

## Response to reviewer comments

We are sincerely grateful to editor and reviewers for their valuable time spent on reviewing our manuscript. The comments are very helpful and valuable, and we have addressed some issues raised by the reviewers in the revised manuscript. Please find our point-by-point response (in blue font) to the comments (in black font) raised by reviewers.

### Reviewer 2

In the manuscript the authors proposed a framework to train the random forest (RF) model so as to output high resolution air temperature map. The RF model takes various environment parameters (mostly derived from remote sensing data) around a dense network of meteorology stations as independent variables and it is trained using the air temperature data observed by those stations. The work starts with a good motivation to provide high resolution air temperature map, which is important for a better understanding of thermal environment of the city and helps for heat exposure assessment.

The method propose by the authors shows the capability of generating high resolution air temperature map. With this temperature map the authors further studied the fine scale canopy layer urban heat island as well as its relationship with driving factors. This, from my point of view, matches well the original motivation of this work.

The workload of this study involves quite a bit effort, especially regarding the preparation of the input variables that are fed to the RF model, and the identification of the proper buffer size, as well as the comparison of the model performances between the proposed RF model and other regression models.

As I did not really give a fast review before the discussion started, in the ‘fast review’ I raised several questions, such as increasing the presentation quality, better organizing the technical stuff, giving more space to technique details, I appreciate the authors’ great effort in address my concerns, I found they have been addressed mostly. So I personally do not see fundamental issues in the current version of the manuscript.

**Response:** Many thanks for your positive and valuable comments, and kind suggestions in both quick review and current rounds. We hope our revisions have properly addressed the various concerns and issues raised.

There are a few minor issues remaining:

L34: “relatively” is unnecessary.

**Response:** Amended.

L83: I suggest replacing ‘Meanwhile’ with ‘However’, and moving this passage to the following paragraph.

**Response:** Amended.

L104-105: I find the last sentence is confusing and is not necessary to put it here.

**Response:** Many thanks for your kind suggestion. We have deleted the sentence.

L107: a link directing to ‘geospatial data cloud’ would be fairer.

**Response:** Many thanks for your kind suggestion. The link is added.

L269-277: Please be aware that due to different weather and climate conditions, it is very risky to directly compare the UHI intensities, even though you seem to have carefully selected the same barely impacted rural reference area. The rural area and urban area respond to different parameters very differently. If you really want to compare UHI intensities from different, I would suggest classifying the UHI intensities into several levels using the quantile instead of the uniform scalar values. If not so, please at least avoid direct comparison, while just plainly describing the table content is fine.

**Response:** Thank you very much for the suggestion. We deleted the comparison part and modified this paragraph.

L406: I would suggest putting it this way: “the RF prediction framework proposed in this work not only can dynamically predict CUHII in detail within highly heterogeneous cities, but also can be built....”. Besides, I see the potential that the model can be used cross a short period as most of the environmental parameters fed to the model probably can remain stable for some time, but I would say that it is rather bold to claim a period like one month or even longer.

**Response:** Thank you very much for the constructive suggestions. We have modified the sentence. The random forest models with the hourly air temperature data were modeled in August 2013, September 2015 and July 2017, and figure 7 shows the model accuracy is higher by using more data in one month with respect to one day (Figure 5). Thank you again for help us improve our model. The above part has been added in Lines 240 to 249 in the revised manuscript. In addition, we also discussed the potential of the model at time scales at lines 452-454.

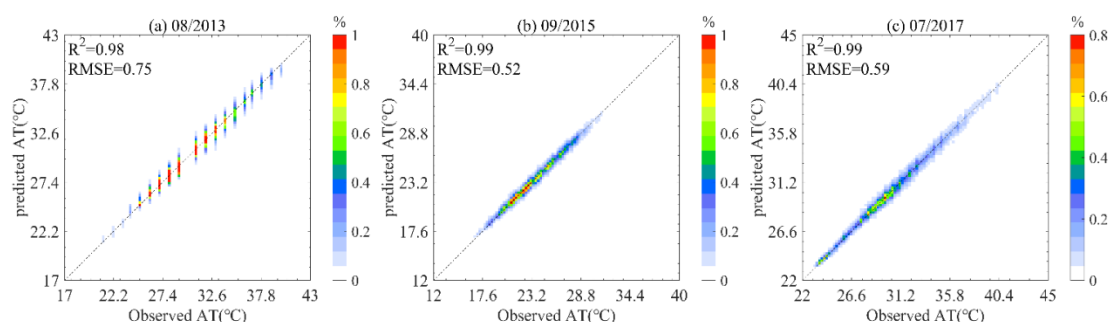


Figure 7: Scatterplot of predicted and observed air temperature using data in a month five-fold CV for the testing set on (a) August 2013, (b) September 2015 and (c) July 2017.

L733: in the caption of figure3, it should be 'canopy layer urban heat island' instead. Please note that in the figure you no longer have Abbreviations like DEM, AHF, LULC, etc.

**Response:** Many thanks for your kind suggestion. Amended.

L764. In the caption of figure10, I suppose by 'standard value', you mean standard deviation.

**Response:** Thanks for your suggestion. Amended.