

PART (I): Key ESSD Overview Questions

1. Is the article itself appropriate to support the publication of a data set?

The article is appropriate and supports the publication of the data set. The methodologies were meticulously explained and it is generally well-structured, well-written, and clear throughout. The article provides significant background on the field site, previous work of similar nature, and the growing need for high resolution DEMs of active volcanic terrains.

2. Is the data set significant – unique, useful, and complete?

The data set is significant and will help improve mapping of volcanic landforms and processes in a highly active region on Earth, known to have caused devastating damage in the recent past. The dataset is unique, in that it will be the highest resolution dataset for this region to date, improving on the current 1 m models by a factor of 4. It is useful as it provides unprecedented detail on the topographic and visual features of a recent, catastrophic eruption, allowing for future identification and mapping of key small-scale features not accessible with 1 m data. It is fairly complete in that it covers the target terrain, and only a small percentage is of lower quality. The authors provide associated shapefiles that delineate these regions, providing a useful guide to the most precise and accurate regions of the DEM. However, the potential applications of the DEM could be more fully developed, as the authors only mentioned at the very end (Conclusions) what type of features or mapping may be facilitated by this data set.

3. Is the data set itself of high quality?

The data is of very high quality as mentioned in 2. above. The resolution of the final DEM is 25 cm, wherein only a few, delineated locations contain less reliable data.

4. Is the data set publication, as submitted, of high quality?

The publication is of high quality and the authors presented the results in a clear, concise, and organized manner. The article is well written and suggests the authors are highly knowledgeable on their field site and general mapping techniques. The article not only explains the data compilation and generation steps, but also provides crucial information on the background and significance of this dataset. The publication will be a great contribution to volcanic terrain mapping, and sets an excellent standard for how efficient UAV photogrammetric workflows can be used to generate very high resolution DEMs in critical, hazard-prone, remote regions.

5. By reading the article and downloading the data set, would you be able to understand and (re-)use the data set in the future?

By reading the article, I would not only be able to re-use the data, but I would likely also be able to recreate the DEM from the photographs given their highly detailed instructions on photogrammetric methodologies. The authors did a great job of carefully describing the field and remote sensing aspects, steps, parameters, the limitations and errors, and how these translate into the final product. Usage of the data is straightforward and fully supported by the article.

PART (II): Overall Rating

The article itself meets the following criteria (rated 1–4, excellent–poor):

Significance: **Excellent** (overall, breakdown below)

Uniqueness: Excellent

Usefulness: (as written- Very good; but can be changed to Excellent; see below)

Completeness: Excellent

Data quality: **Excellent**

Presentation quality: As written- **Very Good**; but can be changed to Excellent (esp. Figs); see below.

PART (III): General Comments:

Above I mentioned two aspects that were sub-excellent, but that can be easily modified with minor modifications to be of Excellent standard.

[1] The first is the 'usefulness' aspect. Although I, having worked with similar tools and locations, am fully aware of the usefulness of this dataset, I believe the authors can improve upon how they describe this in their article. The authors could make it more clear how a 0.25 m dataset is better than the island-wide 1 m dataset. This is unclear throughout, and only in the 'Conclusion' do the authors mention the plethora of sub-meter landforms that can be mapped, and which couldn't be before. (The only one they mention in the body is the 'kipukas'). For example, I would love to see an image of (i) the newly imaged kipukas, even if just briefly annotated, or even (ii) some images of the new mapping of the new lava flow field area used to calculate the new size, perhaps compared alongside the old mapping. This would really highlight the power of the new dataset, and nicely show how the increased resolution will significantly help with the mapping.

[2] These last few comments above bring me to my second point, which is the presentation of the figures. In general, although the data is beautiful, informative, and significant, the figures could provide a bit more context/information. This will in turn provide guidance into its usefulness (linked to point [1] above). For example, providing a side-by-side figure, which contains both a field photograph (if available!) of a couple of examples of the sub-meter features (pressure ridges, etc.), next to its identification on the orthomosaic, would be hugely impactful. Especially if these are features that could not previously be imaged, but are now fully mappable thanks to the new dataset. In general, the figures could do with a bit more detail, I have provided a review of the first three figures to illustrate this.

Figure 1- I think some 'connection lines' would be useful between the locations labels and the actual landforms. What feature corresponds to the Ilheu de Losna, for example? It is a bit unclear, and arrows would allow you to place labels further away (e.g., Monte Beco is superposed). Scale bar and north arrow from the inset is not legible, so I would just delete, and leave scale bar on main image. There is no information on location (e.g., a central lat/long, or x,y axes) which would be useful for readers unfamiliar with location and scale of Fogo and/or even Cape Verde.

Figure 2- The image has no direction, location, scale, or any annotations showing what we are meant to be looking at. Are we inside the Cha? Or looking at it? As an example, I think it would be quite interesting if you showed in Figure 1 where this photo is (location + direction of view). This would provide much more context and help understand the landscape better!

Where are the lava flows indicated in the caption? What is the far away topographic feature on the very right? You could even have a multi-panel series of photos, if you don't want to overload with labels.

Figure 3- What are the purple circles? What is the black line? (I know, but other readers might not)

Finally, I think Figure 6 should be one large figure which contains both the altitude overlain over the hillshade. This is the main result and should be large (but instead Figure 7 with the errors is larger and draws more attention).

PART (III): Specific Comments/Suggestions

[Note that I use this abbreviation throughout: Replace with = Rw]

Line 16: Missing a full stop.

Line 17: "During" December

Line 18: add "(UAV)" after unmanned aerial vehicle since you use this abbreviation in line 27

Line 19: Here (and in the body) explain the acronym RTK

Line 20: There is a space between 23. And 9

Line 20: All the superscripts and subscripts (except one, in line 458), are not formatted properly. This is likely just a formatting issue but just making sure the authors are aware.

Line 26: What is a kipuka? Can provide brief explanation (2-3 words)

Line 30: Rw "Detailed knowledge 'of' volcanic..."

Line 31: Rw "assessments and for advancing our capability"

Line 32: Rw "may incur considerable loss"

Line 32: Why is Small Developing Islands States capitalized?

Line 35: Rw “very high-resolution” (not very-high)

Line 36: In this list you’ve used oxford comma, where usually you don’t throughout. Make sure you are consistent in this formatting style.

Line 37: Rw “lava flow fields” (not lava-flow fields, you also use the former elsewhere)

Line 37: No comma between ‘fields’ and ‘may’ (can’t separate the subject and verb of the sentence)

Line 41: Fix “lava flow-flow field”?

Line 43: Rw “Fogo, an island located in the Cape Verde archipelago off Western Africa, is”

Line 50: Remove “Effectively, ”. You already used ‘almost’ to indicate an approximation.

Line 58: There is a small formatting error just before “the SE flank”

Line 69: You use two type of “approximately” abbreviations in this sentence, I would stick to just using the \sim symbol before 45.

Line 72: Should you perhaps define HOTSAT, MODIS, SEVIRI etc. for reader unfamiliar with these data types/methods?

Line 72: Rw “...SEVIRI data to determine the location of the hotspot...”

Line 77: Remove comma after DEM

Line 80: Replace “show” with “suggest”

Line 85: Rw “point out the need for up-to-date”

Line 86: Rw “topographic modifications”

Line 87: A bit confusing, what do you mean by a combined method? Maybe just Rw “Bignami et al. (2020) combined 21 images...”

Line 88: remove comma after “January 2015”

Line 95: It is more common practice to use a comma directly after ‘e.g.’ and ‘i.e.’; I would edit this throughout. It’s the same as putting a comma after ‘for example,’.

Line 103: Make sure you are consistent with hyphenation of ‘high resolution’, sometimes you hyphenate, other times you don’t.

Line 103: You have already defined UAV above (line 76).

Line 111: Rw “DEMs...”

Line 112: Rw “1990s”

Line 113: Rw “topographic points”

Lines 115-116: I would add acronyms inside parenthesis, with a semi-colon, followed by references. For example “light detection and ranging (LiDAR; Mouginis-Mark...”.

Line 116: Rw “mid-2010s”

Lines 118-119: Rw “available, allowing for centimetric to...”

Line 120: Rw “are not open-access”

Line 121: Rw “UAVs have a broad range of applications, “

Line 125: Rw “polar”

Line 123: Rw “...UAV surveys for conducting research...”

Lines 131-133: Rw “The significant versatility of UAV applications, in addition to the added value of accessing otherwise rough, remote terrains—such as volcanic eruption sites— make them a powerful tool for acquiring...”

Line 133: Rw “by the naked eye”

Line 133: et al. is missing a full stop

Line 134: Rw “...it is essential for undertaking rapid terrain recognition..”

Line 135: Rw “has evolved rapidly in the last decade”

Line 136: You should introduced SfM acronym here.

Line 136: “structure from motion began to allow for facilitated”

Line 137: Maybe define, spell out GNSS

Line 138: You can’t use ‘to’ directly after ‘allow’, you either have to add an object (allows US to), or switch to “allows for the generation of these products”

Line 139: Define RTK

Line 139: Rw “even faster workflows in-situ and the production of highly...”

Line 147: Rw “studies have demonstrated the”

Lines 147-168: Up to now the introduction has been well-written and informative. However, this paragraph needs a bit of a tweak with regards to 2 things. Firstly, in the very second sentence you say that “these show the potential of the survey produced at Fogo”, but you haven’t even talked about the studied yet. I

think A sentence of this sort should be moved to the end of the paragraph. So that you list of all the studies, and then say, “see? now you can see all the potential of our survey”, in context with previous work.

My second qualm is that, in general, this paragraph reads a bit like a shopping list. You provide a very long list of individual works and what they did. I wonder if you could add a bit more variety to the sentences, or group things which are similar, and/or allow it to flow a bit more naturally.

Lines 149-150: Remove “As examples of UAV-based mapping”

Line 150: et al. with a full stop

Line 151: Rw “allowing them to monitor the volcano’s evolution”

Line 152: Rw “dome, having”

Line 156: Rw “3 cm orthomosaic”

Line 157: Where is Holuhraun?

Line 159: Put “During XX” at the start of the sentence.

Line 163: Rw “which allowed for the improvement of the monitoring”

Line 168: This is where you should add a short conclusion/linking sentence to say where your work fits in here.

Line 171: Rw “Cape Verde islands are”

Line 172: Rw “relative to its”

Line 184: Rw “being bounded in the remaining”

Line 189: Remove “of the flank of the volcano”, it is implied in flank failure of a volcano

Line 189: “off the coast of Fogo”?

Line 191: Rw “attesting to the”

Line 199: Rw “however this contradicts the stratigraphic”

Line 200: Remove “Effectively”

Line 201: Rw “vents located at the”

Line 203: Rw “eruptions, which had vents located in the northwestern, southwestern, and southern flanks...”

Line 205: If you have more than one adjective, separate with comma; Rw “lava-infilled, high-altitude summit depression”

Line 211: Rw “is generally a flat”

Lines 215-216: Rw “large, scattered, rafted blocks”

Line 216: Rw “sequences on its surface”

Line 218: Rw “to the east, and particularly to the west”

Line 220: Note sure about ‘conferring’; generating of resulting in?

Lines 220-221: Rw “fanned, leveed, channelled morphologies”. Lots of adjectives!

Line 221: Remove second “some”

Line 229: Remove “as” before “a high-altitude”

Line 233: What do you mean by enhanced flow?

Line 241: Rw “building, and covered”

Lines 243: Can you not reconstruct using both methods? I would use ‘both/and’ instead of ‘either/or’

Line 246: Rw “conducted roughly 20”

Line 247-248: I am confused with the sentence “but with the occupation... gas emissions”

Here, I will stop my line-by-line assessment of wording, syntax, typos, and grammar, in the interest of time, but would like to just point out a couple of line-specific (more technical) things:

Line 314: What manual tie points did the authors use if the terrain was homogenous? Are these points of high-confidence?

Lines 316-318: The sentence “The advanced ... no automatic rematch” needs a bit more explanation since a lot of these terms are not described. What parameters do the authors mean? What is ‘the alternative method’?

Lines 336-337: “it was not possible to obtain a good quality point cloud all over” sounds a bit more negative than its meant to be. In fact, is sounds like there was NO good point cloud coverage over the entire dataset. I would edit to emphasize that only few, select locations did not have good quality coverage!

Lines 459-460: For resolution and RMSE—is the usage of two different units on purpose or by accident? I don’t think you should write the data error in a different unit, as it might look like you are trying to make the error seem smaller than it actually is.