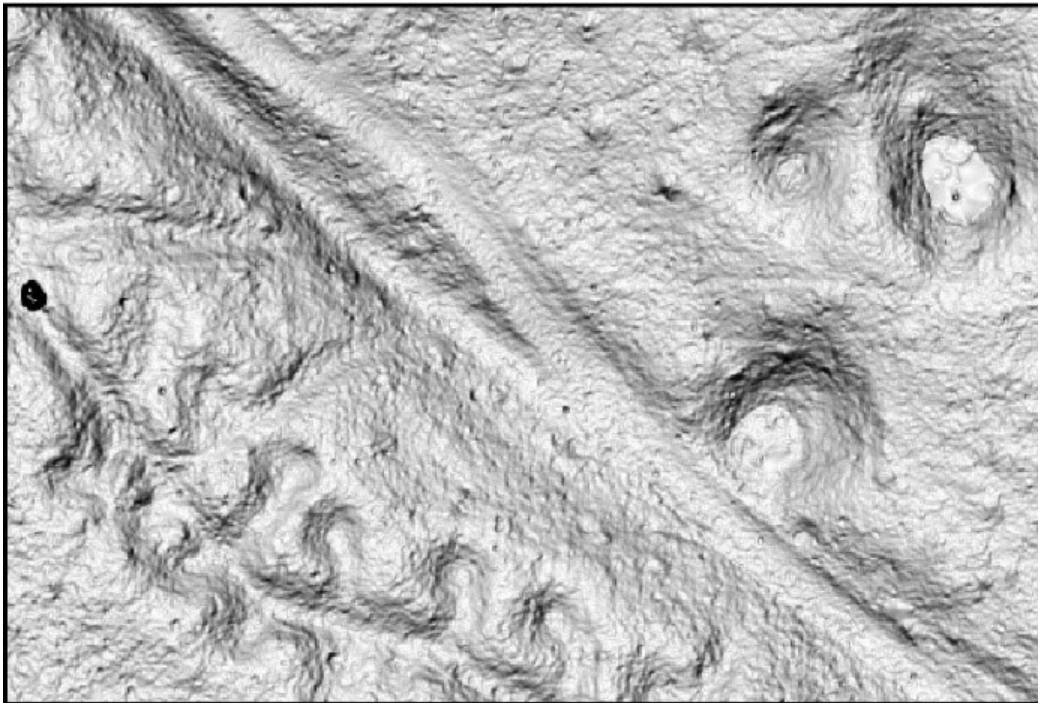
DJI L1: non-repetitive



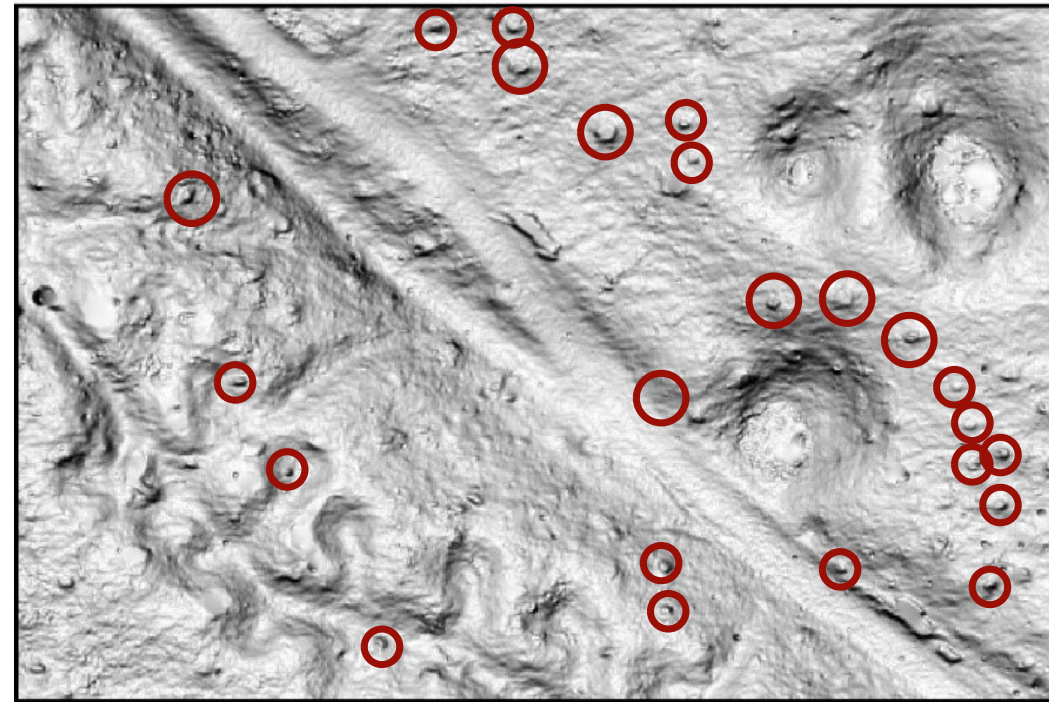


Results

MiniVUX-3 UAV



DJI L1: non-repetitive





Conclusion

- The main difference that can be noticed is point density. L1 point clouds are characterized by higher point density; however, analysing the density on the ground, the repetitive scanning pattern resulted in the lowest density (lower than for the Riegl laser scanner).
- The quality of the DTM is also strongly influenced by the type of scanning pattern – data acquired with DJI Zenmuse L1 with repetitive scanning pattern do not have enough points on the ground for archaeological application.
- Data collected by both scanners Riegl miniVUX-3UAV and DJI Zenmuse L1 with non-repetitive scan patterns are enough to identify remains on the study area.



Thank you for
your attention

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