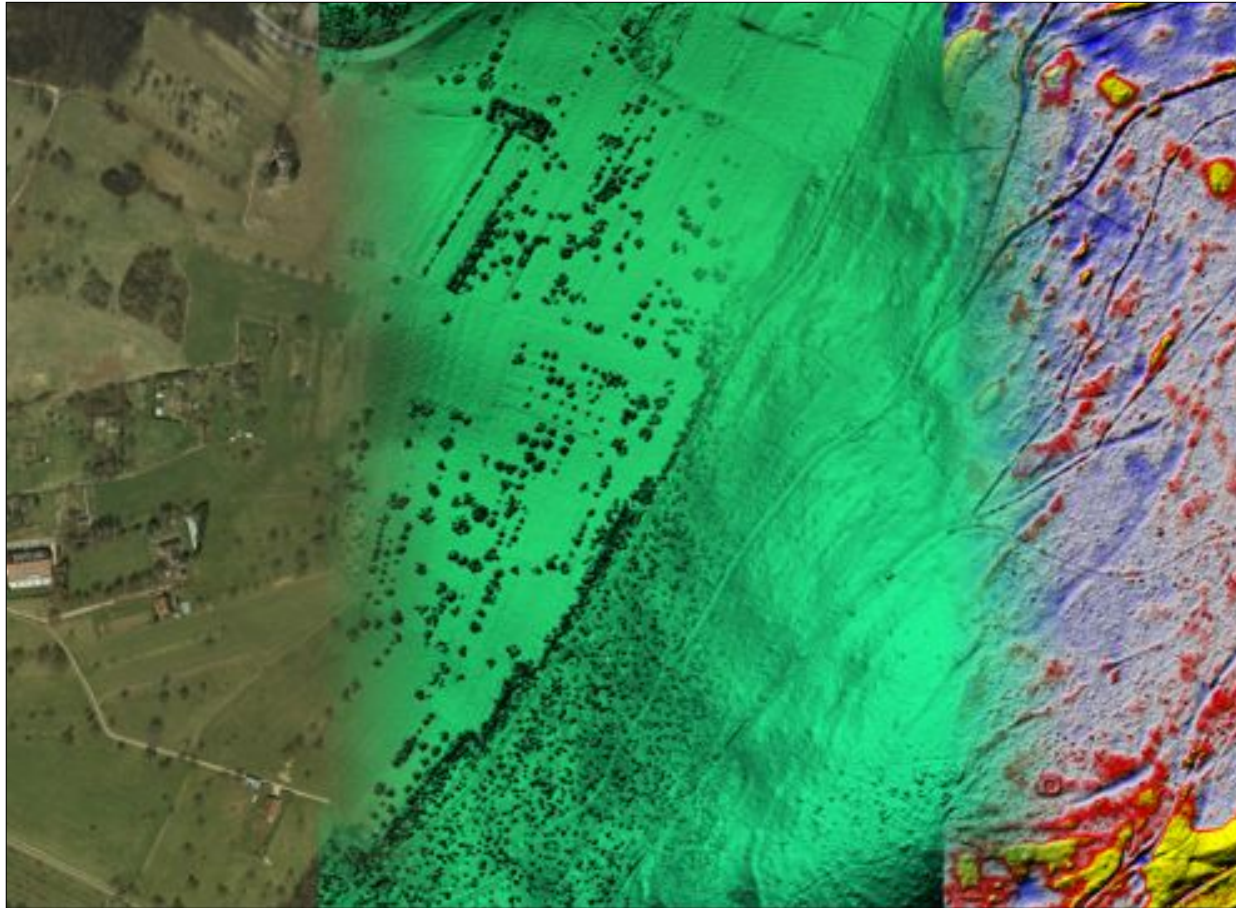
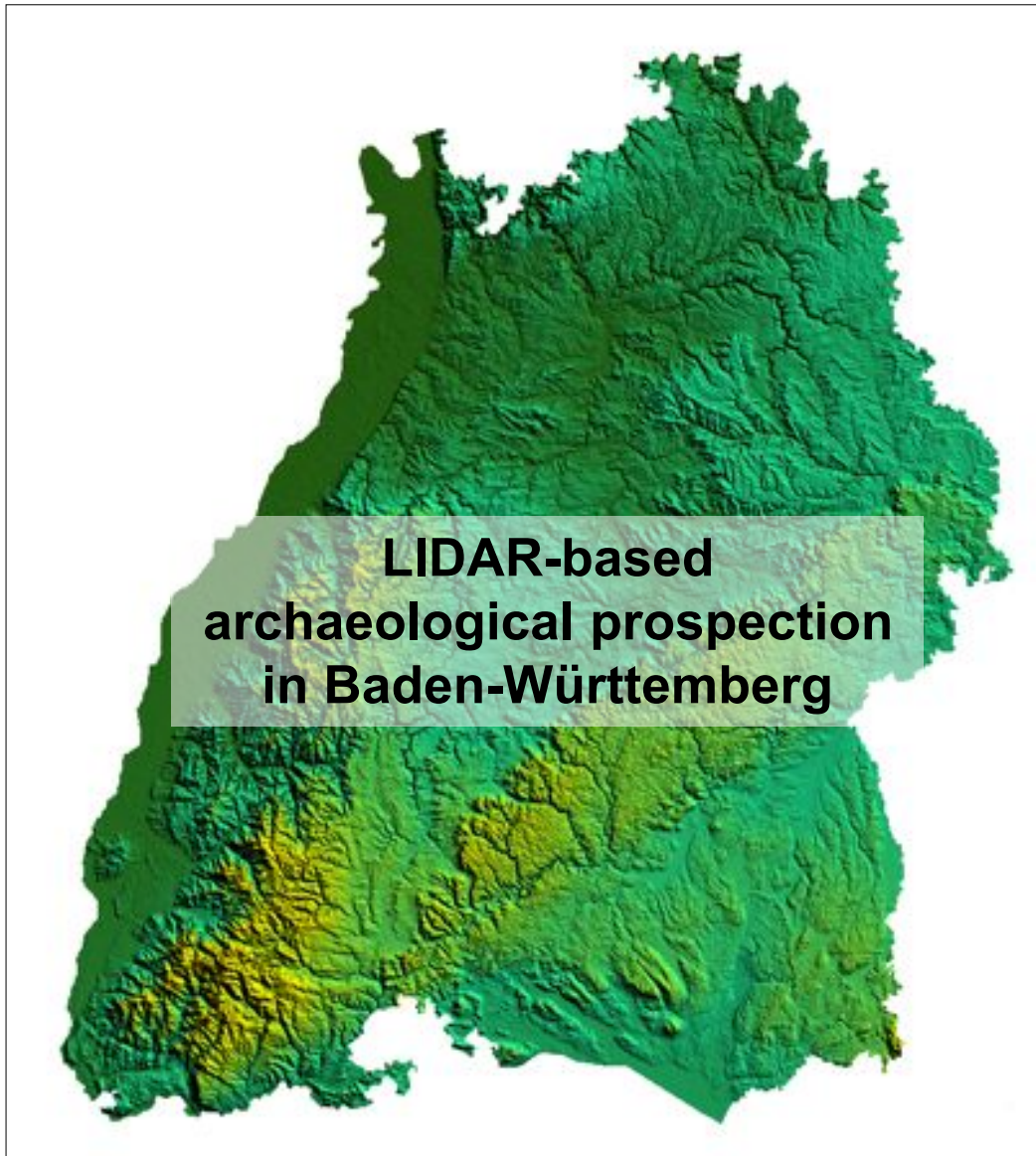


The potential of LIDAR-based DEM and LRM for the archaeological prospection of large areas



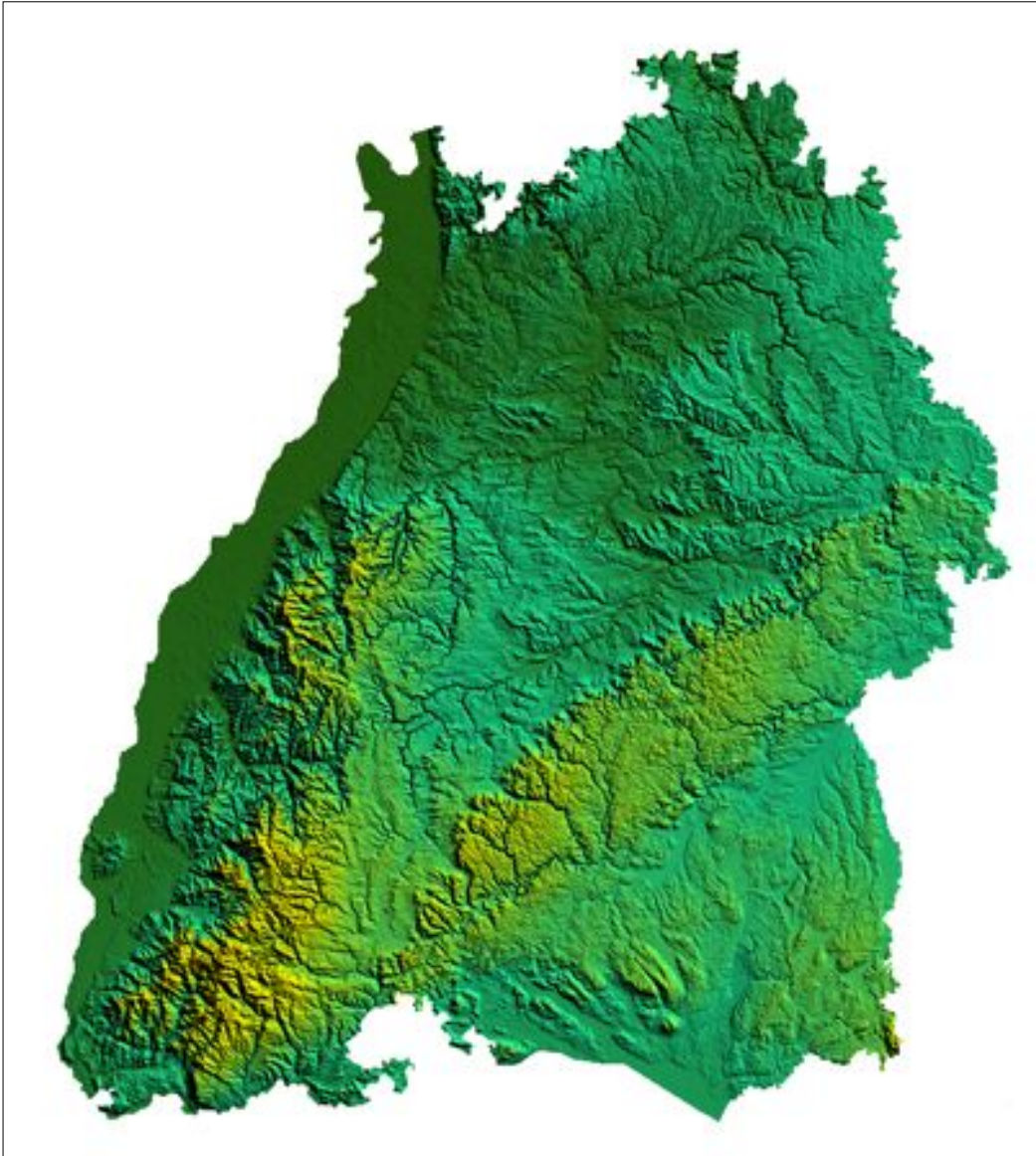
Introduction



Aims:

- archaeological prospection of Baden-Württemberg
- verification and extension of archaeological site database

Introduction



LIDAR data:

- State Surveying Office
- vegetation-filtered point cloud
- ~1 point/m²
- costs: annually 50 €/km²
(split among all users:
several ministries and
subsidiary institutions)

Project details:

- persons: 1
- access to results: in-house

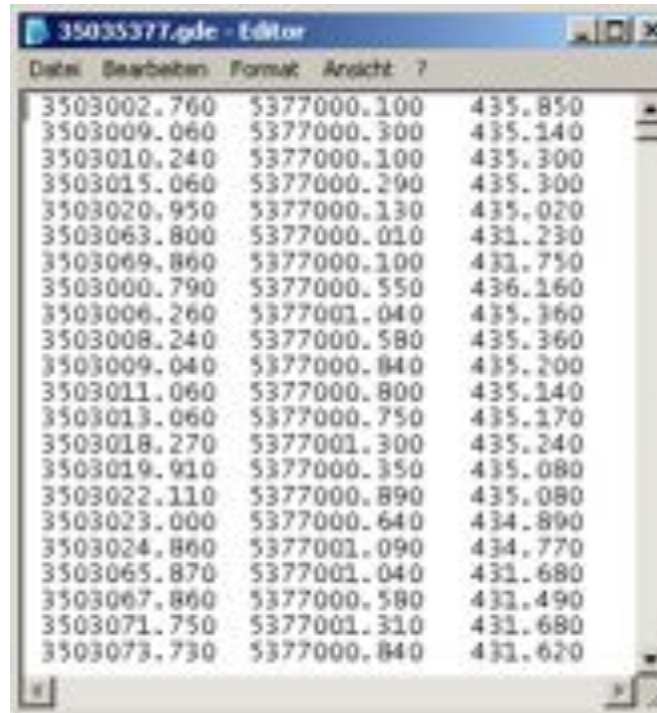
Challenge 1: data management

Data amount

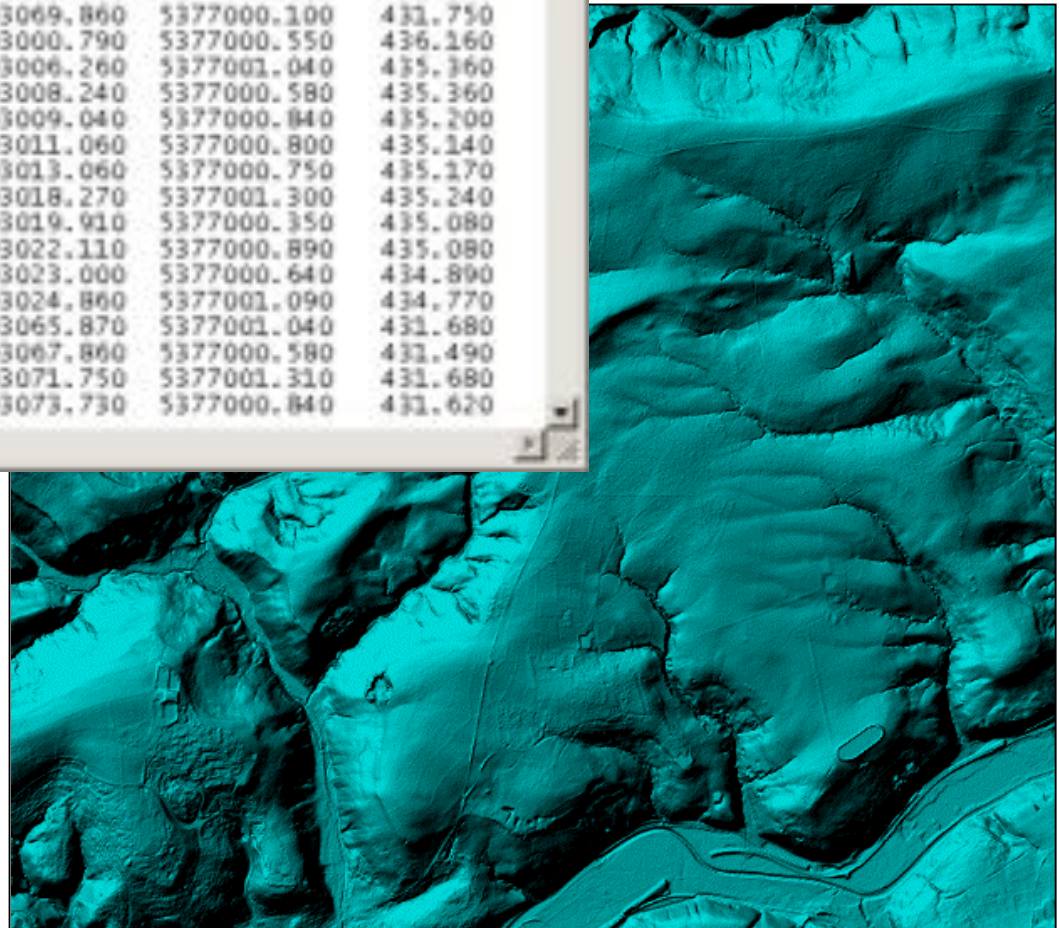
- 35 751 km²
- raw data:
 - >1 TB in ~160 000 files

File sizes

- combine files
- max. ~0.5 GB
- 25-100 km² per file
- 400-1600 files per raster layer
- 8-9 raster layers
- up to 22 vector layers



Datei	Bearbeiten	Format	Ansicht
3503002.760	5377000.100	435.850	
3503009.060	5377000.300	435.140	
3503010.240	5377000.100	435.300	
3503015.060	5377000.290	435.300	
3503020.950	5377000.130	435.020	
3503063.800	5377000.010	431.230	
3503069.860	5377000.100	431.750	
3503000.790	5377000.550	436.160	
3503006.260	5377001.040	435.360	
3503008.240	5377000.580	435.360	
3503009.040	5377000.840	435.200	
3503011.060	5377000.800	435.140	
3503013.060	5377000.750	435.170	
3503018.270	5377001.300	435.240	
3503019.910	5377000.350	435.080	
3503022.110	5377000.890	435.080	
3503023.000	5377000.640	434.890	
3503024.860	5377001.090	434.770	
3503065.870	5377001.040	431.680	
3503067.860	5377000.580	431.490	
3503071.750	5377001.310	431.680	
3503073.730	5377000.840	431.620	



Data management

Bearbeitungsstand und Auswahl LIDAR Baden-Württemberg (Gauss-Krüger-Segmente)

Speichern ? EXIT

Anzeige: **Bearbeitung** Datenqualität Daten ADAB Detektiert

Legende Bearbeitung

- Auswahl
- außerhalb B-IV
- nicht bearbeitet
- 1 Rohdaten zusammengeführt
- 2 Punktdichte + Datenlücken
- 3 DOM gerechnet
- 4 DOM & LRM gerechnet
- 5 BLN -> ASC
- 6 LRM gerechnet
- 7 Kartierung in Arbeit
- 8 Kartierung fertig
- 9 Import ADAB fertig

Auswahl

Auswahl aufheben

In Global Mapper laden

Ausführen / Markieren

[1] Rohdaten zusammenfassen

[2] Punktdichte + Datenlücken

[3] DOM gerechnet (OK)

[4] DOM & LRM berechnen

[5] BLN -> ASC

[6] LRM berechnen

[7] Kartieren in Global Mapper

[8] Kartierung fertig (OK)

[9] Import ADAB (OK)

Legende Datenqualität

- außerhalb B-IV
- < 125 cm
- 125 - 150 cm
- 150 - 175 cm
- 175 - 200 cm
- > 200 cm

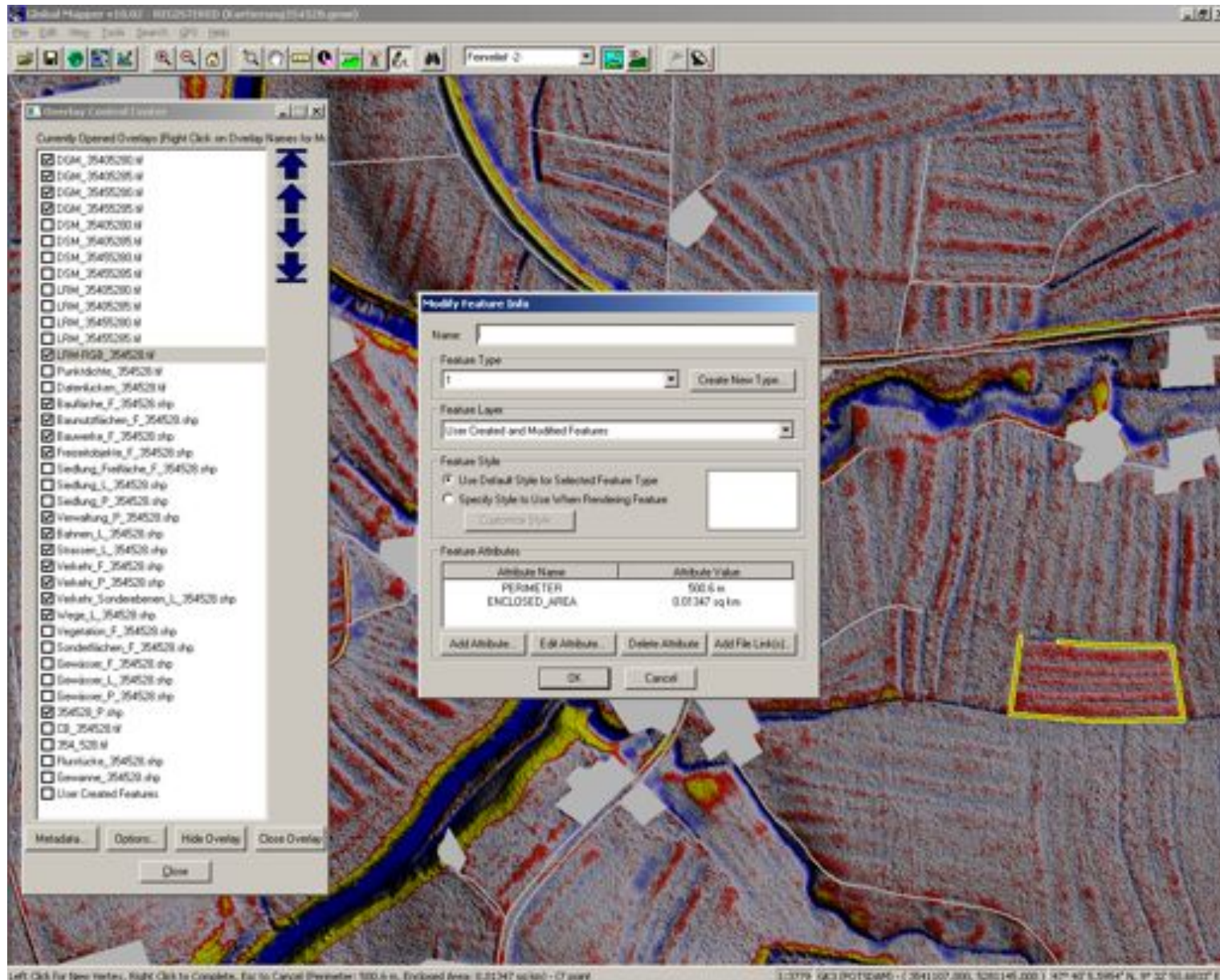
Info

Wellen
Routingen

GR-Segmente: 301537
Kartieranzahl: 100
Beste Karte: 144
Schlechteste: 103
Mittelwert: 102
ADAB-Daten: 312

In Bearbeitung
Fortschritt:

Data management




Data management

Steuerung für Global Mapper

Beleuchtung Kartierung Speichern


Standard vertikal



Höhe: 50 Richtung: 315 OK

Datei ein/aus

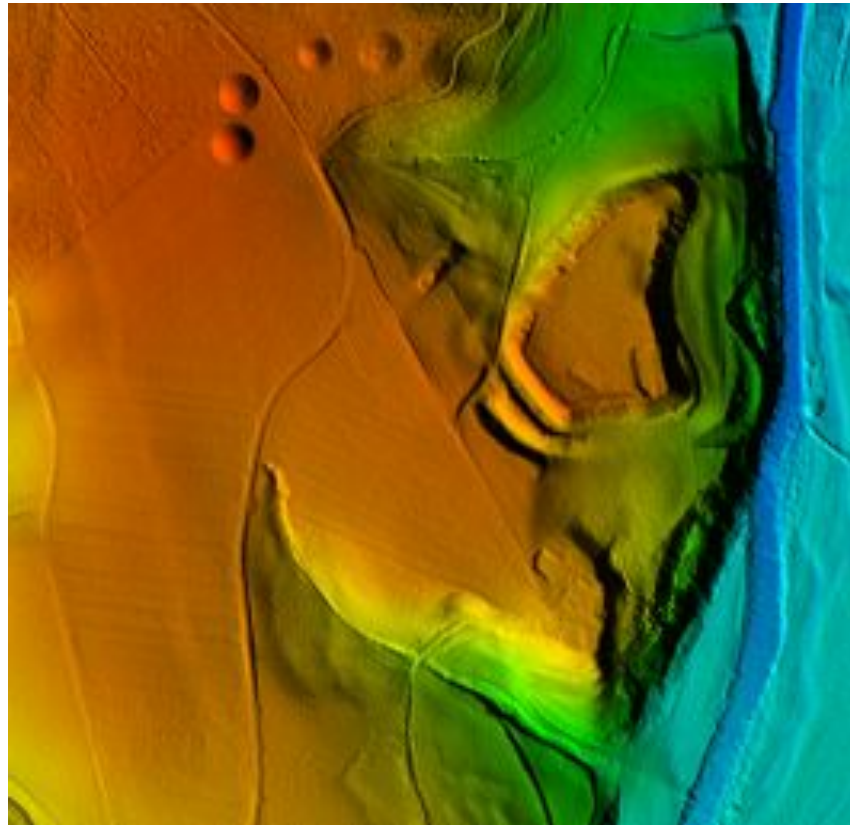
neues Objekt	ADAB-Objekt
Hügel	JA
Grube	NEIN
Podium	NEIN (Sebaund)
Wald	NEIN (Datenlücken)
Graben	
Wall/Graben	ADAB-ID setzen
Abwech	
Terrasserung	
Waldsack	Geologie: Rutschung
steilwärtige Pluvrenze	Geologie: Doline



Bearbeitung nur Karte Wo bin ich? In Google Earth

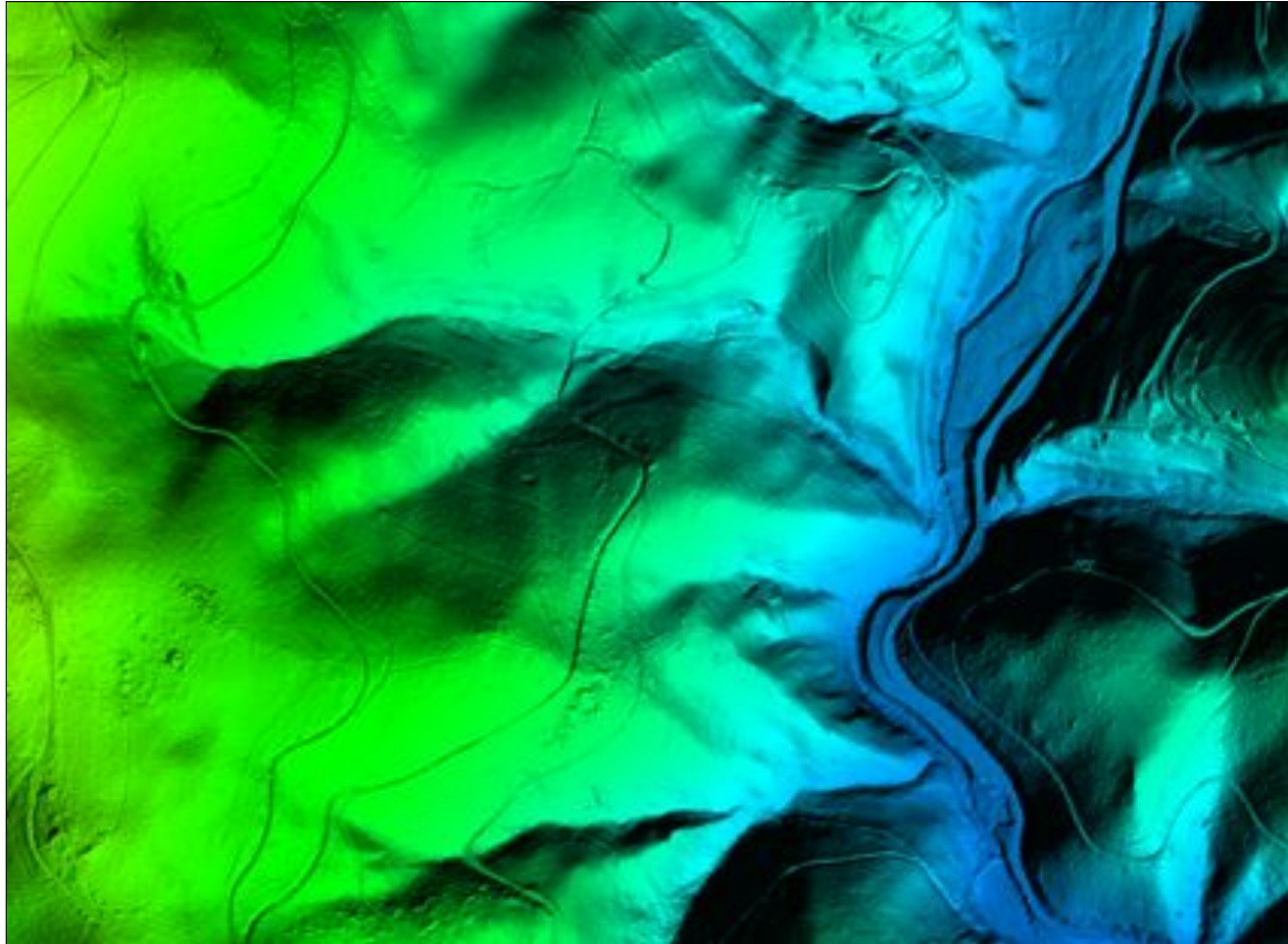
Challenge 2: finding hills in the mountains

- conventional hill shading
- visibility depends on illumination



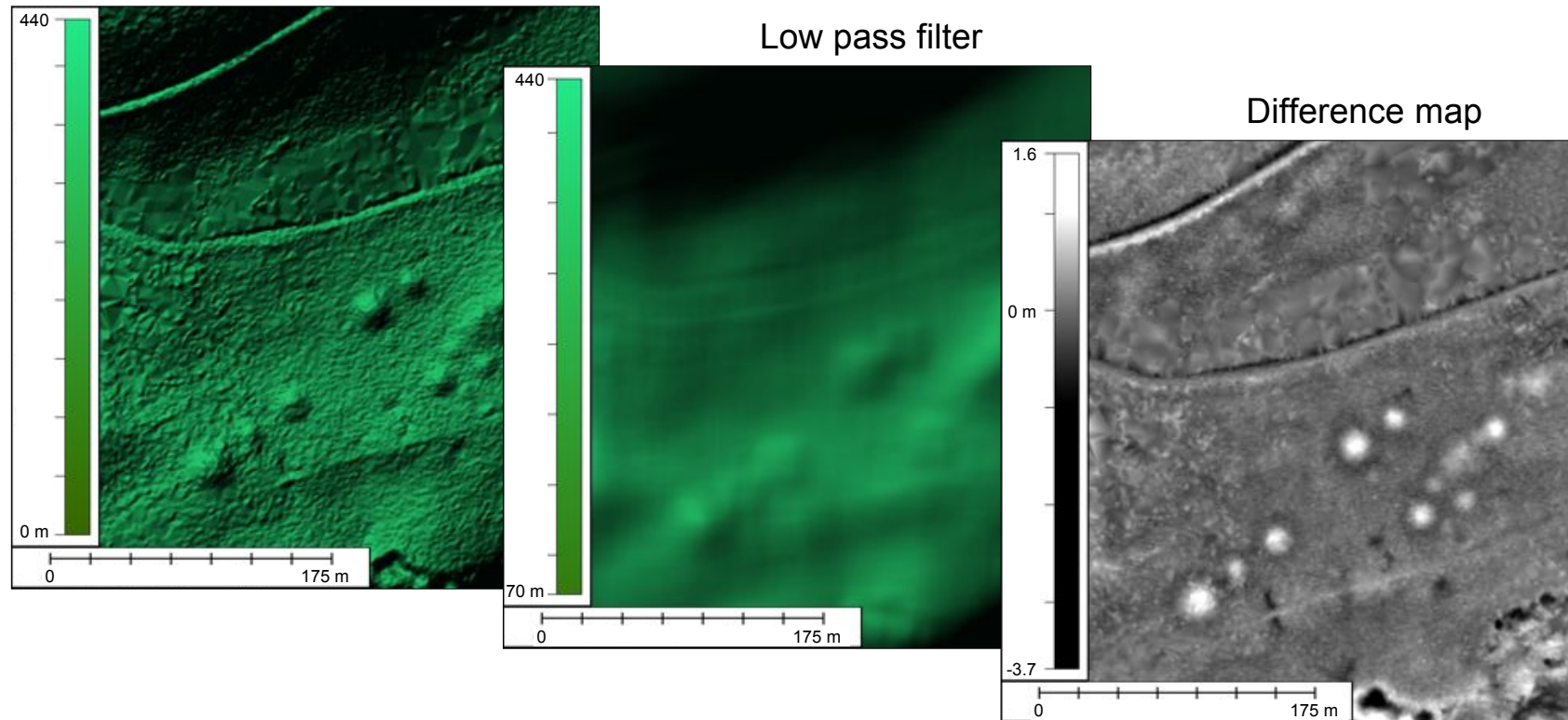
Finding hills in the mountains

- optical illusion: relief inversion



Finding hills in the mountains

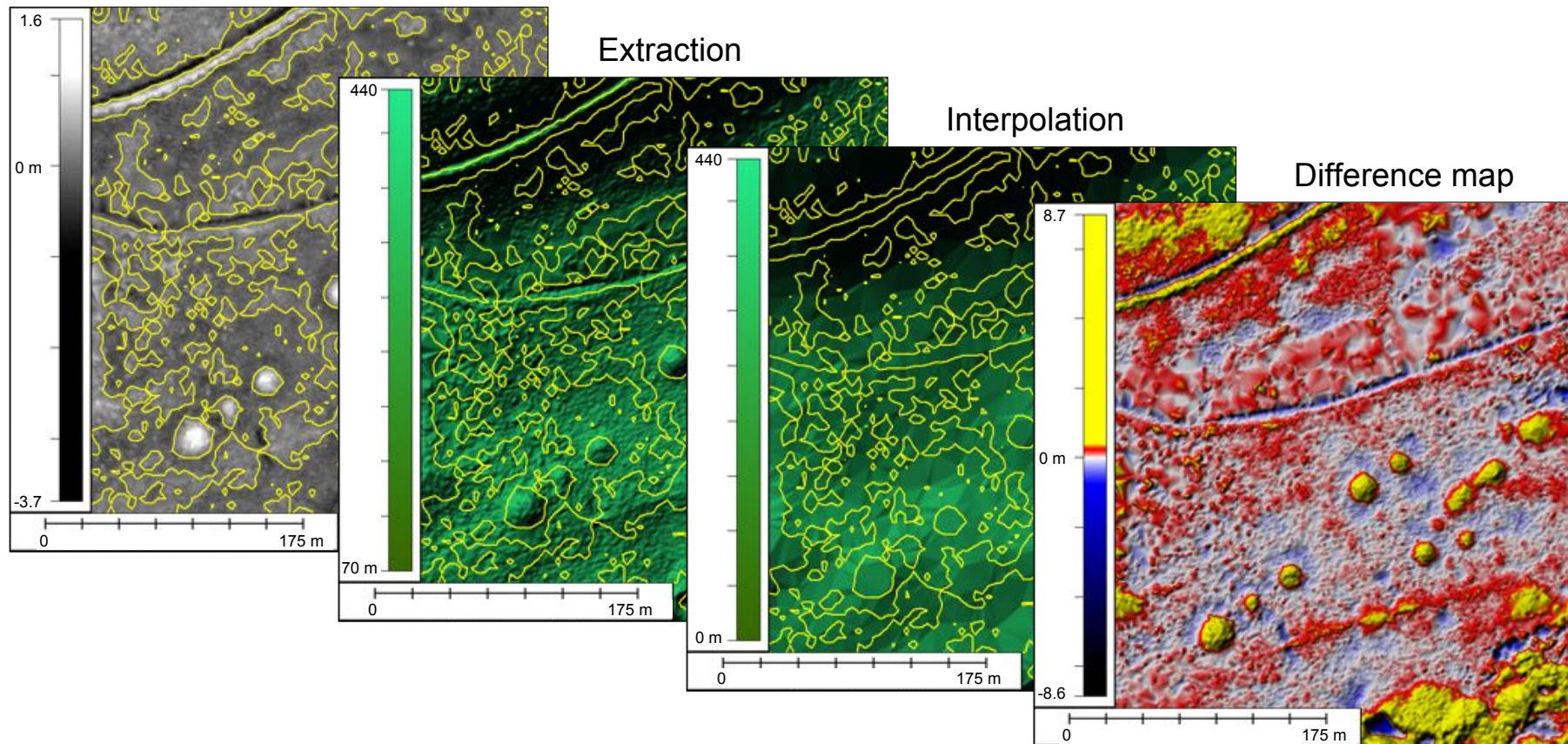
- What is interesting, what isn't?
 - + small-scale surface structures
 - + small elevation differences (mostly ~ 0.1 to 1.0 m)
 - large-scale landscape forms



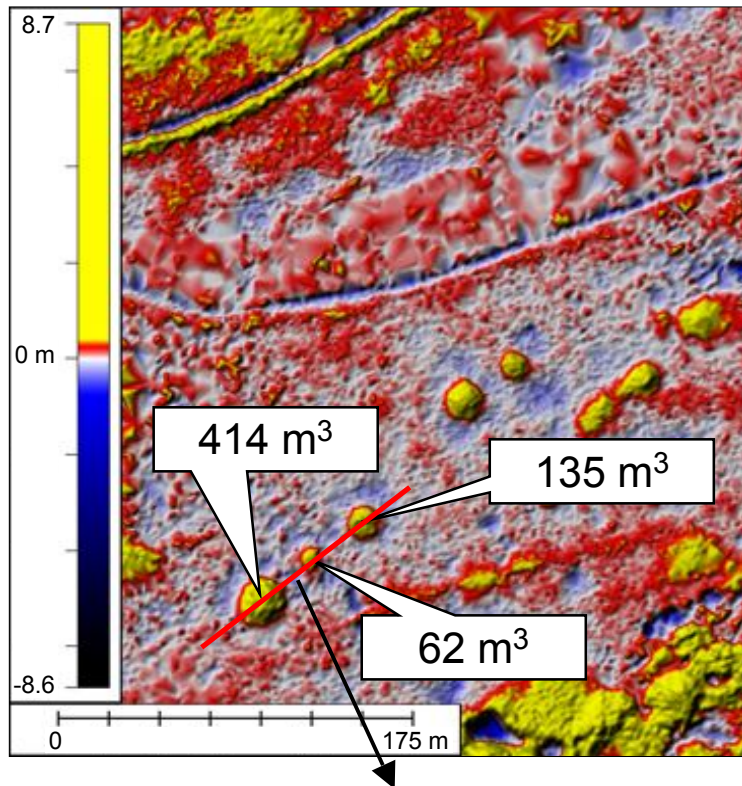
Finding hills in the mountains

Difference map

- adavantages/disadvantages
- improvement



Finding hills in the mountains



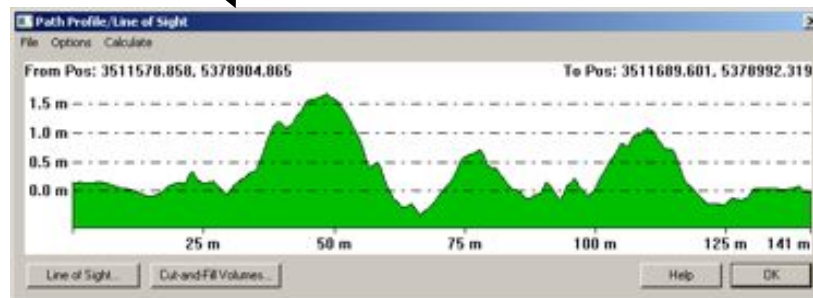
Local Relief Model

Advantages:

- local topographic anomalies
- independent of illumination
- morphometry applications

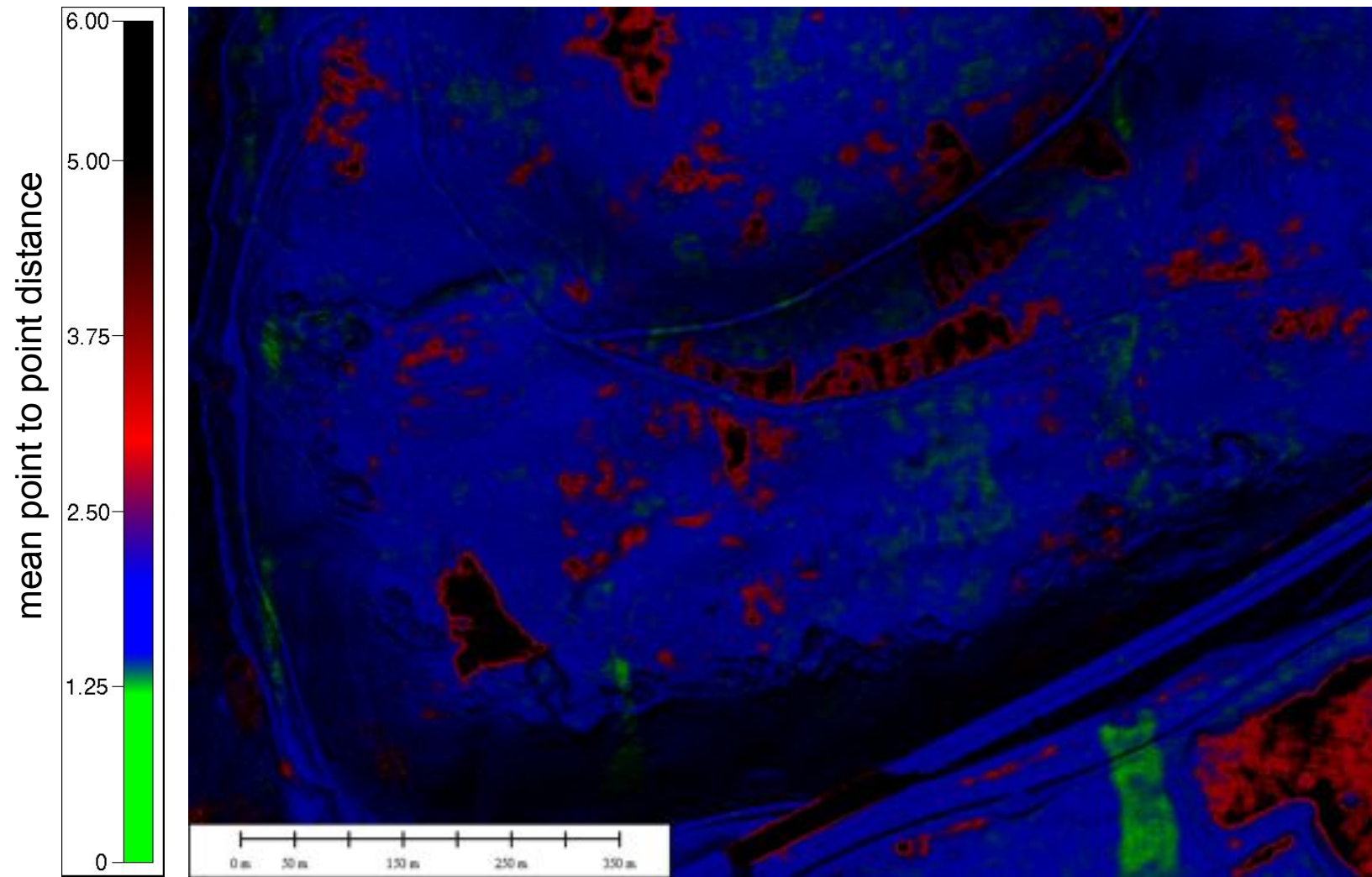
Disadvantage:

- computation

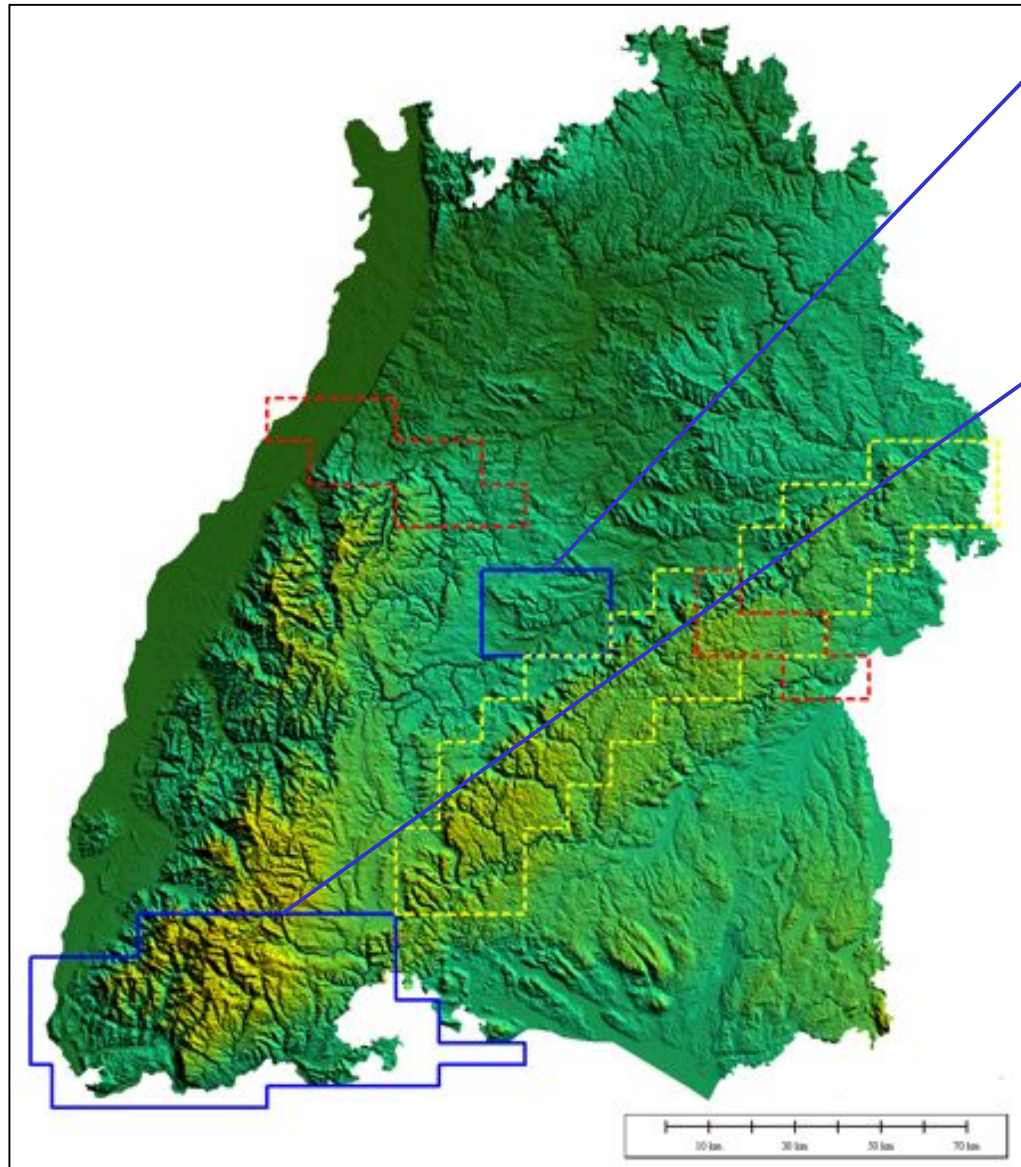


Supplementary data

- data gaps and point density



First results



Schönbuch

- 600 km²
- 1966 known sites
- 2513 LIDAR results

Southern Black Forest

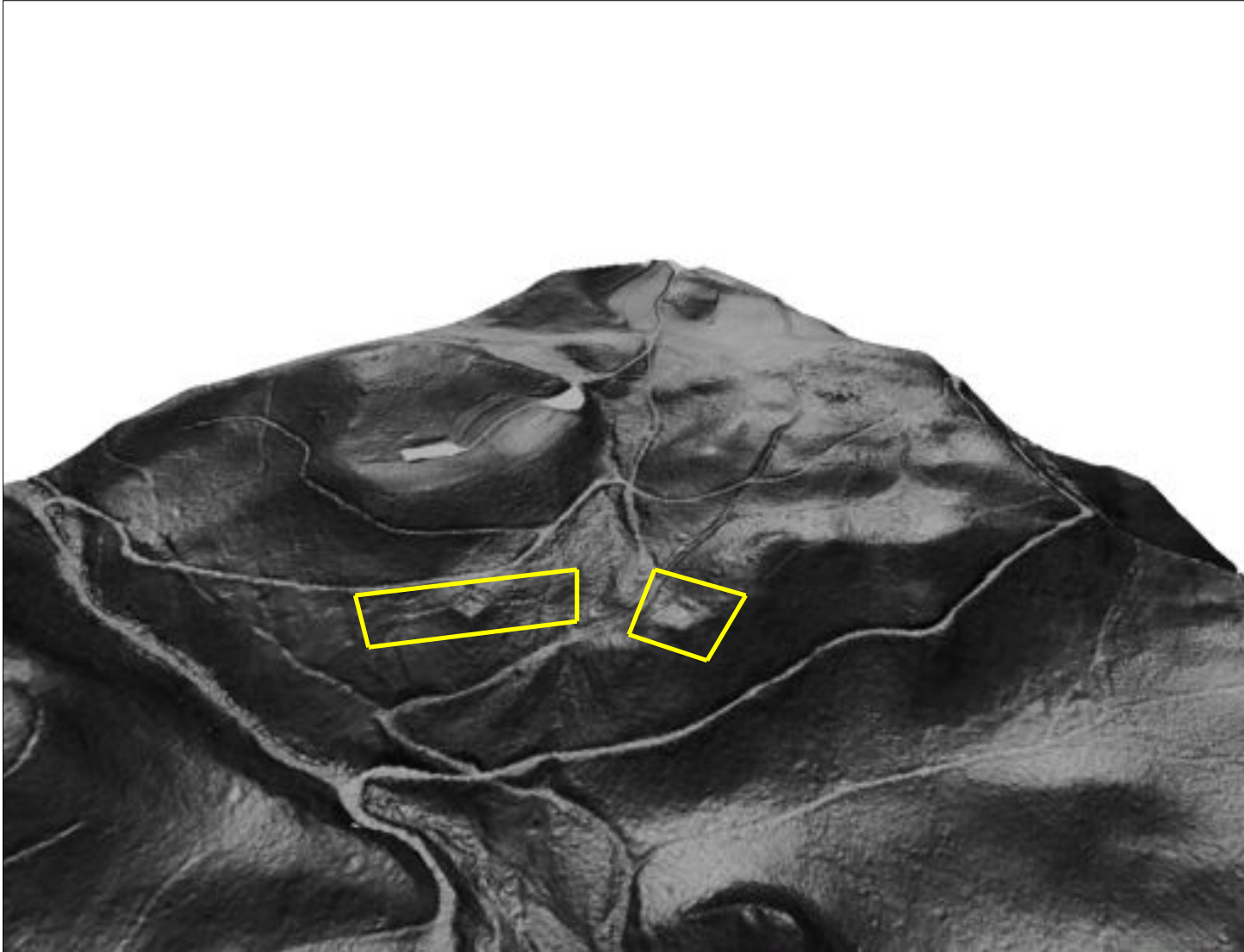
- 2750 km²
- 3760 known sites
- 59337 LIDAR results

Results

- charcoal kiln sites
- terraces, ridge and furrow
- mining traces
- sunken roads
- (burial) mounds
- earthworks

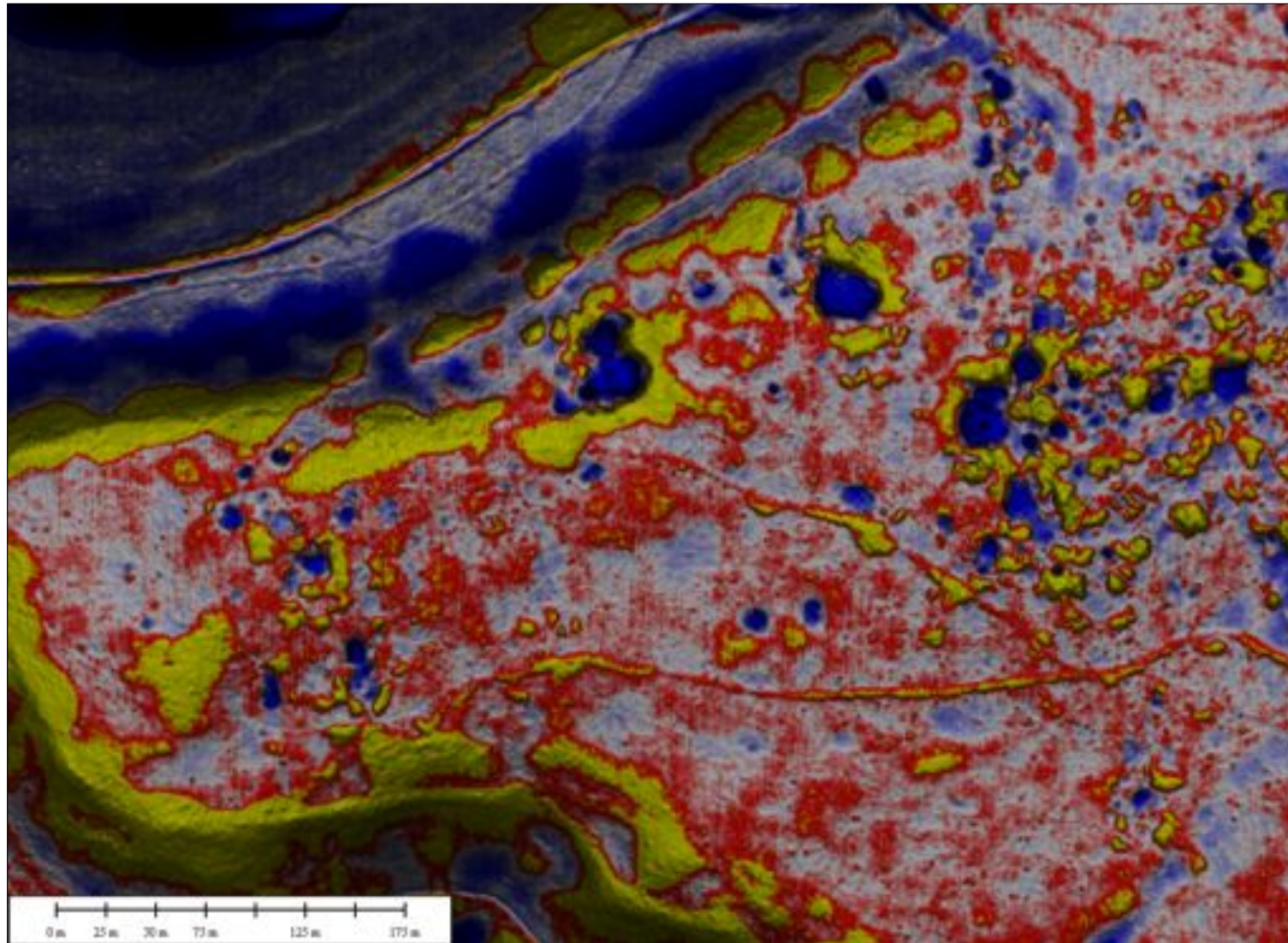
First results

Upper Rhine area: fortifications



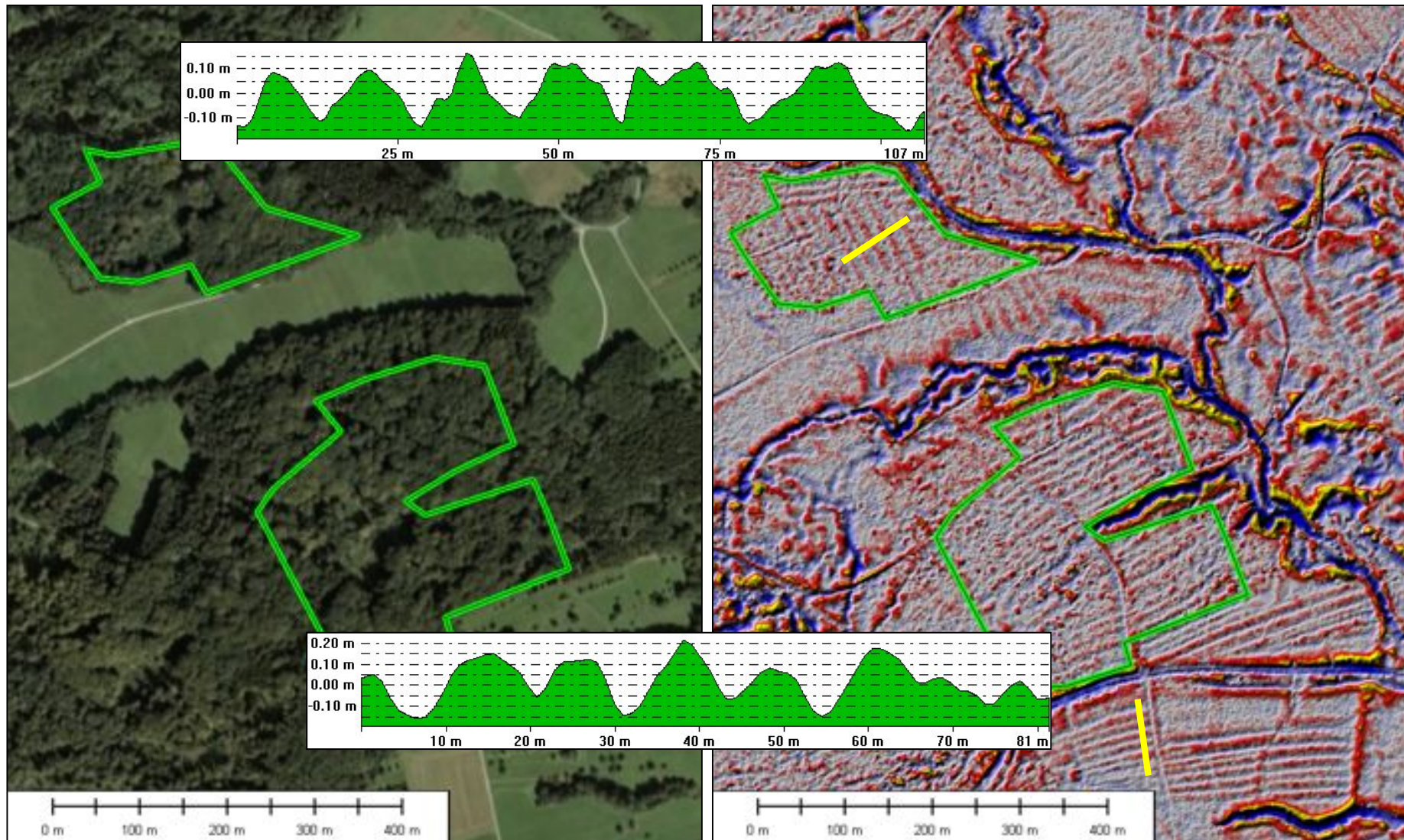
First results

Upper Rhine area: mining traces



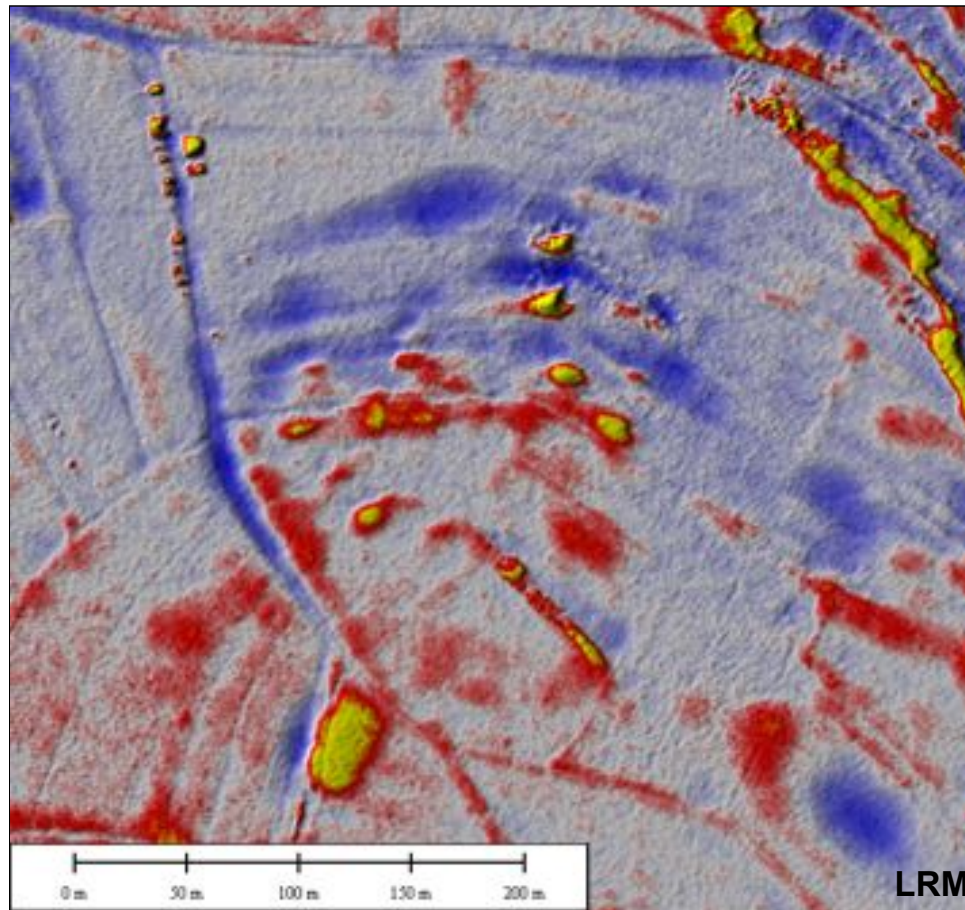
First results

Schönbuch: ridge and furrow



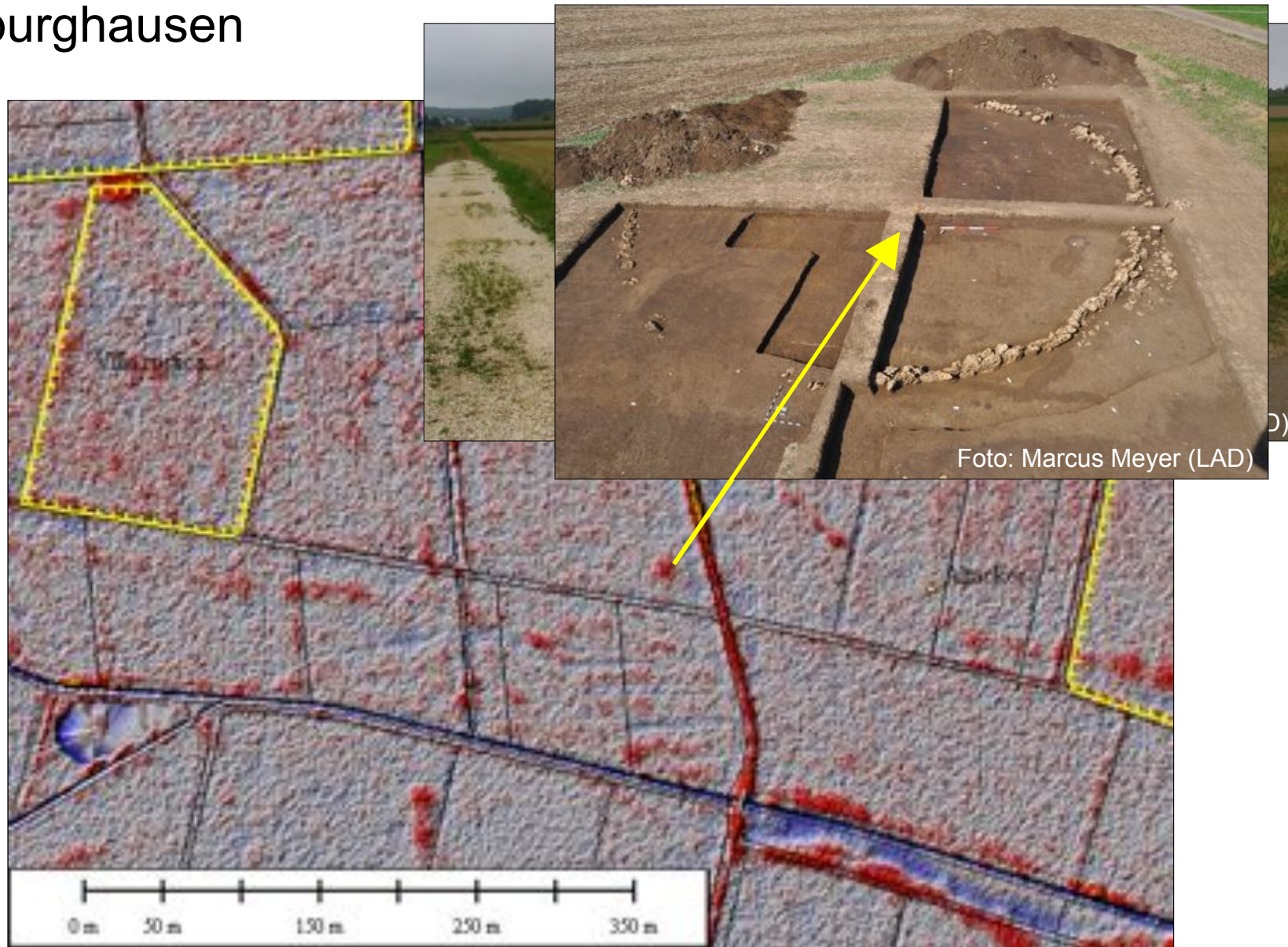
First results

Southern Black Forest: burial mounds



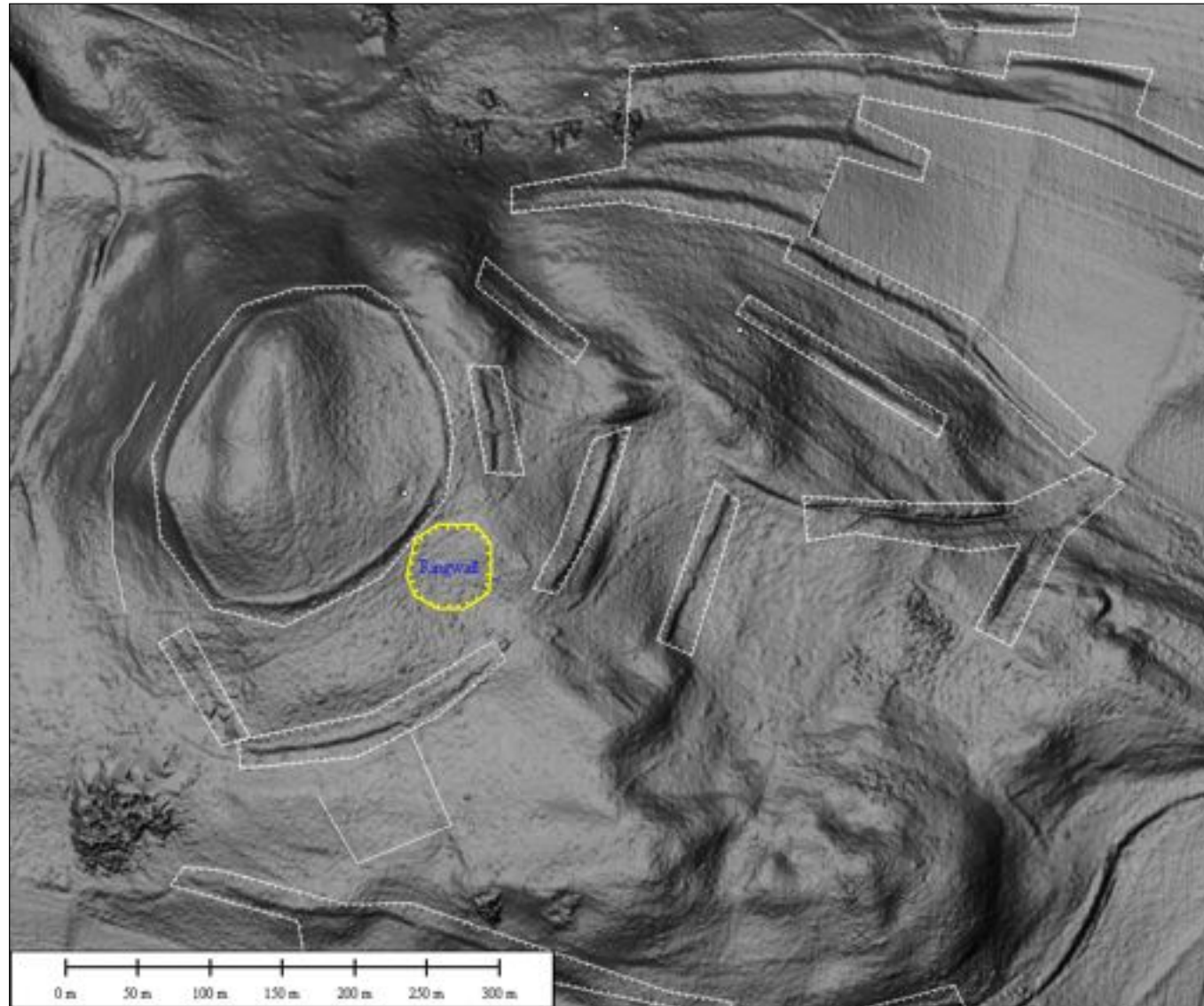
First results

Goldburghausen



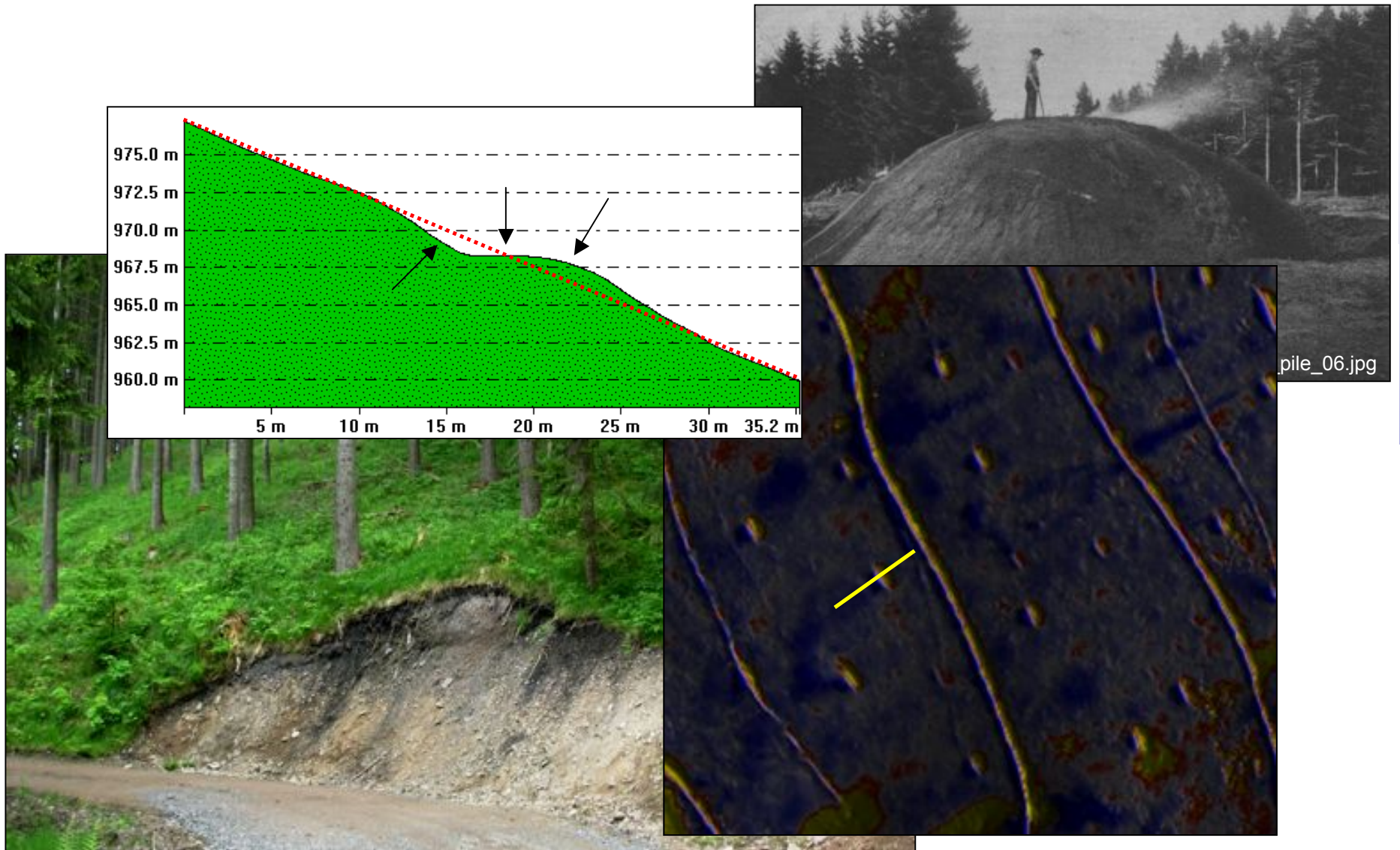
First results

Upper Rhine area: neolithic ring fort



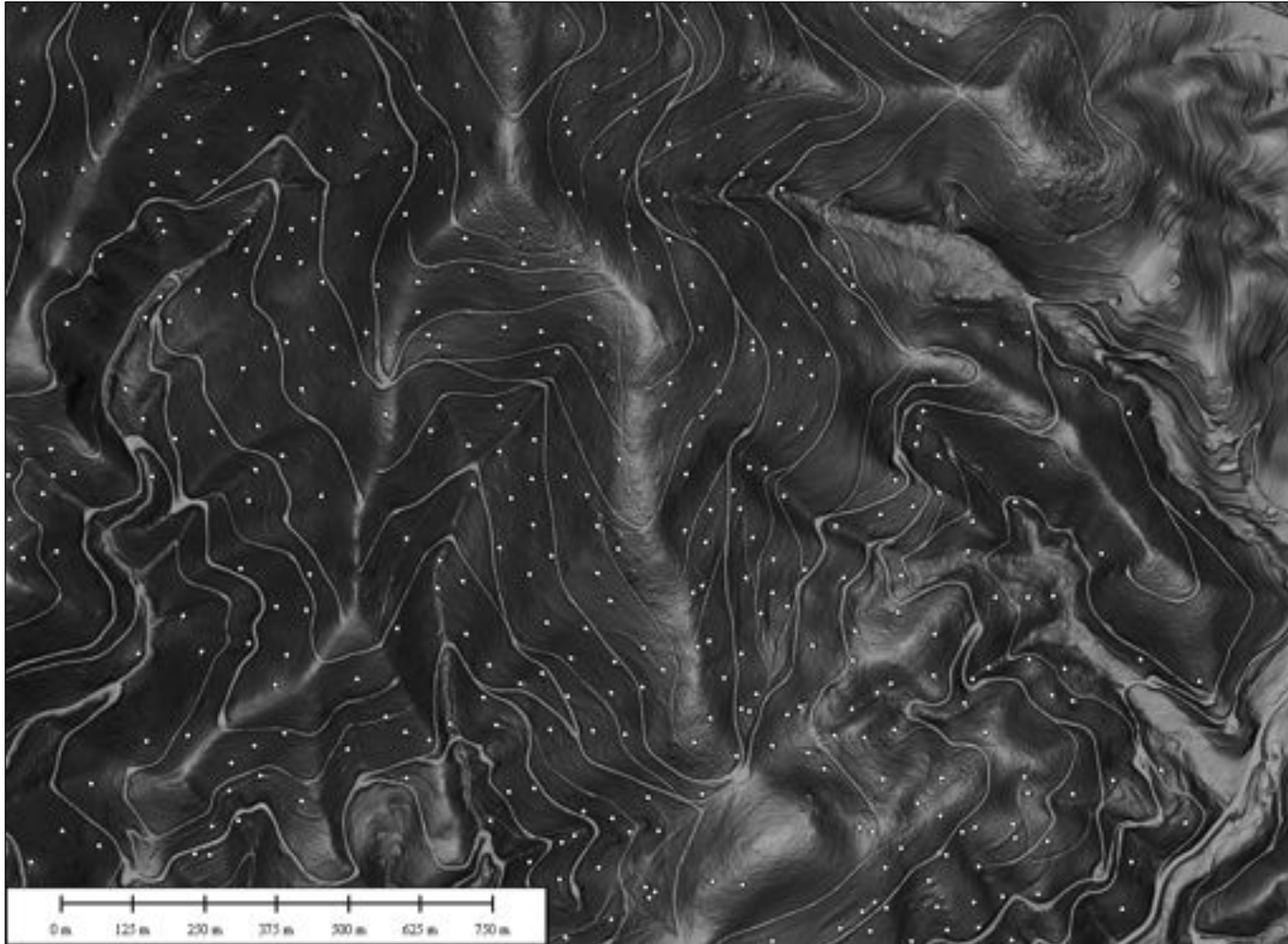
Spatial distribution of sites

Southern Black Forest: charcoal production



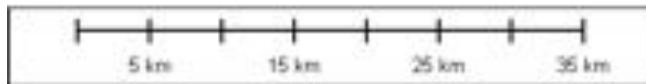
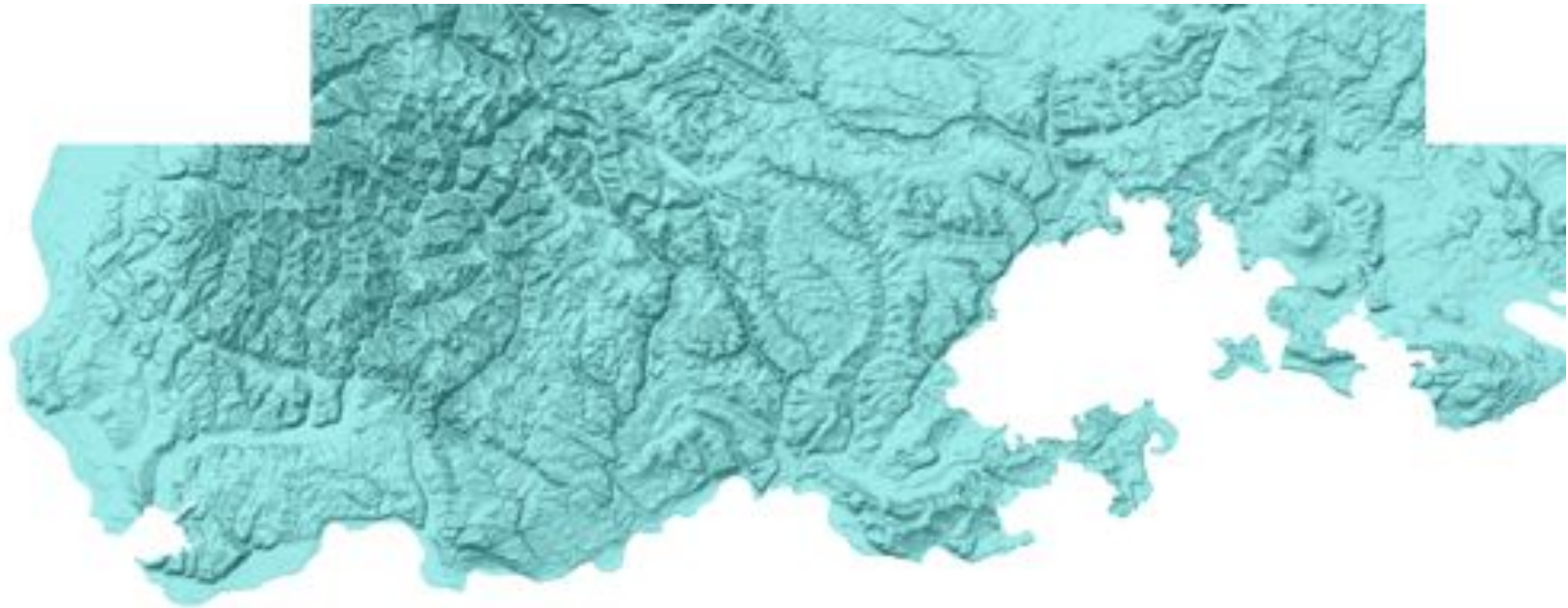
Spatial distribution of sites

Southern Black Forest: charcoal production



Spatial distribution of sites

→ comparing site types

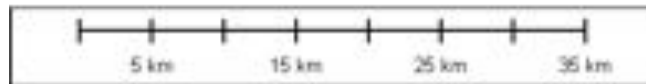
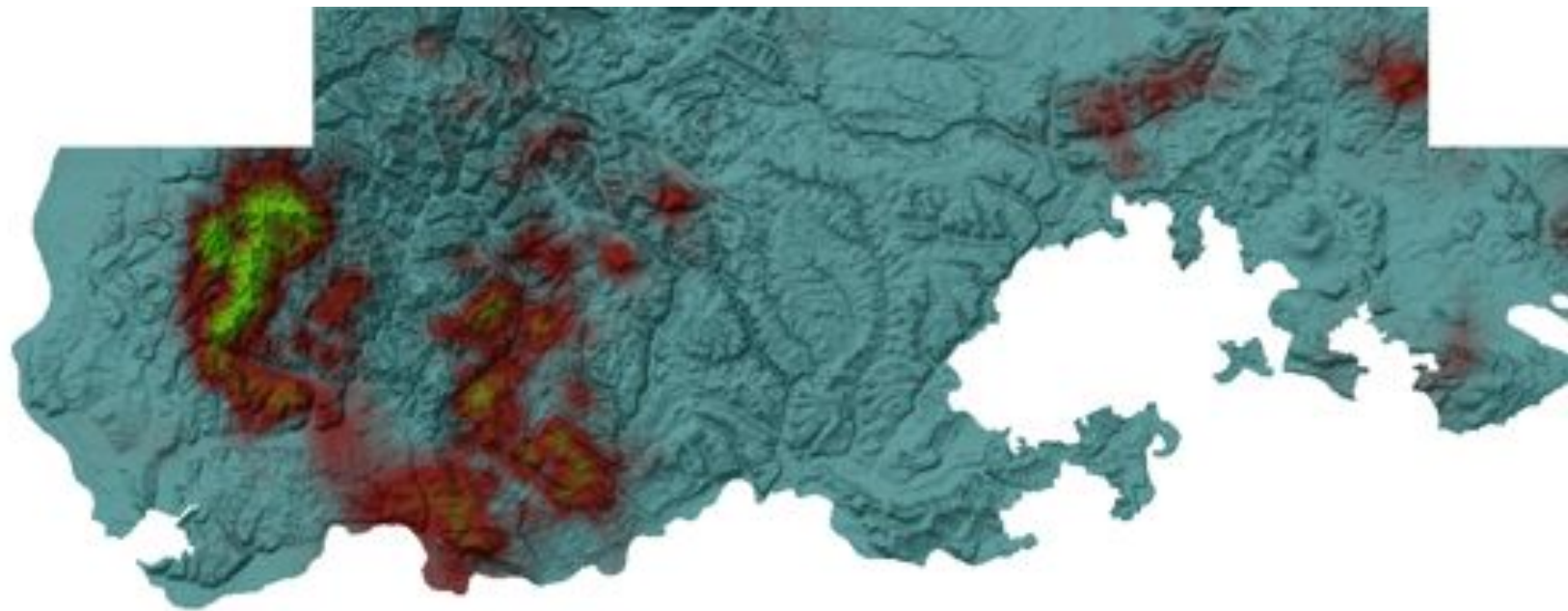
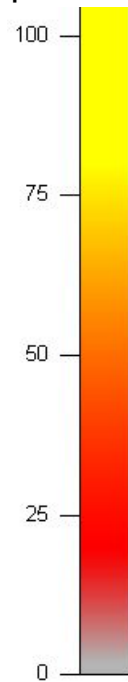


Spatial distribution of sites

→ comparing site types

- Charcoal kiln sites

per km²

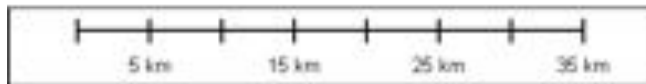
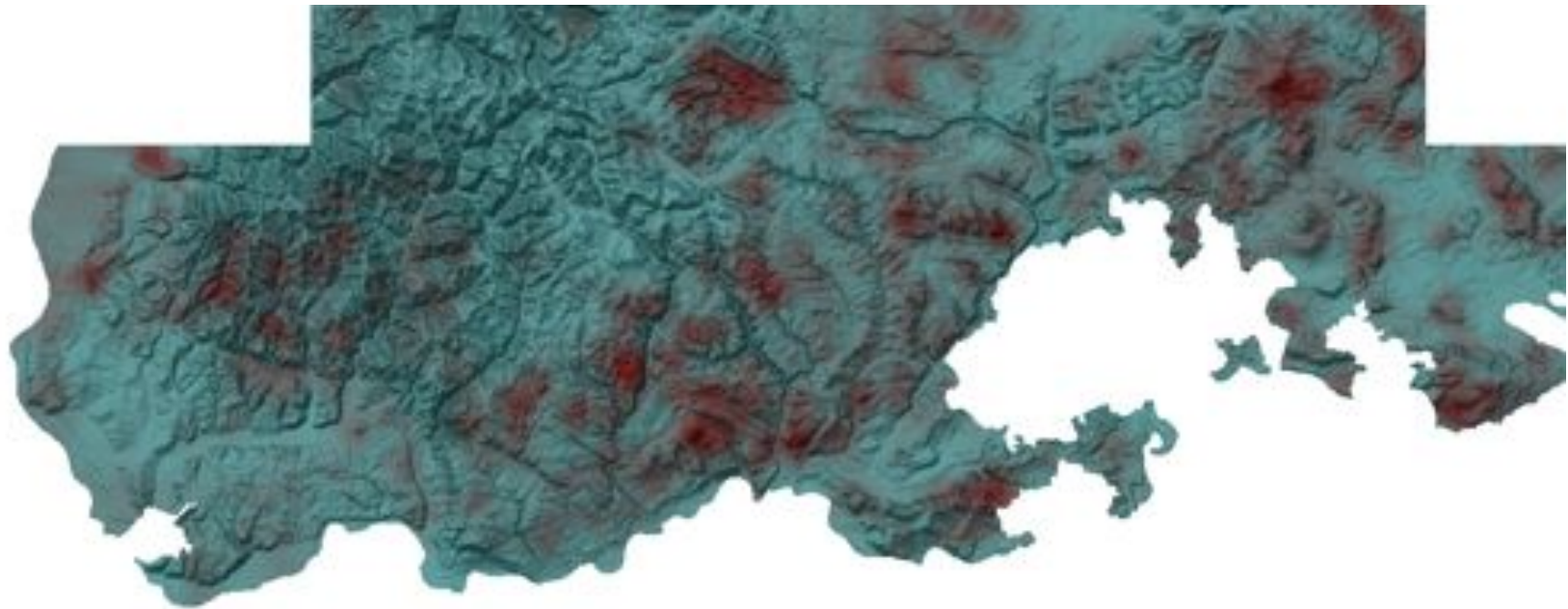
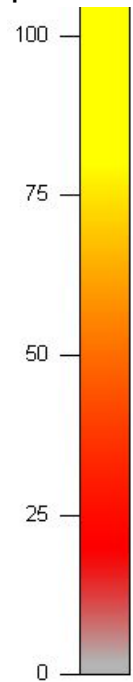


Spatial distribution of sites

→ comparing site types

- Terraces

per km²

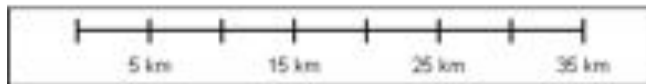
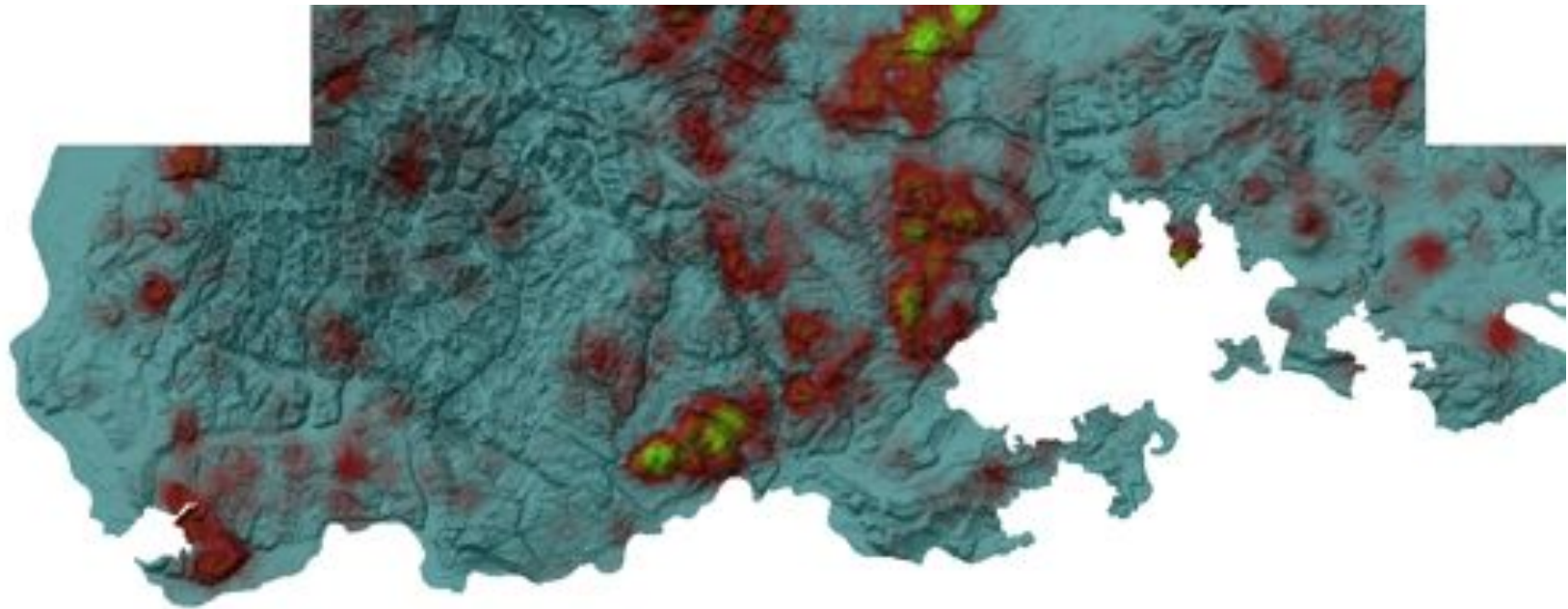
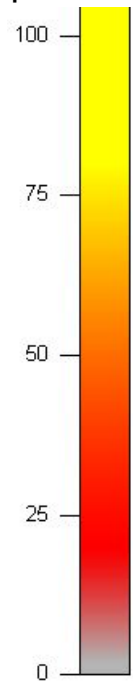


Spatial distribution of sites

→ comparing site types

- Mounds

per km²



Conclusions

- LIDAR as a tool for archaeological prospection
- coverage of large areas with single method
- land cover bias: dense vegetation, preservation
- large amount of prospection results
- potential for site distribution analysis

