

Interactive comment on “Earth transformed: detailed mapping of global human modification from 1990 to 2017” by David M. Theobald et al.

Anonymous Referee #3

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General comments

Theobald et al., mapped the temporal change and the “current” state of the degree of human modification, H using the Direct Threats Classification v2 (Salafsky et al. 2008; cmp-openstandards.org) methodology. The presented dataset can be highly valuable for both research and decision making. However, some clarifications and revisions are needed beside the concerns already raised by Reviewer 1 and 2. Most importantly, I recommend the authors to share the complete dataset and clearly describe the dataset provided.

Specific comments

Data

It would be useful if the authors could provide a readme file (or improve the usage note

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description on Dryad) for the data provided, perhaps a table listing what files and data are actually shared. (I only tried to check on the data using Python, not sure if use of e.g., Google Earth Engine would have showed up anything differently. If there are differences, the authors could perhaps try to bridge the differences or recommend a preferred software.)

It was for example unclear to me:

- What does each of the three data folders represent? E.g., what does 60c and 60s stand for in the folder names?
- Within the folders, there are several files. A readme file could describe what each of these files contain.
- (It could be something wrong on my side, but I could only plot the Oceania files with the ending “0000000000-0000032768”, whereas the 0000000000-0000000000 files threw the following error: Readorwritefailed. gHMv1_1990_1000_60c_land-0000000000-0000000000.tif,band1: IReadBlockfailedatXoffset121,Yoffset39:TIFFReadEncodedTile(failed.).
- The manuscript also mentions a recent 2017 dataset, but none of the folder names contain “2017” (only 1990 and 2015).
- The manuscript states that “global datasets for 1990, 2000, 2010, and 2015” are provided, but it’s unclear which files contain the 2000 and 2010 data?
- The embedded metadata could be complemented with lat, lon, date, and unit information?
- The data description mentions the change stressors and the uncertainty analyses, but are these really included in the data deposited at Dryad? It would be useful if the authors shared the individual stressors, for users who might want to inspect the importance and contribution of individual stressors to the overall H.

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Perhaps consider adding a time index for the variables that vary in the stressor equations. For instance, in the Urban and Built-up (L182-) authors state that the probability on GHSL stressor $p(C)$ is based on 2014 data, seem to suggest that years for I_{bu} varies according to Table 2, and do not specify the year for F_{bu} . Adding a time index (e.g., u or t , as in Eq 3) would help the reader see which variables are kept constant and which ones are varying according to Table 2.

As there are several comparisons made with the Human Footprint (HF) and the temporal human pressure index (THPI), it might be useful to also provide an overview table or systematic description of how these datasets differ or are similar to each other in terms of their methodology and data input use as well. This may facilitate interpretation of the comparison results.

P6L164: H_{med} and H_{mad} are very similar. Perhaps consider changing to H_{median} .

P13L433: "We found that about 19.1 Mkm² of natural lands were lost by 2017". However, e.g., (Ramankutty, Evan, Monfreda, Foley, 2008) estimates that cropland occupies 15 million km² and pasture 28 million km², and FAO estimated that agricultural areas amount to about 50 million km² in 2000 (http://www.fao.org/uploads/media/grass_stats_1.pdf). I would suggest the authors to comment on those differences, to not leave the reader wondering why the estimates differ so much.

P14L476: "we found that 14.5% of terrestrial lands globally have been modified, which is roughly similar to HF". (12.3% for 2009; Venter et al. 2016). About half of the Earth's terrestrial surface has been transformed by humans, e.g., according to (Hurtt et al., 2006) "42–68% of the land surface was impacted by land-use activities". Perhaps some comments on such difference might be insightful for the reader as well.

Table 1: Could you also clarify, perhaps in this table, which stressors were used for the 1990-2015 and the 2017 datasets, respectively? (Perhaps by splitting the "year" column to "years used in 1990-2015 dataset" and "years used in the 2017 dataset"). It

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would be nice with a clear overview.

Related to Reviewer 1's comment on the usability of the data: possibly, you could consider a 0.5 degree resolution dataset for users who do not need the higher resolution version, and only wishes to do some quick initial inspections, comparisons, or visualizations, or those in the world who are not so lucky to have quick and reliable internet connection or adequate computer power. This is not a recommendation in anyway, just an idea for increasing usability.

References

- Hurtt, G. C., Frolking, S., Fearon, M. G., Moore, B., Shevliakova, E., Malyshev, S., ... Houghton, R. a. (2006). The underpinnings of land-use history: three centuries of global gridded land-use transitions, wood-harvest activity, and resulting secondary lands. *Global Change Biology*, 12(7), 1208–1229. <https://doi.org/10.1111/j.1365-2486.2006.01150.x>
- Ramankutty, N., Evan, A. T., Monfreda, C., Foley, J. A. (2008). Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. *Global Biogeochemical Cycles*, 22(1), 1–19. <https://doi.org/10.1029/2007GB002952>

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