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Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "HazMapper: A global open-source natural hazard mapping application in Google Earth Engine" *by* Corey M. Scheip and Karl W. Wegmann

Anonymous Referee #1

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Scheip and Wegmann present an online-GIS to display and analyse perturbations of the Earth's surface. This toolbox allows the user to select among three different satellite missions, to choose a period of interest, and calculate landscape changes using a vegetation index. The authors show five case studies to visualize the detectable impacts from volcanic, coseismic, and rainfall-related mass movements, and burnt areas from wildfires.

The authors argue that HazMapper is designed for people with little prior knowledge in a GIS environment, or who could have limited access to powerful computing facilities. This goal seems to be fulfilled given that the interface (Figure 1) is designed

in clear and visually appealing fashion. The downside of the presented web GIS is that the possibilitiesâĂŤfor the time beingâĂŤremain very limited beyond calculating a vegetation index. Clearly, practitioners may benefit from the resulting maps of vegetation change. Yet from a scientific perspective these maps need at least a minimum amount of quality check to judge how useful this maps are. Yet, unfortunately, any measure of accuracy or uncertainty (and discussion thereof) remains elusive in the current manuscript. Some questions (without logical sorting or relevance) that could be answered in more detail are: - What can we do in regions with frequent cloud cover?

- How can we detect mass movements that do not cause disruption of the vegetation cover, such as slowly moving landslides or mass movements in arid or un-vegetated (high mountain) regions?

- How does HazMapper perform in the era before 2012, when only patchy Landsat 7 images are available?

- How does the resolution of the sensor affect the minimum size of detected disturbances?

- Are rdNDVI values comparable across the three different sensors? What are the optimal thresholds to set during analysis?

- How can we make sure that the automatically detected changes come from the same trigger?

I highly appreciate the goal of the authors to help non-experts in doing rapid post-event analysis, but I found few information that guides these non-experts through their analysis. Limited knowledge about the regrowth rates, for example, could lead to large misestimates of detected changes, if the window is not set accordingly during the analysis. It was therefore surprising to see that the current manuscript offers no discussion section where such issues are considered in detail.

In the following, I list some minor line-by-line comments that mostly address possibili-

ties to clarify or shorten the manuscript.

L14: Is it important to distinguish between 'developed' and 'undeveloped' countries here?

L17: What is 'significant' here?

L18: 'characterization': more specific?

L20: 'typically persist in vegetated landscapes': Could the authors briefly explain why that is the case?

L23-24: 'provides a single time-stamp of ground conditions': People familiar with dating would argue that one can read out way more from a landscape than a single time-stamp from one field visit. . .

L24: Why should people with no 'interest' perform field work?

L26-27: 'observe, monitor, and track': suggest using only one of these terms L29: How do the authors define 'increasingly complex'?

L35: 'obvious advantages': such that? Could there also be some 'not so obvious' disadvantages, for example in the field of data protection regulations?

L55: Use the more familiar 'GeoTIFF' instead 'geoTIF'?

L58: 'Can be' instead of 'is'?

L59: 'other opaque atmospheric components': such as? Maybe haze and dust?

L58-63: Not sure whether this motivation is useful at this stage, because all these arguments call for using non-optical data sets such as radar, given that they suffer less from atmospheric disturbances.

L64-69: Are the satellite images radiometrically corrected?

L98: Would be good if the curated examples are publicly accessible without having a

Google account.

L112: What if internet access is limited or unavailable in 'regions with less adequate resources'? Would this rule out the use of the HazMapper?

L112: Please avoid subjective terms such as 'incredibly'.

L113-115: These two sentences are slight repetitions from previous arguments, for example in L21-24. Consider shortening (or deleting).

L115-116 & L118-119: These arguments have also been brought up before. Could it make sense to redistribute the content of Chapter 3 into Chapters 1 and 2? Most of these argument could strengthen the overall motivation of this paper in the introduction. I do not see too much additional value in a chapter on its own that compares different GIS environments.

L128-135: These sentence largely contain arguments from previous sections, and could be more useful to expand the line of arguments (or number of references) there.

L134-L137: These two sentences should go into Section 2.

L138-139: Repetition, consider deleting.

L151-154: Again repetitions from previous sections. By the way, I'm not sure whether downloading 'one to a few pre- and post-event images' demands 'high-powered computers and large digital storage capacity'. The authors may acknowledge that downloading one Landsat scene before and one after a landslide, each $\sim$800 MB large, and loading them into memory can be done with the bulk of post-2010 computers, no?

L157, L159: What can Huffman's paper from 2014 tell us about a debris flow that happened in November 2019?

L165-173: What is the reason for this mini-review on the local geology / geomorphology? It feels like this paragraph dissects a bit the logical flow between the preceding and the following paragraph in this chapter.

L185: ‘Fatalities from coseismic mass wasting events can increase significantly’: from which baseline do fatalities increase and by which rate? And how do the authors define ‘significantly’ in this regard?

L197: ‘when expanding the analysis window to the predicted 300 km maximum distance’: What did the authors prevent from not considering the full radius of 300 km from the beginning?

L198-199: How did the authors make sure that these landslides were generated from the same earthquake?

L199-201: Structure of the sentence is not fully clear. Please elaborate, possibly splitting this sentence into two.

L201: ‘future’ is a bit odd for a tool that uses historic images. . .

L202: What is the content of this ‘robust spatial and temporal catalog’? Figure 4 shows no more than a rdNDVI map, without explicitly digitizing individual landslides or debris flows, measuring their areas, estimating their volumes, their runout paths, spatial density, potential different time stamps of occurrence, and so on. Also, how do the authors define ‘robust’ here? So far, the authors show no accuracy assessment, in terms of how much of the total area (as one measure of accuracy) is correctly classified by the rdNDVI. What are the commission / omission errors, compared to manually mapped landslides? It is hard to believe that this approach picks mass wasting events error-free, especially in tropical regions with rapid regrowth rates along river channels.

L234: ‘17,000 acres‘: what would be the area that HazMapper predicts?

L237: If HazMapper only uses the rdNDVI, how can it distinguish between burnt areas and a landslide that happened in that area, or clear cutting?

L238-239: How do the authors measure ‘the most severe burn’, assuming there are different types of vegetation cover with a study region that might have completely different starting NDVI values?

L249: Is there a reference that shows that the annual number of fatalities from volcanic eruptions has increased from year to year in the past 500 years?

L254 / L264: ‘downslope hazards‘: more specifically?

L265: What do the authors mean be ‘decimated’?

L273: These ‘analytical false negatives’ urgently demand quantification!

L274: How can the authors judge from satellite images that these features are ‘hyper-concentrated flows’? And how they define the ‘transition to hyper-concentrated stream flows’?

L290: What do the authors recommend for cases where we have persistent cloud cover, possibly over months to years? There are many coastal and mountain regions, and many scientists or practitioners would wish to see a solution to this problem. This calls for a fuller discussion regarding the limitations of HazMapper.

L291: ‘Future code modifications‘: such as? This could be a core problem of HazMapper: How can we map landscape change if there is no vegetation?

L297: And what does this ‘comparison’ show? Seismologists tend to use seismic data, and HazMapper uses optical satellite images, both parties probably have a hard time to make their datasets comparable to each other. Where is the overlap?

L303: No discussion chapter?

L317: How ‘good’ is this ‘approximation’ in real numbers?

Figures 3, 4, 6: What are the slope thresholds good for? Why are they (close to) zero?

Figure 4: Why do C and D have a different color scale? Could it be that D and E have wrong labels?

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