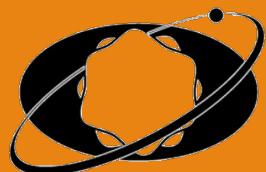


# Špecializované vizualizácie dát z leteckého laserového skenovania

## a ich využitie na detekciu reliktov kultúrnej krajiny

*Tibor Lieskovský*

*Alexandra Bucha Rášová*



Katedra globálnej geodézie a geoinformatiky

•••• STU  
•••• SvF

SLOVENSKÁ TECHNICKÁ  
UNIVERZITA V BRATISLAVE  
STAVEBNÁ FAKULTA

GeoKARTO 2022

8. – 9. September 2022

# ARCHEOLÓGIA NEVIDITEĽNÉHO



# MOTIVÁCIA



Zdroj: ČÚZK – DMR 5G



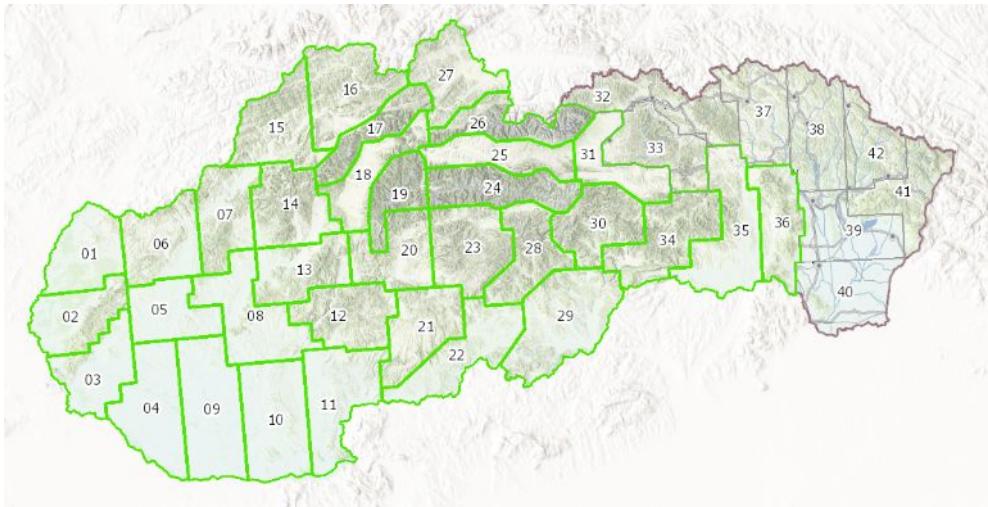
Zdroj: ÚGKK SR – DMR 5.0



Zdroj: STU - KGGI

# VÝCHODISKÁ

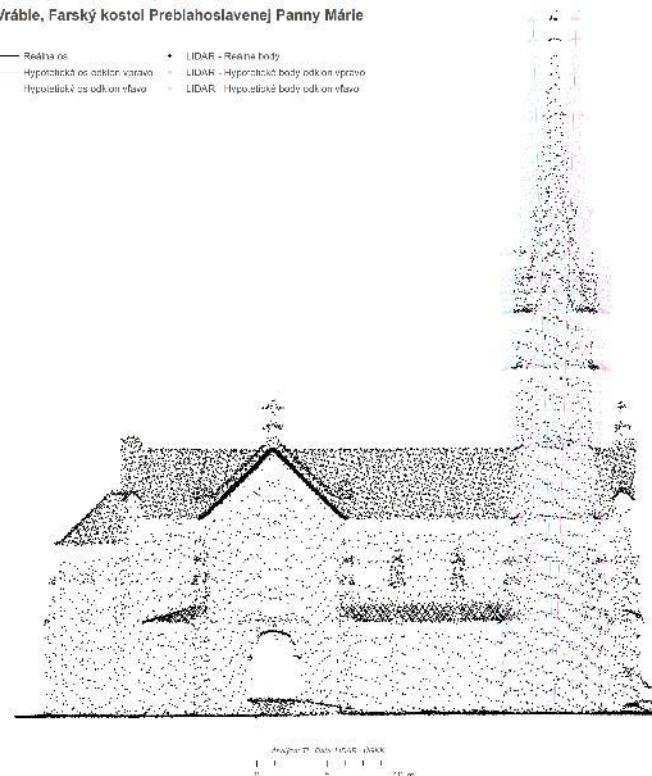
- Voľne dostupné dátá (mračná bodov) od ÚGKK SR
- Vysoká hustota triedy ground
- Vysoká presnosť klasifikácie
- Vysoká priestorová presnosť



Zdroj: ÚGKK SR – Geoportal

Bočný pohľad (východná strana kostola)  
Vráble, Farský kostol Preblahoslavenej Panny Márie

- |                                 |  |
|---------------------------------|--|
| Reálna os                       | • LIDAR - Reálne body                      |
| Hypotetická os aktuálnej stavby | • LIDAR - Hypoteiticke body zdrojom vpravo |
| Hypotetický os odkom vľavo      | • LIDAR - Hypoteiticke body odkom vľavo    |

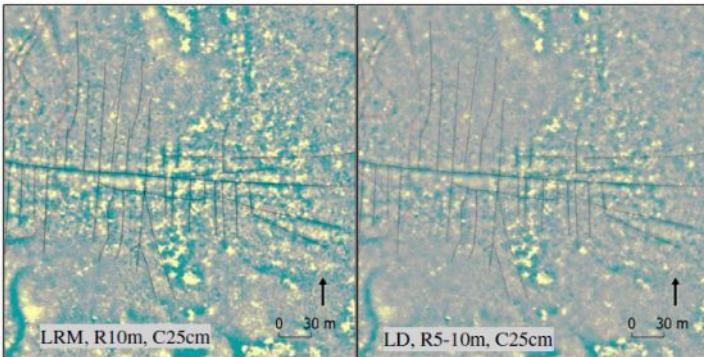


# VÝCHODISKÁ

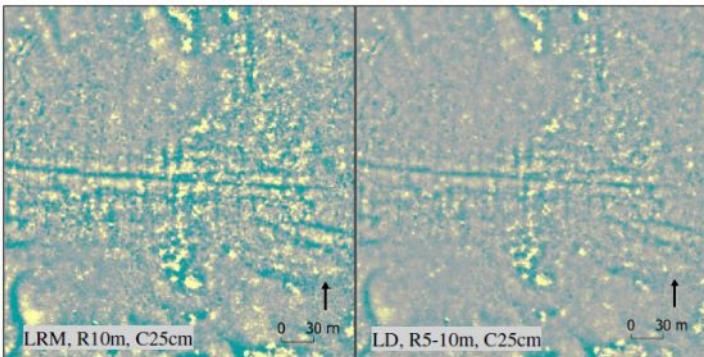
- Návrh vlastných vizualizačných metód
- Interpolácia dát LLS do DEM s vysokým rozlíšením
- Tvorba DFM (Digital feature model)

# SPECIALIZOVANÉ VIZUALIZÁCIE - TVORBA

Rozličné vyjadrenie krvosti terénu

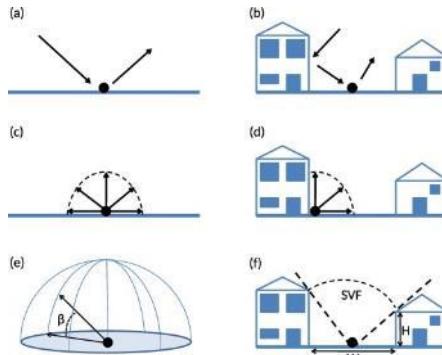
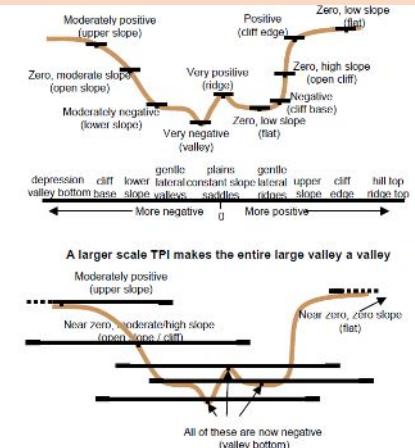


Obr. 51 Porovnanie metód v mierne ľalienom teréne



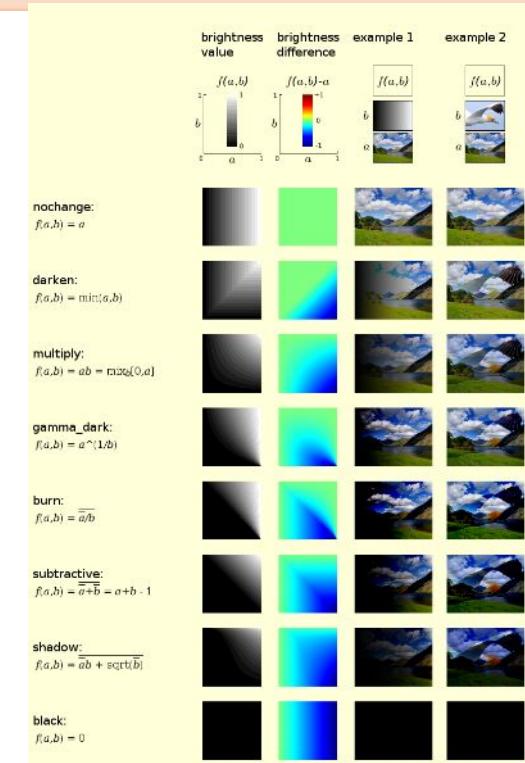
Zdroj:  
Dominika Staníková (2020): Návrh kartografického modelu na vizualizáciu dát leteckého laserového skenovania pre potreby dokumentácie kultúrneho dedičstva

Rozličné vyjadrenie gradientu zmeny



Zdroj:  
M. Dirksen et al: Sky view factor calculations and its application in urban heat island studies  
<https://doi.org/10.1016/j.ulclim.2019.100498>

Individuálne metódy farebného kombinovania vrstiev



Zdroj:  
Blend Modes Examined 1: Brightness&Contrast  
<https://yahvuu.wordpress.com/2009/09/27/blend-modes1/>

# ŠPECIALIZOVANÉ VIZUALIZÁCIE

Skúsenosti zo spracovania dát LLS  
v Guatemale  
(PACUNAM LIDAR INITIATIVE)

The screenshot shows a lidar visualization of ancient Maya structures in Guatemala. The main image is a detailed 3D surface model of a city, highlighting various buildings and plazas. To the left, there's a sidebar with sharing options (Facebook, Twitter, LinkedIn), a 'RESEARCH ARTICLE' section about lowland Maya complexity, and a 'MY SAVED FOLDERS' section. At the bottom, there are links to related content and similar articles.

Nadviazanie na výsledky  
Slovinských a Rakúskych aktivít  
vo vizualizácii (RVT)

This screenshot shows the homepage of the Institute of Anthropological and Spatial Studies. It features a group photo of people, addresses, and sections. A prominent link leads to the 'Relief Visualization Toolbox (RVT)' project page, which includes tabs for About Us, Members, Programs and Projects, Publications, Collaborations, and Home. The RVT page details its purpose as a toolbox for generating digital elevation models (DEMs) from lidar data, mentions funding from the Austrian Research Agency, and provides links to manual versions 2.2.1 and 2.2.2.

This screenshot shows the 'RVT manual version 2.2.1' page. It displays several code snippets in a syntax-highlighted editor, likely Python or C++, used for generating DEMs. Below the code, there's a visualization of a digital elevation model (DEM) showing terrain elevation in a color-coded grid.

This screenshot shows the cover of the book 'AIRBORNE LASER SCANNING RASTER DATA VISUALIZATION: A Guide to Good Practice' by Žiga Kokalj and Ralf Hesse. The cover features a lidar visualization of a landscape.

Vlastné skripty a  
algoritmy

This screenshot shows a code editor with a large block of Python code. The code is part of the Relief Visualization Toolbox (RVT) and is written in a clean, readable style. It includes comments explaining the purpose of various functions and variables, such as 'generate\_raster' and 'read\_lidar'. The code is heavily annotated with docstrings and inline comments.

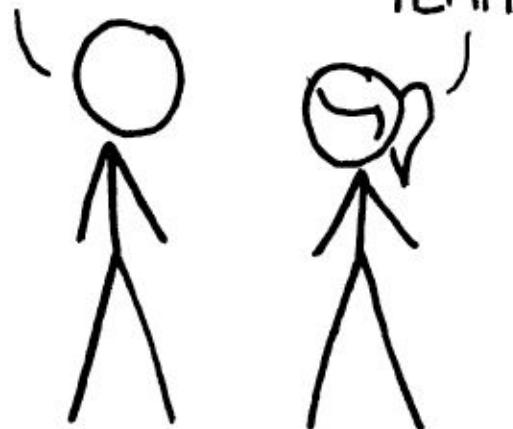
# ŠPECIALIZOVANÉ VIZUALIZÁCIE - INTEGRÁCIA

HOW STANDARDS PROLIFERATE:

(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC)

SITUATION:  
THERE ARE  
14 COMPETING  
STANDARDS.

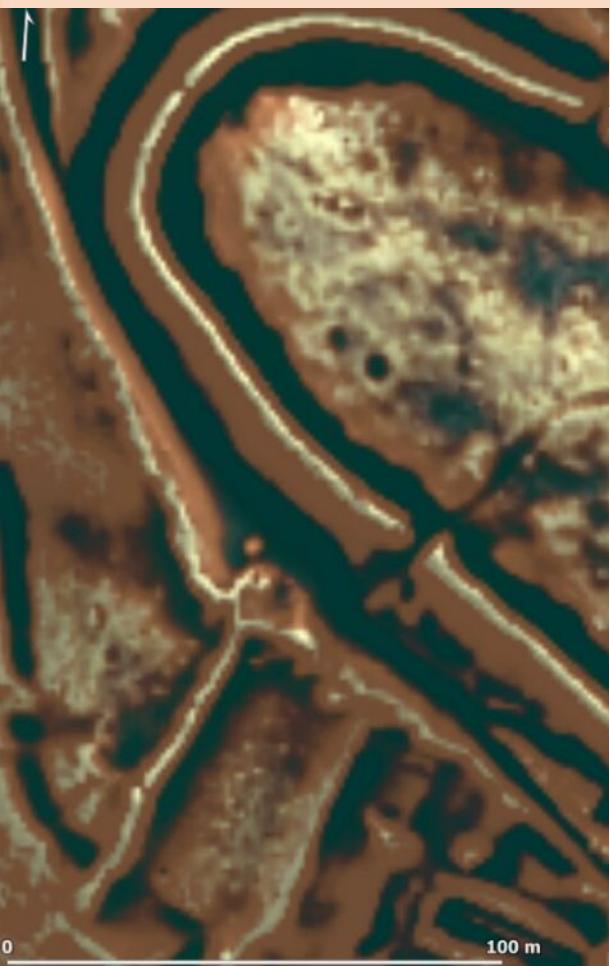
14?! RIDICULOUS!  
WE NEED TO DEVELOP  
ONE UNIVERSAL STANDARD  
THAT COVERS EVERYONE'S  
USE CASES.



SOON:

SITUATION:  
THERE ARE  
15 COMPETING  
STANDARDS.

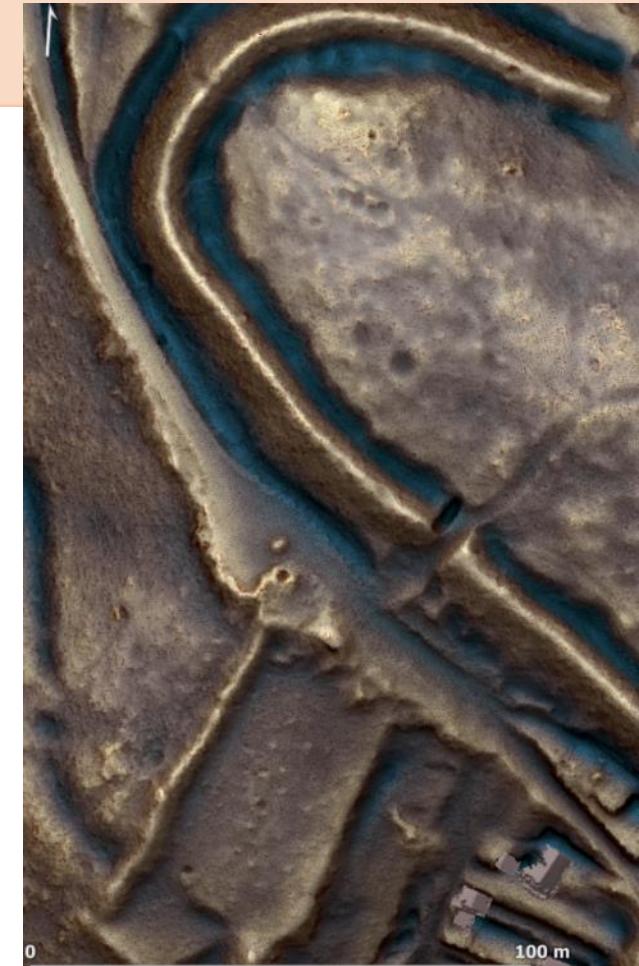
# ŠPECIALIZOVANÉ VIZUALIZÁCIE - INTEGRÁCIA



Rovina 1m/px

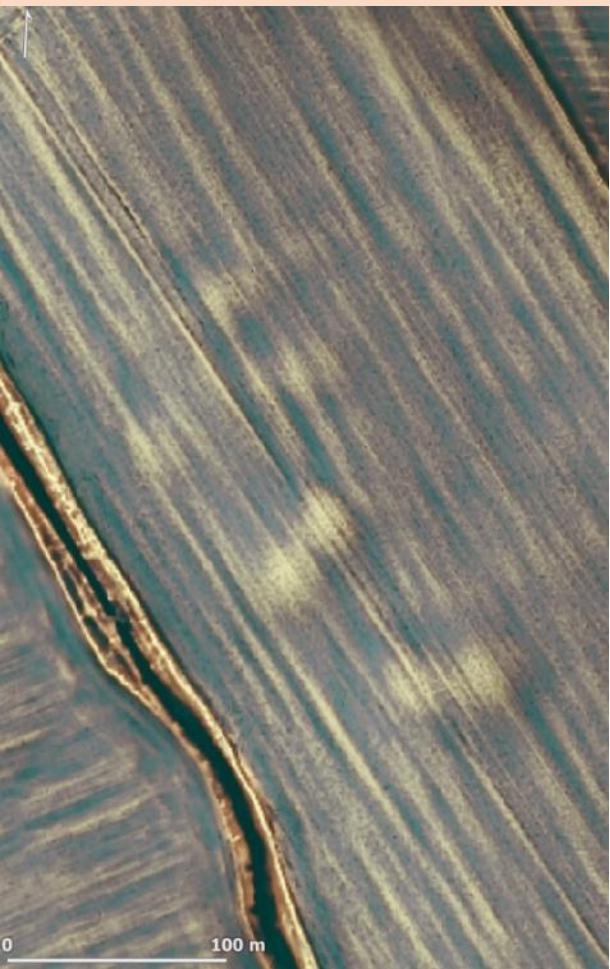


Všeobecná krajina 1m/px

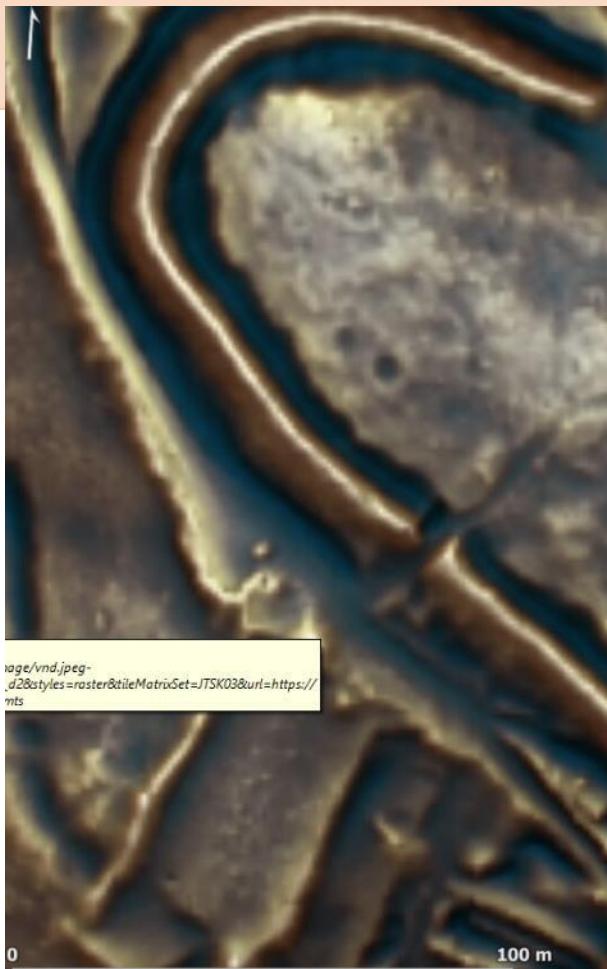


Všeobecná krajina 25cm/px

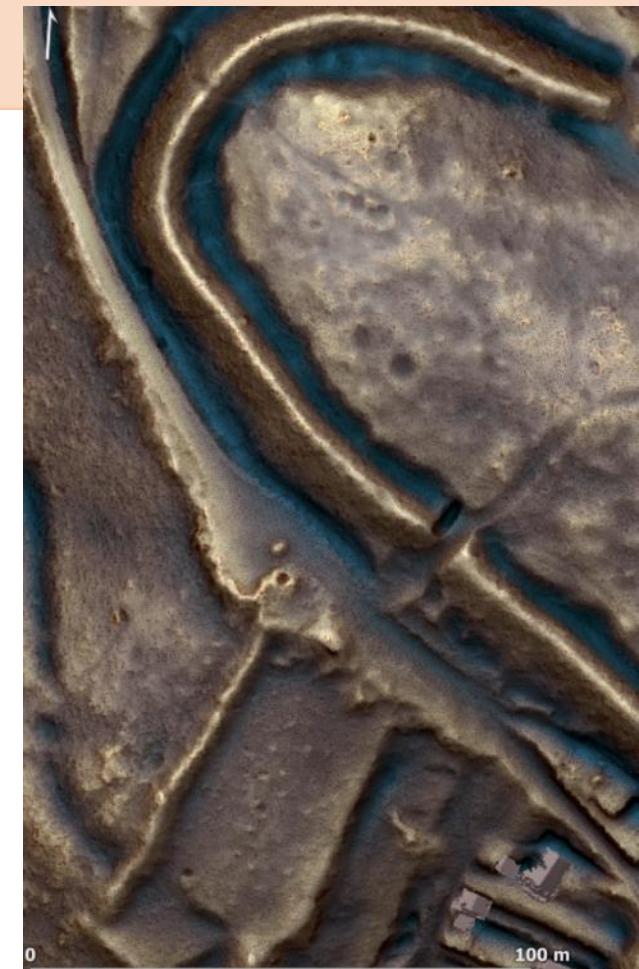
# ŠPECIALIZOVANÉ VIZUALIZÁCIE - INTEGRÁCIA



Rovina 1m/px

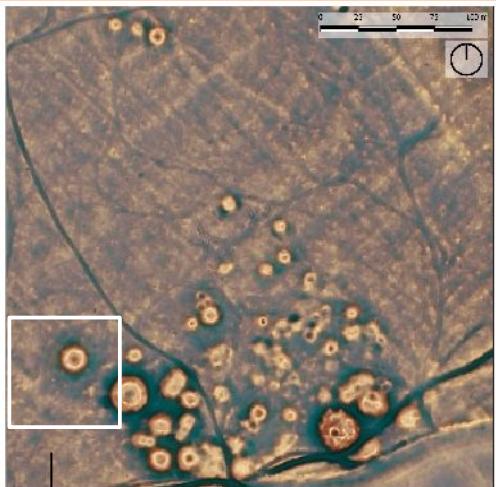


Všeobecná krajina 1m/px



Všeobecná krajina 25cm/px

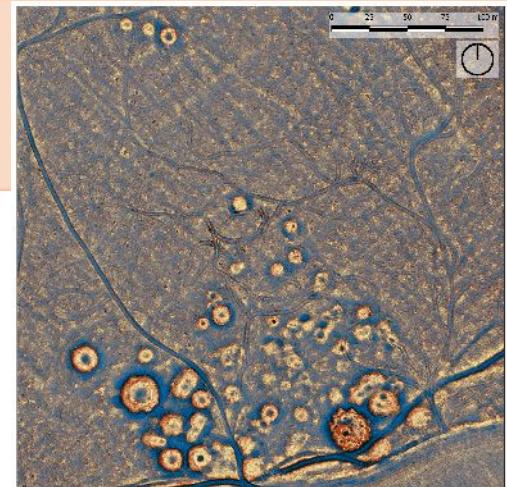
# INTERPOLÁCIA na 25cm/px



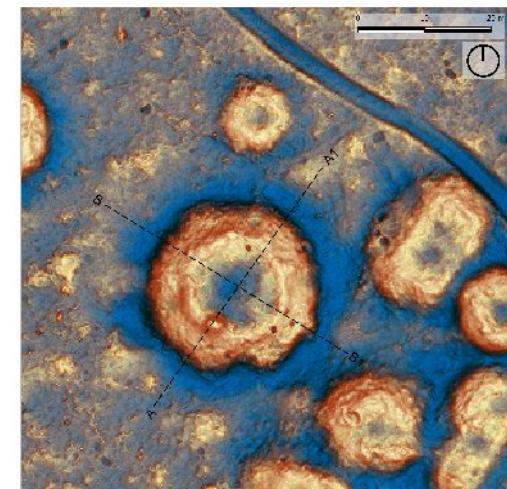
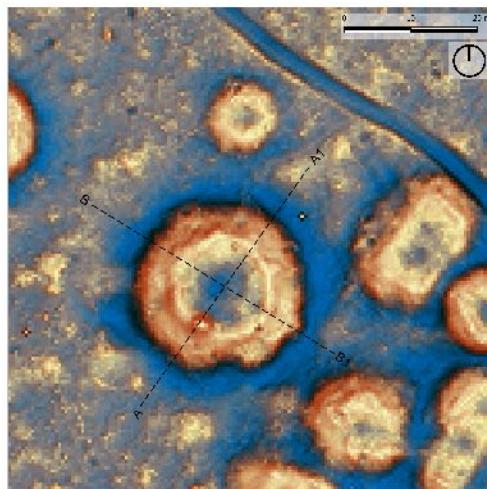
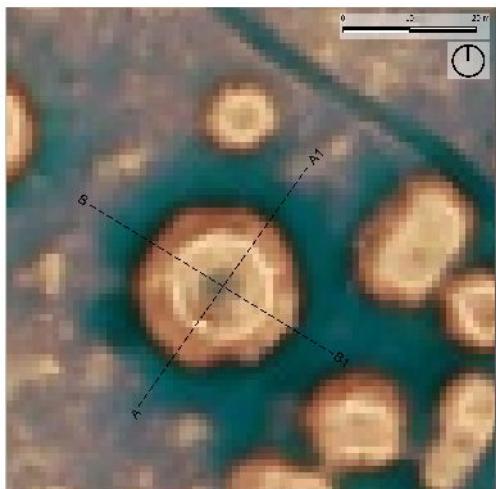
DEM - 1m / px



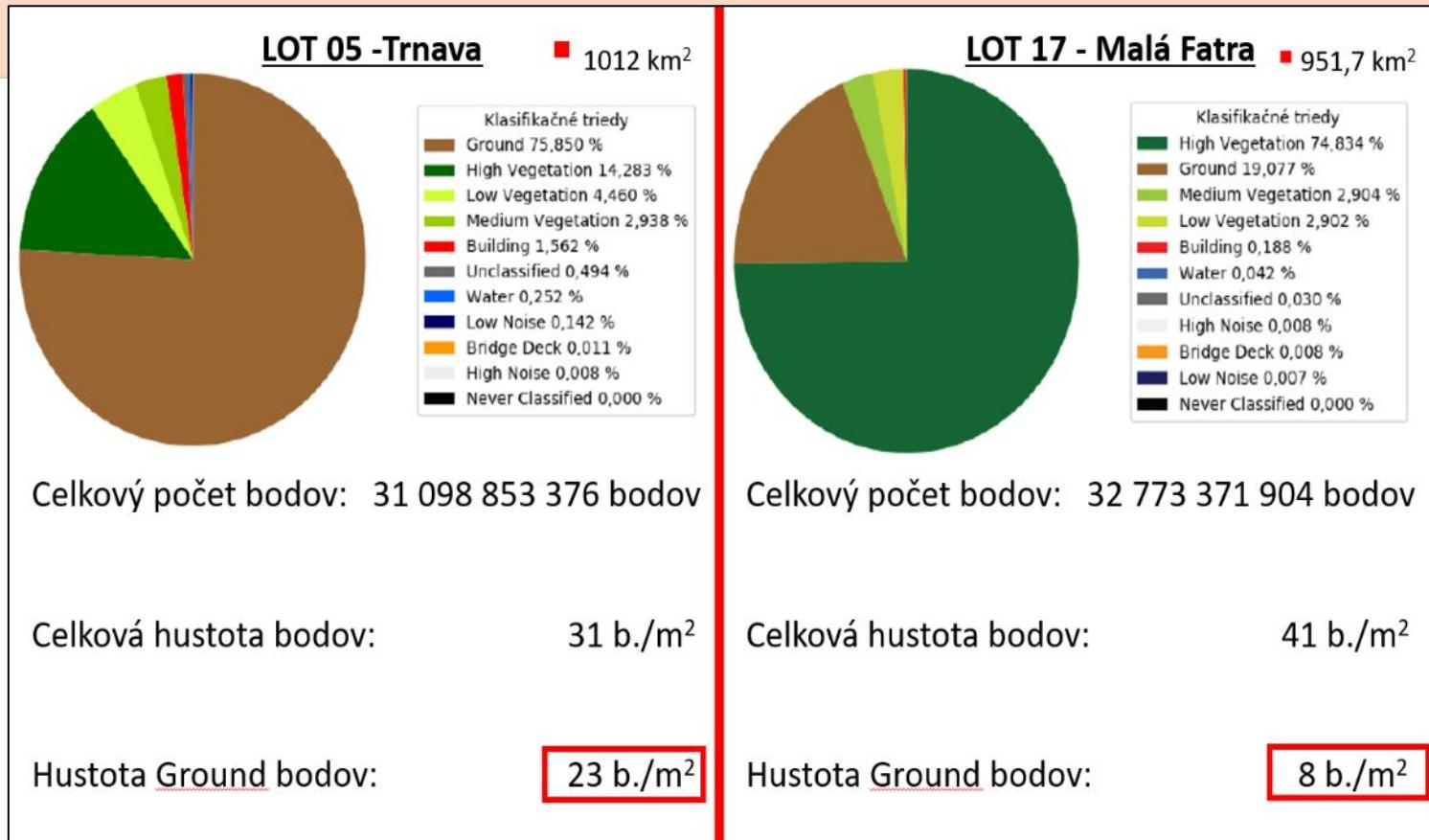
DEM - 0,5m /  
px



DEM - 0,25m /  
px

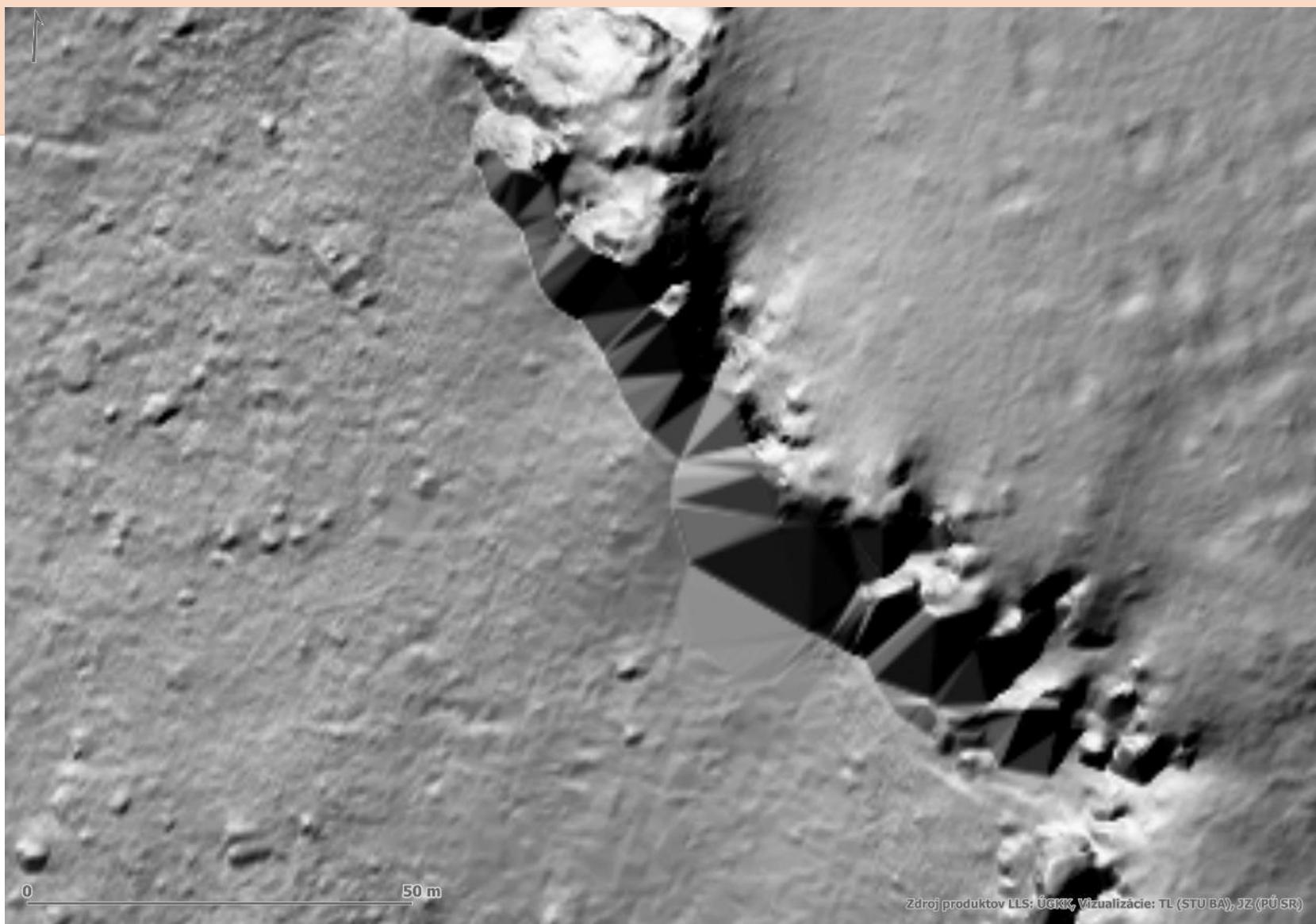


# INTERPOLÁCIA - „PRIZNANÉ“ LIMITY DÁT



Zdroj: ÚGKK SR

# INTERPOLÁCIA na 25cm/px



Zdroj produktov LLS: UGKK, Vizualizácie: TL (STU BA), JZ (PÚ SR)

# VIZUALIZÁCIE – DSM vs. DMR

Trieda: 02 - Povrch

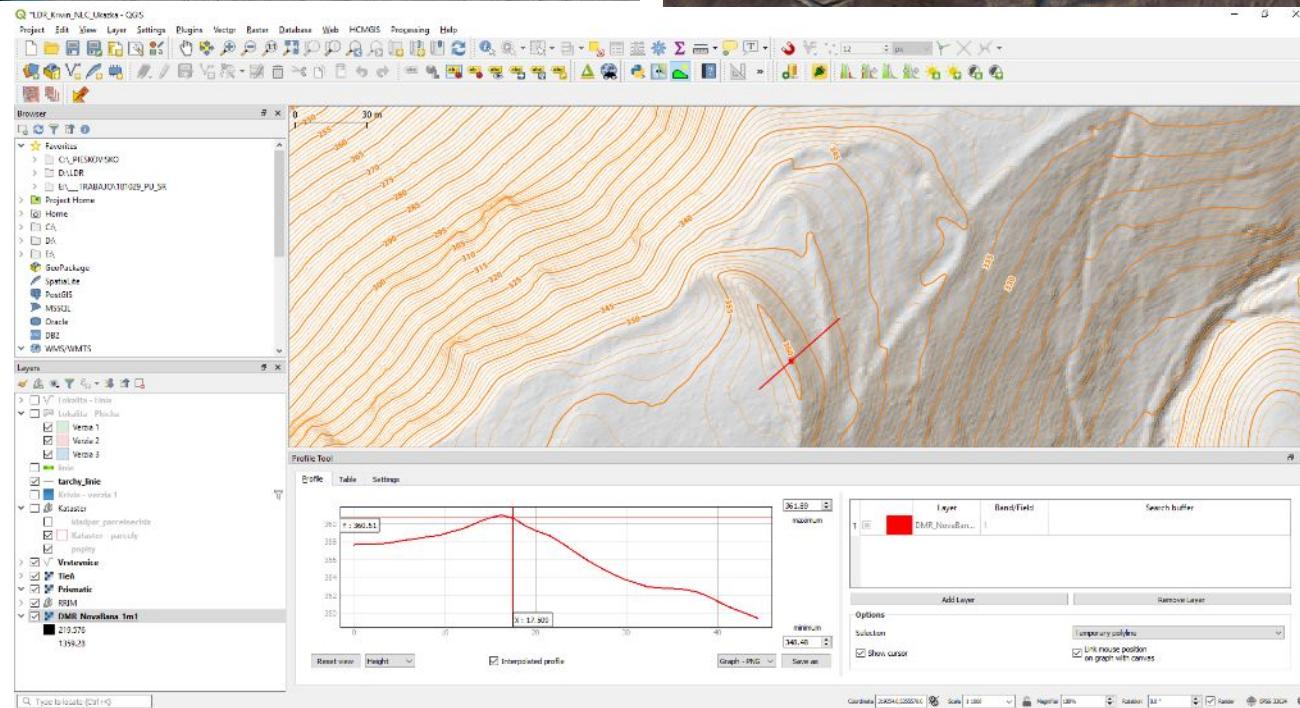
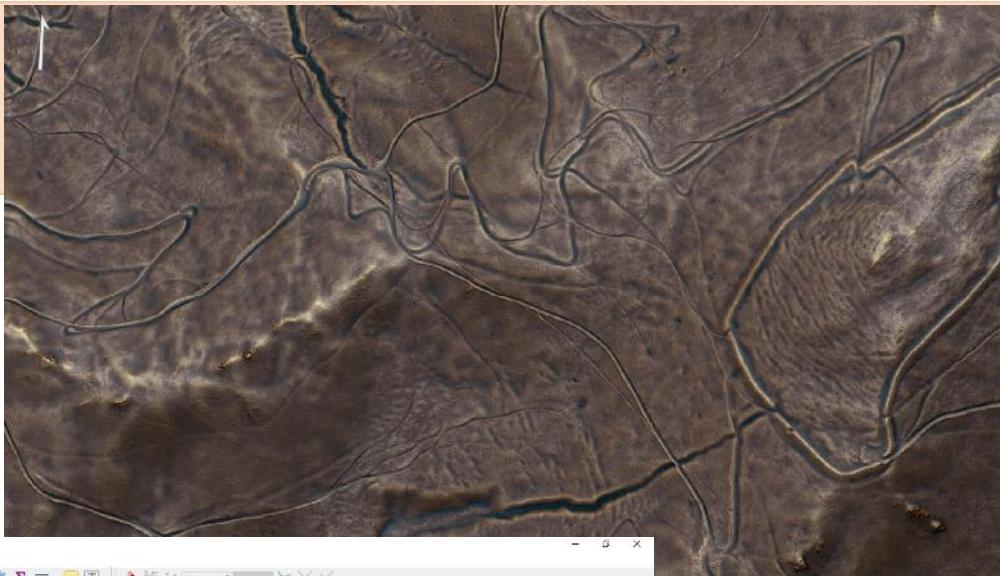
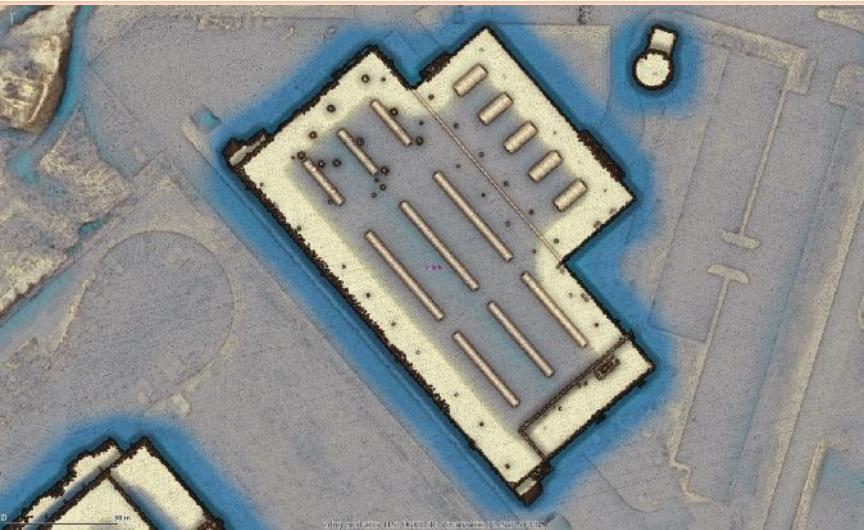


# VIZUALIZÁCIE – DFM (feature)

Trieda: 02 – Povrch , 06 Budovy



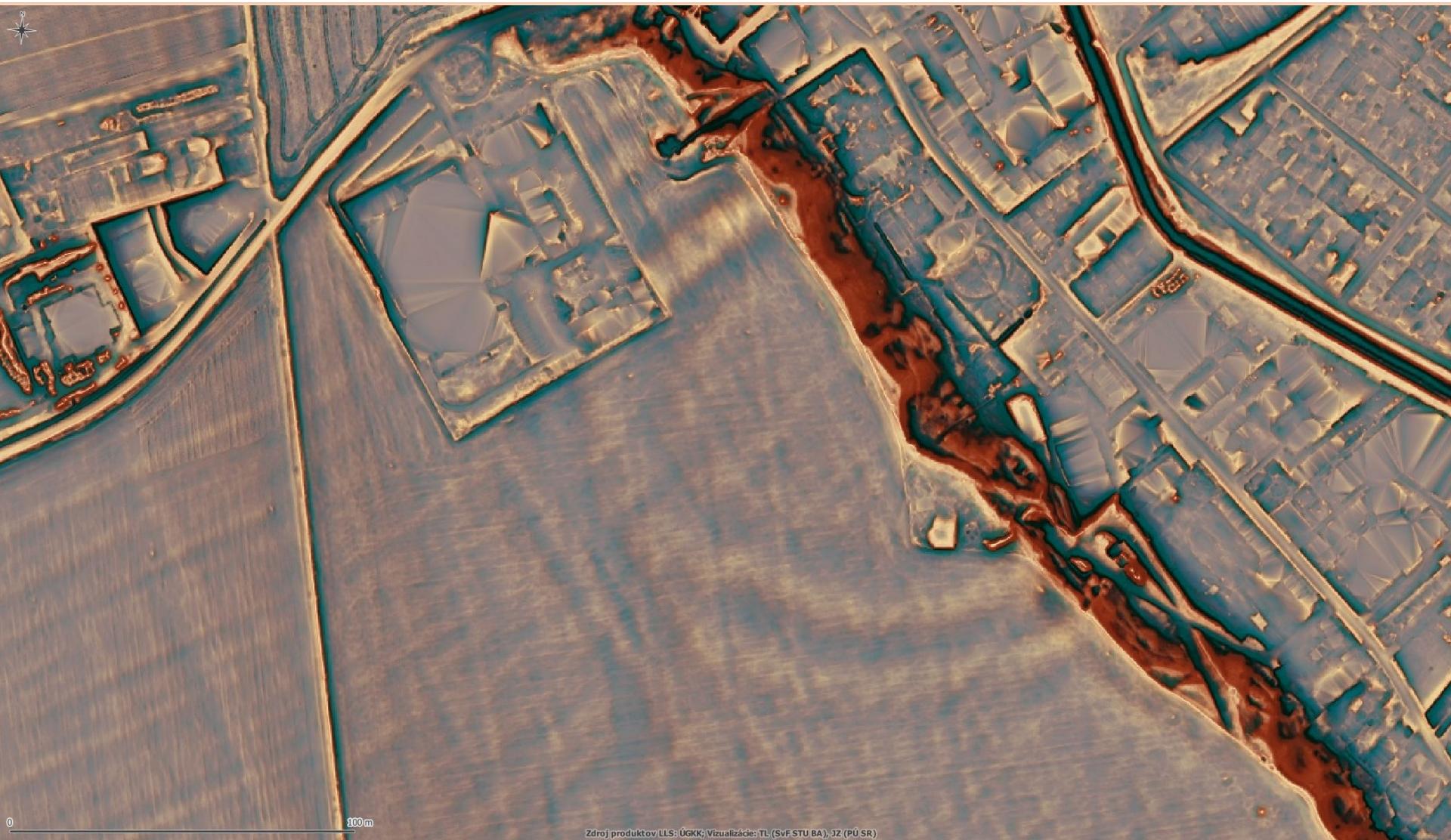
# VIZUALIZÁCIE – LIMITY



# ARCHEOLÓGIA NEVIDITEĽNÉHO

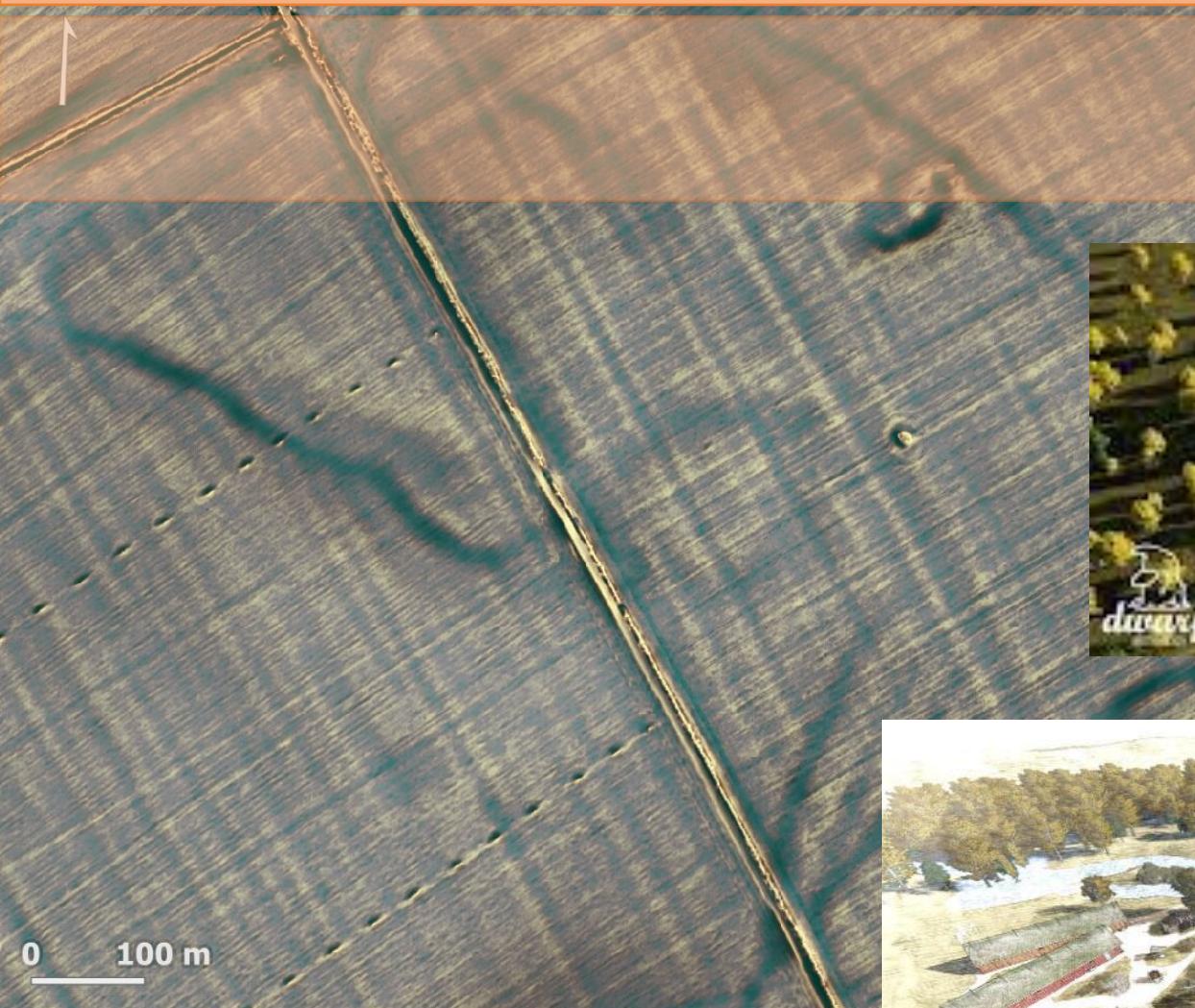


# ARCHEOLÓGIA NEVIDITEĽNÉHO

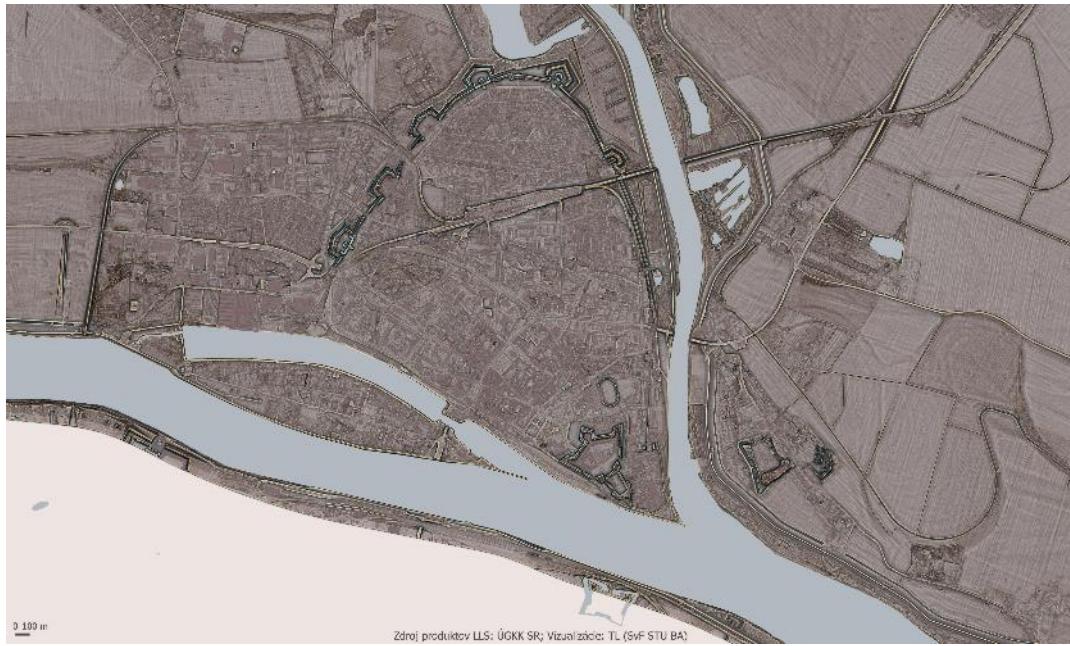


Zdroj produktov LLS: ÚGKK; Vizualizácie: TL (SvF STU BA), JZ (PÚ SR)

# ČO VIDÍME...







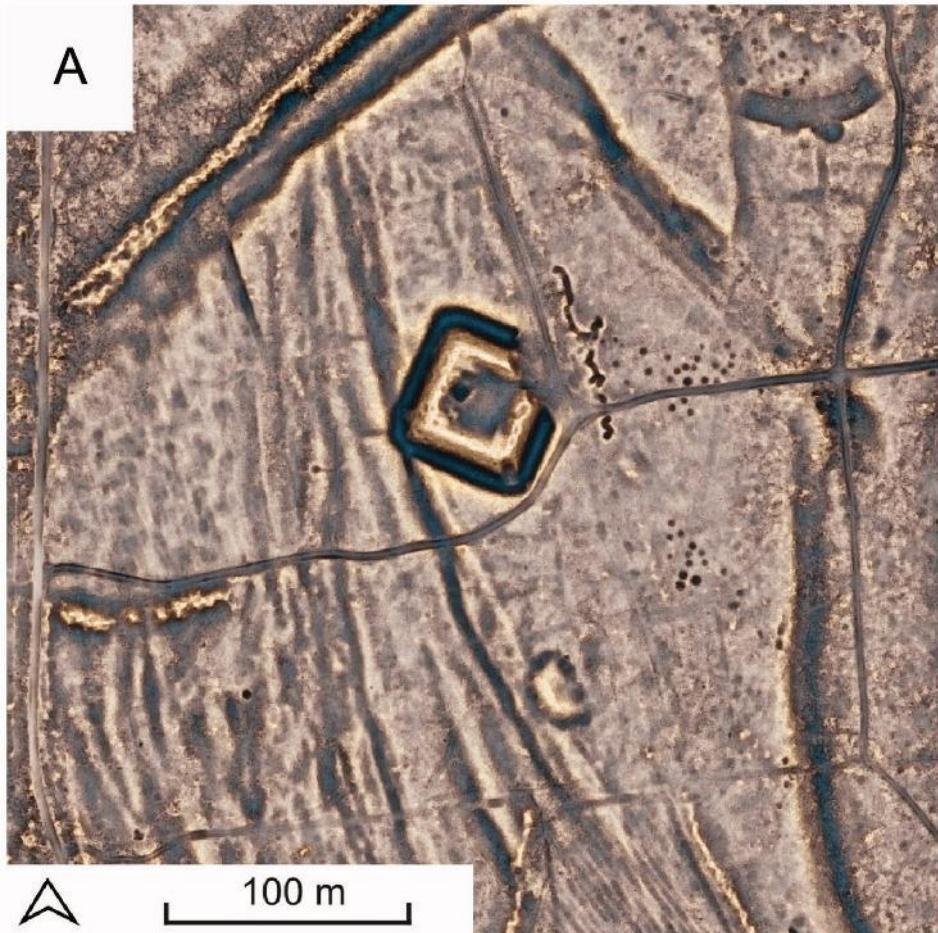


Zdroj produktov LLS: ÚGKK SR; Vizualizácie: TL (SvF STU BA)

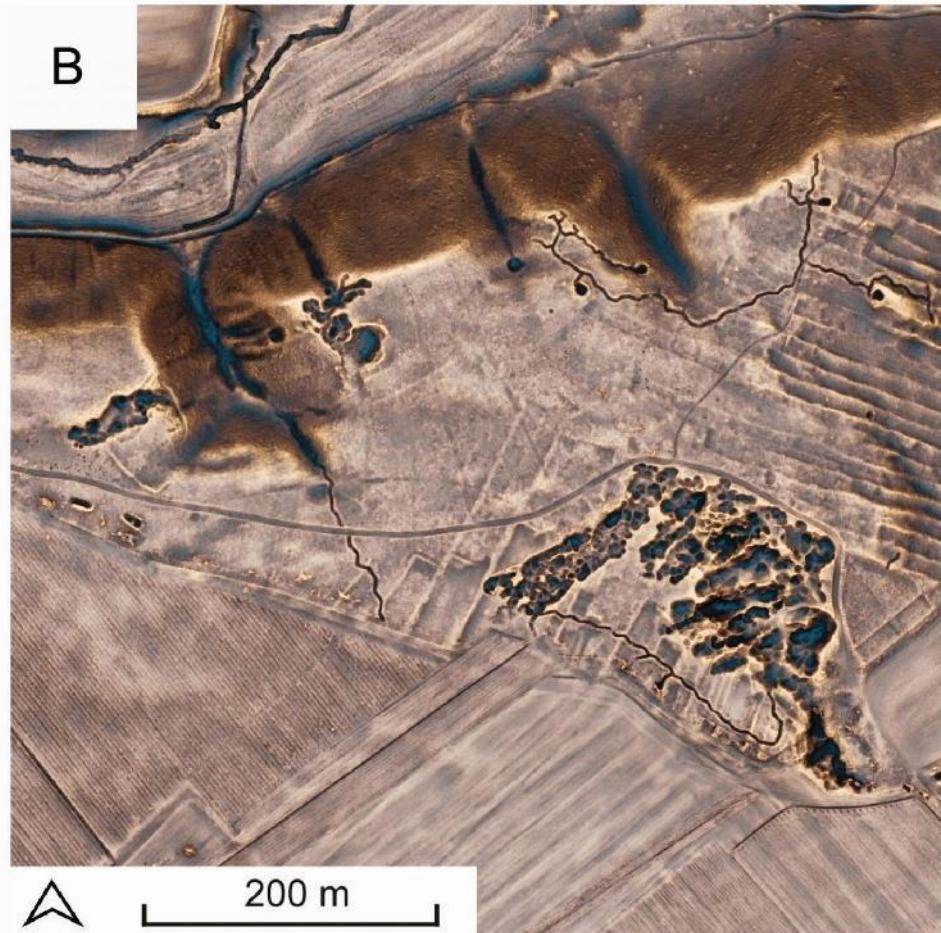


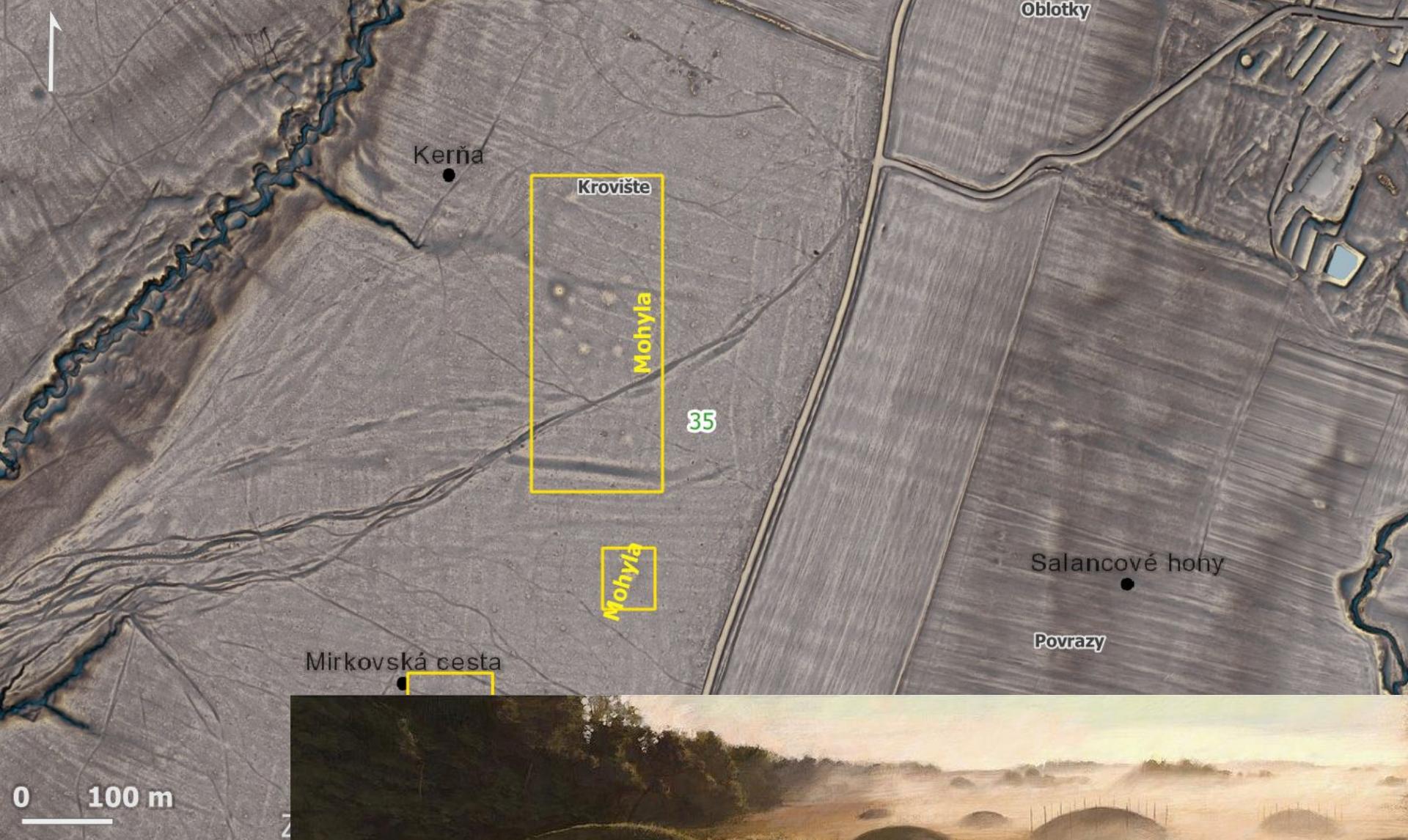
Zdroj produktov LLS: ÚGKK SR; Vizualizácie: TL (SvF STU BA)

A



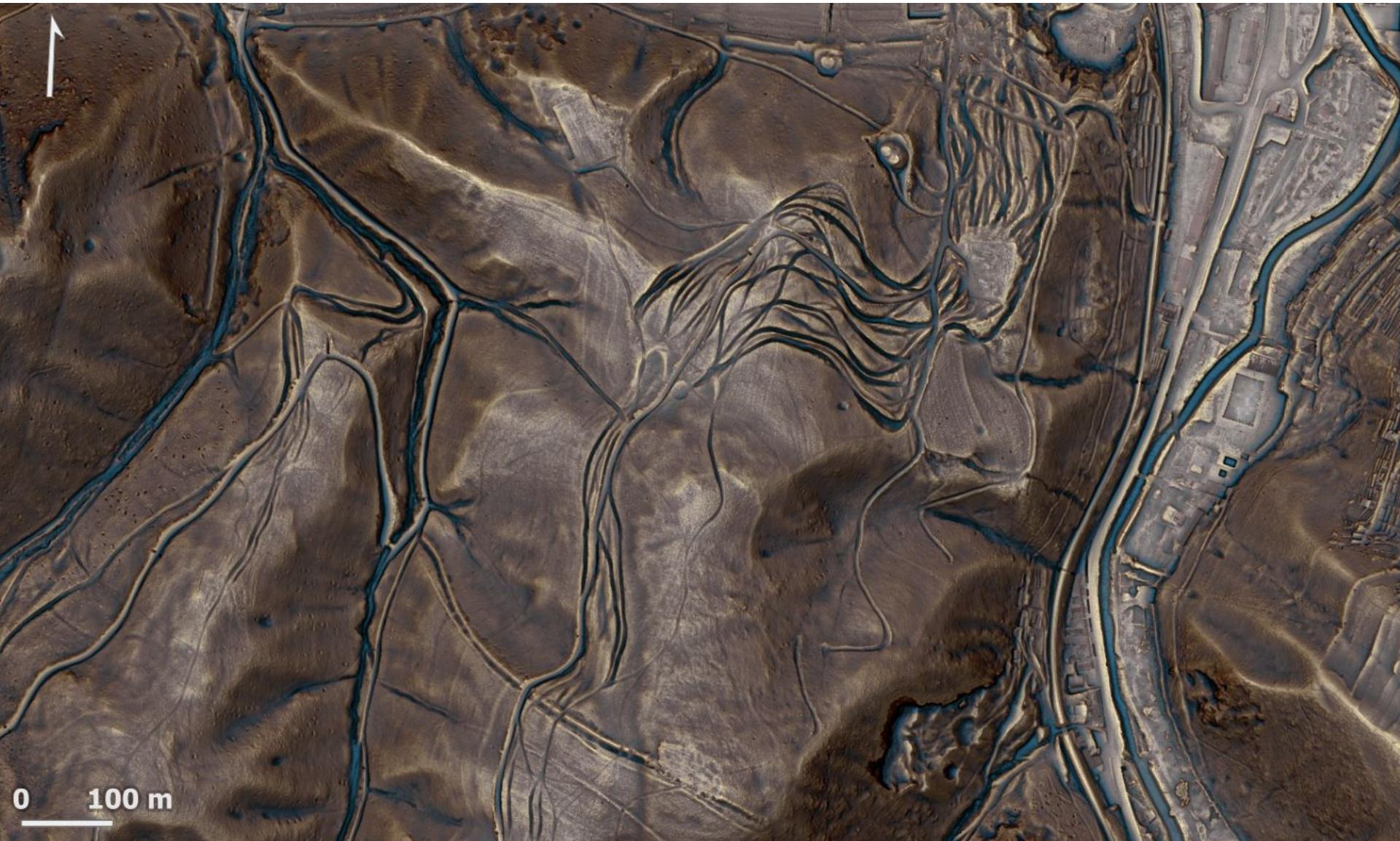
B





Zdroj:  
Samson J. Goetze





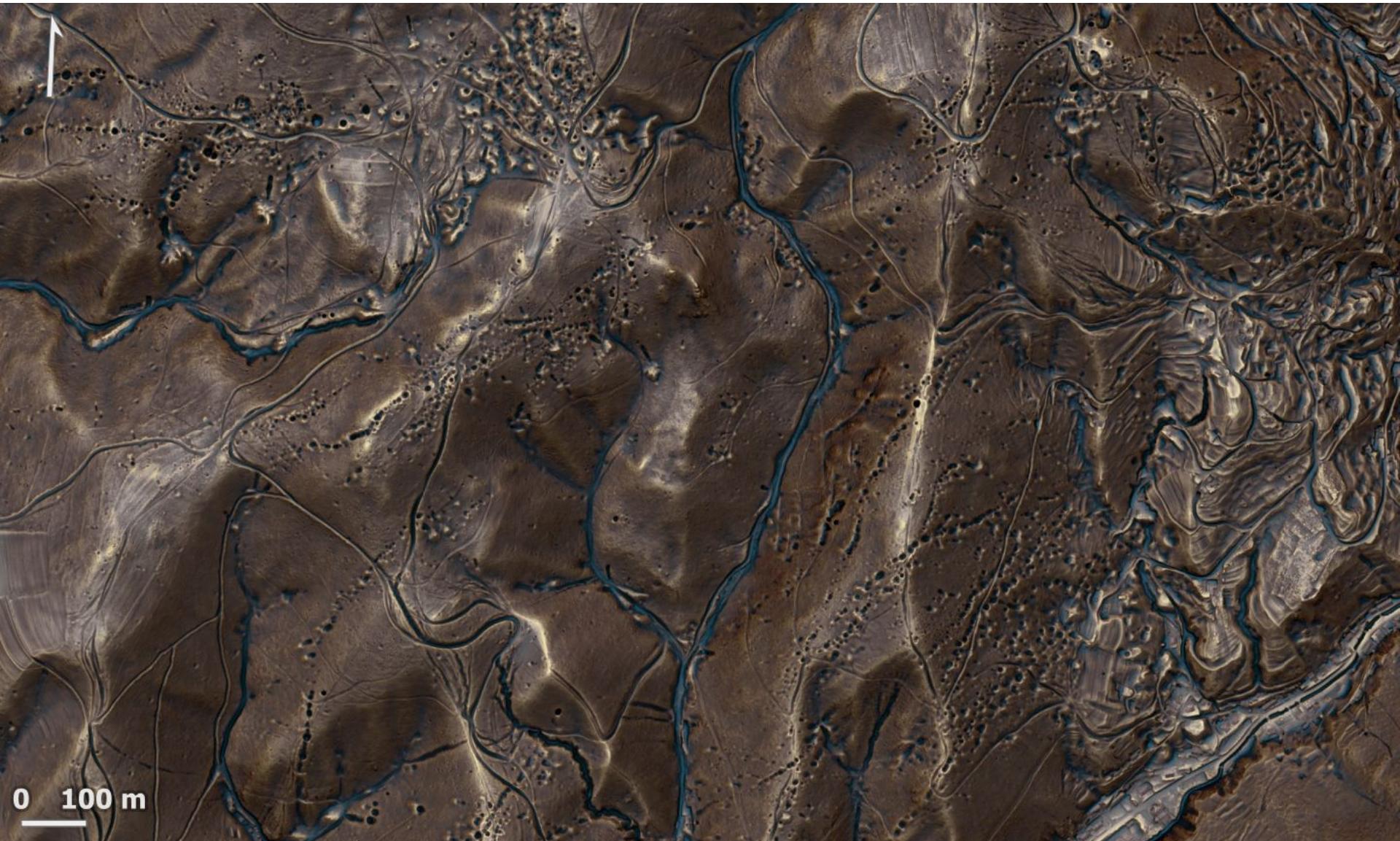
0 100 m



Zdroj produktov LLS: UGKK SR; Vizualizácie:



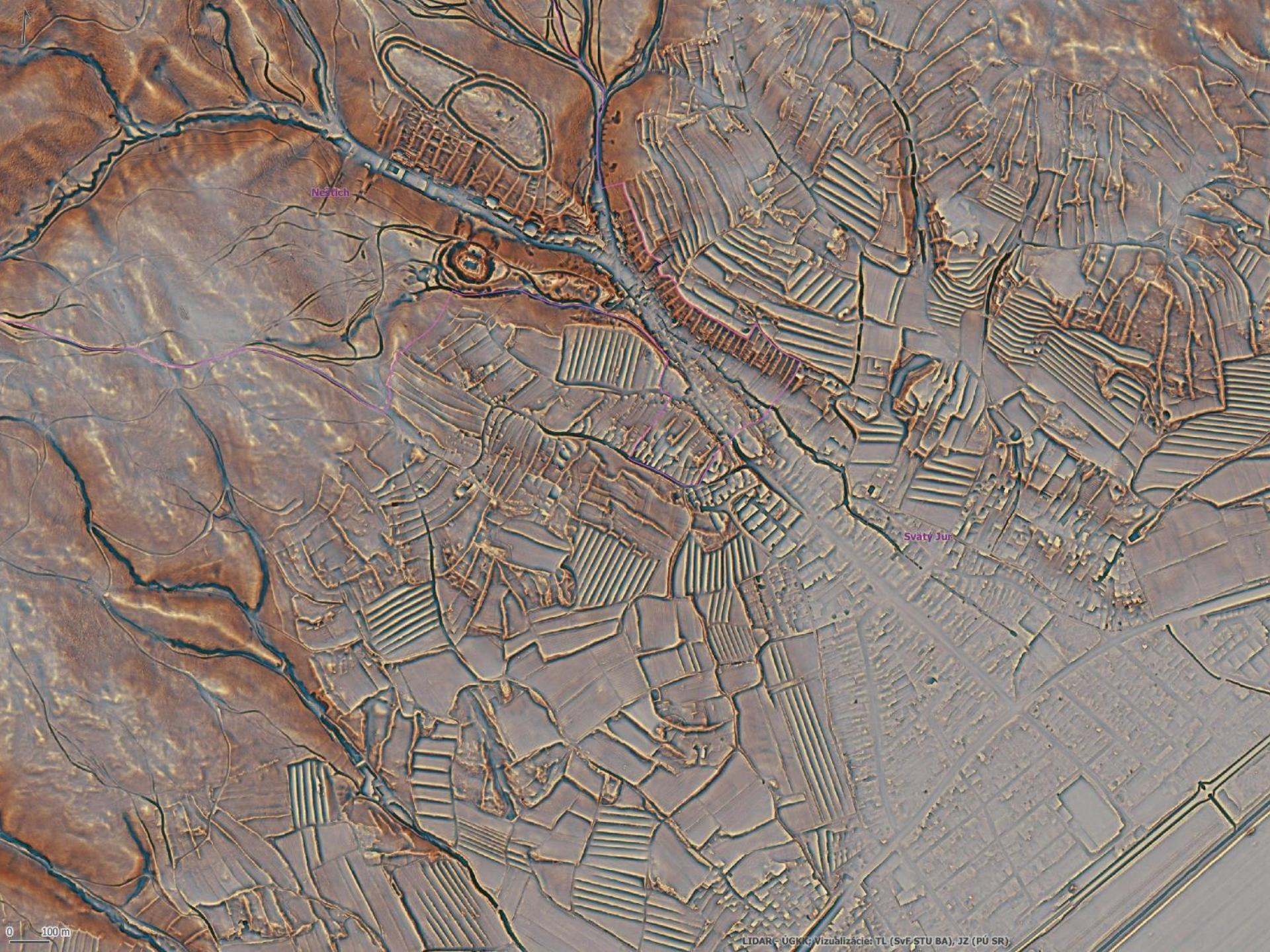
Zdroj produktov: USGS; NLCD; Vizualizácie: TL (SvF STU BA)





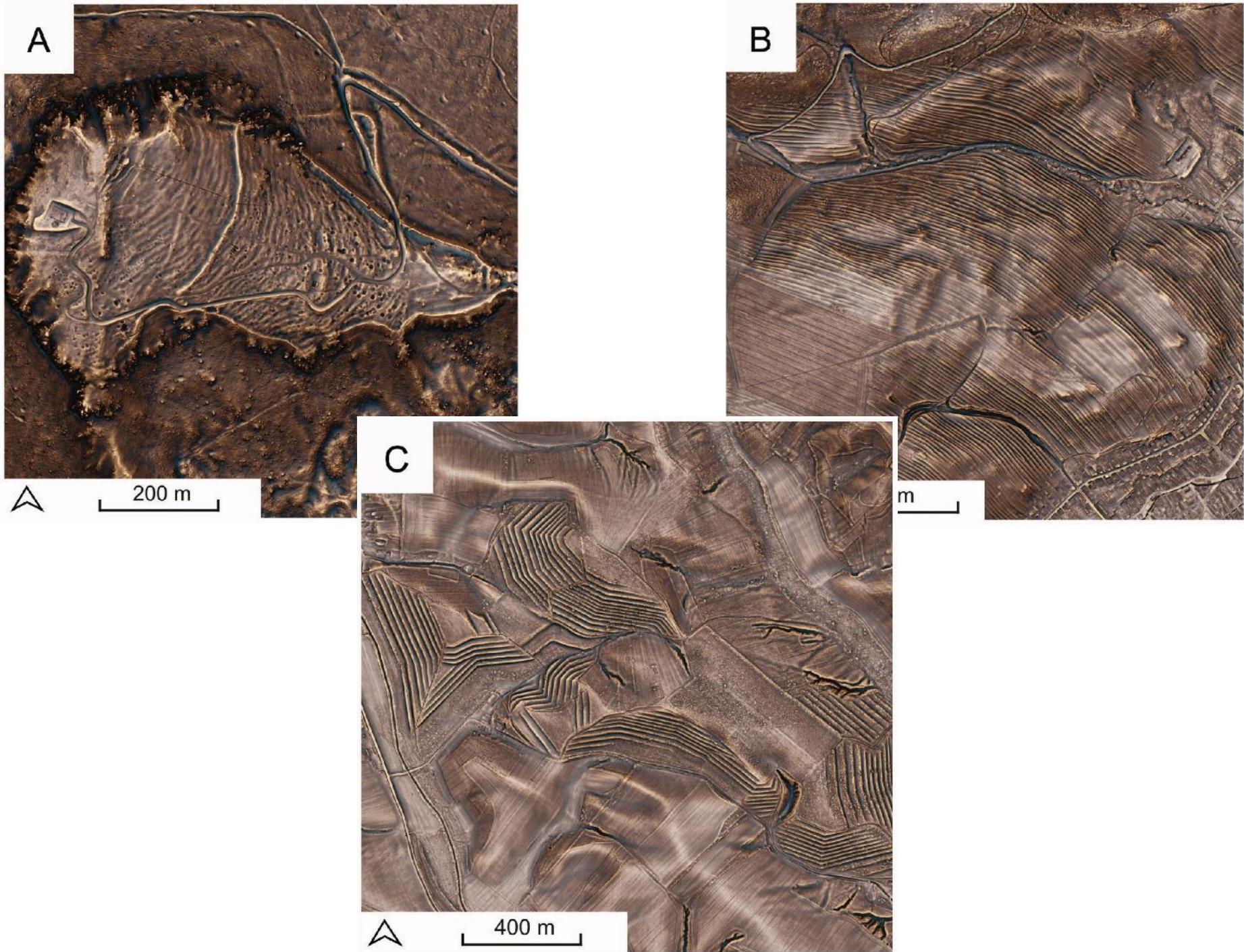
±

0



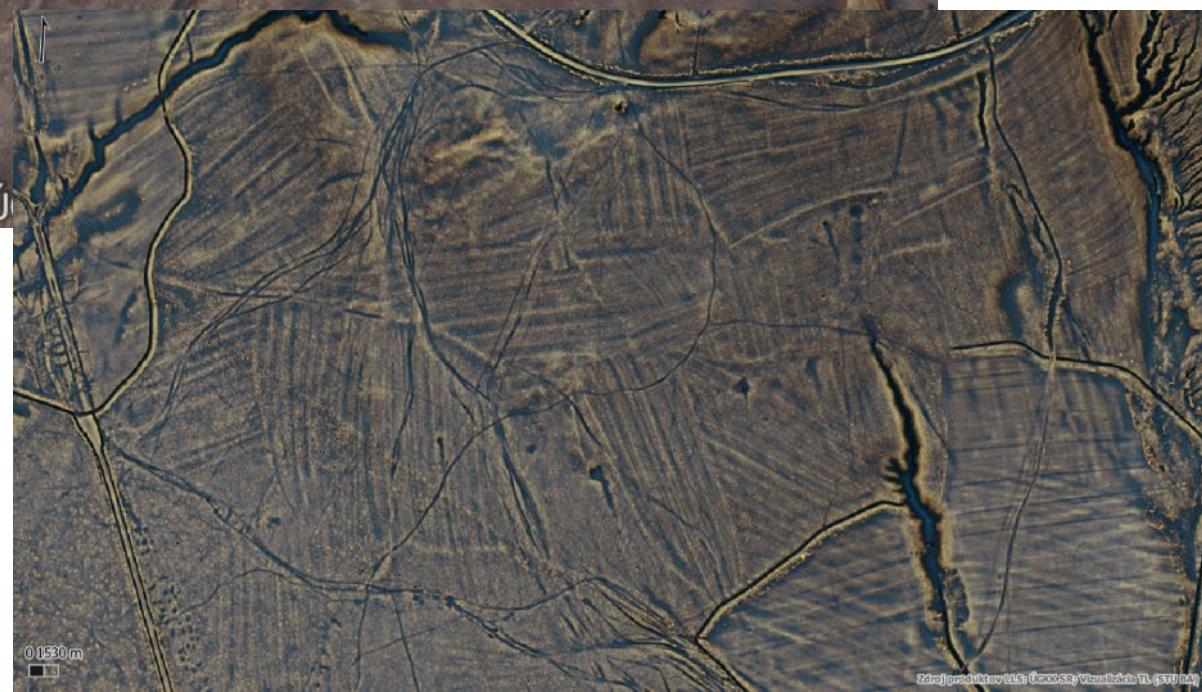
0 100 m

LIDAR - ÚGKK Vizualizácie: TL (SvF, STU BA), JZ (PÚ SR)









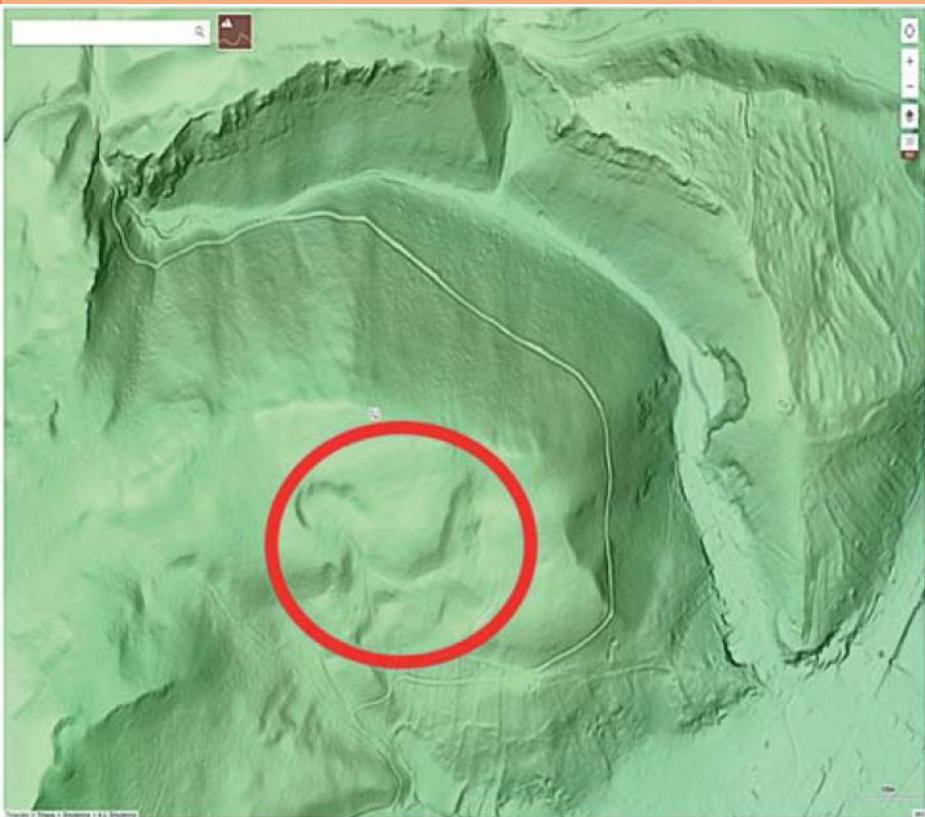


0

100 m

Zdroj produktov LLS: ÚGKK SR; Vizualizácie: TL (SvF STU BA)

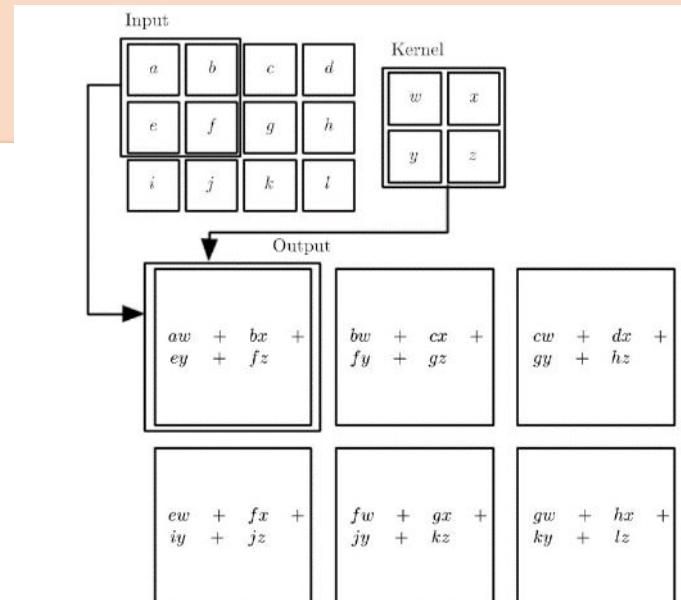
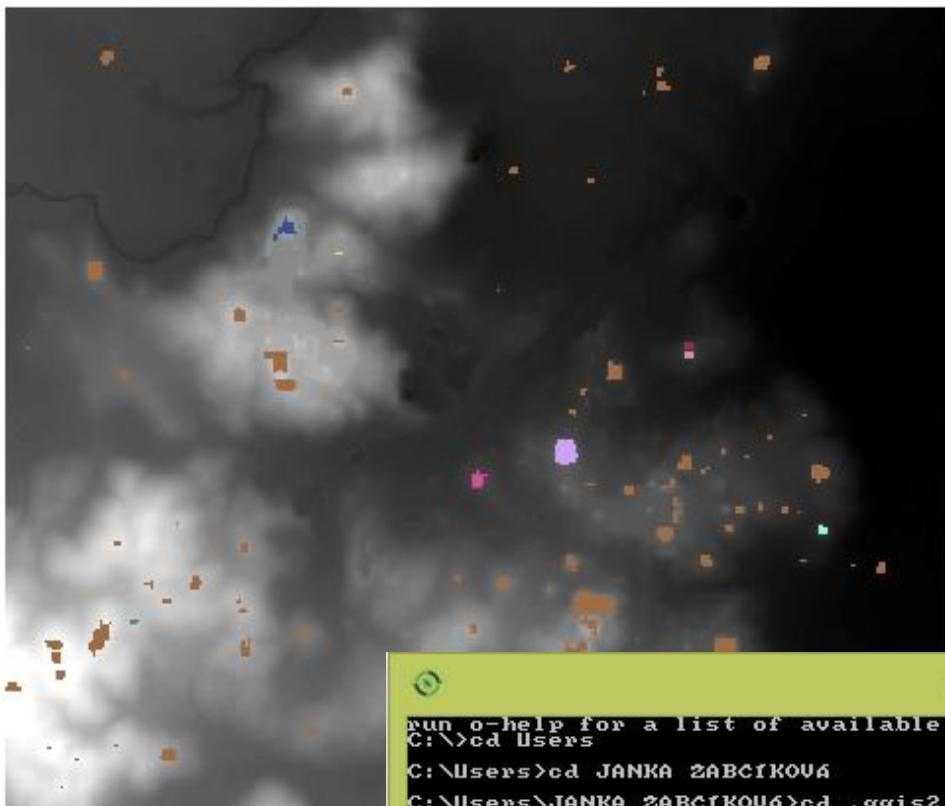
# LIDAR – ETIKA?



# ČO ĎALEJ?



# CO DALEJ? – POCITACOVE VIDENIE?

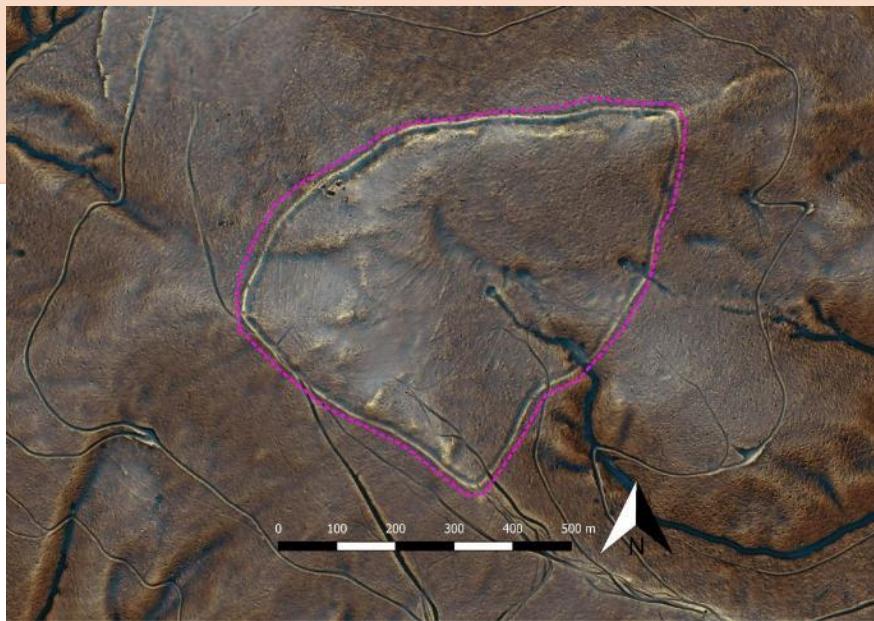


OSGeo4W Shell

```
run o-help for a list of available commands
C:\>cd Users
C:\Users>cd JANKA_ZABCIKOVA
C:\Users\JANKA_ZABCIKOVA>cd .qgis2
C:\Users\JANKA_ZABCIKOVA\.qgis2>cd python
C:\Users\JANKA_ZABCIKOVA\.qgis2\python>cd plugins
C:\Users\JANKA_ZABCIKOVA\.qgis2\python\plugins>cd GOMEL
C:\Users\JANKA_ZABCIKOVA\.qgis2\python\plugins\GOMEL>pyrcc4 -py2 resources.qrc -
o resources.py
C:\Users\JANKA_ZABCIKOVA\.qgis2\python\plugins\GOMEL>
```



# ČO ĎALEJ? – „Citizen science“



Zdroj: Mgr. Martin Miňo – Skupina Archeo BB Kraj



 **merginmaps**

# ĎAKUJEM ZA POZORNOSŤ



Zdroj produktov LLS: ÚGKK-SR; Vizualizácie: TL (SvF STU BA)

[tibor.lieskovsky@gmail.com](mailto:tibor.lieskovsky@gmail.com)