

## **Comment on hess-2020-640**

Anonymous Referee #1

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Referee comment on "Quantifying the effects of urban green space on water partitioning and ages using an isotope-based ecohydrological model" by Mikael Gillefalk et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2020-640-RC1>, 2021

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This paper presents the results of an urban ecohydrological modelling exercise using the ECH20-iso model. Growing season field measurements, including soil water content were used to calibrate the model. Qualitative validation was carried out by comparing measured and simulated water isotopes, surface temperature, and simulated transpiration to measured sap flow data. Overall, the paper was well organized and enjoyable to read. The clarity and simplicity of the figures was appreciated. I think there is room to improve the clarity of the methods with some additional details (see suggestions in specific comments below). As well, I recommend the authors try to make the model validation more quantitative (see suggestions in specific comments below). Lastly, I think the authors could place some additional focus on the urban design/management implications of the grass results, which suggest they are as important as trees for regulating green water fluxes.

48-9: Reverse order of this sentence, i.e., ... by increasing infiltration and groundwater recharge, and thereby reducing stormwater runoff.

55: Replace 'removing' with 'to remove'.

57: Replace 'gives recreational benefits' with 'provides recreational opportunities'.

57-8: Remove '...to actually...'

63: Should be '... quantities of water that are partitioned...'

70-1: The point being made here is unclear. I recommend revising the wording for greater clarity.

76: 'setting' should be plural.

81: Grammatical issue in this sentence – isotopes is plural, but sentence doesn't reflect that.

96-7: Could the aggregated percentage of green and blue space be broken down for both?

Figure 1: Add a scale bar and north arrow to the zoomed in map of the observatory site.

144-5: Do the authors think that the drought conditions preceding the study could have impacted the results in any way?

151: Missing words in this sentence - '... installed at the top of the flux towers...'

150-7: What is the fetch (or footprint) of each tower? What proportion of the study period is each tower measuring convective fluxes that are representative of the observatory site? This will depend on wind direction of course.

Section 2.2.: Throughout this section it would be helpful to know the make/model of all the sensors that were used.

161-4: How was soil sampled? How was water extracted? How was isotope analysis performed?

166: I recommend providing a brief overview of methods and then referencing Kuhlmann et al 2020b for more detail.

188-9: Is available moisture at the surface not used as well for partitioning available energy into convective fluxes?

198: How is the vegetation rooting parameter obtained? Is it based on field measurements of rooting depth?

204: The calibration period is the period over which data were obtained from the site. Validation is qualitative. Is there 2020 data that can be used to validate?

206: The soil division in the model is unclear to me. Were soil surveys used to characterize the spatial distribution of soil types? If not, was there any verification of the assumed soil characteristics?

Figure 3b: Is the local drainage network storm sewers? Is there any channelized flow through the site?

239: I think you could use 'ground-to-atmosphere' instead of 'upwelling'.

247-9: How common are "infiltration hotspots" at sharp interfaces between impermeable and permeable surfaces? In my experience, these areas are usually quite compacted, thereby preventing infiltration.

267-8: Were surface cracks visible to the field team?

274-5: Are the authors referring to the measured or modelled SMC here? Layer 3 is not shown in Figure 2. It's not clear which data is being discussed.

299-300: I think the authors should try to provide some interpretation of the poor fit in late June, late Aug and early Sep.

307-8: What do the authors mean by 'This compares with the 352 mm of precipitation during the calibration period.'? All the ET values are larger than P.

318-20: Is there some way to estimate E from these surfaces to see if they account for the missing amount?

324-7: In layer 1, SWC is generally higher at the beginning and end of the study period

with fluctuations (but lower baseline) in between. Why is the water age relatively high in April/May and Nov? Maybe the April soil water is old from the previous winter, but November receives a fair amount of precip. Some explanation of the distribution of ages at the beginning and end of the study period would be helpful.

362-5: Would the authors recommend more, denser SWC measurements in urban soils?

391: Spelling error – trees.

396: It's unclear what '... generally capturing processes adequately...' means. What were the criteria for evaluating this? On line 397, 'generally good reproduction' is used. Can the authors be more quantitative, e.g., measured and modelled isotope values were within x-x % of one another? It's unclear what is meant by '... this simulation required...'.

399: Similar to the last comment, '... somewhat less successful...' seems too vague. Can the fit be assessed quantitatively?

399-400: I recommend being more explicit about the number of wetting fronts that the isotopic results reflected.

Figure 10: This is a nice conceptual figure.

Section 4.4: It might be worth mentioning that sometimes preferential flow pathways can form along impermeable-permeable surface boundaries. This would move water away from the area and potentially make it unavailable for green or blue water fluxes. Something to explore in future work perhaps. [I see the authors make this point later on line 454-6... excellent].

Section 4.5: Could the authors comment further on the role of grass in promoting green water fluxes? Many sustainability-focused landscape designers seem to be moving away from grass (or lawns), but perhaps the findings of this study are an argument in their favour.