UNIVERSITY OF LIFE SCIENCES ”KING MIHAI I” FROM TIMISOARA
”YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH IN APPLIED LIFE SCIENCES”

05-06 November 2026



THE USE OF AERIAL PHOTOGRAMMETRY FOR DOCUMENTING THE ROMAN AMPHITHEATRE AT ULPIA TRAIANA SARMIZEGETUSA, ROMANIA

SIMINA Alexandra Manuela(1), Roxana Herbei (2), Lucian Octavian DRAGOMIR(1),
1 University of Life Sciences "King Mihai I" from Timișoara, România
2 University of Petrosani, România

Abstract: *Digital documentation supports the conservation and study of archaeological heritage. This paper describes the aerial-photogrammetry workflow used to document the Roman amphitheatre at Ulpia Traiana Sarmizegetusa, Romania. A DJI Matrice 400 drone equipped with a 45 MP DJI Zenmuse P1 camera was used to acquire aerial imagery. The project documented in DJI Terra contains 353 images. The raster product was exported in GeoTIFF format and examined in Global Mapper. Four ground targets were used both in model adjustment and in checking the resulting data. The orthophotoplan provides a continuous view of the amphitheatre and its archaeological context. Since the same targets served both purposes, the accuracy check is not fully independent.*

• Introduction

Digital documentation provides spatial information for identifying, representing and monitoring archaeological structures. Aerial photogrammetry can produce orthorectified images that show monuments in their wider spatial context.Objective: To document the Roman amphitheatre at Ulpia Traiana Sarmizegetusa using aerial images and to describe the role of ground targets in georeferencing and quality control.

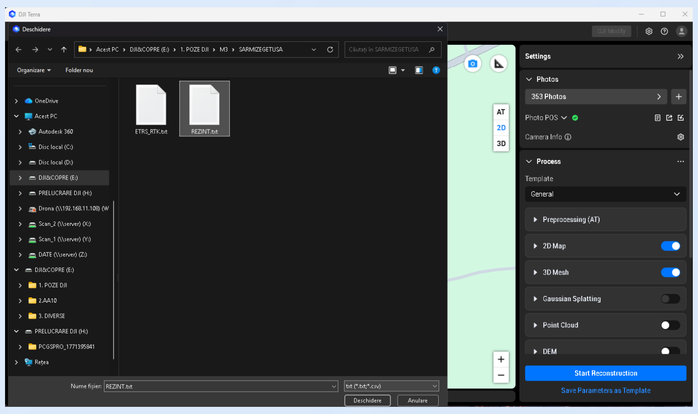


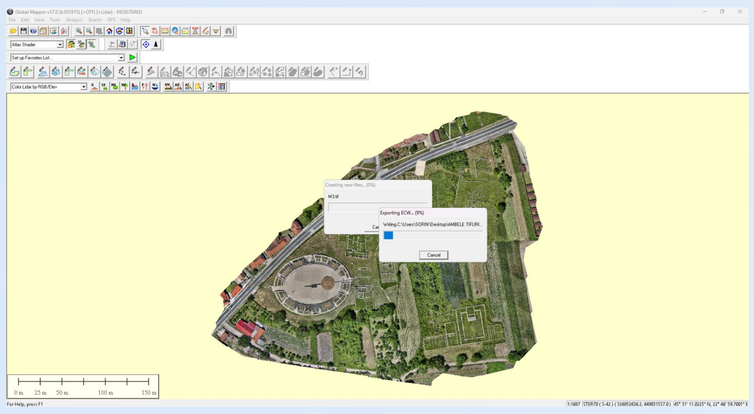


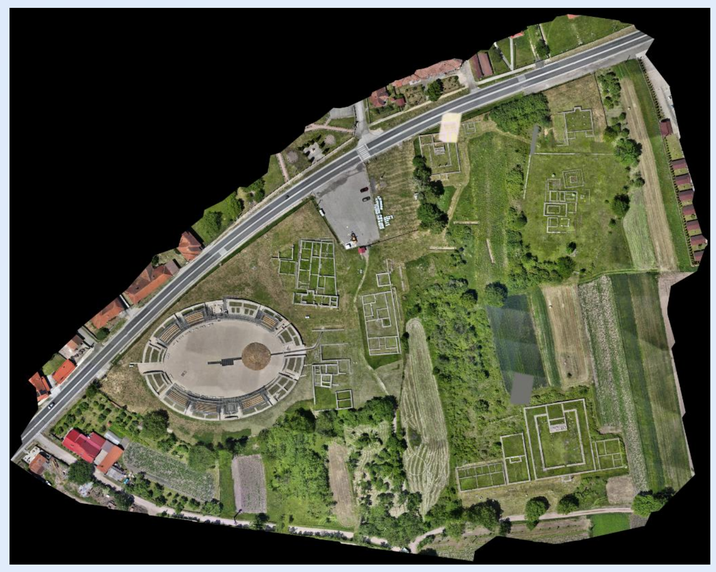


• Material and method

Study area: Roman amphitheatre, Ulpia Traiana Sarmizegetusa, Hunedoara County, Romania.Equipment: DJI Matrice 400 UAV, DJI Zenmuse P1 full-frame camera (45 MP) and GNSS receiver.Image processing: 353 images documented in DJI Terra; generation of the 2D mapping product; export to GeoTIFF and examination in Global Mapper.Ground targets: Four targets were used both to support model adjustment and to check the output. The GNSS receiver screenshot showed FIX status and displayed estimates of 0.015 m horizontally and 0.020 m vertically.

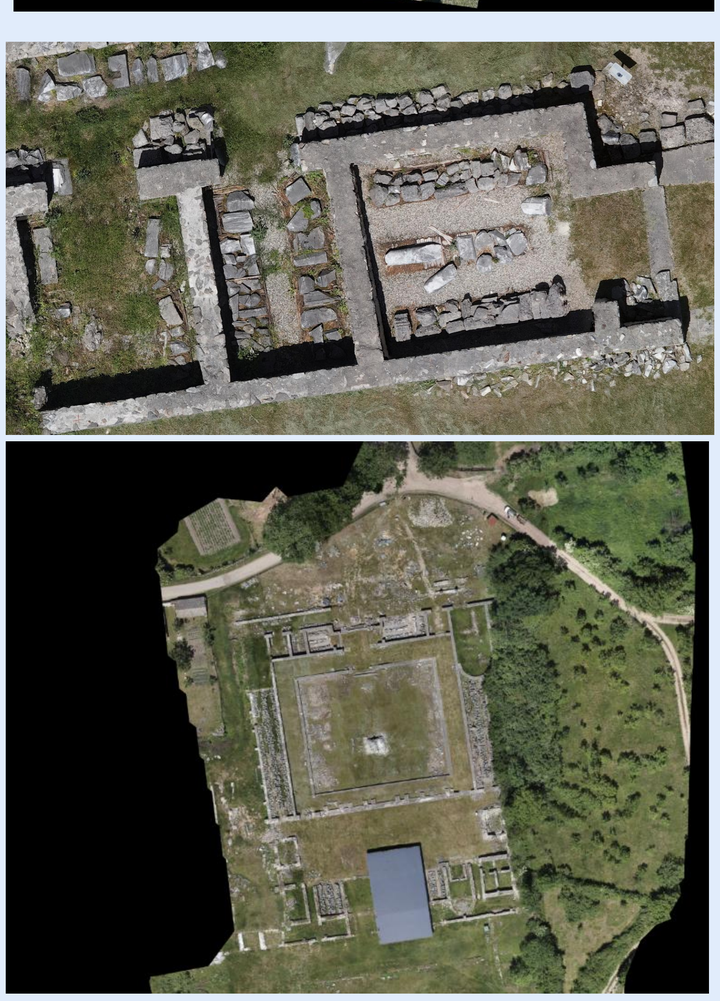






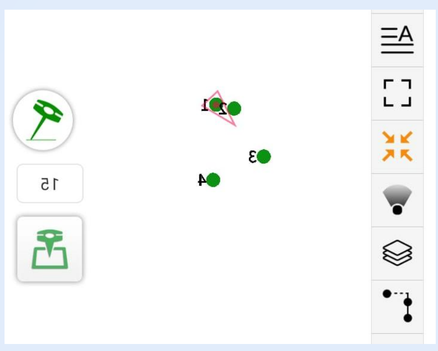
• Results and discussions

The orthophotoplan presents the amphitheatre and its surrounding archaeological context as a continuous raster product. It can support visual documentation, spatial interpretation and integration with other geospatial datasets once the final coordinate reference system is confirmed.The four ground targets supported model adjustment and checking. Because the same targets were used for both purposes, the check is not an independent validation. The GNSS receiver’s displayed FIX precision values are not a measure of the final orthophotoplan accuracy.The screenshots show different coordinate reference settings: WGS 84 / UTM Zone 34N and Stereo70 / Pulkovo 1942. The final GeoTIFF coordinate reference system should therefore be confirmed.









• Conclusions

Aerial photogrammetry using the DJI Matrice 400 and Zenmuse P1 provided an orthophotoplan for documenting the Roman amphitheatre and its archaeological surroundings. DJI Terra and Global Mapper supported image processing and raster examination. Future accuracy assessment should use independent check points, coordinate comparisons and a confirmed coordinate reference system.

Acknowledgement: The authors acknowledge the use of the equipment and software described in this study.