

Response to editor comments

We would like to thank the editor for his time and constructive comments. We took another look at the manuscript and improved it according to the suggestions. Please find below the detailed responses.

Dear,

Thank you for submitting a revised version of your manuscript. Although the revisions address the main concerns of the referees, I would like to encourage you to have another look at the manuscript to further improve the following issues:

(1) The urban environment is extremely heterogenous and this is also true for its soils. In the method sections the soil conditions are detailed but this information is not referred to in the abstract or the discussion. Expressing the sink and sources at the tree level is an elegant way of dealing with this issue. Both the problem and solution could be better stressed in the discussion.

As suggested, we added into the abstract that we studied the trees in the three different growing media. In addition, we modified the following to abstract (L15):

“The models were able to capture the variability in urban carbon cycle and transpiration due to changes in environmental conditions, soil type, and tree species. Carbon sequestration potential was estimated for an average street tree and for the average of diverse soils present in the study area.”

In addition, we highlighted the problem of diversity and the solution used in this study in the beginning of the second paragraph in the discussion (L456):

“Urban areas are heterogeneous with variation in soil properties, plant species, and biomass. Even streets have diverse soil types, making it difficult to assess the carbon sequestration potential of street tree plantings. Here, we estimated the sequestration potential for street trees by utilizing an average calculated over diverse soil types and taking into account the most common city-wide planting pocket size for street trees (25 m²). “

(2) The heterogeneity of the urban environment is a bit downplayed in the introduction. It is mentioned but the terminology is vague, i.e., L29-30. Add the context of these studies (temperate/tropical/boreal cities with X inhabitants and Y% green spaces). The cited 14% is context-dependent. The next sentence makes this clear but it is not clear when/where this 14% has been observed.

We agree and we clarified the context of the studies on L29 in the revised MS:

“Urban green areas have been found to sequester significant levels of city GHG emissions. For example, the biogenic carbon fluxes in Boston, USA, and Florence, Italy amounted to 14% (Hardiman et al., 2017) and 6.2% (Vaccari et al., 2013) of both cities’ GHG emissions, respectively.”

After these sentences, we stressed the diversity by mentioning variation both in soil and in plant species and biomass.

(3) The abstract still contains three different error-measures. This is confusing and has a flavour of cherry picking. The error-measures are explained after the abstract. Are the three error values so important that they should be mentioned in the abstract? Note that Biogeosciences aims to publish biogeochemical studies. For Biogeosciences, the model application is more interesting and should

be the focus of the abstract. The model development and evaluation is the tool but not the most interesting result. This could be better reflected in the abstract and discussion.

We agree that the error-measures are not any of our key messages and those do not need to be mentioned in the abstract. Thus, the following sentences were removed as they truly are more model development and evaluation and not application (L15-17).

“SUEWS simulated the stomatal control and transpiration well (RMSE<0.31 mm h⁻¹) and was able to produce correct soil moisture in the street soil (nRMSE<0.23). Yasso was able to simulate the strong decline in initial carbon content but later overestimated respiration and thus underestimated carbon stock slightly (MBE>-5.42 kg C m⁻²).”

(4) Which processes should be included in urban models that are currently not accounted for in the forest models? If it is just different climate, the current forest models are capable of dealing with that. The text hints at the interactions between the vegetation and the built-up area but it is not clear which interactions are accounted for. It remains also unclear how the Yasso model (which was developed in a forest context) was adjusted for the urban environment. Consider adding a table listing the underlying assumptions and specific urban-processes that were accounted for in this study. Such a table could help the readers to better understand how your approach differs from simply running a forest model with an urban climate forcing.

As suggested, we clarified the urban processes by adding a sentence to clarify the interaction between built and vegetative surfaces to introduction, L49:

“In reality, the built environment in urban areas allows the formation of the urban heat island effect, strong variation in soil moisture, and lateral water flows between built-up and vegetative surfaces. “

In addition, we added a new Appendix B: “Specific urban processes used in CO₂ models”, which includes a table that clarifies the specific urban-processes that were accounted in this study.

(5) As a non-English speaker myself, I do appreciate the difficulty in expressing ones thinking in another language. The English in the manuscript is readable but there are still several grammar issues and awkward sentences. A native speaker could easily overcome these issues. Correct language is likely to broaden the readership and to increase the chances that the paper gets cited.

The manuscript has now gone through the language revision by a native speaker working in University of Helsinki language services.

Specific issues

(6) There is no page limitation so avoid these nontrivial acronyms LOI, BD, LA, NE, ... they are a burden for the reader

We have tried now minimize the use of acronyms:

1. BD and LA are removed as they are only mentioned once.
2. LOI is now used if it appears multiple times in one section. Otherwise, the acronym is not used.
3. NE is now used only for Figure 9.

(7) Table 1. All acronyms should be explained in the caption.

The variable names are modified so that there are not acronyms.

(8) *L87. This is methods and should be moved to the methods.*

The sentence was removed. It is already clear from the methods.