Point-to-point

We are glad to have received many insights and relevant comments from the reviewers and the editor. The review process has led to a considerable improvement in our manuscript. Based on the remaining feedback from the minor revision, we carefully adjusted the manuscript to address the last few comments. Below we present a point-by-point summary of all edits to address these suggestions.

Most of the changes were in made the Discussion by reorganizing the sections and giving more informative headers. Also, we included some of the limitations of our approach more clearly, as suggested.

The reviewer's and editor's comments are in orange colour, while in black are our answers and in red the alterations in the text found in the track changes file.

Reviewer #1

For this review, I first focused on the authors' response to the comments from the reviewers together with the tracked changes. After that, I reread the "clean" version of the manuscript to assess the quality. Beforehand, I want to express that the authors have done a great job and the quality of the manuscript has improved considerably. Below, I explain my positive view on the revisions. A few points of concern and others out of curiosity are left. These should not be hard to address.

Response to comments

The authors have taken the comments of the reviewers seriously and have taken the time to respond to all of them. I would like to compliment the authors on the improvement of their figures, which are now easier to read and understand (Figure 6 is especially very insightful). The overview of available models that are able to model urban evapotranspiration is expanded and now in my view includes all major model types completing the introduction. This inclusion also showcases the added value of SCOPE compared to the existing models needing less parameters as input.

I do agree with the authors that interception does not mitigate UHI, droughts or make cities more sustainable. However, in order to create a complete overview of the water balance and specifically the composition of the ET signal observed with EC this is an important process, as shown by the literature cited by the authors. This is thus important for the final claim of the paper at the end of the conclusion: "Therefore, our approach is well-suited to produce ET maps that are highly relevant to urban planning and climate change mitigation.".

The discussion has been shortened and its readability and relevance have improved. The authors successfully frame their findings and limitations. However, I think the discussion could be more to the point. The sections are a nice separation, but the headers are not informative and already show that it are more 6 than 3 sections, as all headers name 2 topics. More descriptive headers and using more, shorter sections should solve the latter issue. The discussion still mentions topics (e.g. EC in urban areas) that are not relevant for this particular manuscript. This change was very successful in the introduction, which is now a pleasure to read.

In the new version, the novelty of the research is clearly argued to lay in the transferability of the model to other cities. In case this is possible, it would indeed be a great addition to the existing knowledge. Theoretically, the model should indeed be more transferable to other cities, given the limited number of parameters needed. From these sites, I find it hard to deduce whether model is indeed transferable. Has this been tested or is this planned? It would be nice to test it on a completely different setting and see how it performs. I am also wondering whether all the open data applied in this method is widely available for cities around the globe.

Main points:

1.1 Interception role in the water balance and in the EC signal contrast with conclusion: "Therefore, our approach is well-suited to produce ET maps that are highly relevant to urban planning and climate change mitigation.".

The sentence was removed from the conclusion, and a similar but more specific phrase was placed in the new discussion section header, "Applications and limitations". The intention is to explain that the maps will not contain the complete water balance similar to the EC measurements but will be well-suited to applications to mitigate UHI.

1.2 The discussion could be more to the point and with more informative headers.

Indeed, following your suggestions and some of the editor concerns, we reorganized and renamed most of the headers to be more informative and specific. We also exclude some sentences to be more straight to the point.

1.3 Has the model transferability to other places been tested or planned?

So far, it was not tested in other places, but it is on the priority list for future works. This sentence was included: "The mapping for the entire city, the inclusion of different levels of imperviousness, a correction for intercepted precipitation, and the assessment of the model transferability in different locations will be explored in future works."

New manuscript

The new manuscript reads more easily and I is possible to follow the reasoning of the authors over the course of the research. A clear aim is defined and in my opinion attained. This makes the whole research more accessible and showcases the progress this paper presents.

When rereading the manuscript, I wondered about particular effects of the urban area on the vegetation. Does SCOPE in any way account for the clothesline effect (Oke, 2002) and additional water supply to vegetation next to impervious surfaces? Otherwise, this should result in a relevant bias, since the change in the fluxes of these effects are considerable.

References Oke, T. R. (2002). Boundary layer climates. Routledge.

The SCOPE calculates the fluxes over a homogeneous landscape (horizontally), and despite the model accounting for the sunlit leaves (edges of the canopy), the edge effect of a vegetated area with another surface is not included. Also, as the correction and validation are performed by footprints that vary constantly and are based on raster data, it is not possible to account for edges in this approach. An object-based approach or canyon design may be needed to account for the clothesline effect, which is very complicated in a (vertical and horizontal) heterogeneous urban area.

Table 1: The last link does not work (related to vegetation fraction).

A new link was included (https://www.berlin.de/umweltatlas/en/biotopes/green-volume/) as the previous one was the direct link to download the WFS vector file from the ftp address, and it would not work directly on the browsers.

L328: It may be convenient to state the definition of rBIAS.

The definition was included: "The rBias is calculated as the sum of the differences between predicted and observed values of each timestamp relatively to the total ET observed in the period."

Editor #2

As you can see, referee #1 is generally pleased with the changes, and only has some minor comments at this point. These will need to be addressed when submitting a revised version. I have also evaluated the revised version myself, and I generally agree with the assessment of referee #1. The manuscript reads well, and most, if not all, of the issues identified in the open discussion have been adequately addressed. What I miss in the current version is a better and more critical discussion on the limitations of the approach. Under what conditions would, for instance, the assumption of zero ET from non-vegetated areas no longer be justified? Berlin is rather dry, and it seems likely that your approach would break down in wetter climates where rainy days are the norm, and ET from paved surfaces can no longer be neglected. Also you might want to propose a future, more stringent, test at another location where the vegetated fraction varies strongly with wind direction and speed. Only in this way it will become clear if the footprint modeling adds any information.

Main points:

2.1 discussion on the limitations of the approach.

To accommodate a more specific section to discuss the limitation of our approach, we create a new header, "4.5 Applications and limitations", and have included new content discussing the main limitations of the approach (below).

"Limitations of our approach related to the neglect of the intercepted precipitation may occur when applying the model in very wet places where rainy conditions are predominant throughout the year. The proposed approach is not able to estimate the complete water balance similar to the EC measurements, which include the interception and anthropogenic sources of evaporation. However, our approach presents higher accuracy with fewer inputs compared to well-known models for urban ET that can be applied in high spatial and temporal resolutions. The latent heat flux estimate from SCOPE can be separated into soil LE and canopy LE, which allows incorporating different levels of imperviousness in the correction factor to overcome our prior assumption of no evaporation from (dry) paved surfaces. Maps derived from our approach are well-suited to support local governments in mitigating UHI effects during extreme summer temperatures as the neglected sources affect winter predictions more. The mapping for the entire city, the inclusion of different levels of imperviousness, a correction for intercepted precipitation, and the assessment of the model transferability in different locations will be explored in future works."

2.2 future tests with other locations where the vegetated fraction vary strongly with wind direction and speed and the role of the footprint modelling.

In the model validation discussion section (4.2) a sentence was added to highlight the role of the footprint and the necessity to further studies with more locations to arrive to a conclusion.

"Further investigation at other locations is needed to conclude the role of the footprint modelling to the overall prediction accuracy where the vegetated fraction varies strongly with wind speed and direction. Otherwise, a simple buffer estimation could be performed instead. While in the ROTH site, the correction using the vegetation fraction from footprints improves the model accuracy compared to a buffer, in the case of the TUCC site using a buffer of 500 metres presents slightly better accuracy than using footprints. This occurs since ET shows a moderate correlation (0.35 and -0.44) with vegetation fraction and impervious fraction extracted from the footprints for the ROTH site but no significant correlation for the TUCC site. However, vegetation fractions can partially explain the difference between observed ET and reference ET (ETo) in spring and summertime, presenting a correlation of 0.44 for the TUCC site and 0.62 when both locations are analysed together. In summer at the ROTH site, the percentage of vegetation fraction increases during the day up to noon, while the impervious fraction presents the opposite behaviour (Fig. 4b), which may partially explain the better correlation."

In the method section "2.2.3 Remote sensing and GIS data" the following sentence was changed to make more clear that the variation in the vegetation franction and height came from the footprint modelling as the GIS data (maps) are from a specific period.

"Although the GIS data such as vegetation height and vegetation fraction maps are derived from a specific point in time, the corresponding source area (footprint) of the EC flux measurements (e.g. ET or LE) continually varies in shape, size and orientation. Therefore, these two inputs were extracted using footprints for both towers, varying hourly to capture the spatiotemporal dynamics of the surface properties."