Comment on bg-2021-242

Anonymous Referee #1

Referee comment on "Carbon sequestration potential of street tree plantings in Helsinki"
by Minttu Havu et al., Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2021-242-RC1, 2021

In "Carbon sequestration potential of street tree plantings in Helsinki" Havu and collaborators present model simulations over an urban area in Helsinki to estimate the carbon sequestration of urban trees. The authors used the SUEWS and Yasso models to simulate the carbon cycle for the vegetation and soil, respectively. Based on the model results, they estimated that the simulated urban area will become carbon neutral in 12 or 14 years. In my opinion, the manuscript is a valuable addition to the literature since many of the land surface model studies omit urban areas despite their growing importance. Also, the manuscript describes the most pressing points to improve modeling of energy and material cycles in urban areas such as soil carbon process in the urban area and groundwater access. However, I think the manuscript would benefit from revisions to make the method and results clearer.

Major comments

The metrics used for model-data evaluation were not well justified. Four metrics were used, i.e., nRMSE, RMSE, nMBE, MBE but it is not clear what is the benefit of this multitude of metrics (what does each metric teach the reader and why are exactly those metrics important to evaluate the models at hand?). This multitude of metrics also blurs the results sections. For example, in L358, nRMSE was better at the Alnus site but MBE was poorer at the Alnus site, but both were mentioned without further explanation. What does this tell the reader about the model (deficiencies)? Also in L372, it is said that the Yasso model showed the best performance in soil3 based on RMSE but it may not be based on nRMSE. As those were not dealt with in the Discussion either, it was not clear how the use of four different metrics enriched the model evaluation.

The study showed that the street trees in Helsinki could become carbon neutral or slightly carbon sink 14 years after planting but it is not clear what happens after those 14 years. How long does an average street tree live? What is the soil volume affected by a street tree? What happens with the wood of street trees once they are replaced? How much carbon is emitted in the management of street trees? How does all of this affect the life cycle carbon cycle of street trees? Thinking about the carbon balance changes after those 14 years is likely to give important insights and implications for the street tree management. One of the strengths of the model would be that a theoretical experiment is possible even though it needs several assumptions. Extending the model application would make the manuscript more suitable for Biogeosciences as it would shift the focus of the manuscript from model development to new insights in the biogeochemical cycle of street trees.

Minor comments

L43 Explain why those methods are not suitable for climate change.

L51 I could not find the necessity of the sentence following with 'Furthermore'. It may mean that simulating the right temperature is very important due to the interaction with urban structures. Does it?

L63 How come the SOC will be increased in urban soils compared to the natural environment? Don't urban structures inhibit such an proces?

L69 Starting with 'in addition' mentioning that the information was not referred to beforehand, was confusing.

L101 It was difficult to understand how the three different soils were laid in the experimental sites.

L124, 128, 134 This content might be more suitable for the result section

L143 Why were the additional measurements primarily used? Was it closer to the sites?

L155 Do you mean the air pressure?

L258, 347 How was the value for the input (0.06) decided?

L349 a slight morning maximum: unclear expression.

L356 Why only two years over four years of evaluation period were referred?

L365 You mean similarly, respiration is higher in Alnus?

L538 The values have a different unit from Fig. 7, which reduces connectivity.

Table 1

It seems to be shown way too early as table 1 is only referred to 4 pages later.

Table 4

Why are RMSE and MBE for SWC only for the Tilia site empty? If it is because the results are normalized then the results for the Alnus site should be empty too.

Figure 2

Function g() has not been mentioned or explained in the text or the caption.

Figure 8

Not clear if 'estimated' points out simulation or observation since the term 'estimates' has been used for observations.