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Open Access Earth System Science Data Discussions

Interactive comment on "Very high-resolution terrain surveys of the Chã das Caldeiras lava fields (Fogo Island, Cape Verde)" *by* Gonçalo Vieira et al.

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Dear Dr Samuel Thiele, Thank you very much for the detailed review, comments and suggestions of our manuscript on the "Very high-resolution terrain surveys of the Chã das Caldeiras lava fields (Fogo Island, Cape Verde) submitted to ESSD. We hope that with the significant changes we have made to the manuscript, following your comments, but also integrating the comments from other three reviewers and from the public discussion, the manuscript is now in good shape to be accepted for publication in ESSD. We have included the suggestions you have proposed in the RC1-supplement file and you may see them in the .doc file with the track changes. Unfortunately, I am not able to submit the revised version in the system at this stage, but I hope that it may be sub-

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mitted immediately after sending the commentaries. Below you find the answers to the detailed comments, as well as the ones to the generic commentary. Thanks again for the time you have put into this review. Sincerely, Gonçalo Vieira

Reply to the general comments (essd-2020-289-RC1.pdf): 1) We have added a clearer message on the broader scope of the dataset, both in the abstract and in the manuscript. 2) We have done significant shortening of the text explaining the application of UAV surveys and modified the order of some paragraphs, such as the case of former line 170, as suggested. We have also significantly modified and shortened the introduction. 3) We have clarified the aims of the surveys in the paragraph starting in line 205, describing that we aimed at a survey with a resolution better than 50 cm. We made sure we followed the protocols outlined by Dering et al. (2019) and by James et al (2017). 4) We thank for the suggestion concerning the sensitivity analysis by James et al (2017, 2019). However, we did not apply the methods proposed by James et al. (2017) since that would imply a fully new approach to the data. We consider that using independent ground control points to evaluate model accuracy provides a satisfactory evaluation of the data set quality. 5) We have made the whole data set publicly available at Zenodo, including the aerial images, the dense point clouds and the 10 cm orthomosaics, DSM and 2014-15 lava flow, as suggested. 6) We have reviewed the manuscript with care and expect that we have improved its readability. Reply to the detailed comments typed in the pdf manuscript (essd-2020-289-RC1-supplement.pdf): - The suggested corrections were implemented and several improvements in the text following the remarks were conducted. - Figure 1 was improved following the suggestions. - Figure 3 was significantly improved accounting for flight details, including take-off/landing locations, GCPs and base station locations. - Figure 4 showing the ground control point collection procedure was deleted. - A new figure 5 showing the location of ground control points, check points and manual tiepoints was created. The ground control point coordinates were made available in the public repository. - Former line 290. The date for the surveys was wrong here. It was 2016. The collection of the extra-GCPs was in 2017. - Section 3.3 was completely rewritten to clarify the

procedure followed for generating the models. Figure 4 showing the general workflow was added. We have also addressed your questions relating to the methods used in PIX4D and clarified those whenever possible. However, the detailed algorithms are not made available by the company. Küng et al. (2011) describe the procedure and we have referenced that paper. We do not present a table for each individual flight, since the georeferencing and the identification of manual tie points was done after the merge of the full flights and these steps were essential to improve the final model results and even matches inside the same flights. This is because we have used a very large number of manual tie points. - The selection of the sharp surface smoothing in the interpolation of the DSM was made to reduce the effects of outliers in the point cloud in areas with worst quality. The visual inspection of the hill shade DSM showed a good quality of the generated surface. Since we have made available the full dense point cloud in the dataset, it is straightforward to produce DSMs using different interpolation methods. - We do not calculate the lava volume, since the pre-eruption model is of very low resolution when compared to the new survey and this is not a goal of the current study.

Please also note the supplement to this comment:
https://essd.copernicus.org/preprints/essd-2020-289/essd-2020-289-AC1-supplement.pdf

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Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2020-289, 2020.

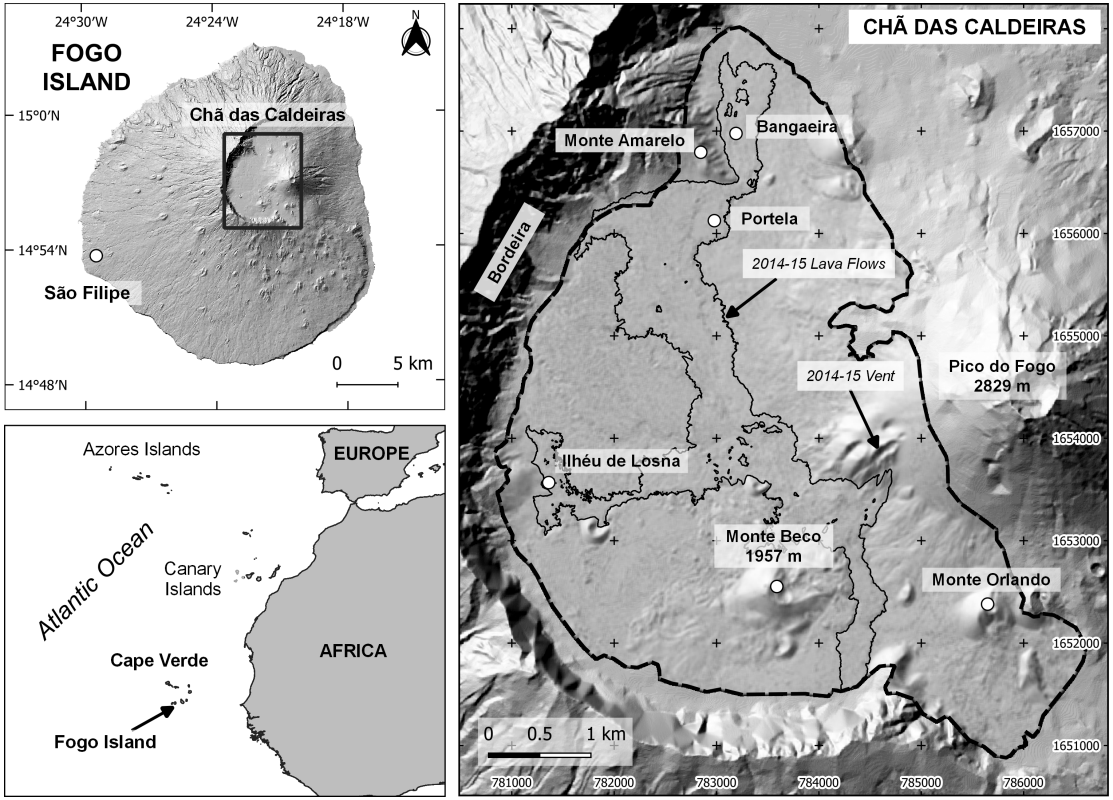

Fig. 1. Figure 1 – Location of the Chã das Caldeiras and of the surveyed area (dashed line) in Fogo Island (Cape Verde). The 2014-15 lava flows are limited by a thin black line. Shaded relief derived from th

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Fig. 2. Figure 2 – The Chã das Caldeiras and Pico do Fogo during the 2014-15 eruption. View towards the southeast with the ‘a’ÄĄ lava flows of 2014-15 in the foreground, evidencing a very irregular and inacces

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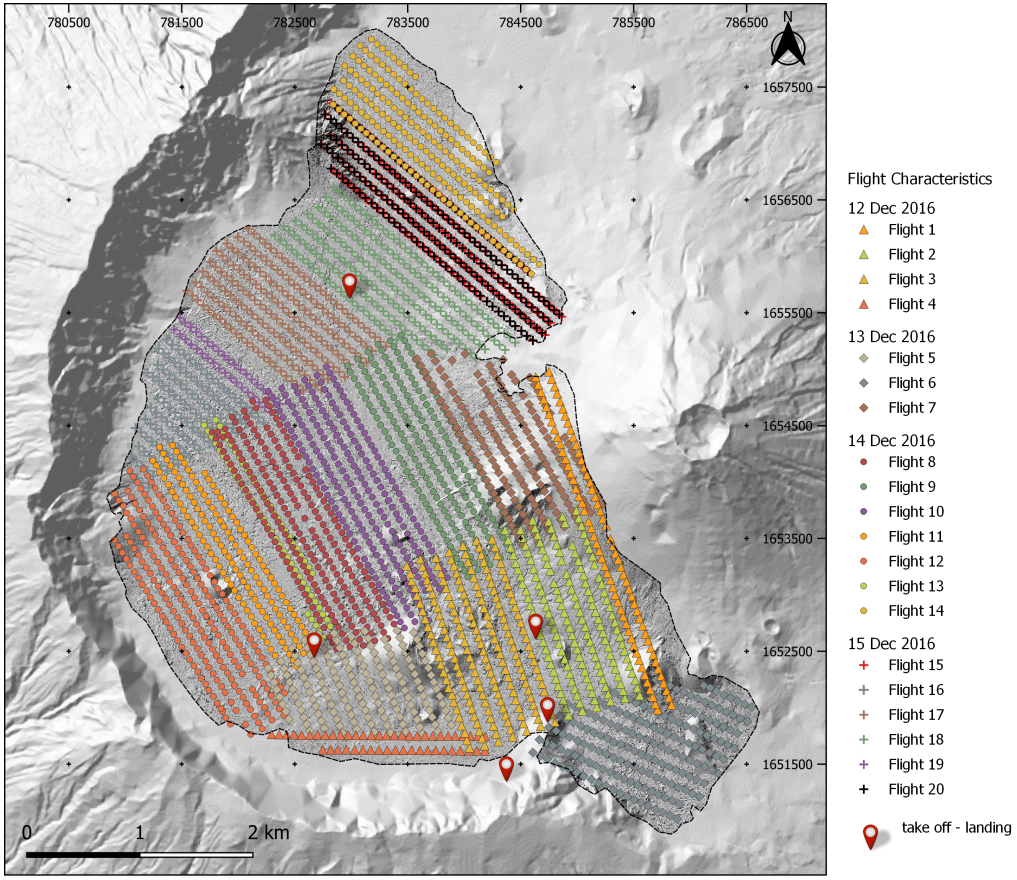

Fig. 3. Figure 3 – General characteristics of the aerial survey of the Chã das Caldeiras with the geolocation of the photographs according to the flights and take-off and landing locations. Shaded inside the

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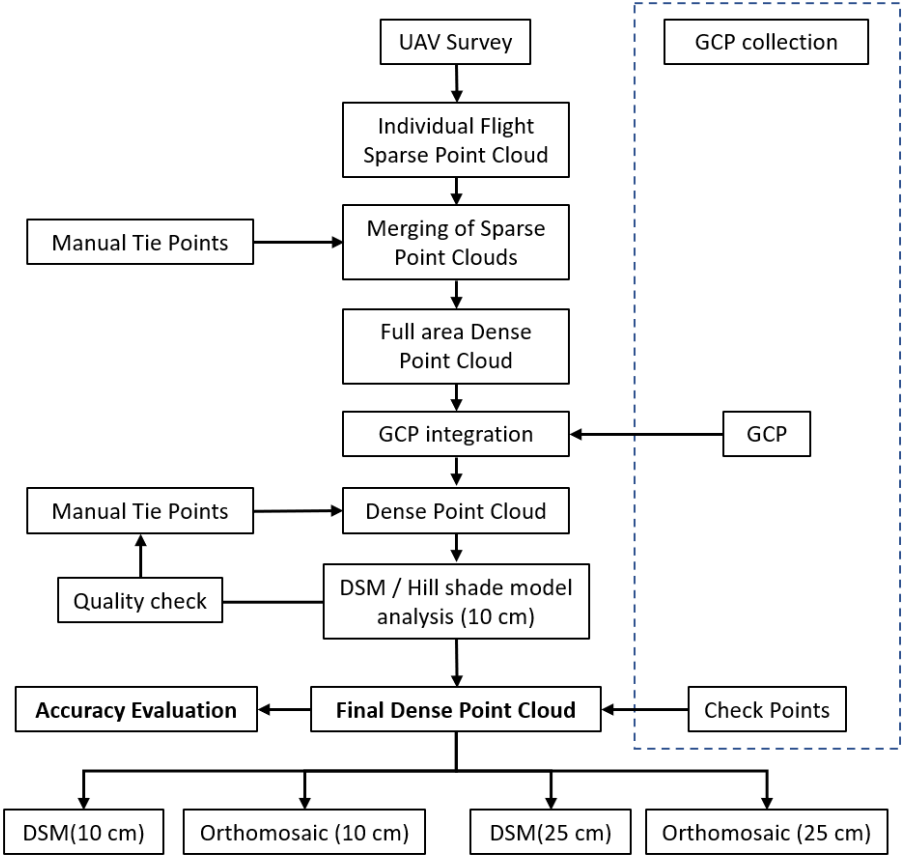

Fig. 4. Figure 4 – Work flow from the field survey to the generation of the DSMs and orthomosaics.

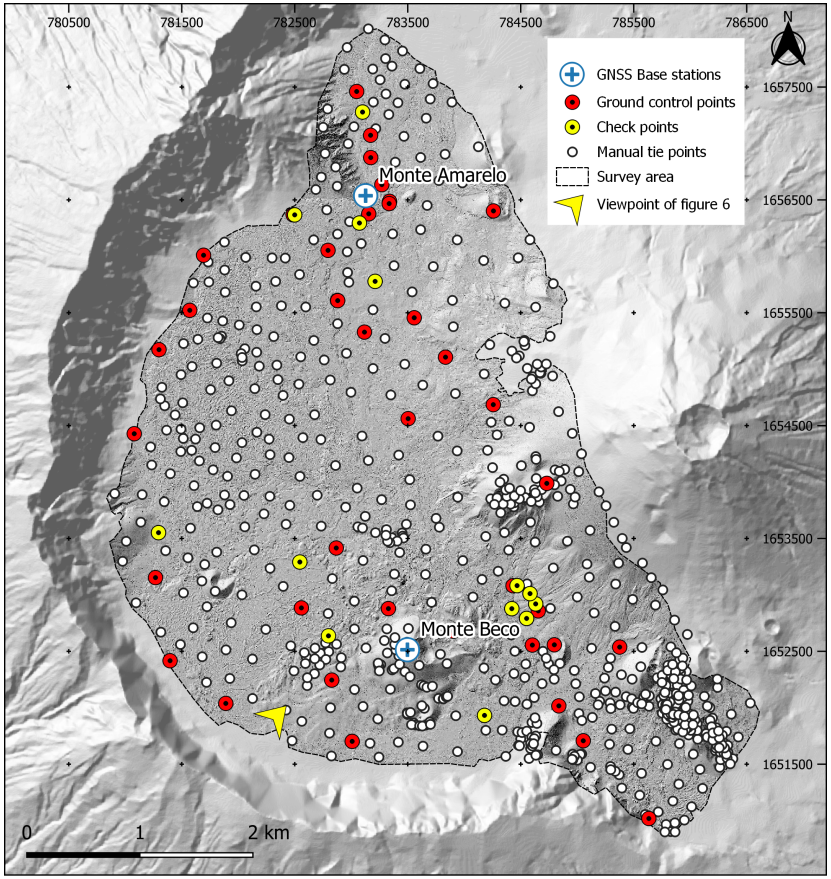

Fig. 5. Figure 5 – Ground control points used for the model and for the accuracy evaluation (check points), manual tie points used to improve the point cloud accuracy and location of the GNSS base stations se

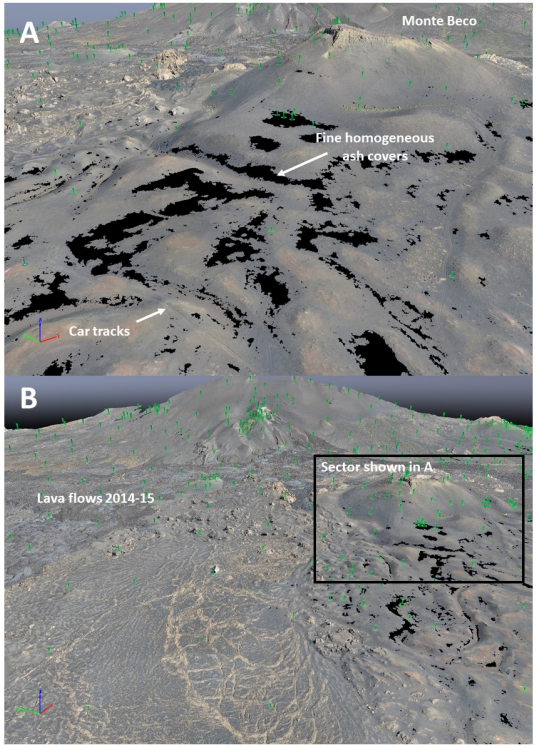

Fig. 6. Figure 6 – Examples of the quality of the 3D dense point cloud. A. Low quality areas in ash surfaces close to Monte Beco (car tracks for scale), B. Most of the point cloud shows dense point coverage a

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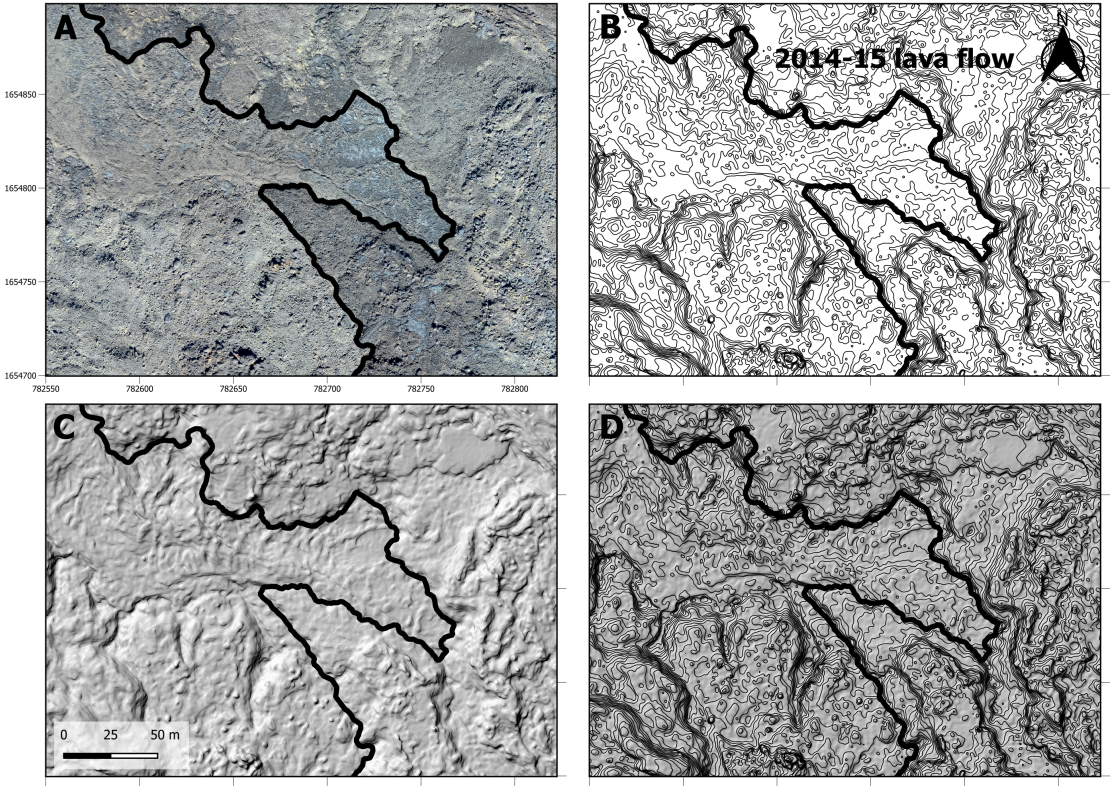

Fig. 7. Figure 7 – Example of manual delineation of the lava flow by making use of the: A. Orthomosaic, B. Elevation contours with 50 cm interval, C. Hill shade model, D. Hill shade model and elevation contou

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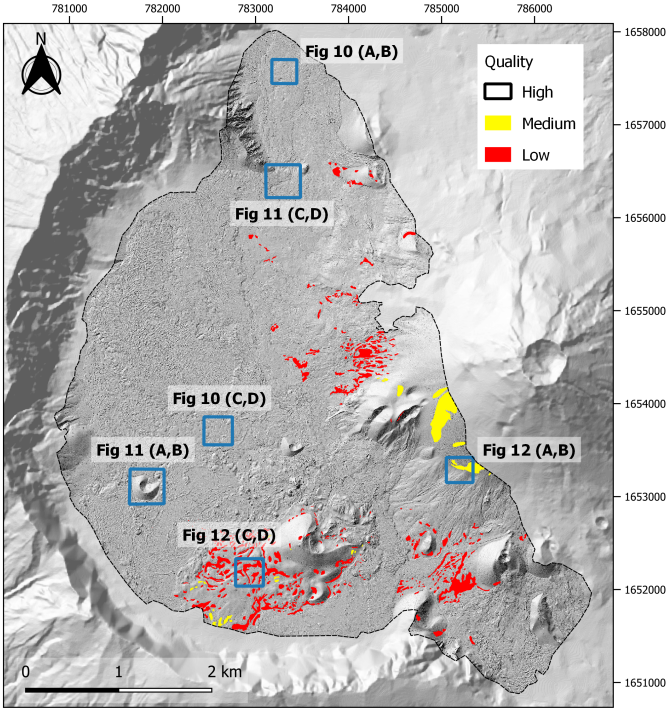

Fig. 8. Figure 8 – Assessment of the quality of the dense point cloud and digital surface model in the Chã das Caldeiras and location of the sectors shown in figures 8 to 10. Shaded relief outside the surveye

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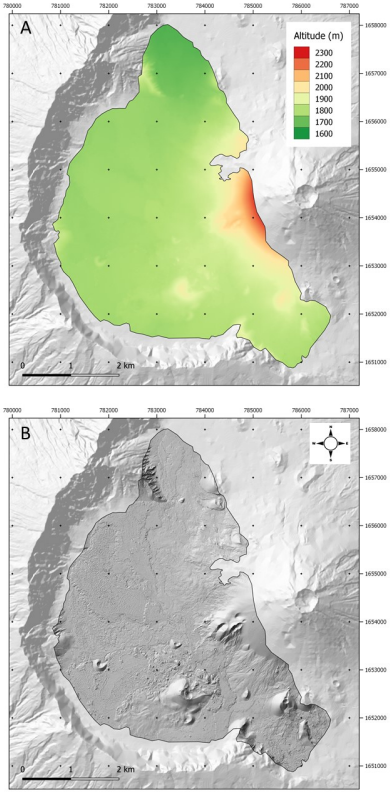

Fig. 9. Figure 9 – Digital surface model of the Chã das Caldeiras (A) and DSM shaded relief model (B). The surveyed area is overlaying the DEMFI (2010) 5 m DEM.

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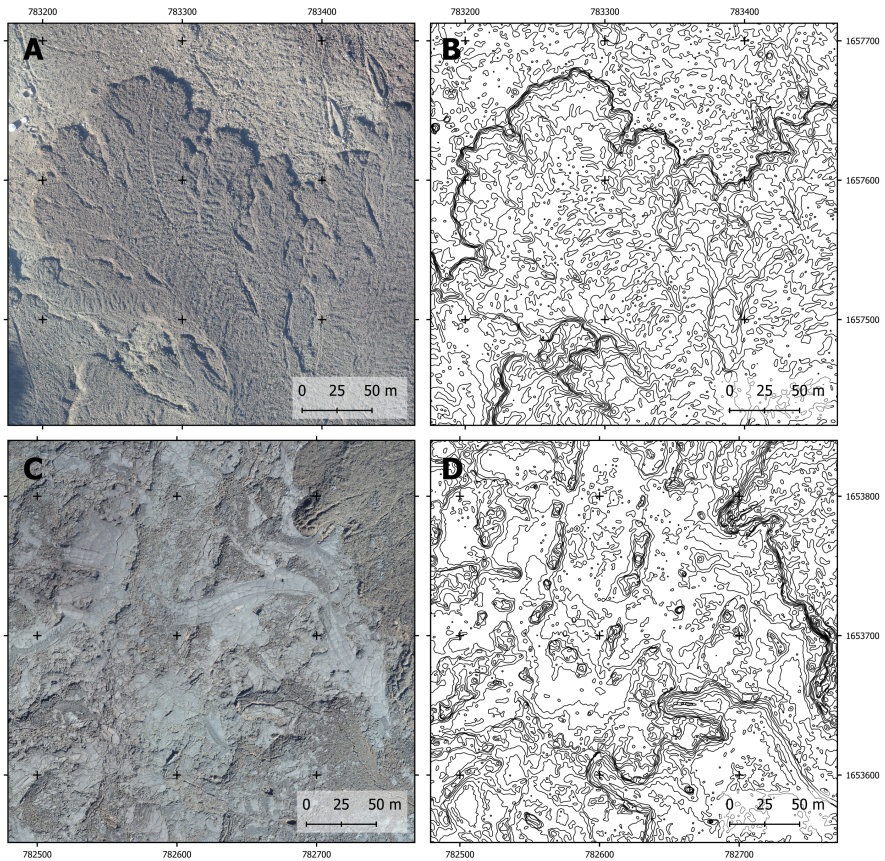

Fig. 10. Figure 10 – Examples of surfaces in the Chã das Caldeiras with high-quality results for the digital surface model, with orthomosaic for visualization (10 cm resolution) and contour lines derived from

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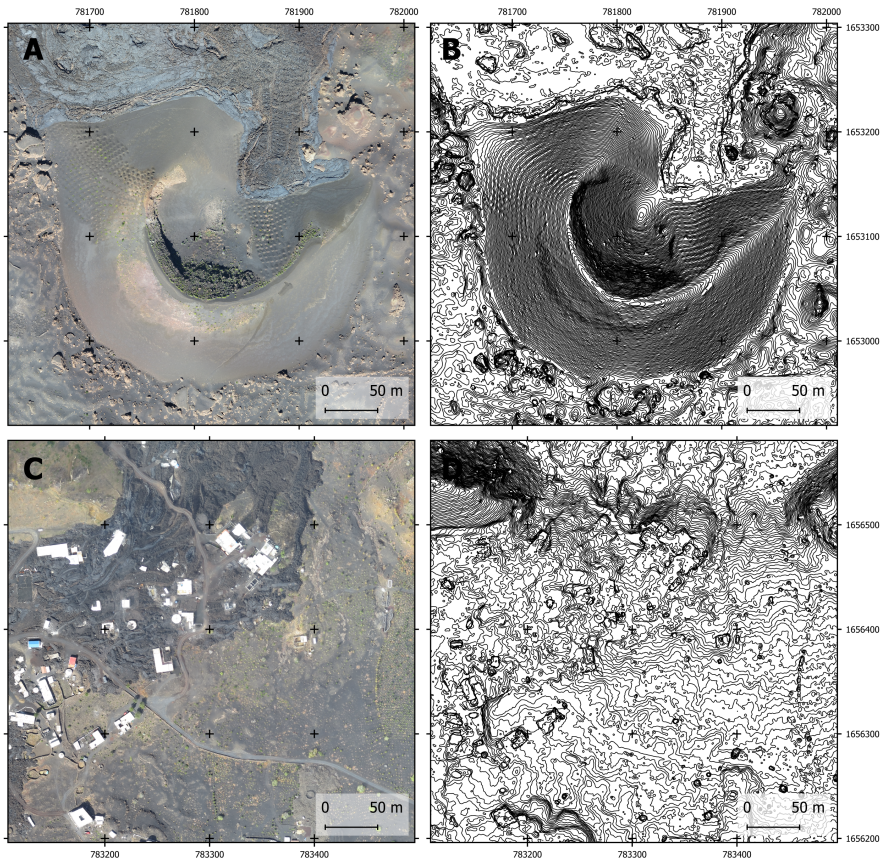

Fig. 11. Figure 11 – Examples of surfaces in the Chã das Caldeiras with high-quality results for the digital surface model, with orthomosaic for visualization (10 cm resolution) and contour lines derived from

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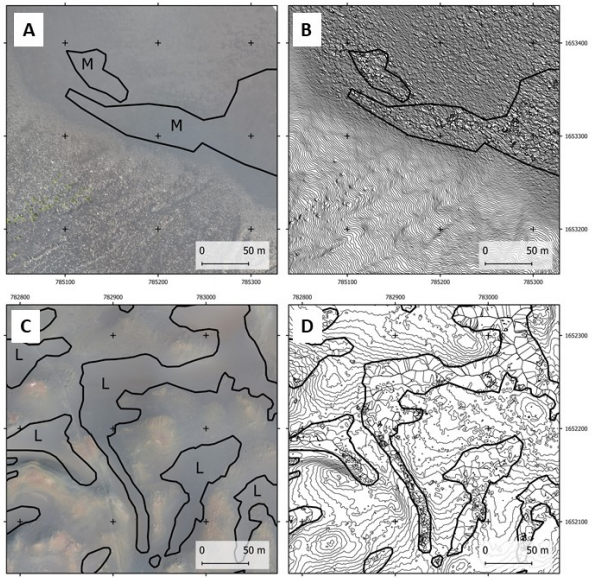

Fig. 12. Figure 12 – Examples of surfaces with medium and low quality. A and B: Steep slope covered with ash with medium-quality results (M) for the digital surface model, with orthomosaic (A, 10 cm resolution

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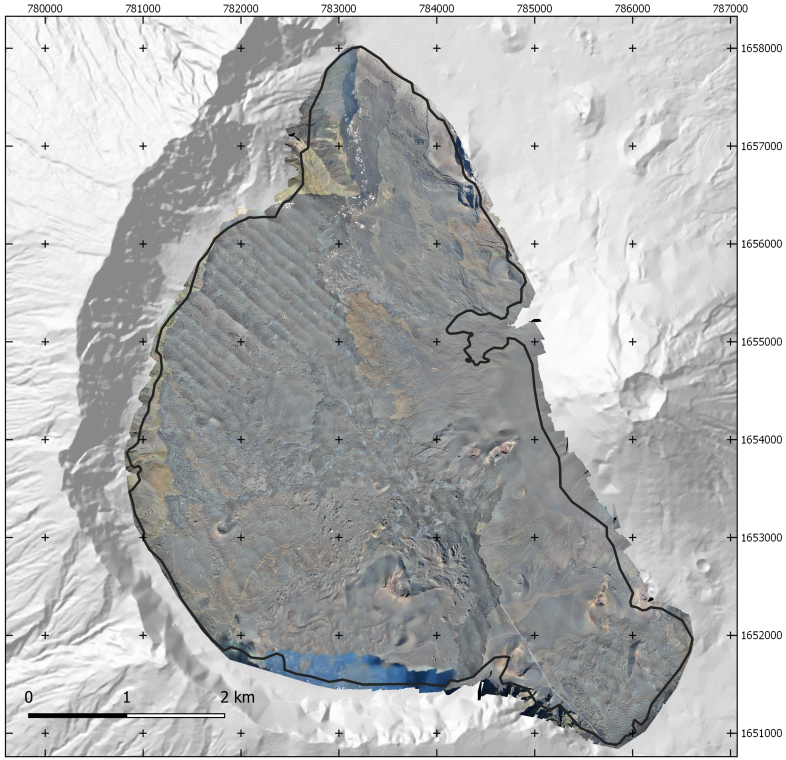

Fig. 13. Figure 13 – Digital orthophoto mosaic with 25 cm resolution of the Chã das Caldeiras. The quality of the point cloud is shown in Fig. 7. Shaded relief outside the surveyed area derived from the DEMFI

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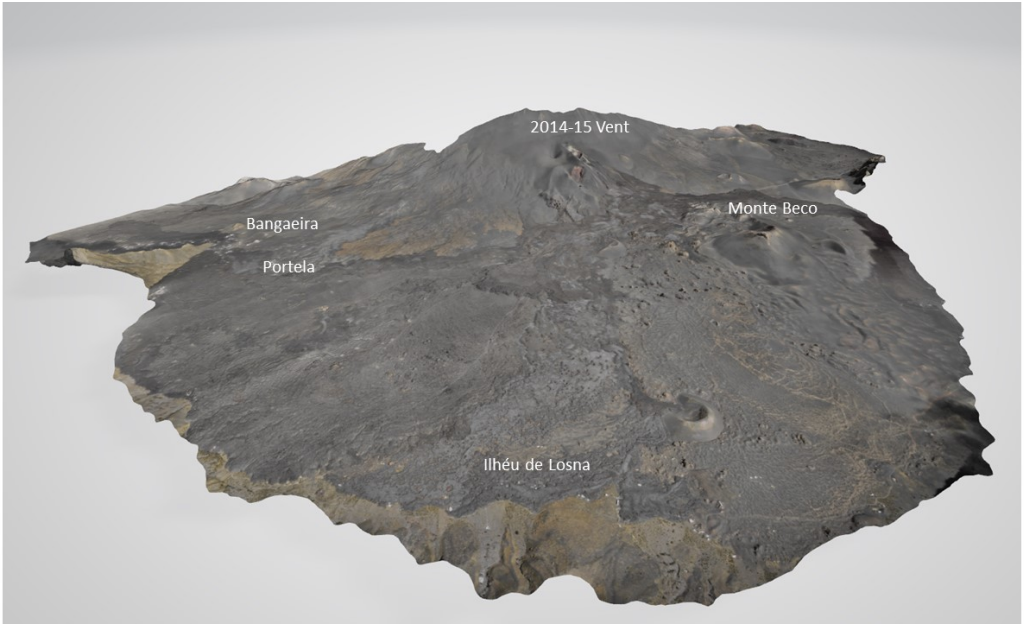

Fig. 14.

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