Suggestions for revision or reasons for rejection (will be published if the paper is accepted for final publication)

This is an interesting and useful study of the urban heat island, energy fluxes and CO2 exchange at a complex urban forest site in Seoul, Korea. Spatiotemporal trends in the observed fluxes are analysed and related to the characteristics of the site and climate conditions (particularly the effect of the East Asian monsoon and a drought period in one of the study years). Urban-rural differences in CO2 exchange and the role of the urban forest in reducing the urban heat island are discussed. The comparison with other urban sites nearby is interesting and discussion incorporating previous studies in the literature helps to set this work in context. The findings of this study are useful for urban planning applications and raise the important point that the potential impact of land management and weather conditions on urban green spaces need to be considered when designing cities.

The authors have addressed the reviewer comments well. The summary of key information from previous studies about the gap-filling methods, flux partitioning and calculation of displacement height and roughness length is much improved. I have a few suggestions for further improvement and recommend this article for publication following consideration of these minor points.

Response: We thank reviewers and editor for their constructive comments on our manuscript, which undoubtedly improved our manuscript. We did our best in revising our manuscript based on all the reviewer's comments and please check our responses below.

Minor revisions

To improve traceability, it would also be good to mention which of the methods in Kent et al. (2018) were used to inform the values for roughness length and displacement height given in L140-144.

Response: We revised our texts as the reviewer suggested by adding the method used in this study.

It is still not very clear how the authors arrive at the conclusion that the tower height requirement is satisfied for most wind directions (L158-160), nor how severely the requirement is not met for particular wind sectors. It would be good to add a sentence here stating which wind directions are potentially problematic (citing results from Kent et al. (2018) if necessary), and if possible, to give an indication to the readers of how this might impact the results.

Response: We added more information into the revised manuscript for the reviewer's comment by indicating the potential issue in a particular wind direction.

L110 Section 2.2.1 presents the climate conditions before the reader knows where this study takes place. Where are the climatological mean values in L112 measured? Similarly, the characteristics of the flux footprint are discussed before the location of the flux tower has been introduced. Suggest moving Section 2.2.1 after Section 2.2.2 (as in the previous version) or even to the end of Section 2.

Response: We revised our manuscript as the reviewer suggested.

L116-118: Swap the order of these two sentences to talk about general conditions first and then the effect on the flux footprint.

Response: We revised our manuscript as the reviewer suggested.

L205: The quality control procedure removes negative CO2 fluxes during night-time on the basis that there is no photosynthesis at night. Presumably the explanation for these negative fluxes is random error and the expected flux should be close to zero. If so, doesn't removing only negative values introduce a bias into the dataset, since the small positive CO2 fluxes are not removed and so the daily/seasonal/annual sum will be larger than expected? Perhaps the authors could add a comment on whether these negative values are substantial proportion of the dataset or only occur occasionally, and what the likely impact of this particular quality control test on the annual total fluxes is.

Response: This is an important point and we added information on the percentage of negative nocturnal F_C values (n = 485, 1.4%) and their potential impact on the annual net carbon exchange (-0.0075 $kgCO_2$ m^{-2} $year^{-1}$, 1.4% of annual F_C) into the revised the manuscript. We considered that such negative nighttime F_C values is beyond the randomly generated error because their standard deviation is relatively larger than that in positive nighttime values. We also considered that generally random error F_C of is relatively smaller in positive signs than negative signs based on the uncertainty analysis (i.e., asymmetry) (e.g., Hong et al., 2020, Int. J. Clim).


L467-470: You could add the reference here to make it clear that the gap-filling and partitioning are based on methods in a separate publication.

Response: We revised our manuscript as the reviewer suggested.

Fig 10: A minor issue, but it is still not clear to me why the panels group different numbers of months together in this way (Jun-Sep, Oct-Feb and Mar-May). Seasonal variation is considered in other figures and also discussed in the text, so perhaps four panels with Jun-

Aug, Sep-Nov, Dec-Feb and Mar-May would fit better, or three panels with four months each, or even two panels separated into the growing season (e.g. May-Oct) and non-growing season. The authors could consider whether a different grouping of months may fit better with the text.

Response: We revised Fig. 10 and its related texts by separating two seasons, (a) growing season (May-Oct.), (b) non-growing season (Nov.-Apr.) as the reviewer suggested.
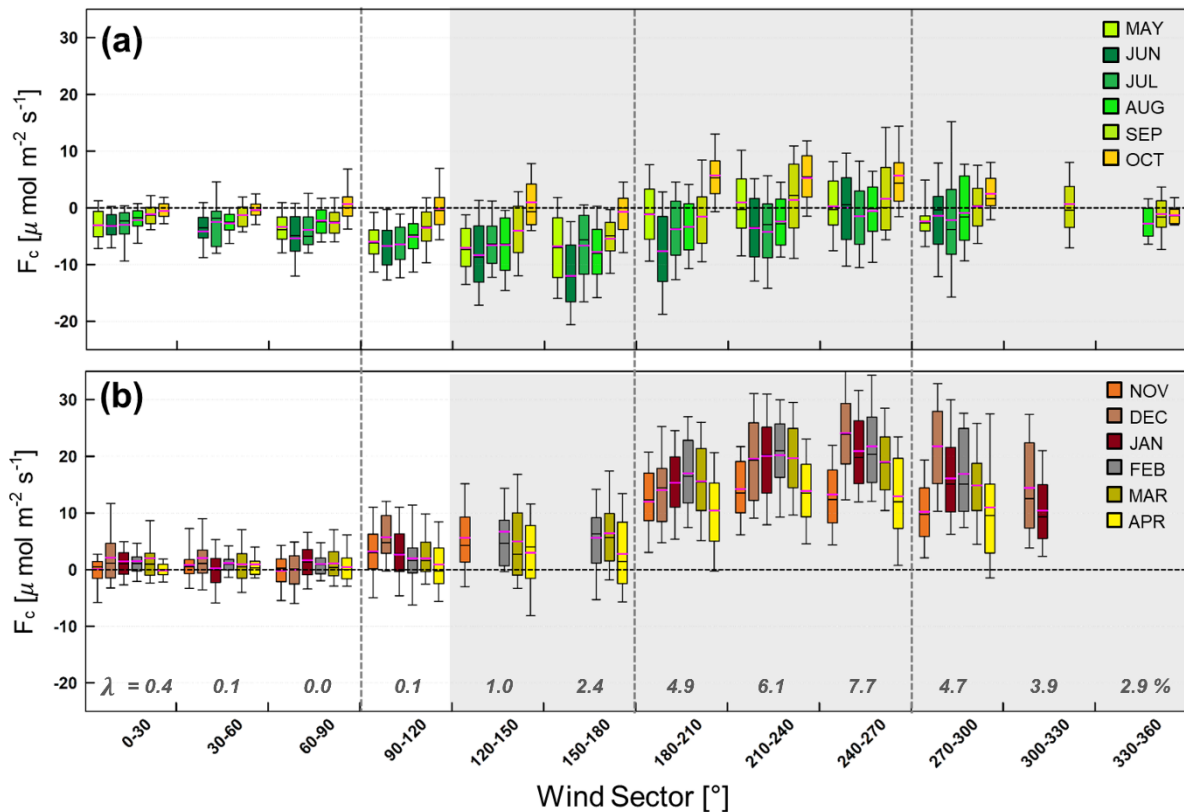
The manuscript would benefit from further English language editing to improve readability. I have made some suggestions below but there are many more which should be corrected before publication.

L48: change to 'at scales from street trees to parks'

Response: We corrected the text.

L94: delete 'from soil and vegetation' as this contradicts the following sentence

Response: We corrected the text.

L96 change to 'park visitors'

Response: We corrected the text.

L128: I think this should be Fig 1 not Fig 2.

Response: We corrected the text.

L251: delete 'over'

Response: We corrected the text.

L283: change 'less' to 'lower'

Response: We corrected the text.

L335: change to 'downward shortwave radiation'

Response: We corrected the text.

L373: change to 'trends with PAR'

Response: We corrected the text.

L795: The Basel sites have much lower vegetation fraction (seems strange to describe them as 'similar').

Response: We corrected the text.

L828: delete 'surrounding'

Response: We corrected the text.

L829: change to 'around the flux tower'

Response: We corrected the text. Thank you.