

## ***Interactive comment on “Google Earth Engine Digitisation Tool (GEEDiT), and Margin change Quantification Tool (MaQiT) – simple tools for the rapid mapping and quantification of changing Earth surface margins” by James M. Lea***

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### **General comments**

The author presents newly-developed tools implemented in Google Earth Engine and Matlab to facilitate researchers analyzing margin change from the satellite record. The author then undertakes a proof-of-concept study on an Iceland outlet glacier to document differences in terminus change measurements as observed by different satellites and quantified by different approaches.

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The general motivation for this research (accelerating the pace of discovery in earth science) is strong and the tool will certainly be beneficial to other researchers. As a community, we should encourage and acknowledge work like this that produces a tool to facilitate the entire field's progress.

The paper is well-written and organized. My only major comments relate to a significant amount of text about operation of the tools that seems unnecessarily specific and could be moved to supplemental text, a readme, and/or tutorial that accompanies the tools. I offer several suggestions that would make the software more versatile, but do not consider implementing these changes as critical for manuscript publication. I therefore recommend this manuscript to be accepted after minor revisions addressing the issues I present below in “Specific comments”.

### **Specific comments**

- How would this routine work for circular margins (e.g., lakes, city boundaries, cropland extents, etc.)?

- Should the instructions beginning on L96 be a supplement instead of main text? These seem very specific and like a step-by-step walkthrough that doesn't necessarily belong in the main text. This kind of reads more like a user manual than material for a science paper. I recognize this is all important information for using the software, but it seems like it could be included in a readme file or an online tutorial.

L110 – Why do you recommend geoJSON as output format? Portability across platforms and programs? You later address this (L209-212), but the reader may wonder here.

L120-121 – The limitation to one platform when using “custom” composite images seems like a big limitation. For example, I like to visualize Landsat 8 imagery in a R,G,B = [b7,b5,b3] = [SWIR, NIR, green] composite. Would it be possible to specify a wavelength or band name (e.g., SWIR) and have GEEDiT look up the appropriate

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band number for that satellite? Could this allow uniform use of composites across platforms? I am aware that the exact wavelengths will vary across platforms, but it is definitely better than comparing a R,G,B = [b7,b5,b3] = [SWIR, NIR, red] for Landsat 5 with the same band numbers for Landsat 8 (where b3 = green).

Section 2.1 – Throughout this section, it seems like references should be made to Figure 1.

L134 – Is it possible to jump to a certain image? Or do you have to “continue to next” several times if you want to pick up halfway through the stack?

L139-140 – Can you script a key stroke (e.g., ctrl+z) to undo a mistakenly drawn vertex? This would be nice for minimizing clicks and mouse motion.

L141 – What is the structure of the geoJSON file? How are multiple margins stored within this file? Is each margin stored as a top-level dictionary (in Python terms, I’m not sure what this is actually called in JSON – the things with key-value pairs), with each date as a sub-dictionary, which then contains the lat/lon’s of the margin vertices?

L144-145 – This seems like another significant limitation with this tool. Could you include a field for user-specified margin names that could be used to organize margins and allow multiple margins in one image to be digitized? This seems like it would slow the pace of change analysis if each margin needed its own file.

L170 – This is somewhat intuitive, but are those dates the first and last images used for margin delineation? This should be specified.

L219-220 – Have these tools been used yet to document changes in non-glacier systems or is this still on the horizon? This is somewhat unclear and you suggest several times that this tool is exportable to other systems, but I wonder if there may be issues specific to other systems that could hinder this tool’s versatility?

Section 2.1 – if you have existing margin outlines, can these be visualized within your current workspace? In Step 9 you discuss merging, but it is not clear to me if you could

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import existing margin polylines into your current session.

L249-251 – Cautionary notes on direction to digitize shapefile seems like readme material.

L296-306 – Again, caveats about how long centerline should extent up/downstream from terminus seem like more readme material than journal paper material.

Section 3.3.4 – It is not clear to me what the advantage of the multi-centerline method is over the variable box method. You show later these are useful for plotting 2D terminus position data, but it is not clear here. Also, it is not clear to me why you are talking about filtering results based upon times between images in this section. Is this feature only available to the data processed in the multi-centreline method?

L345-354 – Aren’t these data also shown in Figure 7? Why not refer to it instead of a supplemental figure?

L400-405 – Is it possible to apply a correction to bring the Sentinel 1 data into agreement with terminus positions observed by the other satellites? Is there a way to predict what this offset will be and correct for it?

L455 – Are you saying Matlab requires an extension that doesn’t cost more to license? Because users would need to have a general Matlab license that costs money, correct? If so, I would clarify this point – the approach is not entirely based upon freeware.

Figure 7 – Could you label the sub-panels in b with what the plots show? This would make the figure much clearer to readers.

#### **Technical corrections**

L199 – Do you mean Table 1? Table 2 is just band numbers and associated wavelengths.

L209 – sentence ends abruptly. Meant to read “converted to shapefile format using MaQiT”?

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L385 – This is redundant with L379-381. One of these should be cut.

L488 – 2017a » 2017 (there is no Carr et al. 2017b)

Motyka et al. 2017 is not in reference list.

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Interactive comment on Earth Surf. Dynam. Discuss., <https://doi.org/10.5194/esurf-2018-24>, 2018.