

Reply to anonymous Reviewer #1

RC1.2: My overall impression of the article is that it feels a bit shallow, especially in the methodology.

Your feeling might not be meant like this but we receive "a bit shallow" in fact as a compliment. It was a bit surprising to see that nobody has tried the obvious before. Instead, we have found only case study data, which is not transferable. In our opinion, it is the strength of this research that we have adapted the well-established, well-acknowledged and international applicable ET_0 approach based on the process-based Penman-Monteith approach to the vertical in an urban street canyon and validated it with experimental data. However, measuring water consumption of vertical green was all but simple or "shallow". While in lines 245-267 we describe the measuring setup, we agree to the reviewer that this description needs to be improved by a technical drawing.

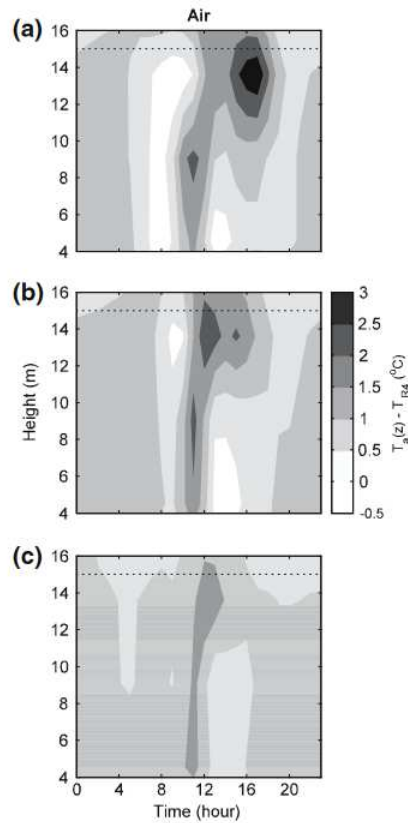
RC1.3: The Introduction reads more like a review article, being quite extensive in digging up older studies on the subject of ET and vertical walls, and the relation to localised data usage. However, I was struggling to see exactly what the point is the authors are trying to make here with this extensive literature research. The subsection on Measuring ET just lists several ET values from different studies - is this really necessary? It would be much more easily accessible if it were tabulated for instance so the Introduction can be made much more concise and to the point. The authors don't reach their objective of the study until page 5, at which point it was still fairly unclear to me what the actual point of the paper is, how the authors will tackle the issue, exactly what the issue is etc.

Thank you for your comment. There are several personal preferences about how introduction sections should be written. However, we will shorten the introduction accordingly, will present data on ET of different studies in a table as proposed and will name the aims of our study in the beginning and deduce it from the state of the art afterwards.

RC1.4: In the Theory section, one particular sentence that struck me as odd was in line 220-222, mentioning that VPD is highly influential on ET, is height-dependent on wind speed, but that would require CFD or local measurements so the authors just omit it...? I find it hard to justify this choice given that the authors explicitly state its importance on ET only to then ignore the variations.

With this criticism both reviewers are right! We agree that this paragraph needs clarification and will be revised. Of course, VPD has a high impact on ET (as shown in Figure 3), high variations of VPD lead to high variations of ET. However, the temperature differences at one point of the facade in the diurnal course are much higher than the differences in the height profile, as shown in Offerle et al. (2007), see the figure below. A height dependency is only visible for short periods. Therefore, we discuss that the impact of the height profile compared to a uniform VPD is neglectable.

Fig. 4 Air temperatures in the canyon as a mean difference from R4 for sunny days in each subset as in Fig. 2: (a) summer, (b) spring and autumn, (c) winter. The line marks the canyon top. All air thermocouples were used to calculate the mean vertical temperature profile i.e. horizontal variation within the canyon is ignored



RC1.5: The Material/Methods section then feels lacking in some details: the scientific quality of the article would benefit some more detailed description or visualization of the measurement setups (both at the experimental site and the external measurement sites). Especially the location of the sensors at the experimental site are important, given the strong non-linearity of environmental properties in the urban area, with wind speed as the most obvious one. The authors very briefly touch upon wind influence but seem to conclude that it is not important for ET estimation - this might also have to do with the location of the wind measurements and the behaviour of the wind at its microclimate.

It is a bit difficult to discuss feelings. From our point of view, the M&M was complete with the reference to Hoelscher et al. (2018), where the setup is described in detail. However, we took your comment serious and as an occasion to re-write the M&M section in a way, that the article is self-explaining. We will add a technical drawing of the measuring setup, a re-draw of the figure 1 from Hölscher et al., 2018 and we will combine it with a technical detail drawing of the water consumption measurements mentioned above.

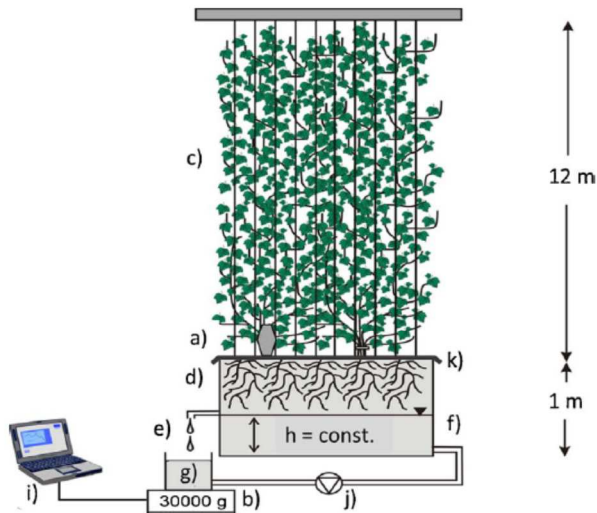


Fig. 1. Design of lysimeters for the outdoor experiment: transpiration measured by sap flow sensors and balance: a) sap flow sensor with radiation shield (for 5 plant stems in total), b) balance measuring the water uptake for all 32 stems, c) climbing plants (*Fallopia baldschuanica*), d) rooting zone in the hydroponic system, e) free outflow, f) intake, g) water reservoir refilled automatically, h) constant water level, i) data logger, j) pump, k) cover.

RC1.6: Another example of missing clarity of the interpolation of climatological data from the of-site stations - how is this done? Is the landscape taken into account at all? What method of interpolation has been used, has this been verified, is it susceptible to errors etc etc. These details are crucial since they can influence the validity of the conclusions.

We fully agree with your comment, interpolating meteorological data is a book on its own. As interpolation of meteorological data is beyond our competences, we decided to check the usability of available data sets. So, we used interpolated data delivered by Meteotest (as described in lines 279 ff). Regarding the interpolation method, we need to refer to Meteotest (2020), as done in the manuscript. We will add some details about the calculation of incoming solar radiation on a vertical pane.

RC1.7: The Results section has a lot of difficult to read text, formatted with Rs(remote_TXL) etc etc, with all the parentheses and mentioned values makes the text a slog to get through. I'd advise the authors to see if these cannot be summarized in a table as well, and to really get to the focus of the results.

Thank you for your comment. Indeed, the descriptions given in lines 294 ff could be substituted by a table making our nomenclature more accessible. So we will rewrite that section.

RC1.8: The figures themselves are also quite hard to read, especially in print.

Thank you for this feedback. We agree that the overall font size in Copernicus' text template is already quite small. The same applies for the figures. We will increase the font size, enhance contrast and resolution for the figures. We will aim to change figures 4,5, and 6 to be full page figures.

RC1.9: The results also feel like they don't quite go deep enough in explaining things, with some statements that feel fairly obvious (e.g. radiation values being of because the wall is shaded for a part of the day - something very obvious that you could have corrected for beforehand). So most of the results feel like quite generic statements, even though there are very interesting tidbits of knowledge in there that could really help judging the quality of using off-site data or not. For instance the possible influence of night-time longwave radiation on night-time ET - interesting stuff to explore.

Thank you for your recommendation. We agree that our data set is really interesting for more pronounced process studies. E.g. the mentioned “**night-time longwave radiation on night-time ET - interesting stuff to explore**” have already been investigated. The pronounced ET during nighttime lead to a new base line correction for sapflow measurements, see Hölscher et al.(2018) – we will point to that fact accordingly.

However, the focus of this article is to develop and to evaluate the adapted standard evapotranspiration ET_0 approach using different data sets with experimental data. Our aim is to adapt the model to use available meteo data for sites in urban settings. Your statement “**the wall is shaded for a part of the day - something very obvious that you could have corrected for beforehand**” is confusing. It seems that our calculation concept has not been understood, which points to possible weaknesses in the text. We will check it accordingly with special care and will explicitly state that in the concept section.

RC1.10: In summary, the structure of the text and figures as well as the phrasing of the aim and results of the paper could use some serious work, but with some more in-depth information on the setup, as well as a more in-depth look at the actual results, would result in quite an interesting paper.

Again, thank you very much for your dedicated work on the review and your appreciation of the overall objectives of the manuscript. We are willing to revise the manuscript accordingly and thoroughly.

Thomas Nehls on behalf of the authors