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Interactive comment on "Local models reveal greater spatial variation than global grids in an urban mosaic: Hong Kong climate, vegetation, and topography rasters" *by* Brett Morgan and Benoit Guénard

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Dear Anonymous Referee 3,
Thank you very much for reviewing the manuscript and providing your feedback. Below we provide point to point responses (AC) to your comments (RC), as well as changes in the manuscript (CM). Page and line numbers refer to those in the submitted manuscript. We also provide a pdf supplement showing tracked changes, new citations, figures, and an appendix added to the original manuscript.

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Discussion paper

On behalf of the authors,
Brett Morgan

RC - Referee comment **AC** - Author comment **CM** - Change in the manuscript

RC3.01 Throughout section 4, you provide comments on how the dataset you have created could or should be improved. This is useful, but it also gives the impression that your dataset is not that good after all. It would be better to either a) clarify in the introduction and abstract that this work is simply a first pass, and that more needs to be done, or b) collect all of these comments in a separate section. Perhaps you can include them in section 4.4: limitations and next steps.
AC3.01 We have combined and condensed the discussion of data limitations into Section 4.4: Limitations and next steps. Thank you for the suggestion.

RC3.02 Data: I found it hard to quickly extract information about the datafiles from the figshare website. Can you reproduce Table 1 along with the data?
AC3.02 Thank you for this suggestion, we have added a file in the figshare repository equivalent to Table 1 of the manuscript, showing file descriptions, units, and raster summary statistics.

RC3.03 Why are you not providing the monthly data through figshare or the doi?
AC3.03 The thought was that having another 120 raster files in the repository would complicate finding and downloading the desired files, especially because we expect only the yearly summary layers would be of interest to most users. We decided to compress the monthly models into a single zip file now available in the repository. This way, they are available for those who are interested but avoid user confusion.
CM3.03 Page 11, Line 4: Individual monthly rasters for each of the 10 climate variables are available as a compressed zip file.

RC3.04 Many of the data files seem to be relatively binary: black or white. I'm not an expert in rasters so I might be missing something here, but how can I extract the

high-resolution detail you are championing in the article?
AC3.04 If we understand correctly, the black and white you describe is referring to the file previews shown on the figshare website. Unfortunately figshare seems to have this standard rendering of raster files, displaying the preview as a binary image. To access the raster data directly and display it how you want, you would need to download the files and open them in GIS software, such as QGIS.

RC3.05 Page 1, line 4: 'variations' not 'variation'
AC3.05 We adopted this suggestion.
CM3.05 Further, these global datasets likely underestimate local climate variations because they do not incorporate locally relevant variables.

RC3.06 Page 3, line 22: are hill fires always human-induced?
AC3.06 As far as is known, yes. In Hong Kong, lightning only occurs during heavy rain, usually during the monsoonal summer. The vast majority of these fires happen during the dry winter, with spikes in frequency associated with holidays and religious practices where burning in hillside cemeteries is practiced. (see Chau, 1994: http://hub.hku.hk/handle/10722/34430)

RC3.07 Page 5, line 2: 'temperature buffers' not 'a temperature buffer'
AC3.07 We adopted this suggestion.
CM3.07 Water bodies adjacent to land areas can act as temperature buffers, contribute to evaporative cooling (Lookingbill and Urban, 2003), and influence precipitation patterns (Heiblum et al., 2011; Paiva et al., 2011); therefore considering their distribution is important for climatic predictions.

RC3.08 Page 5, line 22: can you provide a reference to Hong Kong's dense network of stations?
AC3.08 Yes, we have added a reference.
CM3.08 In contrast, interpolation in Hong Kong is benefitted by a relatively small geographic area and a quite dense network of weather data provided by dozens of perma-

nent weather stations (Hong Kong Observatory, 2018).

RC3.09 Page 5, line 27 and 28: I think you should add the word 'absolute' before the variables maximum and minimum temperature, to clarify that these are the highest and lowest temperatures recorded in each month.
AC3.09 We did consider adding the word "absolute" to these variables, but this might add to confusion about the meaning of the measurement. "Absolute maximum temperature" of a given month might normally refer to the highest temperature ever recorded in that month, but what we provide instead is data that represents the averaged absolute maximum values recorded over a period of 20 years. To ensure clarity of the meaning of each variable, we have added Appendix 1, which provides definitions for easy reference.

RC3.10 Page 6, line 10: why do you have high confidence in the long-term averaged weather station data?
AC3.10 The confidence is based on the good availability of measurements for averaging - a weather station's data was only included if at least 8 full years of measurements were available for use, and most stations had many more years than that threshold. So we can be fairly confident that the averages are good approximations of the true climate at each station.
CM3.10 This low lambda value was selected because of the relatively high confidence in the long-term averaged weather station values (based on at least 8 years of data).

RC3.11 Page 7, line 8: please refer to the resolution of the rasters as 30m, to be consistent.
AC3.11 We adopted this suggestion.
CM3.11 All rasters are provided at an identical 1 arc second (30 m) resolution and in the WGS84 geographic coordinate system.

RC3.12 Page 7, line 15: Aren't you only providing the rasters at one scale?
AC3.12 The rasters are all at one resolution (30 m), but the values of these topographic

variables were calculated using buffers at multiple scales. For example, relative elevation at a given 30 m pixel will vary depending on the size of the surrounding area (in our case, a circle of a given radius) to which it is compared. We adjusted the wording to help clarify.
CM3.12 For this reason, we provide these rasters calculated at multiple buffer scales.

RC3.13 Page 8, line 5: Can you provide a brief explanation why the highest maximum temps are in inland valleys?
AC3.13 Yes, and we have also added a sentence about how the difference in maximum vs. minimum temperature patterns can be explained by urban heat island effects.
CM3.13 This pattern may be explained by urban heat retention: buildings act as heat sinks which absorb solar radiation during the day, and slowly release heat at night, causing increased minimum temperatures. The high maximum temperatures in inland valleys may be due to reduced air circulation in sheltered locations, and lack of complex vegetation or urban structures providing shade.

RC3.14 Page 8, line 15-16: Aren't you arguing in this study that your new dataset is high resolution? Consider rephrasing this sentence.
AC3.14 Not exactly. We do want to highlight that our rasters have a much higher resolution than similar datasets that are available globally. However, describing a raster simply as "high" or "low" resolution is quite arbitrary, as many 1 km datasets are described as "high resolution." For certain applications, 30 m resolution would be quite low. Assessment of urban microclimate is one of those cases, and we attempt to convey this.

RC3.15 Page 9, line 29: I would say 'our models', rather than 'The new models'
AC3.15 We adopted this suggestion.
CM3.15 Our models generally indicate greater spatial variation than Worldclim, with cool areas colder, warm areas hotter, and wet areas wetter.

Please also note the supplement to this comment:

https://www.earth-syst-sci-data-discuss.net/essd-2018-132/essd-2018-132-AC3-supplement.pdf

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2018-132, 2018.

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