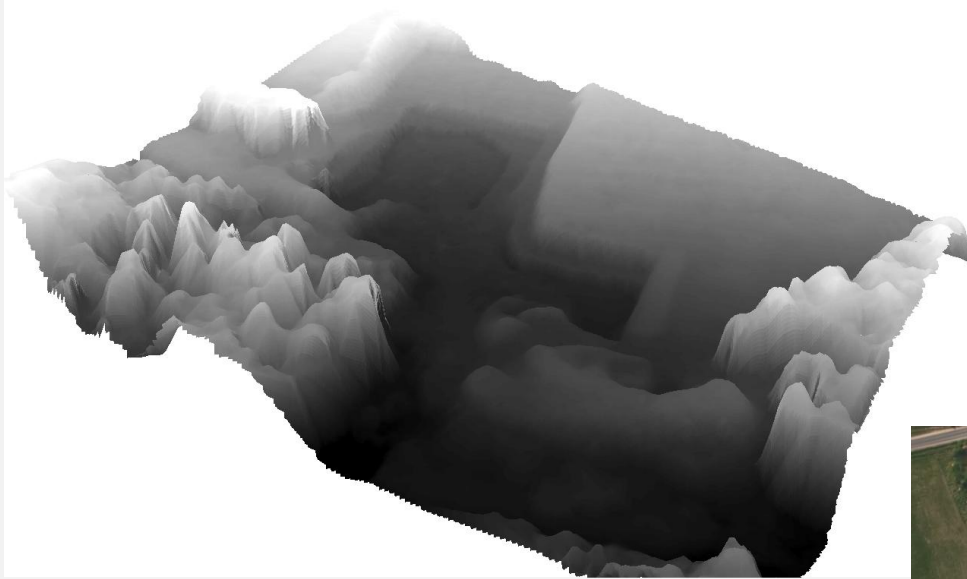


SENSITIVITY ANALYSIS OF UAV-PHOTOGRAMMETRY FOR CREATING DIGITAL ELEVATION MODELS



UAV-Photogrammetry and motivation

- Wide spread method due to low costs
- Poorer quality comparing to professional imagery
- no information about accuracy

Motivation

- Potential of UAVs for photogrammetric applications
- Extensive field campaign:
3D-reconstruction of geomorphologic landforms.



Experimental Setup

- Quarry with different geomorphologic units
- 1042 GCPs mounted in the field
- 3 different reference datasets:
 - Coordinates of GCPs measured by total station
 - 2000 additional TS measurements (High Risk)
 - Airborne LiDAR



SENSITIVITY ANALYSIS OF UAV-PHOTOGRAMMETRY FOR CREATING DIGITAL ELEVATION MODELS



Control points
marked by total station
measurements (High Risk)



UAV and Payload

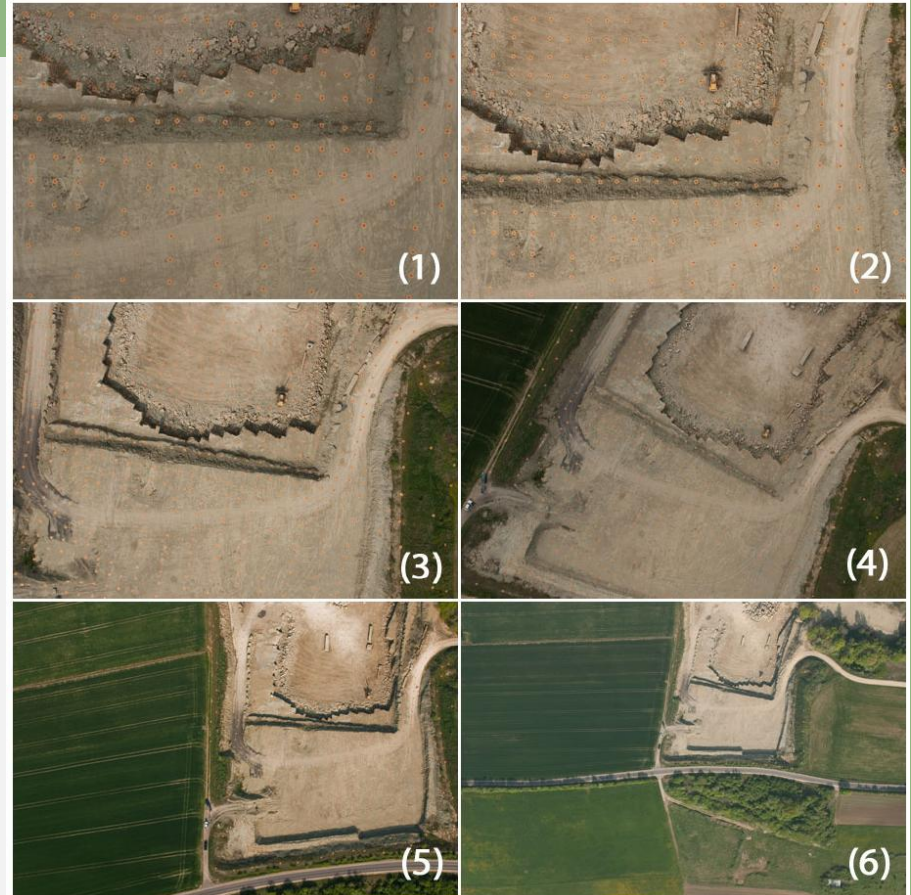
- MAVinci Sirius I
 - Autonomous waypoint navigation
 - Payload capacity ~ 1500gr
 - 20 min flight time
- Calibrated Canon 300D +
Sigma 28mm/1.8 lens



SENSITIVITY ANALYSIS OF UAV-PHOTOGRAMMETRY FOR CREATING DIGITAL ELEVATION MODELS

Image acquisition

- 19 flights during two days
- 413 usable images
- Flight altitudes 50-550m

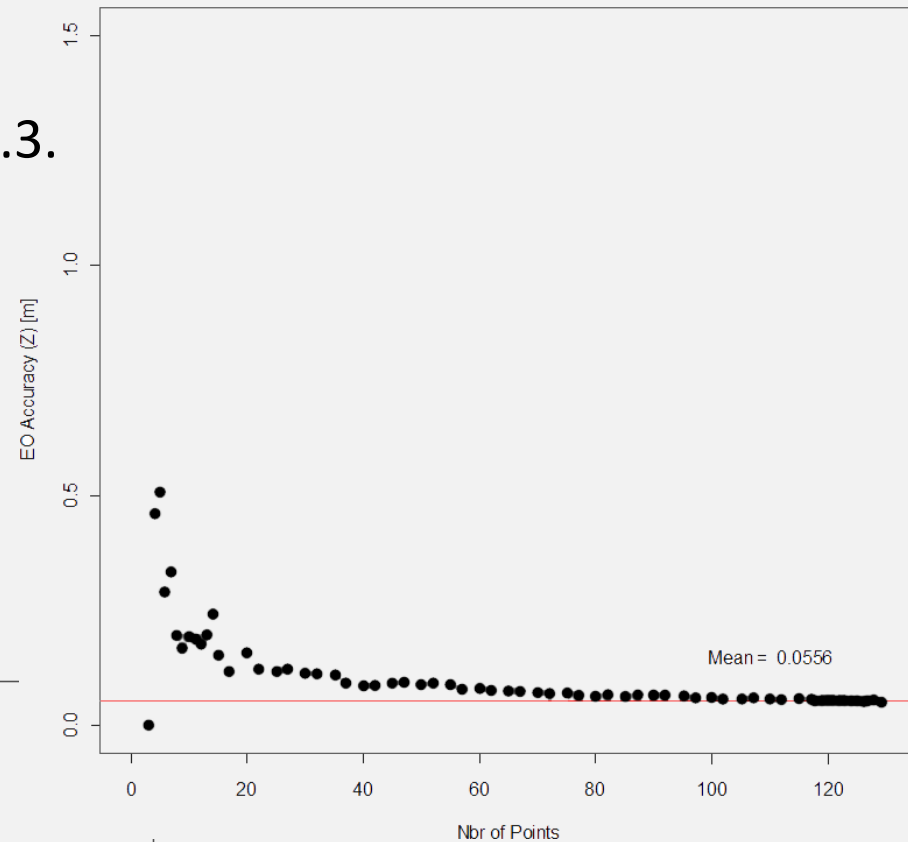
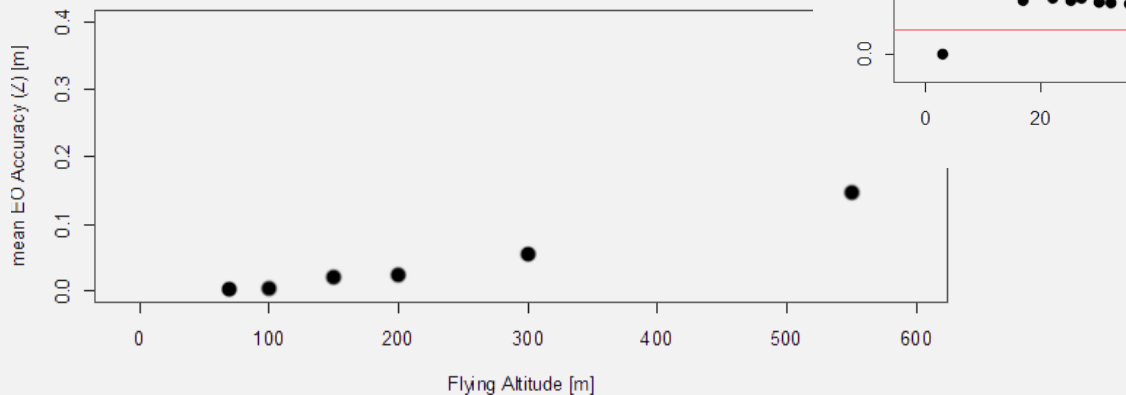


- Low trigger frequency
→ multiple flights at low flight altitudes

Problem: shadow moved during image acquisition

Indirect Sensor Orientation

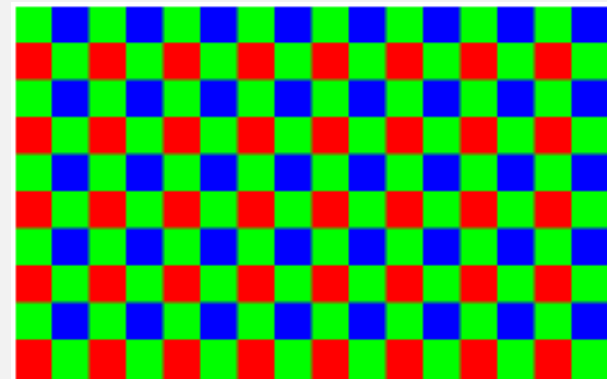
- Processing executed in LPS 9.3.
- Aerotriangulation
- Different number of GCPs



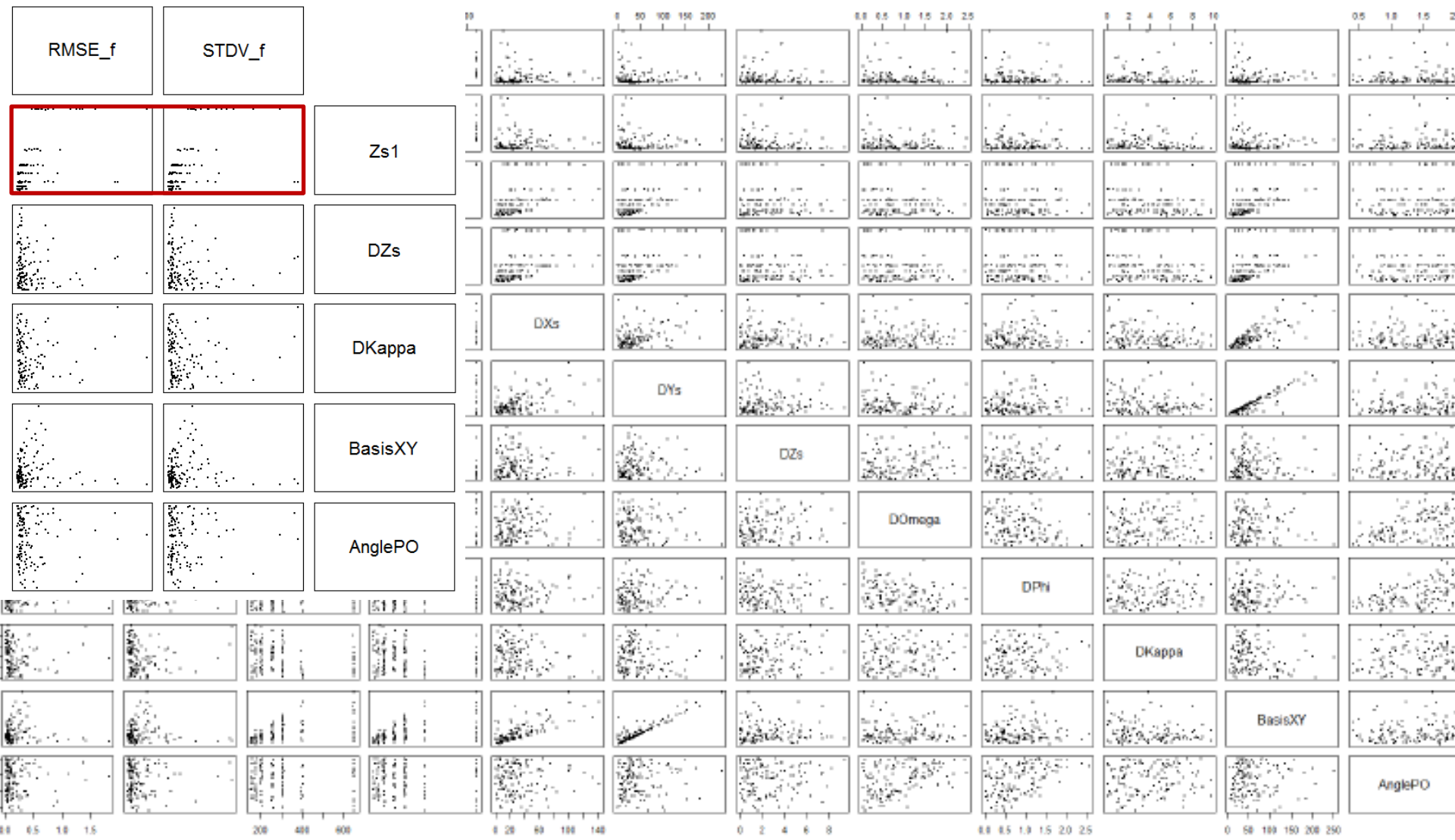
DEM Generation

- 133 image pairs were chosen for evaluation
- three different datasets were generated:
 - Algorithms applied on blue channel
 - Algorithms applied on green channel
 - Algorithm applied on green channel, indirect SO with reduced accuracy

- Residuals between DEMs and reference

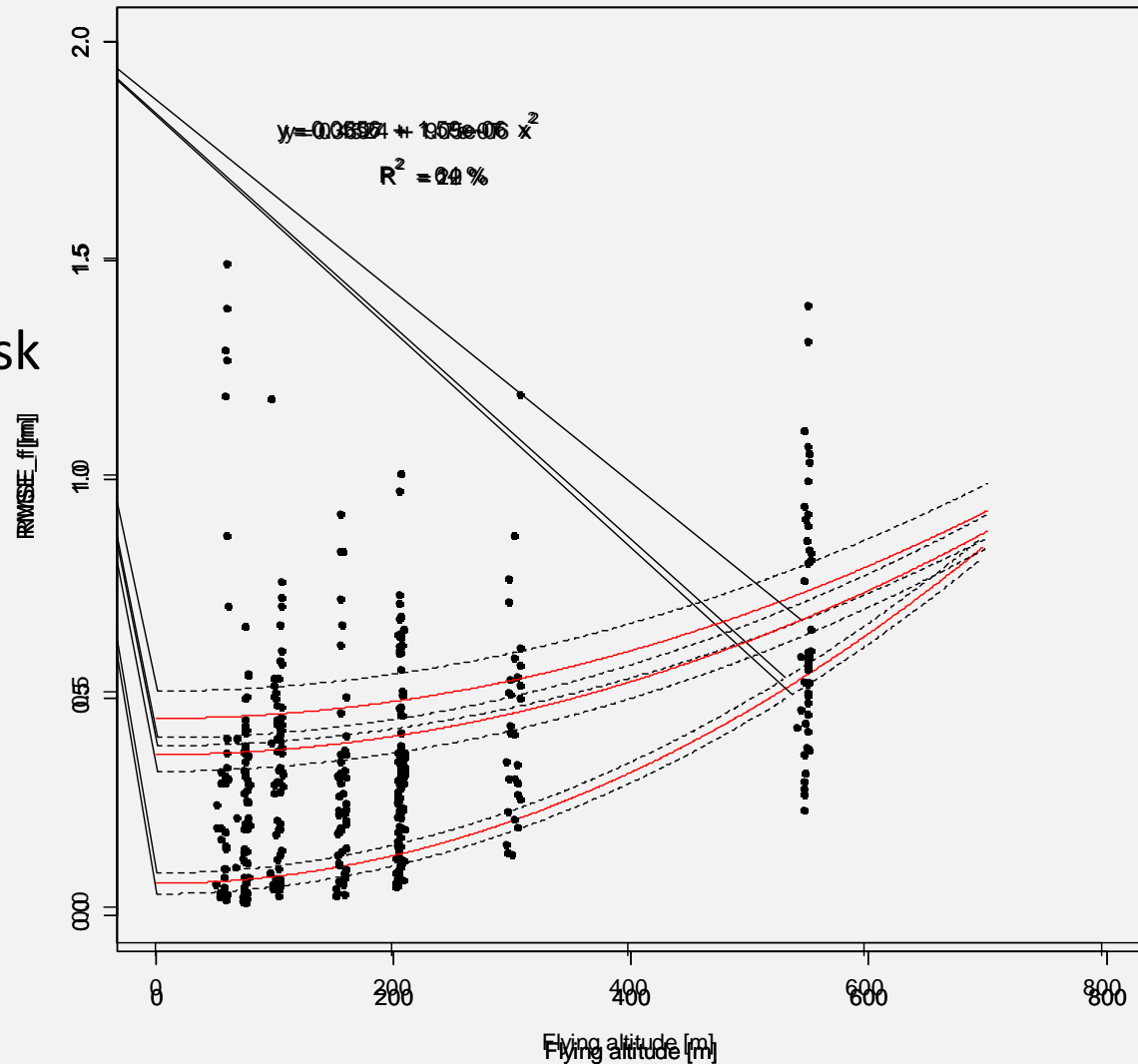


SENSITIVITY ANALYSIS OF UAV-PHOTOGRAMMETRY FOR CREATING DIGITAL ELEVATION MODELS



Results & Discussion

Dataset: 1
Reference 1 - GCP
Reference 2 - High Risk
Reference 3 - LiDAR



Results & Discussion

Dataset 1 = blue channel

Dataset 2 = green channel

Dataset 3 = reduced GCP accuracy

Dataset	Reference	Equation	R²
1	GCP	$y = 0.0558 + 1.59e-06x^2$	64 %
1	High Risk	$y = 0.4534 + 9.5e-07x^2$	9 %
1	LiDAR	$y = 0.3694 + 1.05e-06x^2$	22 %
2	GCP	$y = 0.0556 + 1.59e-06x^2$	64 %
2	High Risk	$y = 0.4524 + 9.7e-07x^2$	10 %
2	LiDAR	$y = 0.3697 + 1.05e-06x^2$	22 %
3	GCP	$y = 0.7404 + 3.25e-06x^2$	21 %
3	High Risk	$y = 1.1686 + 1.87e-06x^2$	7 %
3	LiDAR	$y = 0.8175 + 2.89e-06x^2$	18 %

*SENSITIVITY ANALYSIS OF UAV-PHOTOGRAMMETRY
FOR CREATING DIGITAL ELEVATION MODELS*

Thank you for your attention !

