Peer Community In Archaeology

# What lies on top lies also beneath? Connecting crop surface modelling to buried archaeology mapping.

***Markos Katsianis*** *based on peer reviews by* ***Geert Verhoeven*** *and* ***Ian Moffat***

Sosic Klindzic Rajna; Vuković Miroslav; Kalafatić Hrvoje; Šiljeg Bartul (2024) Digital surface models of crops used in archaeological feature detection – a case study of Late Neolithic site Tomašanci-Dubrava in Eastern Croatia. Zenodo, ver. 4, peer-reviewed and recommended by Peer Community in Archaeology.
https://doi.org/10.5281/zenodo.7970703

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This paper (Sosic et al. 2024) explores the Neolithic landscape of the Sopot culture in Đakovština, Eastern Slavonija, revealing a network of settlements through a multi-faceted approach that combines aerial archaeology, magnetometry, excavation, and field survey. This strategy facilitates scalable research tailored to the particularities of each site and allows for improved representations of buried archaeology with minimal intrusion.

Using the site of Tomašanci-Dubrava as an example of the overall approach, the study further explores the use of drone imagery for 3D surface modeling, revealing a consistent correlation between crop surface elevation during full plant growth and ground terrain after ploughing, attributed to subsurface archaeological features. Results are correlated with magnetic survey and test-pitting data to validate the micro-topography and clarify the relationship between different subsurface structures.

The results obtained are presented in a comprehensive way, including their source data, and are contextualized in relation to conventional cropmark detection approaches and expectations. I found this aspect very interesting, since the crop surface and terrain models contradict typical or textbook examples of cropmark detection, where the vegetation is projected to appear higher in ditches and lower in areas with buried archaeology (Renfrew & Bahn 2016, 82). Regardless, the findings suggest the potential for broader applications of crop surface or canopy height modelling in landscape wide surveys, utilizing ALS data or aerial photographs.

It seems then that the authors make a valid argument for a layered approach in landscape-based site detection, where aerial imagery can be used to accurately map the topography of areas of interest, which can then be further examined at site scale using more demanding methods, such as geophysical survey and excavation. This scalability enhances the research's relevance in broader archaeological and geographical contexts and renders it a useful example in site detection and landscape-scale mapping.

***References:***


Renfrew, C. and Bahn, P. (2016). Archaeology: theories, methods and practice. Thames and Hudson.

Sosic Klindzic, R., Vuković, M., Kalafatić, H. and Šiljeg, B. (2024). Digital surface models of crops used in archaeological feature detection – a case study of Late Neolithic site Tomašanci-Dubrava in Eastern Croatia, Zenodo, 7970703, ver. 4 peer-reviewed and recommended by Peer Community in Archaeology. https://doi.org/10.5281/zenodo.7970703


# Reviews

## Evaluation round #2


DOI or URL of the preprint: https://doi.org/10.5281/zenodo.7970703
Version of the preprint: 1


### Authors' reply, 26 January 2024

Hello,
thank you for your work on our paper. We made the modifications and uploaded them to Zenodo.
Best,
Rajna

### Decision by Markos Katsianis, posted 19 January 2024, validated 21 January 2024

**Second Round decision on article**

Dear authors,

Thank you for your efforts to address the reviewers' remarks. I closely read the revised version and found that most of the comments have been adequately addressed. The addition of supplementary information, especially, has proven valuable for appreciating the methodology employed.

I would like to draw your attention to a specific comment made by Ian Moffat regarding the comparison of your results with those of other similar studies. While you have made efforts to contextualize your findings by including mentions of similar studies, there is room for further elaboration. Expanding on these comparisons would make your contribution even more informative for a broader audience, including those who may not be experts in this field.

For instance, upon revisiting your text, I particularly found interesting the fact that both in the DSM and the DTM the elevation of the crops follows the ground elevation (Fig. 4), which is something that may contradict typical examples of cropmark detection. See for example the illustrations in Renfrew & Bahn 2016. Archaeology: theories, methods and practice. Thames and Hudson. p.82, also available at https://rcahmw.gov.uk/cropmarks-2018/, where the vegetation is depicted to appear higher in ditches and lower in areas with buried archaeology. Could this difference be attibuted to factors other than the specificity of the cases?

Finally, in the uploaded version I have also included some minor phrasing corrections and addressed typos using track changes mode. I would perhaps suggest a final proofreading to ensure the resolution of any remaining minor errors.

If further clarifications are needed, please feel free to contact me. I look forward to receiving your revised manuscript.

Best regards,

Markos Katsianis **Download recommender's annotations**

## Evaluation round #1

DOI or URL of the preprint: https://doi.org/10.5281/zenodo.7970704

Version of the preprint: 1

### Authors' reply, 05 January 2024

Hello,

thank you for your effort, and to reviewers for their constructive comments. We included all of them, uploaded a new clean version on Zenodo, and upload here the tracked changes manuscript.

In the second version of the paper, the following changes were made:

1/ Minor grammatical inputs suggested by reviewers

2/ A detailed analysis of the comparison between the DSM and the DTM along with a new figure showing the cross sections / profiles for both data sets

3/ Corrected mistakes regarding the resolution of the generated DEMs (The value was wrong and the wrong value was copied to the other dataset as well)

4/ Addded data: DEMs for both datasets to Zenodo under separate DOI's, links in the text

5/ Added 3D model reports which also contain information on flight time, altitude and other data, under a single DOI also on Zenodo, link in the text

6/ Additional refrences and a few additional sentences in the conclusion

Regarding the question from mr. Verhoeven: Yes the dataset acquired from a lower height (DSM 2022) was purposfully completed in a lower resolution (Medium settings in Agisoft Metashape), while the dataset from a higher altitude (DTM 2023) was completed on a higher setting (High settings in Agisoft Metashape) to compensate for the difference in height.

Best,

Rajna

**Download tracked changes file**

### Decision by Markos Katsianis, posted 08 November 2023, validated 08 November 2023

**First Round decision on article**

Dear authors,

I am happy to inform you on receiving the reviews for your article "Digital surface models of crops used in archaeological feature detection – a case study of Late Neolithic site Tomašanci-Dubrava in Eastern Croatia". You may find their feedback valuable for improving your manuscript.

Please, carefully consider the constructive remarks made by the reviewers and proceed with the necessary revisions. In your reply, please incorporate some comments explaining how you have integrated the suggested improvements.

In my perspective, your contribution serves as a useful example for comparing the results and usability of different site survey methods. Considering the reviewers' comments can provide a more comprehensive contextualization of your research within the broader landscape of similar applications and relevant technologies.

Furthermore, it is important to ensure that any supplementary information is readily accessible via the provided web source.

Should you need and clarification, please do not hesitate to contact me.

Looking forward to receiving your revised manuscript.

All the best,

Markos Katsianis

## Reviewed by Ian Moffat, 11 October 2023

This is an interesting case study of an extraordinary Neolithic site that is beautifully revealed through aerial and geophysical survey. The authors have done a good job of discussing the results of this survey, but I do wish that they had compared their results more widely to other, similar, studies. This could include comparing UAV data from sites with and without crops or comparing their results to other Neolithic sites. I would also be interested in seeing a more rigorous analysis of the difference between the DTM and DSM. They certainly look visually similar, but it would be interesting to see if they are exactly the same size and how similar the degree of elevation difference over the feature is in both surveys.

A few minor editorial suggestions:

Ensure that Neolithic is always capitalised (it isn't in the abstract).

Provide the complete words for all acronyms when you use them for the first time.

It would be useful to have some more information about your pre-UAV aerial photo surveys such as the altitude, camera and the time of year that they were flown.

Your magnetometer data is extraordinarily good but please provide some more information about acquisition and processing parameters.

Line 149: "microtopography" rather than "microtpography"

Finally, while I recognise that this is a parocial comment to make about a paper about Croatia, I suggest that the data be made available at an English language site to maximise the opportunity for evaluation.

## Reviewed by Geert Verhoeven, 31 October 2023

Dear authors, thank you for your paper. I have no major comments. I have attached a version of your text indicating misspellings and some grammar mistakes. I also added one small comment.

Finally, you might find it interesting to know that there exists a paper discussing the use of vegetation DSMs and canopy height models extracted from aerial photographs: https://www.mdpi.com/2072-4292/8/9/752

Sincerely

**Download the review**