

Geosci. Model Dev. Discuss., author comment AC1
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Reply on RC1

Nils Wallenberg et al.

Author comment on "Locating trees to mitigate outdoor radiant load of humans in urban areas using a metaheuristic hill-climbing algorithm – introducing TreePlanter v1.0" by Nils Wallenberg et al., Geosci. Model Dev. Discuss.,
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Thank you for your helpful comments! The inclusion of a table with summary of statistics proved to be quite beneficial as it provided us with some information which we were previously only speculating around. For example it made us realize that the greedy algorithm certainly is an excellent option to the hill climbing algorithm, as the resulting tree locations from this algorithm are quite different from the hill climbing algorithm, but can help cool, in this case the study area, sometimes equally or even more. From an urban planning perspective these two algorithms can therefore work as alternatives to each other in that they potentially result in different tree locations. Furthermore, it shows what we discussed in Sect 5.1 (Model limitation and potential), that recalculation of SVF (sky view factor) have a minor effect on cooling outside the shaded area, only contributing between 3.3-19.1 % of the total mitigation of average Tmrt (mean radiant temperature) in the entire raster. Here it is important to add that these 3.3-19.1 % are spread out over a large number of pixels (all pixels from which the new trees are visible). It should also be mentioned that even though the greedy algorithm sometimes have a higher mitigating effect on the study area, the effect per shaded pixel is more efficient for tree locations established with the hill climbing algorithm.

As for the real world settings versus the study area, the scope of this paper presented here is to demonstrate the model. Your comment is definitely appropriate and future work includes testing this on larger areas and different urban environments, adding many more trees. Ideally it would also be worth investigating if locations determined by the model are feasible or if underground aspects, e.g. pipes, root space, etc., would prevent tree planting. The greedy algorithm could be a great option for studies on larger number of trees especially if the area is large and possible locations as well as areas with excessive heat are large. In a small area with competition for space, on the other hand, the hill climbing algorithm and its functionality of moving trees simultaneously could be an advantage. Still, testing the two algorithms and their pro's and con's are certainly aspects of future work.

A table with summary statistics, comparing different surfaces and different model runs and a following discussion as well as further discussion/explanation on real world settings will be added to a revised manuscript.