

# Landscape changes documentation using GIS

Jan Pacina - Jan.Pacina@ujep.cz

Faculty of the Environment, J. E. Purkyně University, Czech  
Republic, Europe



EUROPEAN UNION  
European Structural and Investment Funds  
Operational Programme Research,  
Development and Education



# Area of interest

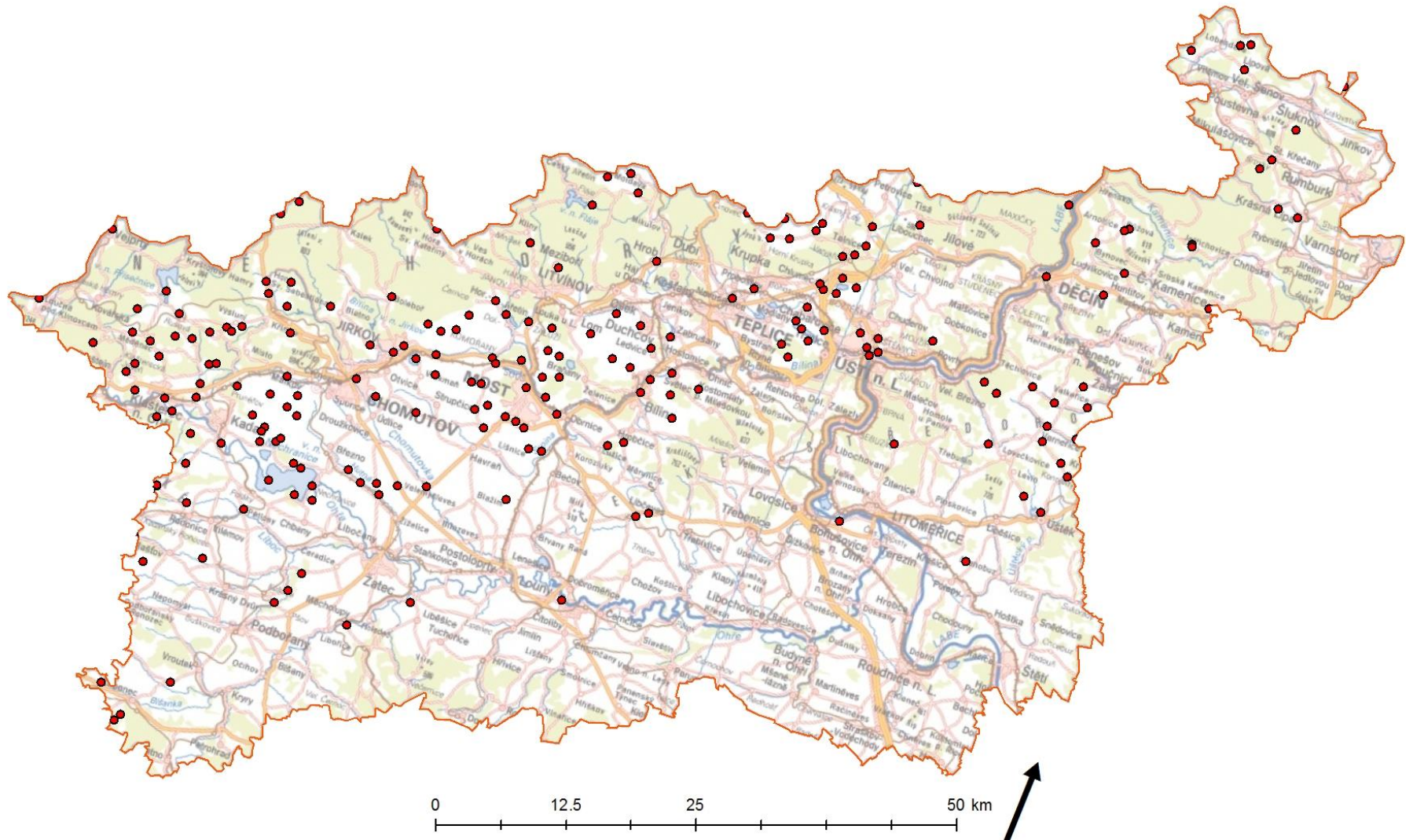




# Landscape changes



# Vanished settlement





# Datasources

- State and regional map archives
- Archival aerial photographs
- LIDAR
- Small Format Aerial Photography
- Bathymetric mapping

# Old maps since 1780'

I. Military Survey



II. Military Survey



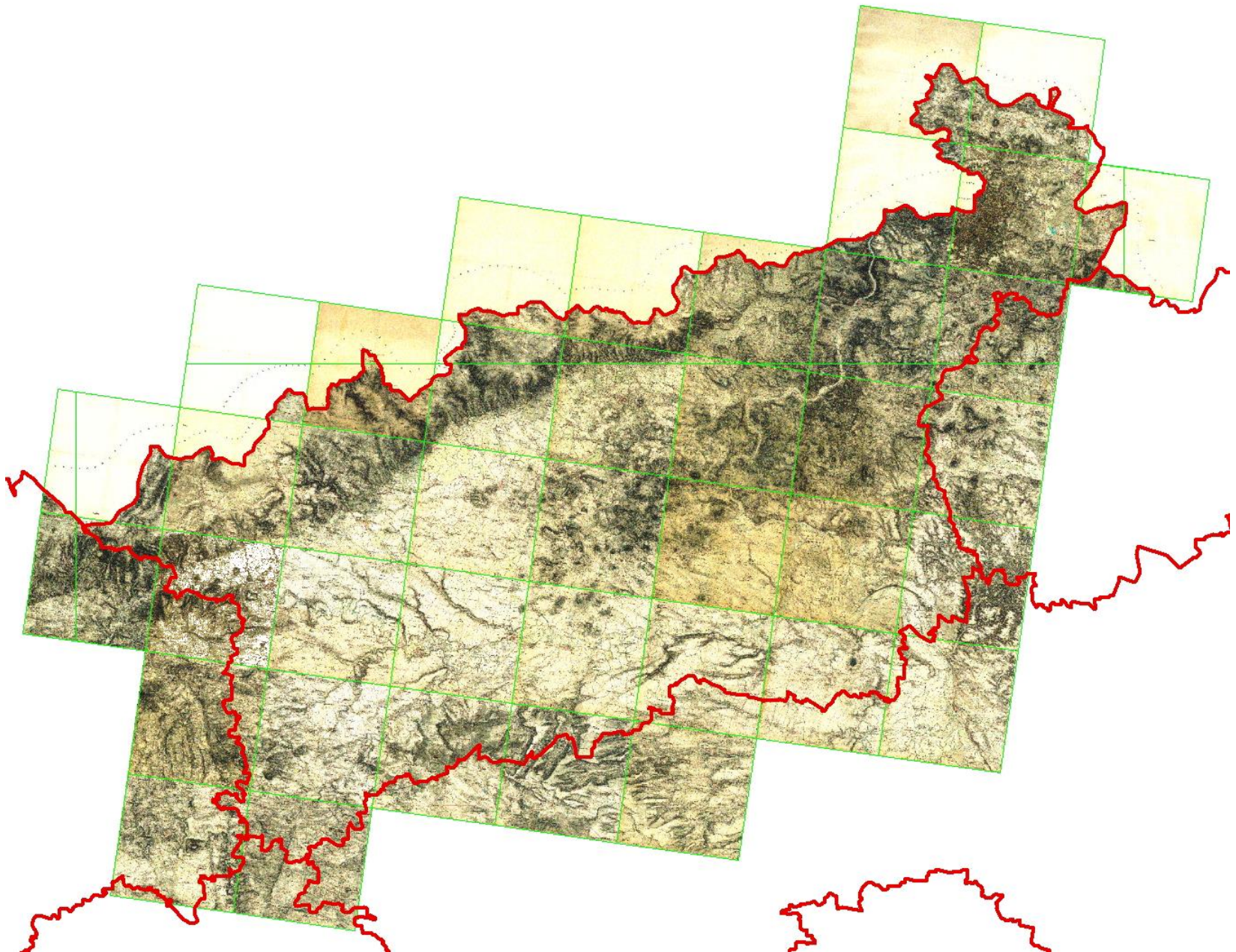
III. Military Survey



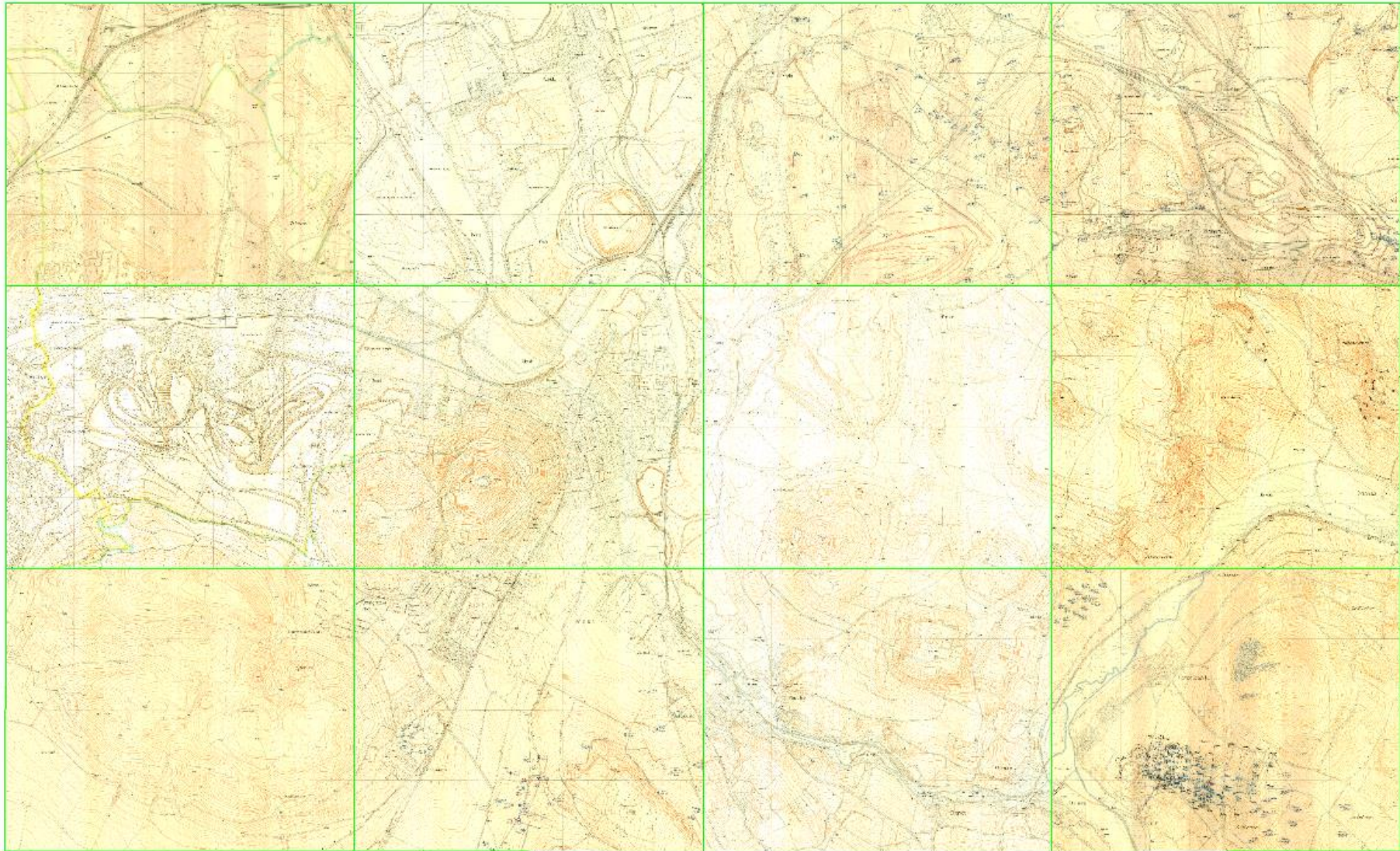
III. Military Survey



# Processing methods - georeferencing

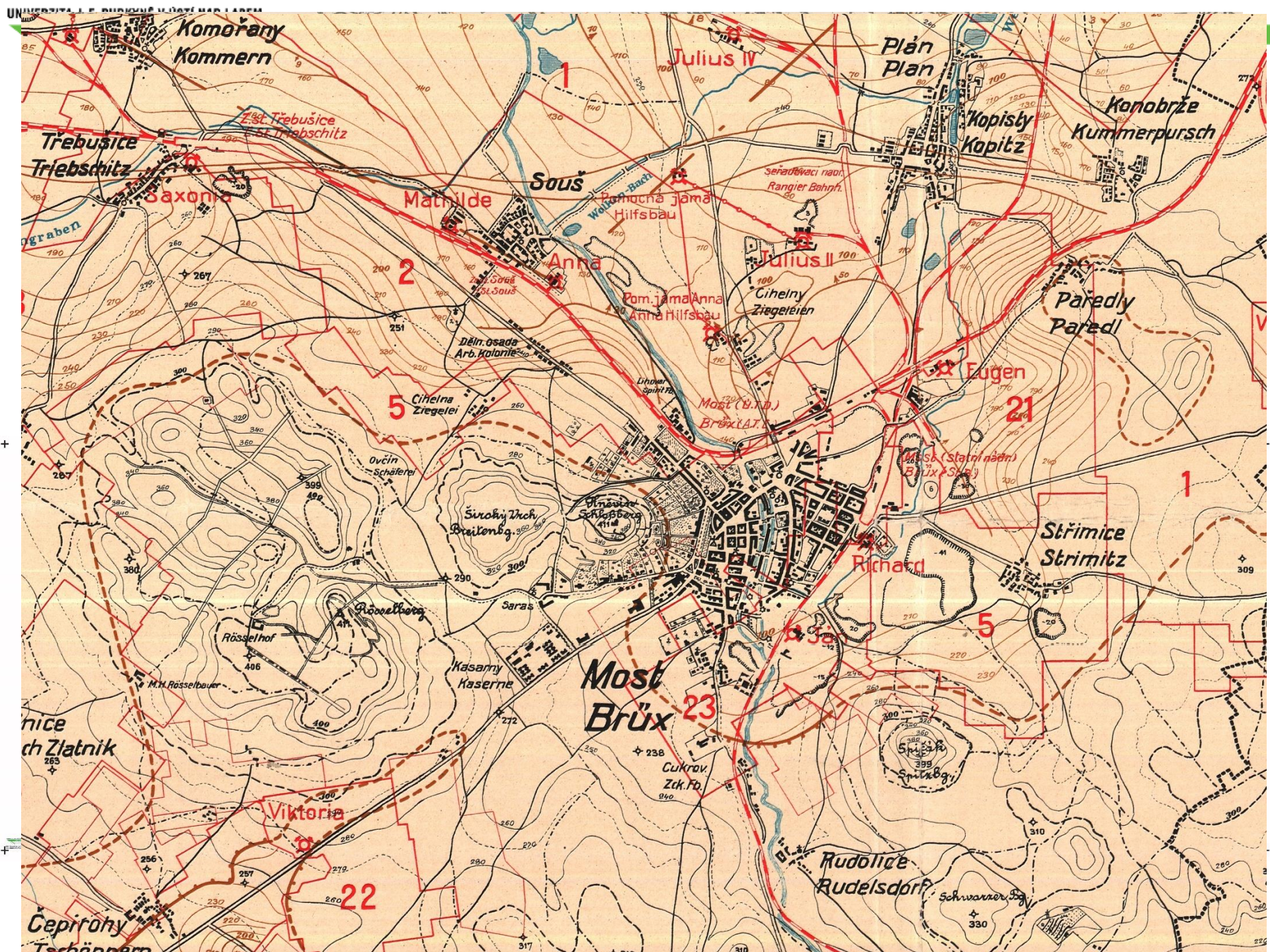


# Processing methods - georeferencing

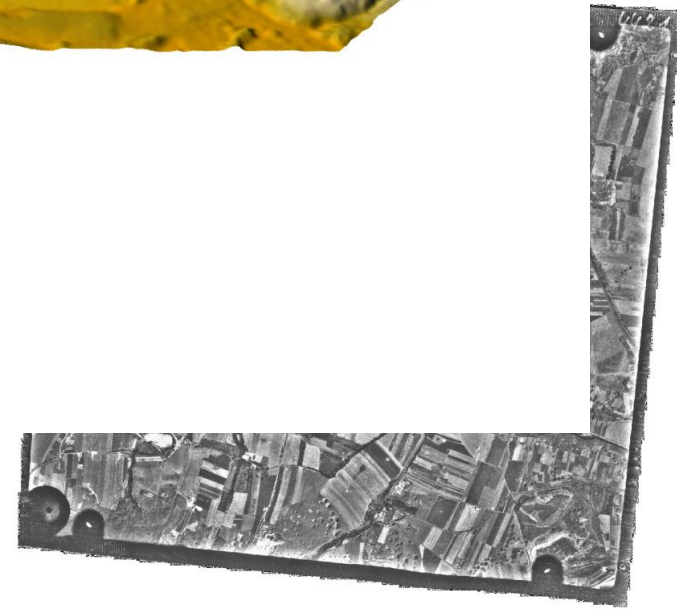
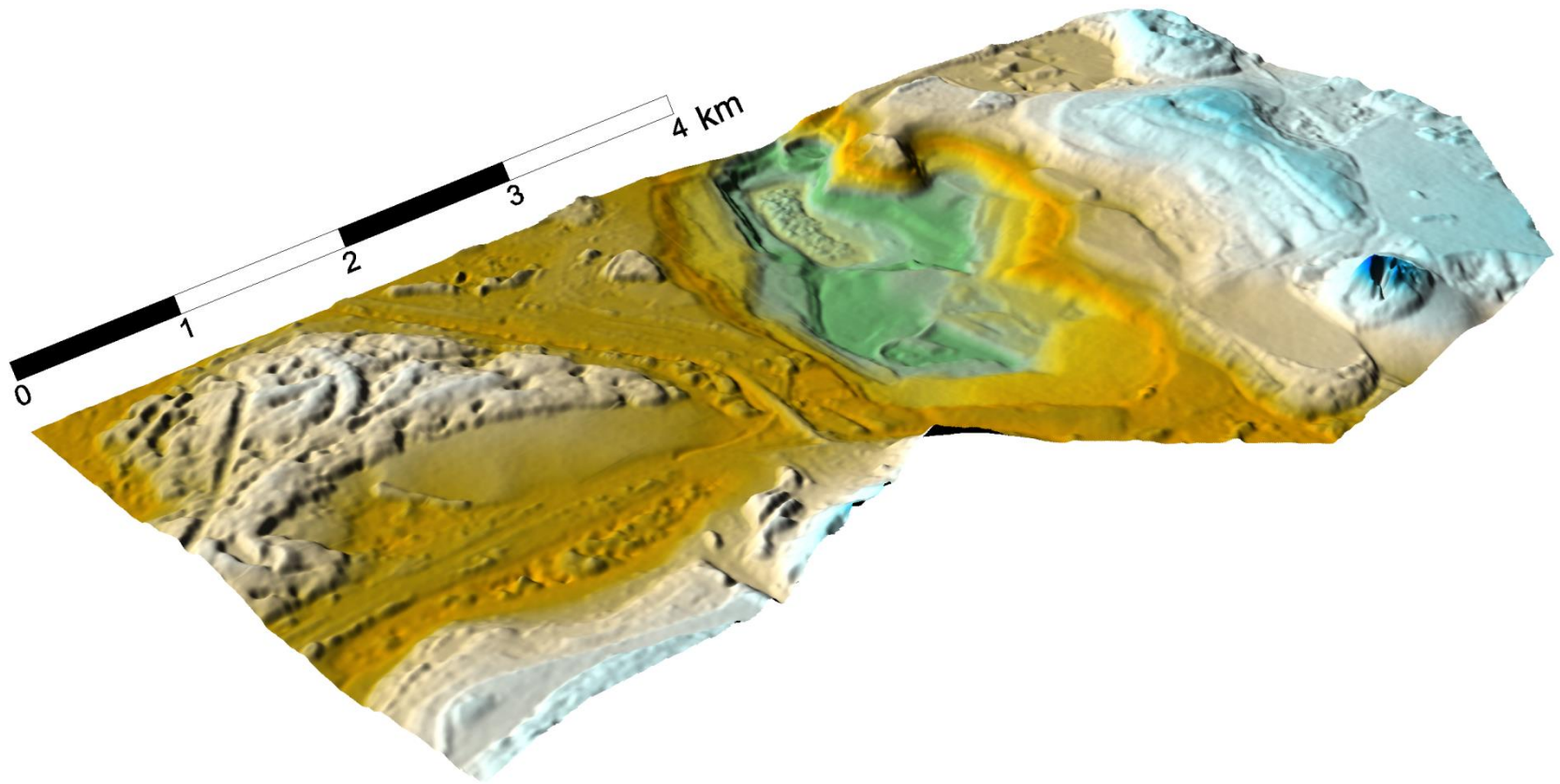




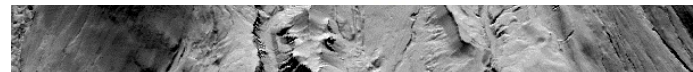
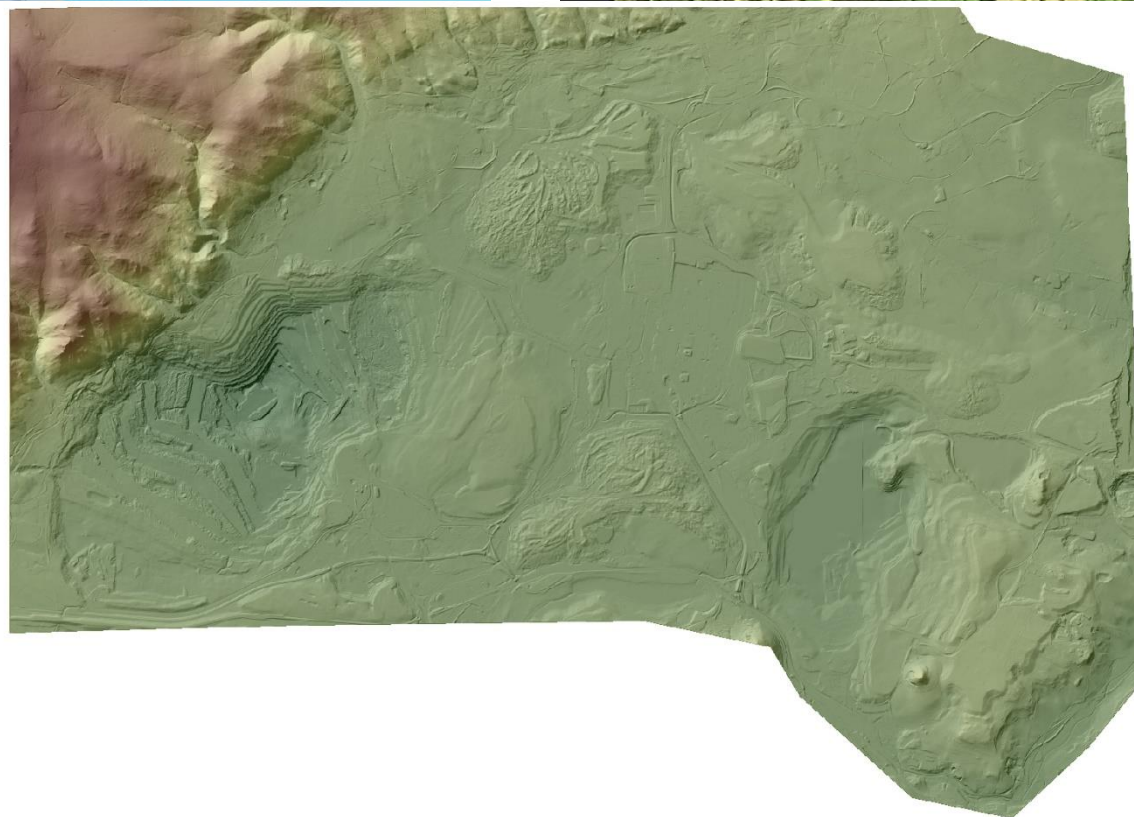
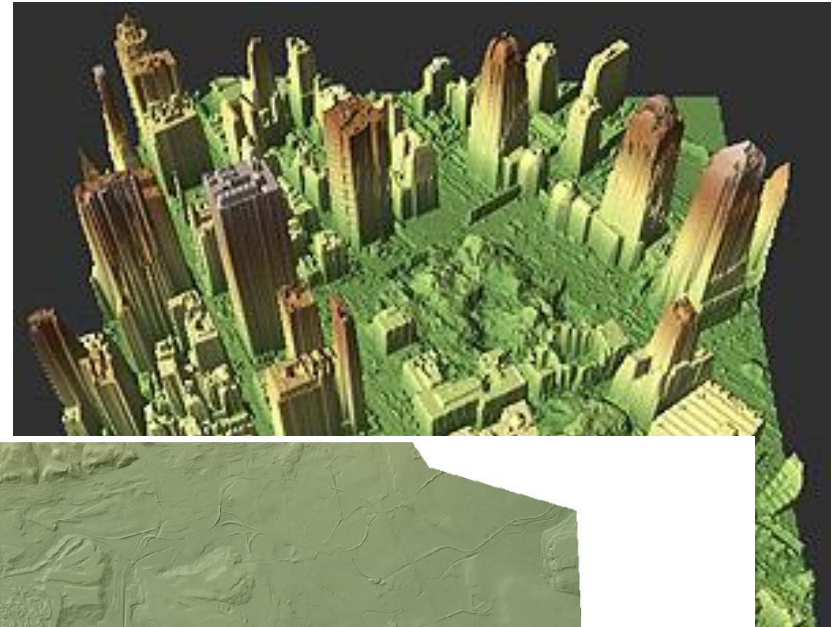




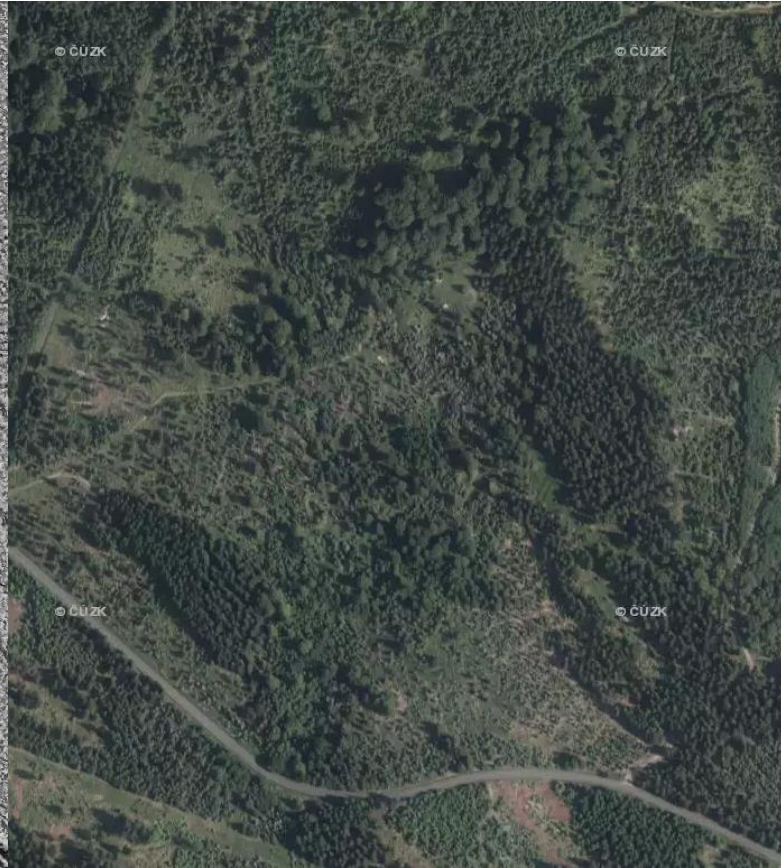
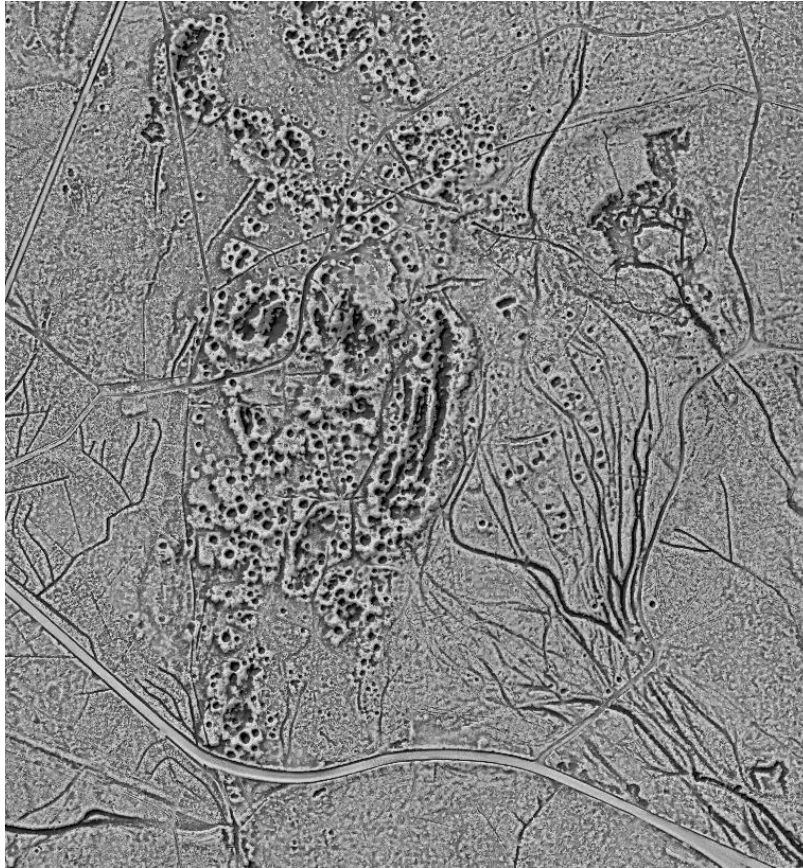
# Aerial imagery processing



# LiDAR



# LiDAR and medieval mining





# LiDAR and medieval mining



# LiDAR and medieval mining



# Small format aerial photography

- aircrafts
- balloons and blimps
- kites
- paraglides
- helicopters
- drones





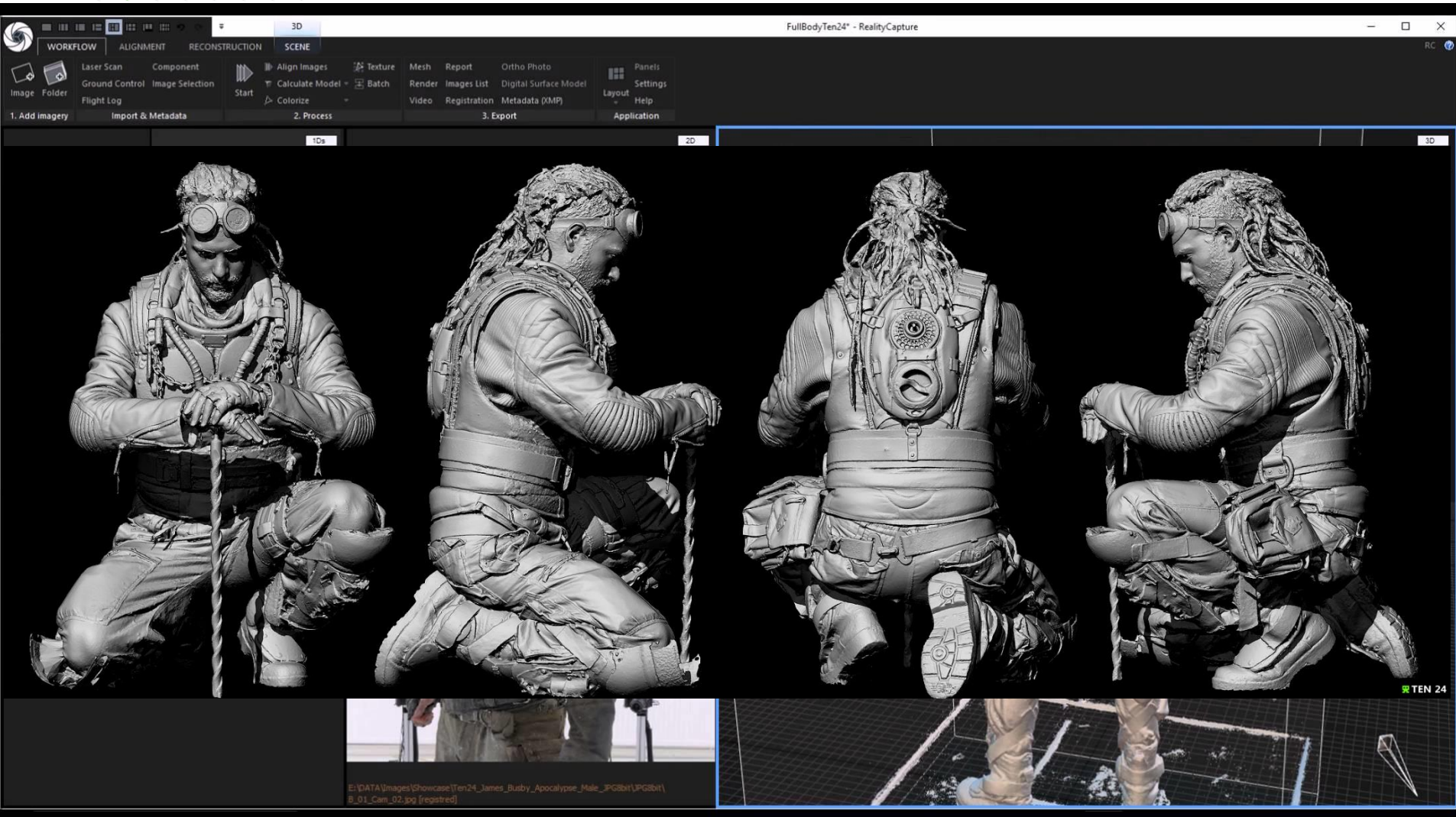
The screenshot displays a 3D reconstruction software interface with the following components:

- Workflow:** WORKFLOW, ALIGNMENT, RECONSTRUCTION, SCENE.
- Process:** Preview, High Detail, Settings, Colorize, Texture.
- Model Alignment:** Set Reconstruction Region, Define Ground Plane, Reset Ground.
- Tools:** Filtering Tool, Simplify Tool, Smoothing Tool, Ortho Projection, Info Panel.
- Export:** Mesh, Snapshot, Video.
- Import:** Ortho Projection, Digital Surface Model, Import Model.

The interface is divided into three main panels:

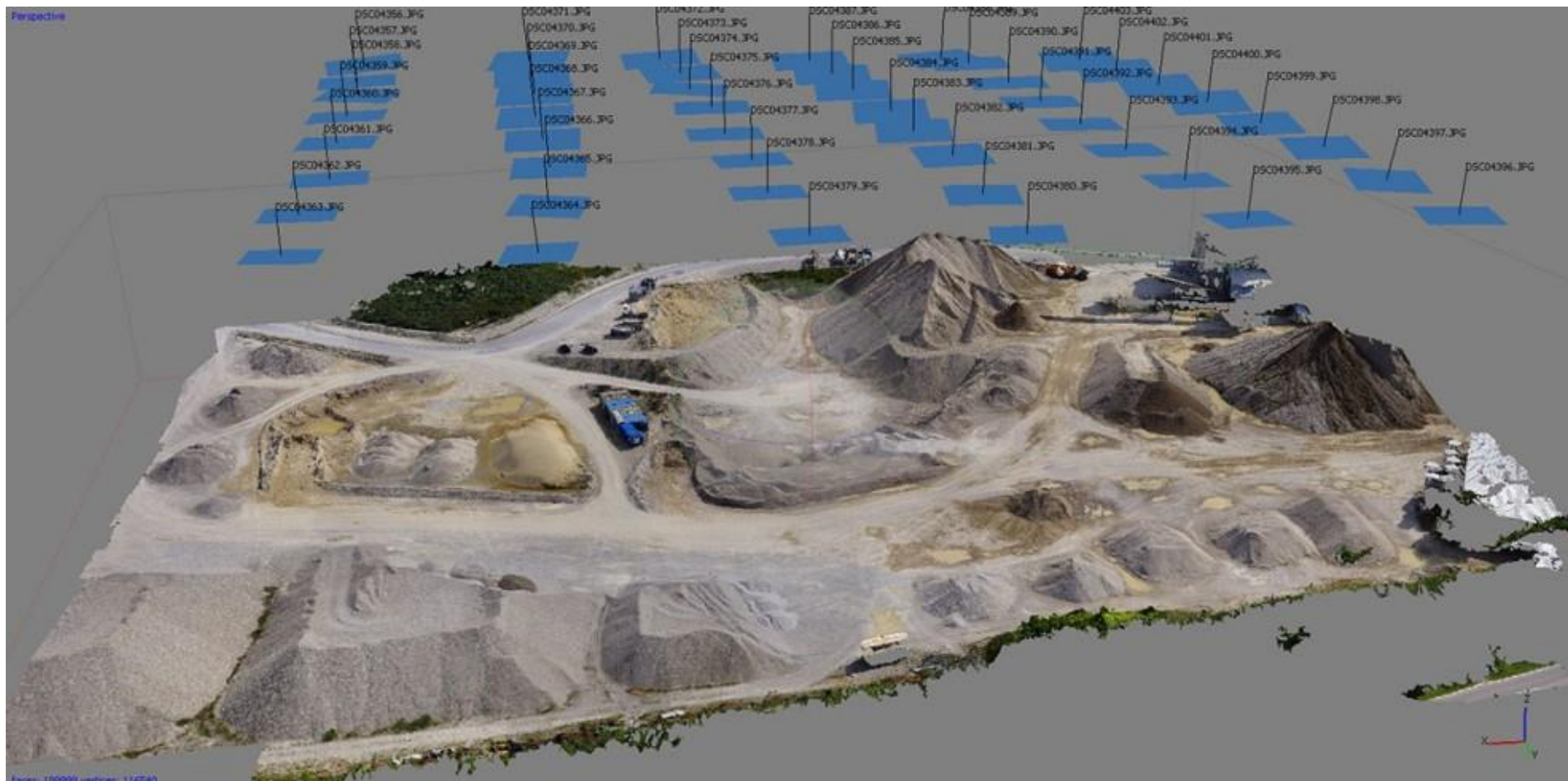
- 2D Image Grid (Left):** A grid of 2D images showing different views of a deer statue. A tooltip for the selected image provides the following data:

|               |                           |
|---------------|---------------------------|
| P3050118.JPG  | Features: 8055/40000      |
| 3968x2976     | focal: 25.53mm            |
| focal: 25.0mm | ppi: -1px, -16px          |
|               | A1: -0.016, 0.064, -0.053 |
- 2D Preview (Middle):** A large 2D preview window showing the selected image of the deer statue. The file path is `D:\Tutorials\Deer\UPG\P3050118.JPG`.
- 3D Viewport (Right):** A 3D view of the reconstructed deer statue model, rendered in a light blue color, positioned on a grid floor within a 3D bounding box. The file path is `D:\Tutorials\Deer\UPG\P3050118.JPG`.

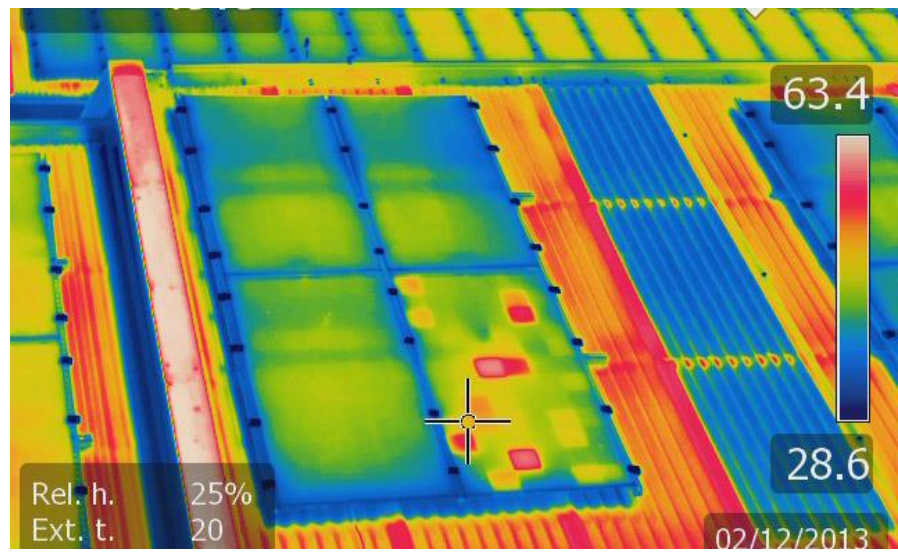
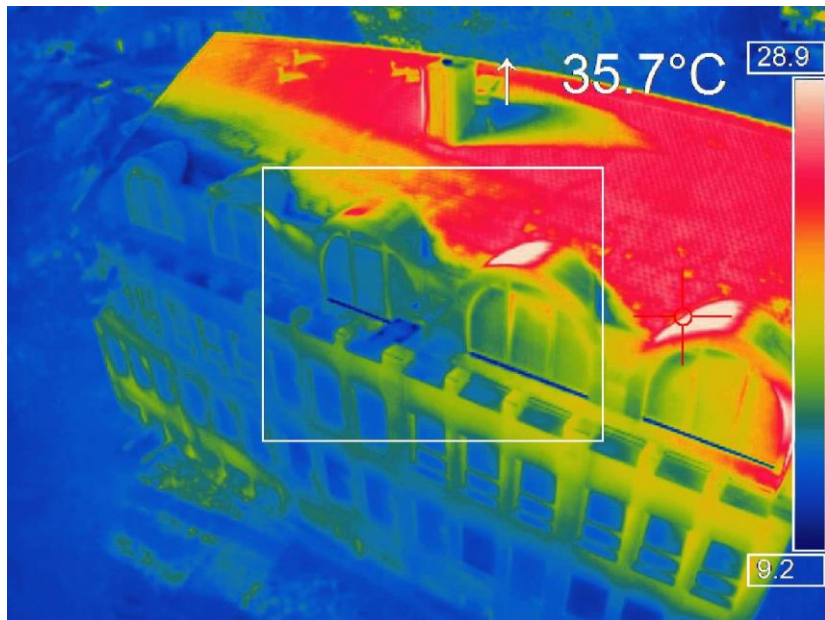
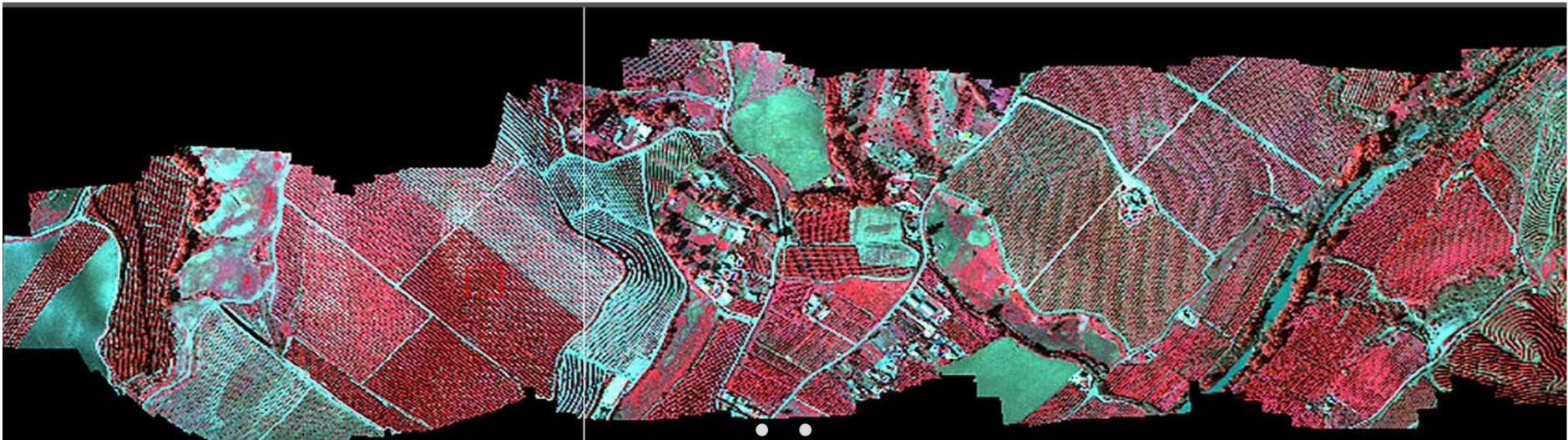


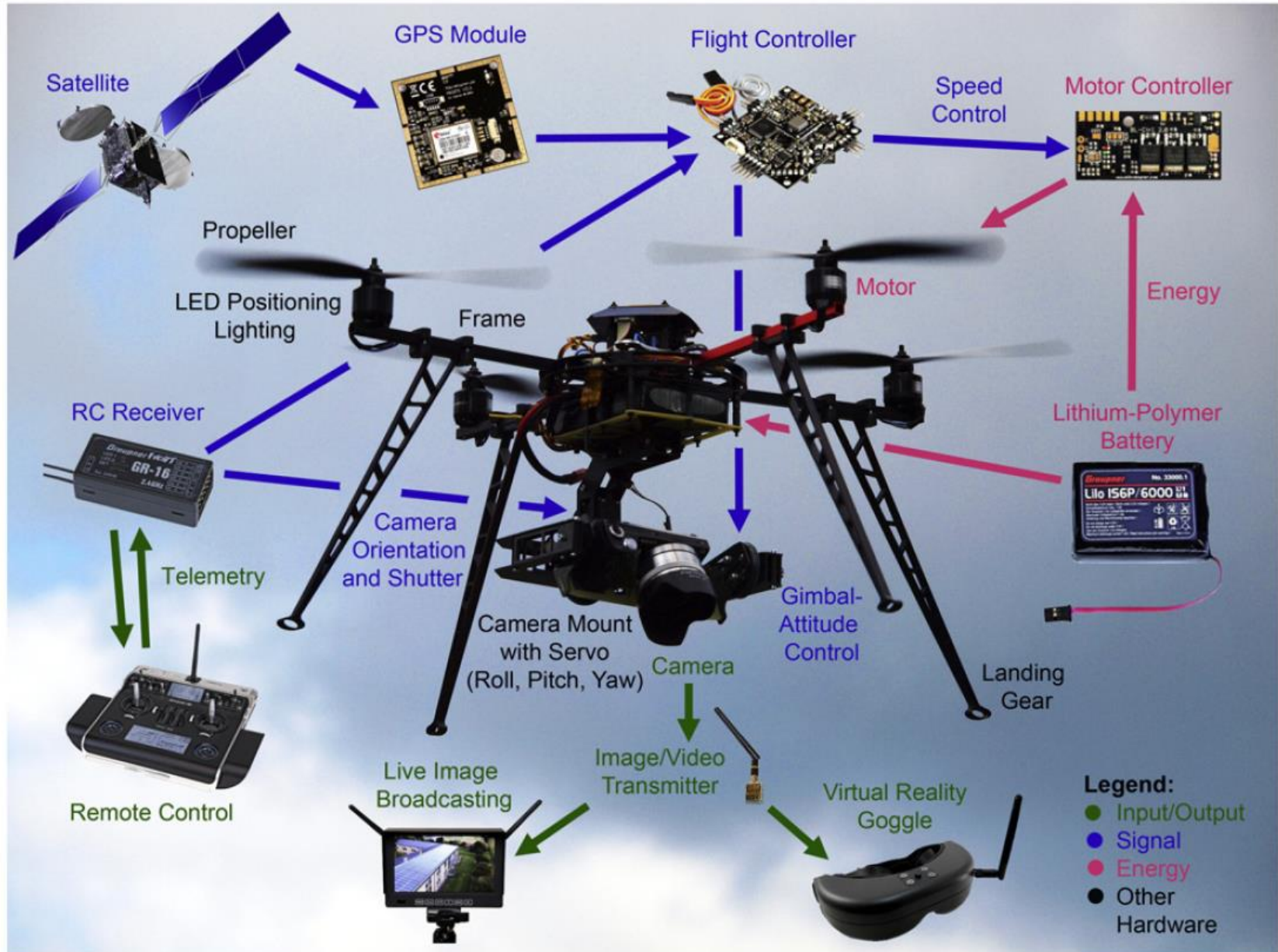


















# Hrad Hněvín



# Kostel Nanebevzetí Panny Marie



**Benedikt**





# Drones



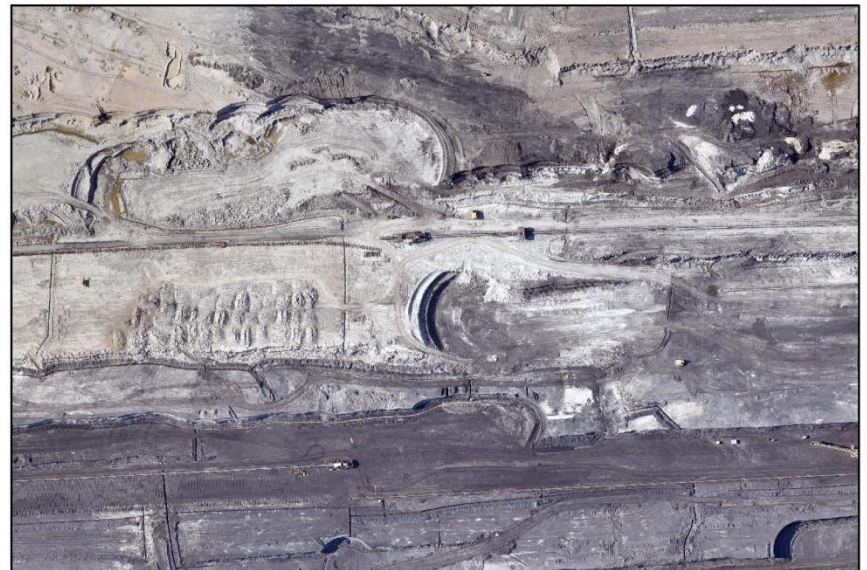
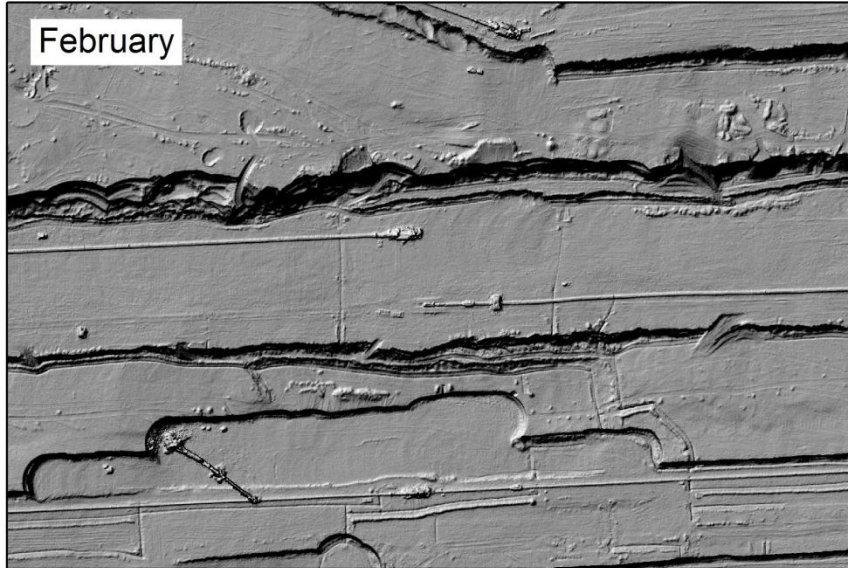








# Small Format Aerial Photography



0 250 500 m



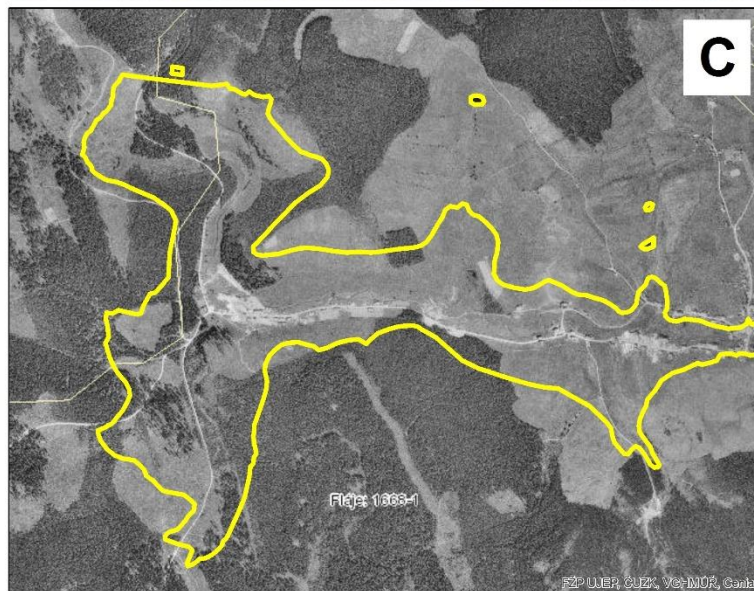
- The village Fláje was established in the 14<sup>th</sup> century.
- In 1921, there were 263 houses and 1099 inhabitants.
- In 1950, there were only 100 houses and 192 inhabitants.
- The Fláje dam was built between the years 1951–1964.



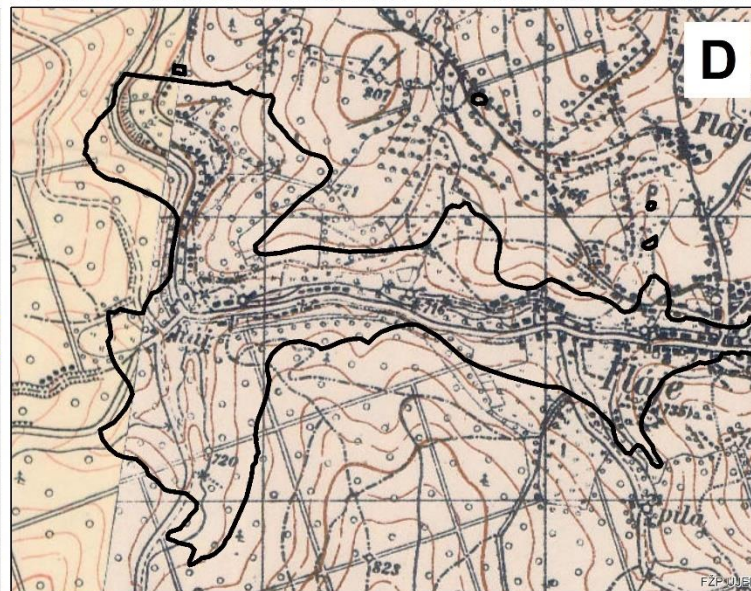
**A**



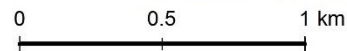
**B**



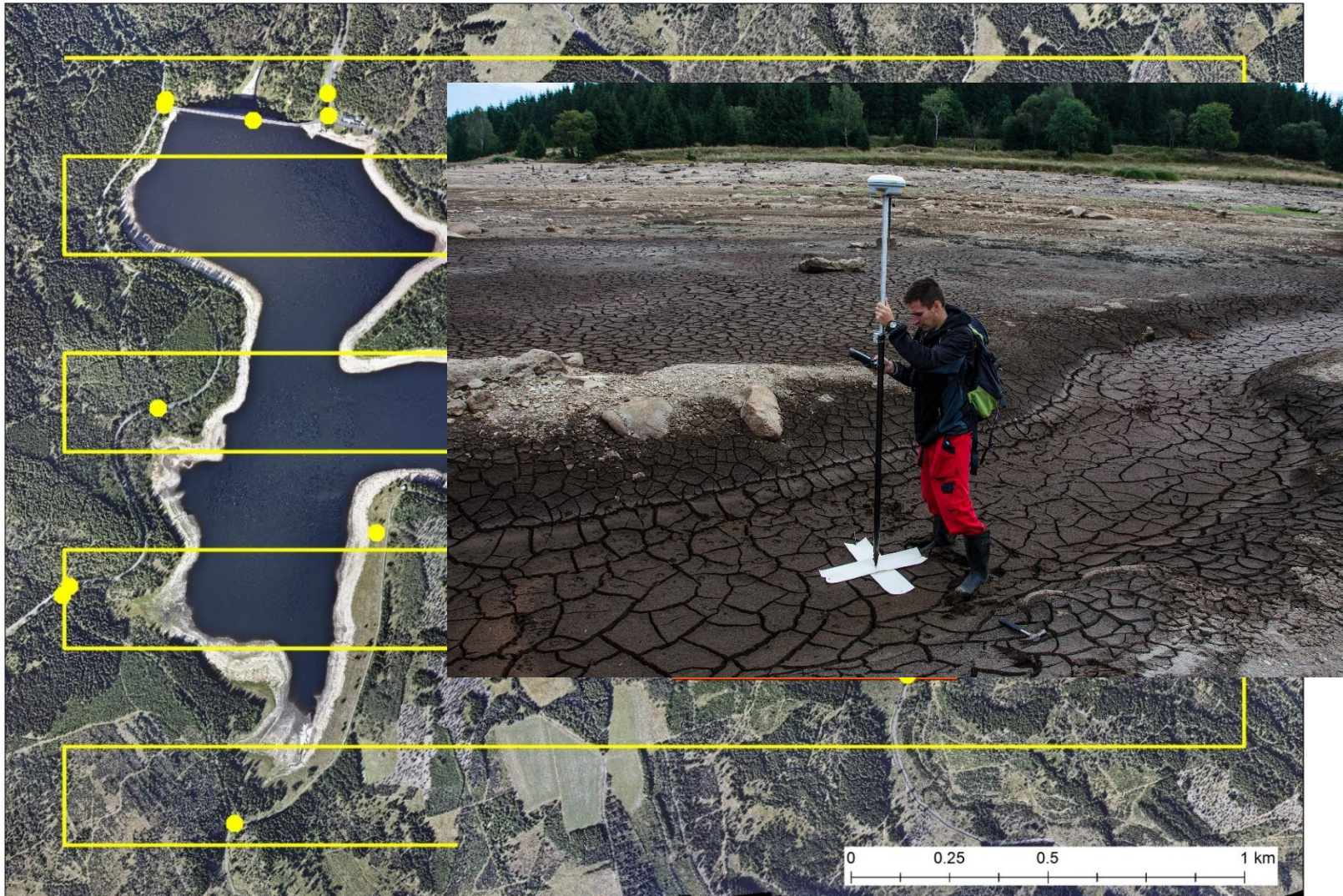
**C**

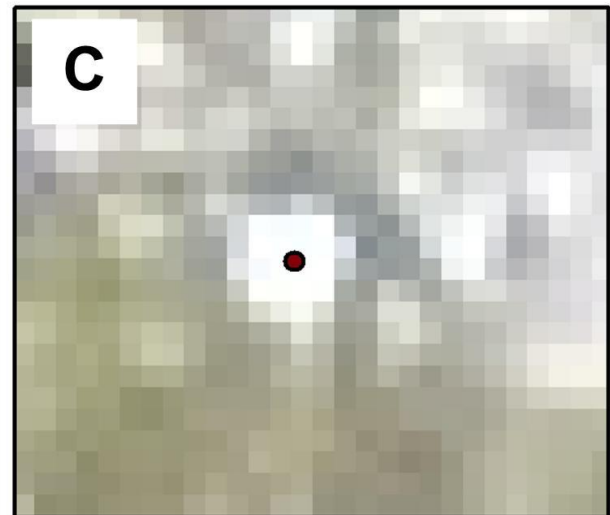
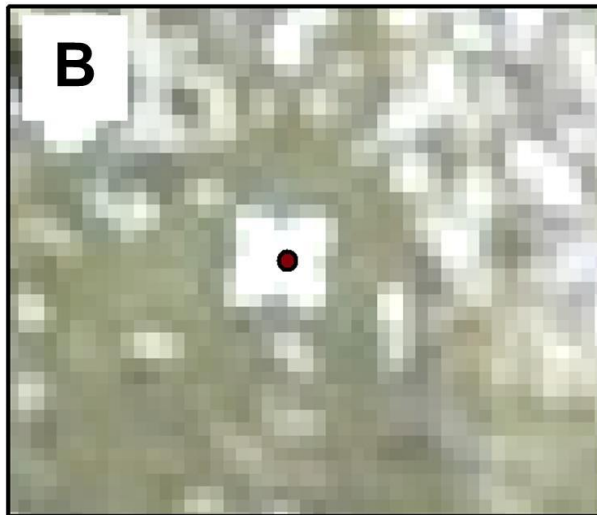
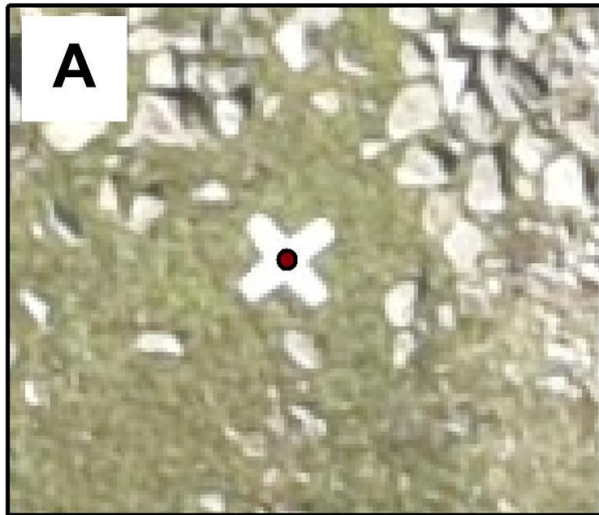


**D**



# Three different flight altitudes: 300 m, 600 m and 1000 m. 31 Ground Control Points (GCP)

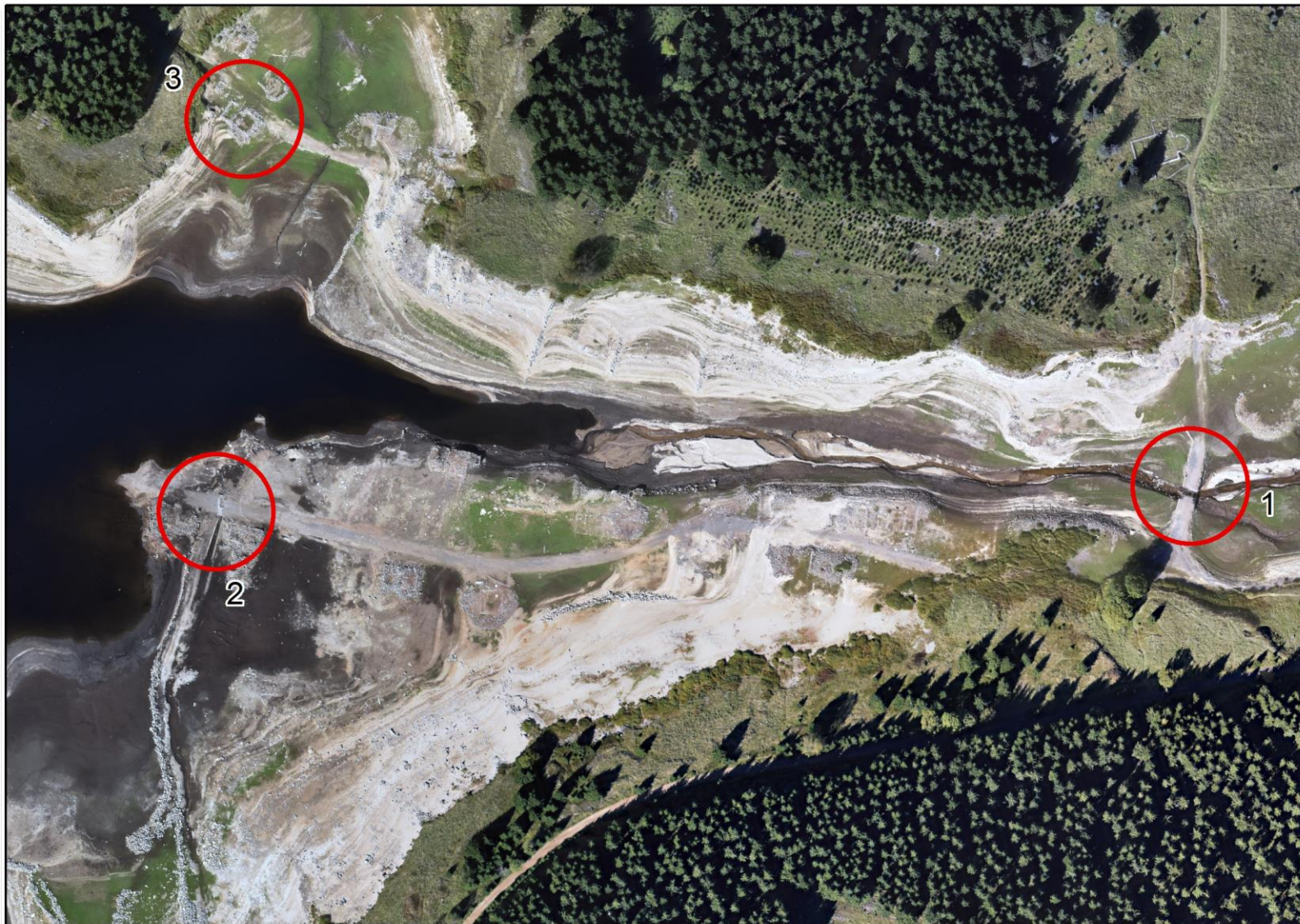


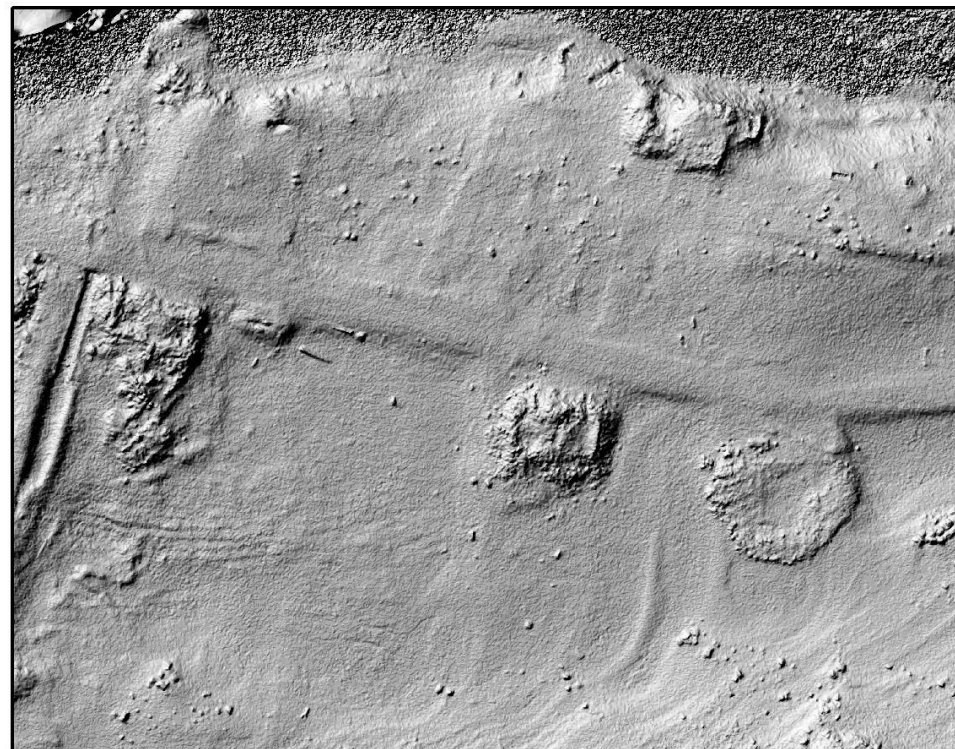


0 1 m



10 m





0 50 100 m







# Small Format Aerial Photography



Riesenburg

Rajhrad

Mills

# Kite Aerial Photography

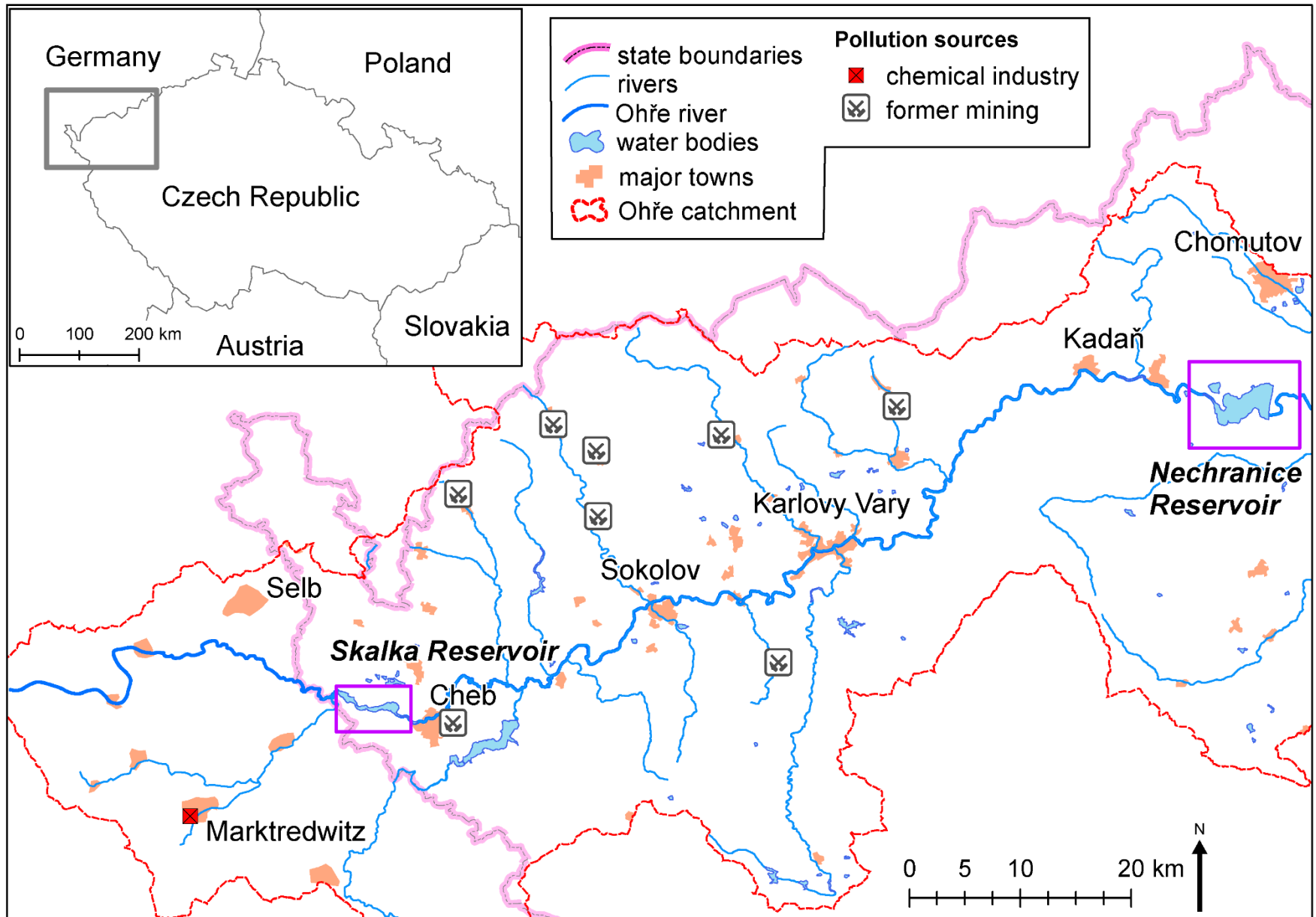




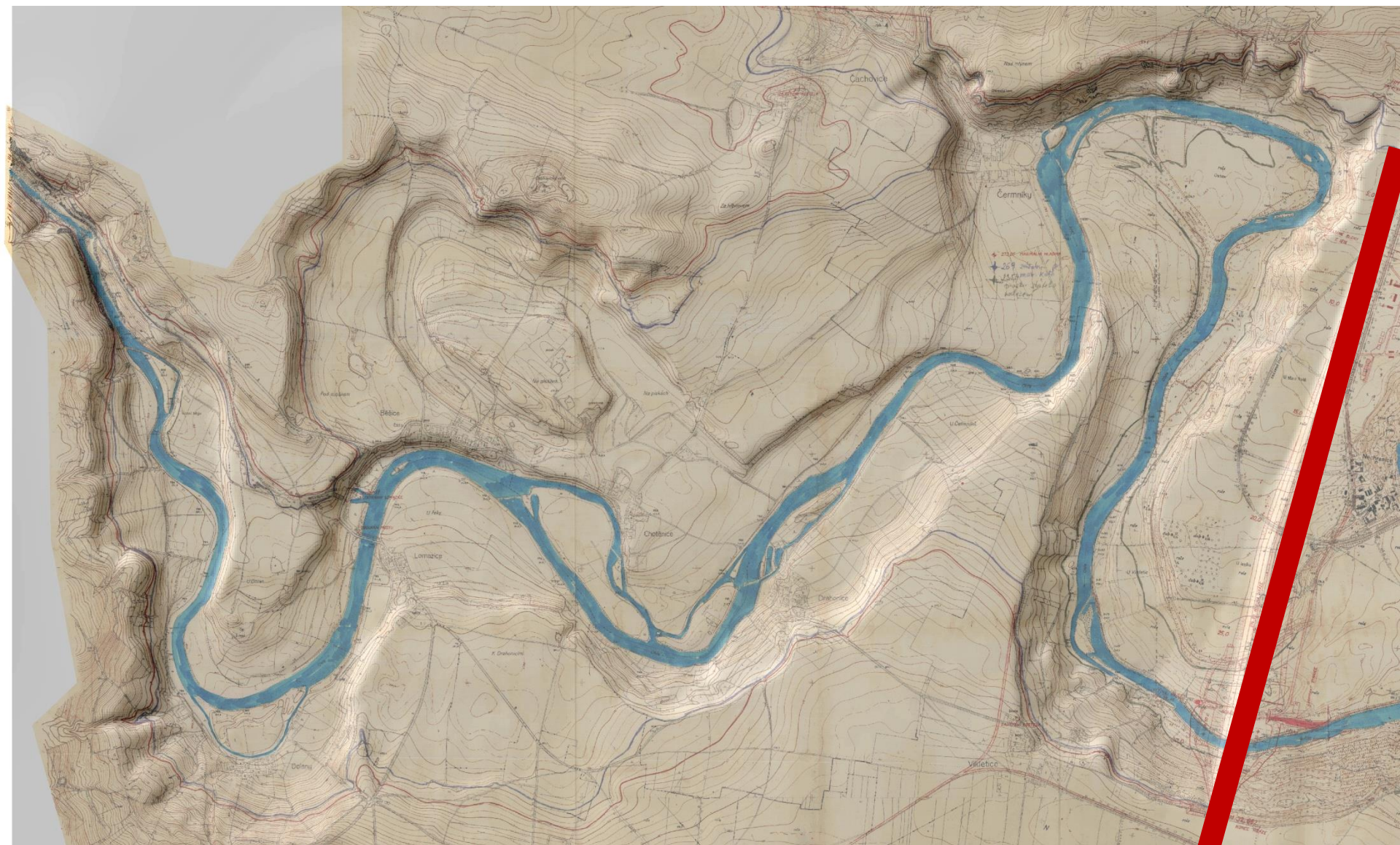


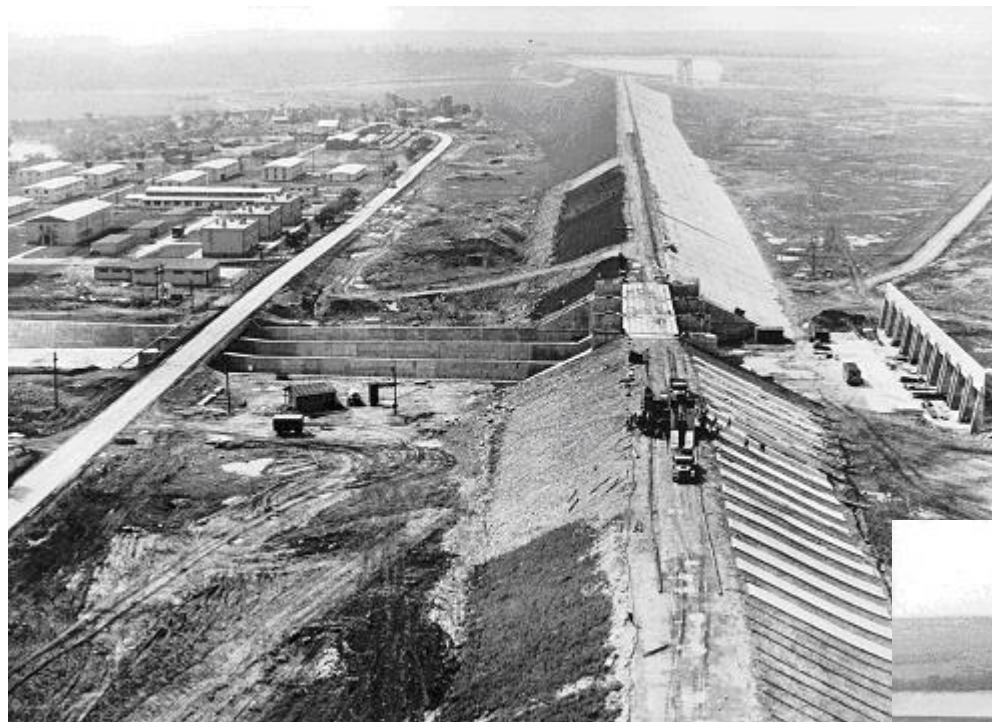
# Bathymetric mapping



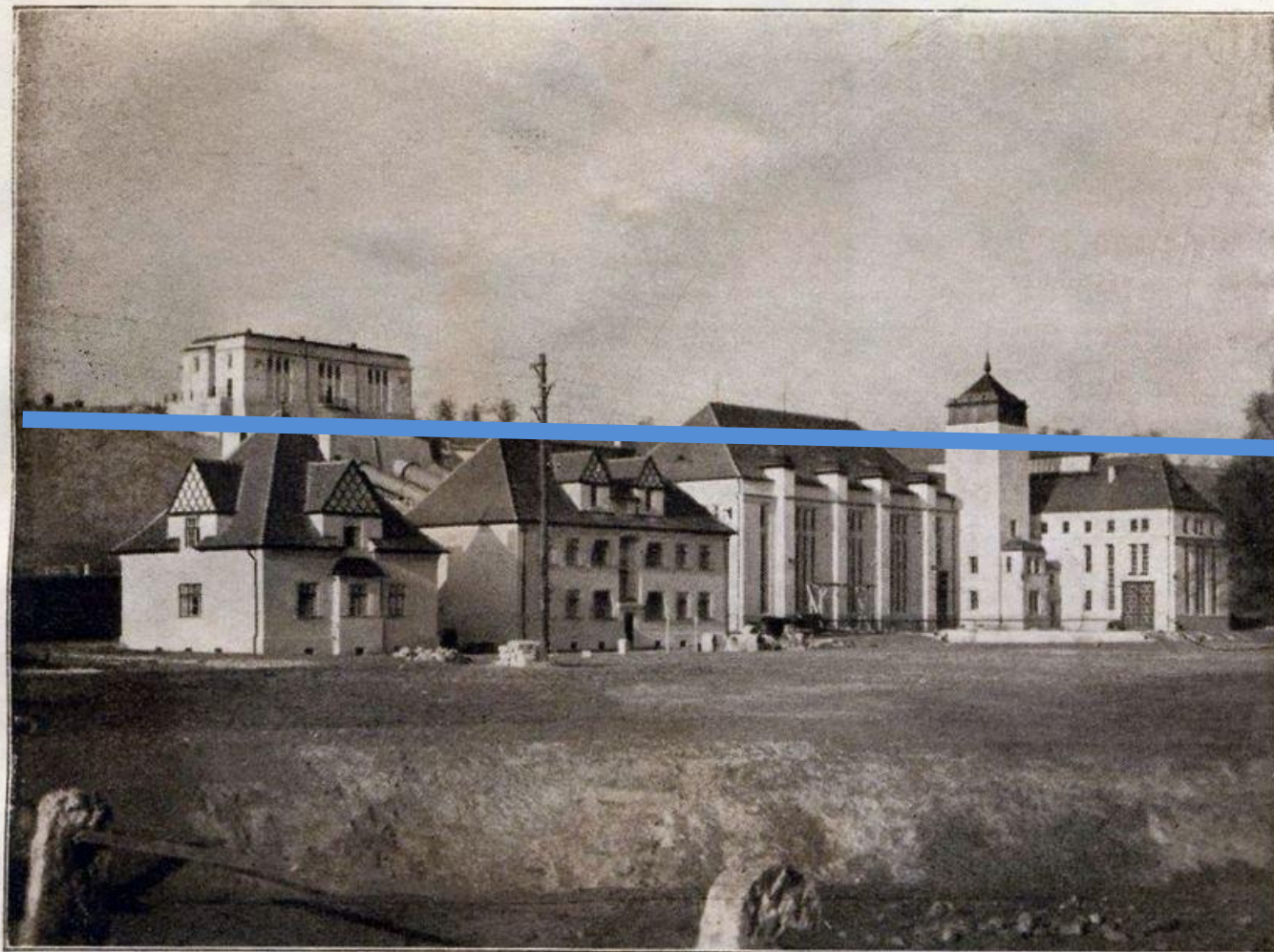


# Bathymetric mapping

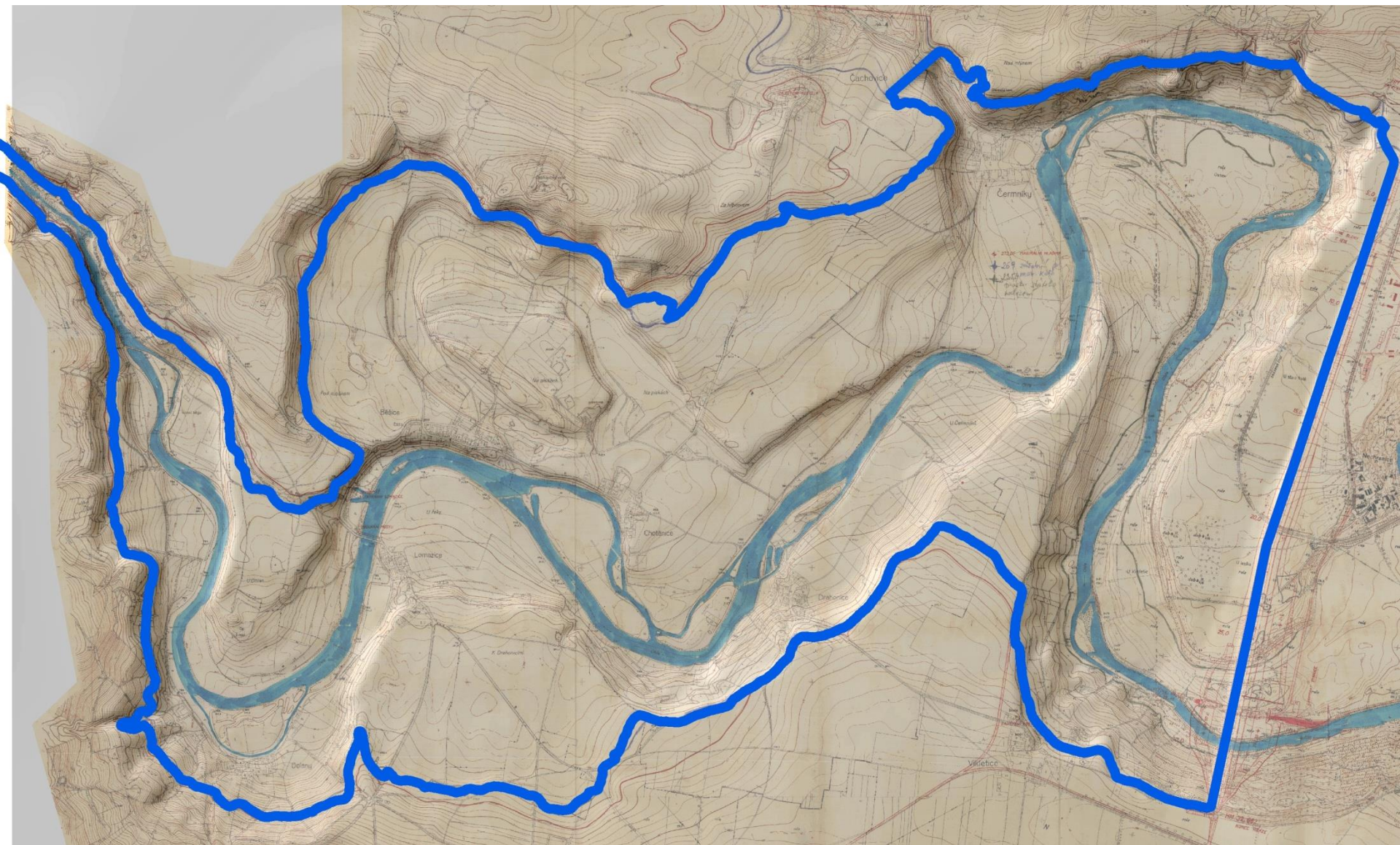






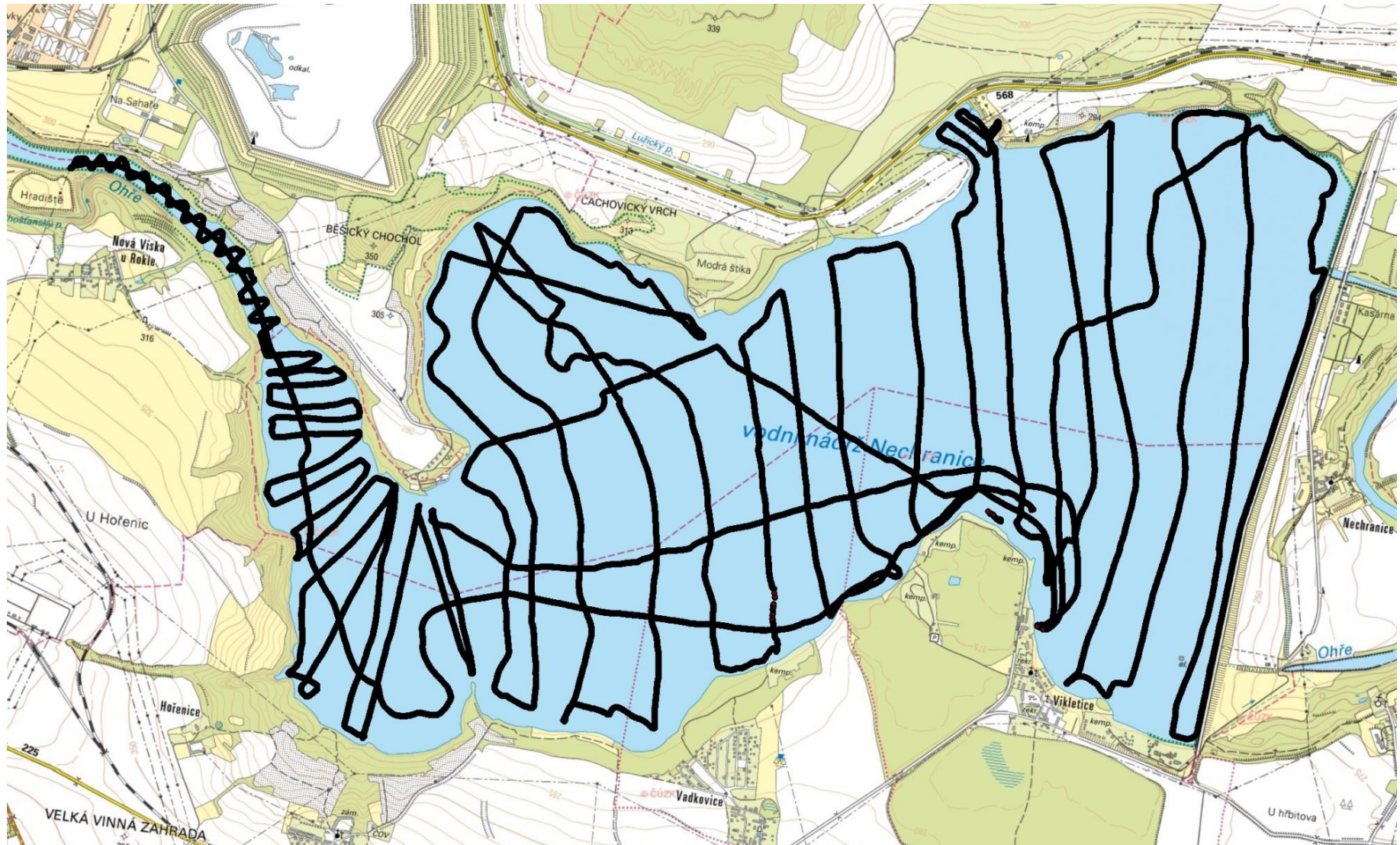


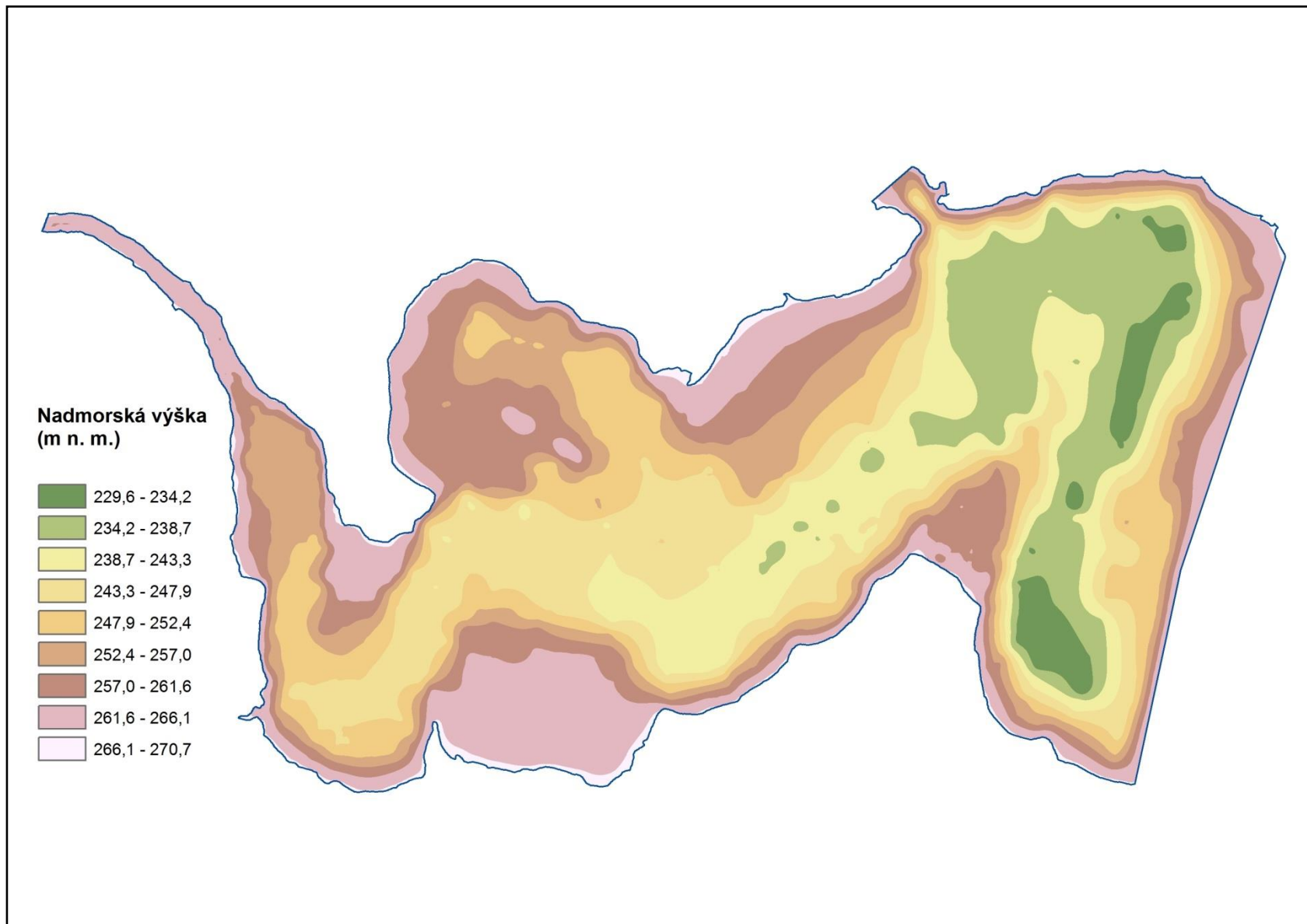
Wasserkraftwerk.

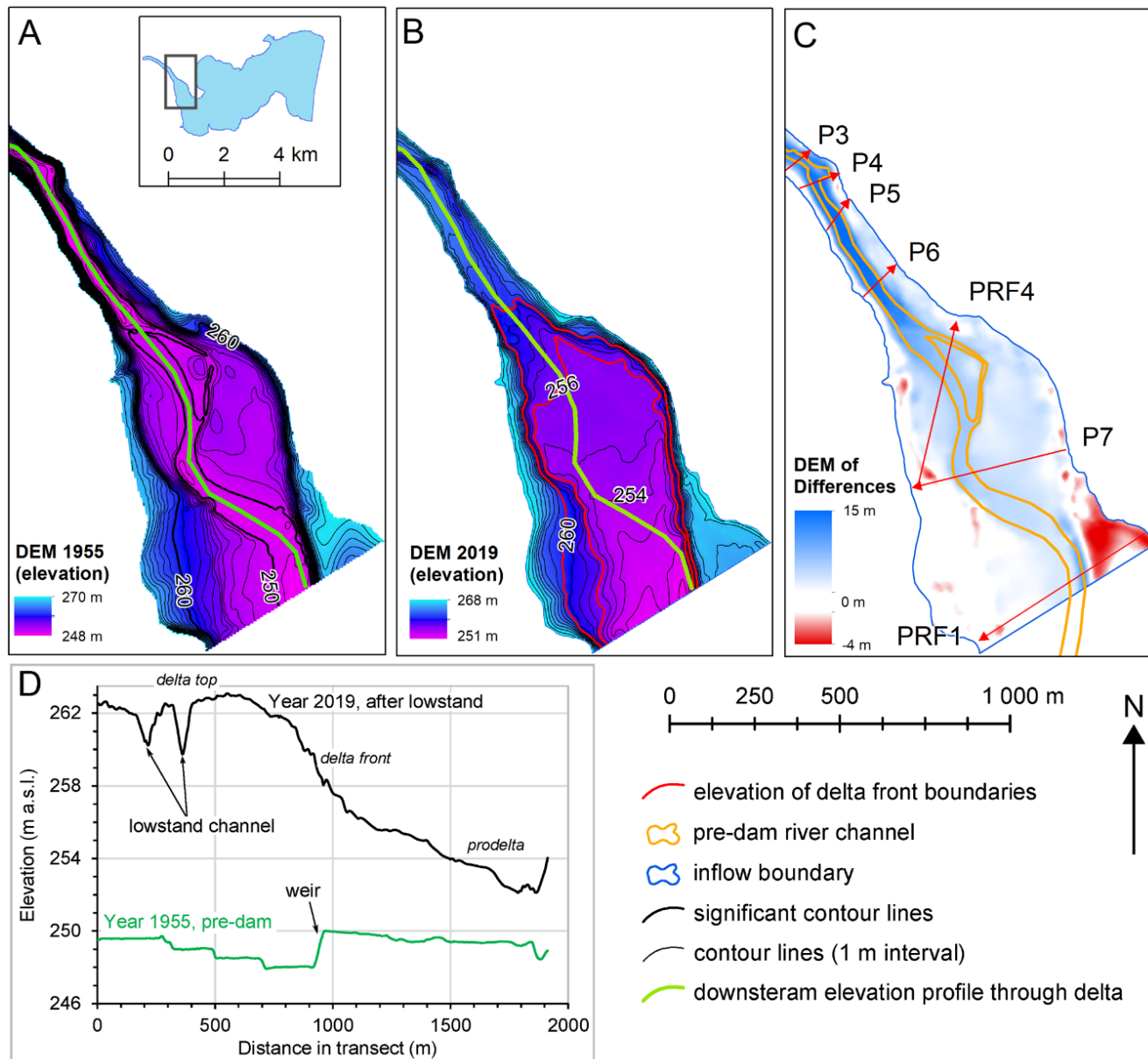




- 57 transects
- total track more than 80 km
- average point density 6p/10m
- scan time 11 hours







# Landscape change modelling





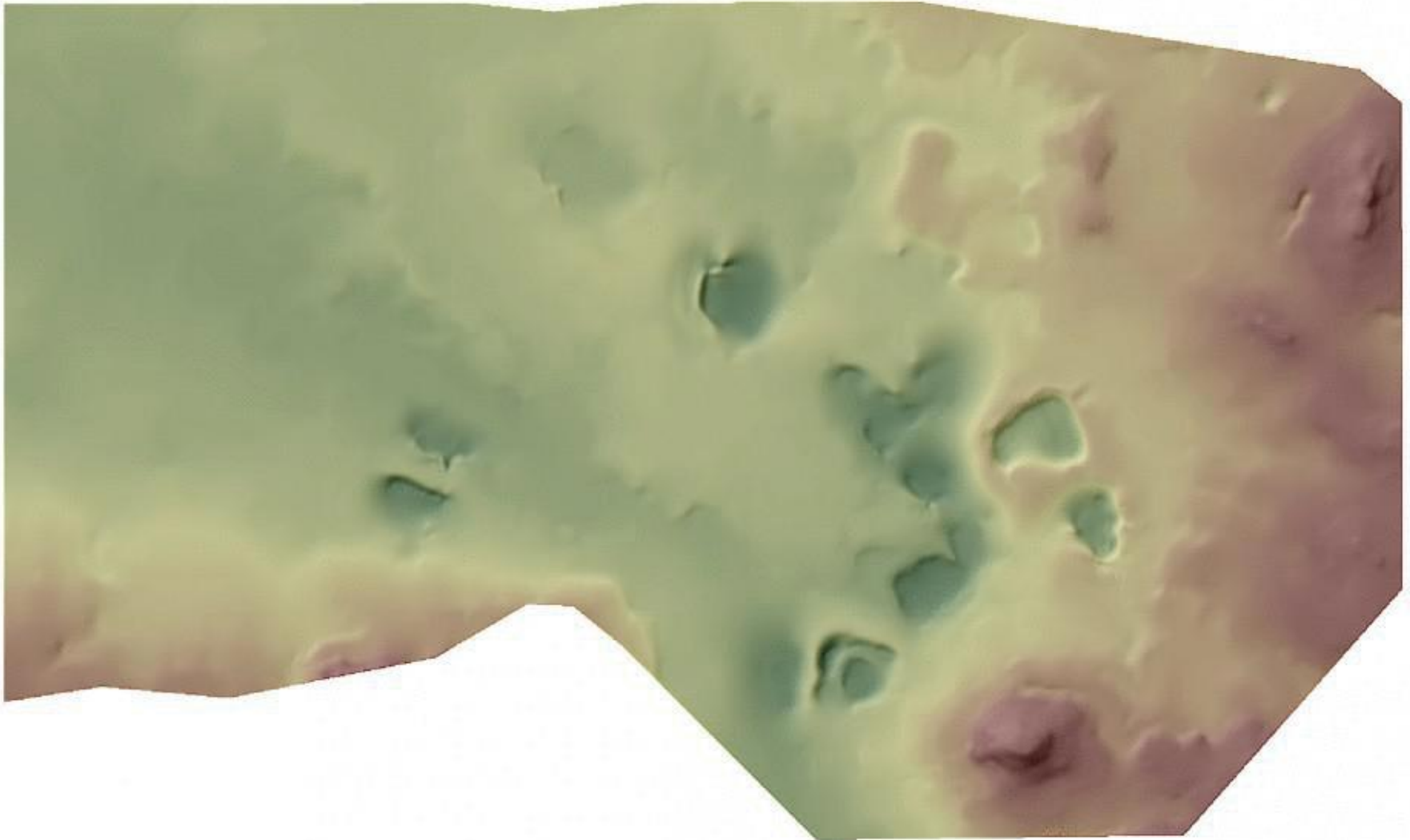
# Terrain reconstruction







## Georelief development



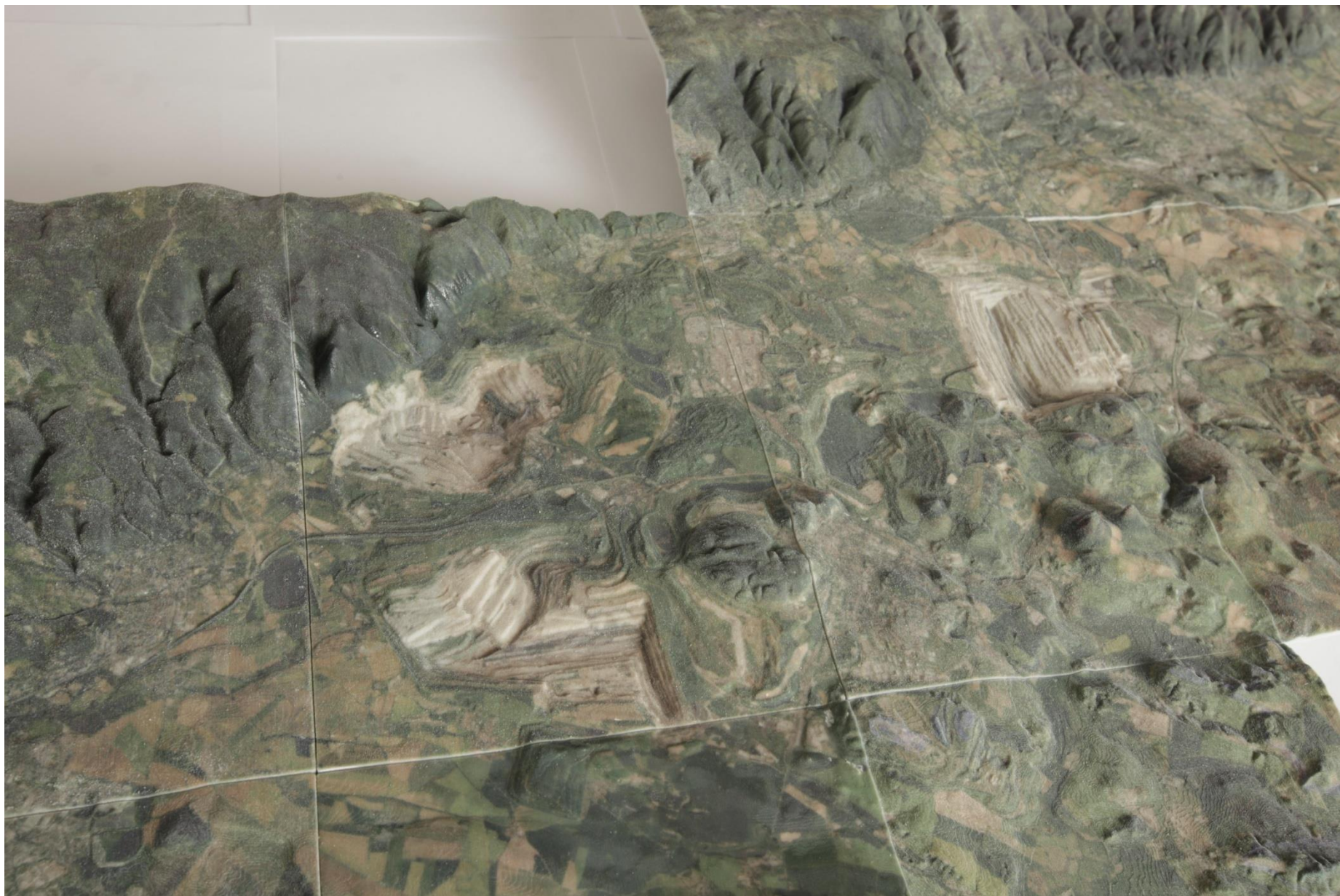
1936



## Visualization – quarry Bílina – year 1938 and 1995







## The effect of sheep-herding in Central Bohemian Highlands

