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Title: High-resolution digital elevation models and orthomosaics generated from historical aerial photographs (since the 1960s) of the Bale Mountains in Ethiopia

We would like to thank the second Referee for his/her time in reviewing our manuscript and for providing valuable suggestions. Our response to your comments are colored in blue, the original comments are colored in black. During the revision process of this article we received additional support and advice from "Luise Wraase". Therefore, in the revised manuscript we have decided to include her as a co-author of the paper. We hope that our responses qualify us to submit a revised version of the manuscript.

Referee: 2

Comment: This article presents an intriguing approach to constructing a digital elevation model of the Bale Mountains in Ethiopia using high-resolution historical images. However, for the manuscript to be considered for acceptance, there is significant room for improvement in various aspects, including overall structure, abstract, introduction, materials, results, and discussion. I offer the following suggestions in hopes of providing constructive feedback.

I am concerned about the paper's originality, as a related article has already been published: Nyssen et al., 2022, Online Digital Archive of Aerial Photographs (1935–1941) of Ethiopia. I would appreciate clarification on the innovative aspects of this manuscript compared to the paper. Please provide a detailed explanation of the data and reconstruction algorithm employed for the digital elevation model.

Response: Our paper is quite different from Nyssen et al. 2022 for several reasons:

1) Methodologically we applied Structure from Motion Multiview Stereo Photogrammetry using the software Agisoft metashape professional. This allowed us to calibrate the images using information like calibrated focal length, principal points, fiducial marks, flying altitude, ground control points and camera exposure stations. However, Nyssen et al. 2022 used the software Photoscan, which is a former version of Agisoft metashape professional and did not include the above mentioned calibration information as an input.

2) We reconstructed DEMs and Orthomosaics for two points in time (1967 and 1984). Thus, there is no temporal overlap with the data from Nyssen et al. 2022, who provide data from 1935-1941.
3) We provide data for the Bale Mountains i.e. the second highest place of Ethiopia. The altitudinal range of our study area ranges from 977 to 4,377 m asl, and hence, there is no spatial overlap with Nyssen et al. 2022.
4) The spatial coverage of our study area is approximately 5,370 km^2 (line 100). However, the spatial extent of Nyssen et al. 2022 is smaller compared to ours i.e. 58 km2.
5) We did the georectification fully in Agisoft metashape professional software, in which both DEMs and orthomosaics were reconsructed. However, Nyssen et al. 2022 did the georectification in ArcMap and generated solely the orthomosaic.
6) The RMSE accuracy achieved for the reconstructed DEMs of 1967 and 1984 is 3.55 and 3.44 m, respectively. However, the RMSE value of Nyssen et al. 2022, is about 30 m.

We added a figure illustrating our workflow (Fig. 14) and wrote an additional paragraph describing the methods in more detail (lines 205-260).

Comment: The abstract is generally well-written, but it should emphasize the innovative aspect of this study, specifically the reconstruction of a detailed digital elevation model, as well as the method utilized. Since this paper offers a public dataset, please include validation methods and accuracy measures.

Response: We edited and restructured the abstract by incorporating the methodology for reconstructing our detailed digital elevation model, the validation methods and the accuracy measures (lines 27-32).

Comment: The introduction section could be further strengthened by emphasizing the importance of a detailed digital elevation model and addressing the limitations of previous research. It is worth mentioning that three-dimensional modeling has been a relatively mature technology dating back to the 1960s. What methods were employed before then to construct these models? Additionally, provide a brief introduction to how the technology used in this study handles image data. While the structure of this section is clear, further clarification is needed regarding the importance and significance of the research area and research questions.

Response: We strengthened the introductory part by adding more paragraphs giving the historical background, details about previous research, emphasizing the relevance of DEMs, and by adding more information about the applied methodology and significance of the study region (lines 65-88).

Comment: The second and third sections can be combined into one, and I highly recommend using a flowchart to clearly explain the entire reconstruction process, including data preprocessing, algorithm modules, and so on.

Response: We kept the second (Material and methods, now seven subsections) and third section (Data processing, now extended by more details on the methods in seven paragraphs) separately because we believe that this enhances the clarity of our manuscript. We added a flowchart to better explain the reconstruction process (Fig. 14).

Comment: The materials and methods section needs substantial revision. Although the paper mentions numerous data preprocessing methods and digital elevation model reconstruction algorithms, many aspects require further elaboration. For instance, consider providing more detail on calibrated focal length, principal points, fiducial marks, and ground control points, accompanied by corresponding images.

Response: Done. We now give more details about calibrated focal length, principal points, fiducial marks, and ground control points (lines 166-170, line 179-181, line 186-189 and line 192-194). Additional images and tables describing more details can be found in the supplementary material (Supplementary Fig. S1-S4 and table S1-S7).

Comment: The Structure-from-Motion Multi View Stereo Photogrammetry algorithm mentioned in the paper should be described in detail, including its processing specifics and core formulas. Highlight the method's specific advantages in your research, such as efficiency, accuracy, and other aspects of the reconstruction process. Overall, these two sections lack detail, and providing more information can significantly enhance the paper's readability.

Response: The Structure-from-Motion Multi View Stereo Photogrammetry is now described in detail in a new paragraph and texts (lines 205-260) including processing specifics and the core formula the algorithm uses to reconstruct the DEMs and orthomosaics. In addition, the overall process is now included as a flowchart (Fig. 14).

Comment: The results and discussion section also need substantial revision. The paper does not highlight many points of interest, such as the study area's topography, vegetation, etc. Consider providing Google Earth images of the study area. From a validation standpoint, the dataset appears to have produced good results.

Response: Thank you for highlighting the good quality of our dataset. We substantially revised the results and discussion section. We added more text regarding the topography and vegetation of the study area (lines 118-130 and 265-271). We added a figure that shows the orthomosaics overlayed on Google

Earth images (Figs. 1 and 6). Additionally, we extended the possible and recent use cases in section 4.1 (lines 293-314).

Comment: I am curious about the specific validation method, as the elevation datasets being compared differ in time and spatial resolution. When performing comparative validation, zoom in on local maps to emphasize the differences between various DEM datasets. Additionally, discuss the influence of vegetation and terrain on mapping accuracy during the elevation model creation process. This section needs significant expansion; otherwise, it will be difficult to attract attention.

Response: We collected georectification and validation points where no landscape change occurred. In order to minimize the effects of vegetation during reconstruction of the elevation model, we used parameters of maximum angle, maximum distance and cell size values to classify the generated dense point clouds to ground points. We added a zoomed-in figure to show the difference between freely available DEMs and the reconstructed DEMs (Fig. 12, more descriptions in lines 320-326). However, the terrain and vegetation cover can affect the accuracy of the generated DEM, which is discussed in lines 275-277.

Comment: Lastly, please rewrite the conclusion section.

Response: Done (lines 388-399).

Comment: Other suggestions include:

Adjust the font size and style of all figures and tables for easier reading.

Response: The font size and style of all figures and tables was adjusted, according to the journal's standard template of Copernicus ESSD.

Comment: Figure 2 may be challenging for readers to interpret due to its grayscale appearance. Please provide appropriate satellite images.

Response: The appearance and visibility of Fig. 2 was improved by increasing brightness and contrast, and adjusting the labels.

Comment: Correct the latitude and longitude information corresponding to Figure 3 and Figure 4.

Response: Done.

Comment: Improve Figure 5's visual appeal.

Response: Done. The figure was improved by increasing length, width and resolution values.

Comment: Unify the paper's font style, such as the red font at line 222.

Response: Done.