Response to the reviewers comments for the manuscript "Multi-layer coupling between SURFEX-TEB-V9.0 and Meso-NH-v5.3 for modelling the urban climate of high-rise cities"

Referee #2

The manuscript by Schoetter et al. presented a recent development of SURFEX-TEB for coupling with Meso-NH by introducing a multi-layer approach and evaluated the performance of the coupled system in Hong Kong. The manuscript is well written and easy to follow, which thus merits to be published after a minor revision. The only moderate concern is the lack of comparison in surface energy fluxes between the new and classical schemes. Besides, a few details need to be clarified before publication, which can be found as follows:
Thank you for taking the time to provide such a careful review of our submission. We have added the comparison of the surface energy fluxes at the stations KP and HKP for the different coupling approaches (new Section 5.3) and conducted a simulation with the single-layer coupling and another formulation for the turbulent mixing length in the SBL scheme as suggested by Reviewer #1. We give the detailed answers to your comments below and provide a version of the manuscript with highlighted modifications.

- Section 2.3: Please discuss the implication of uniform wall surface temperature with respect to uncertainties.
Done.

- L295: please add Kwok et al. (2020) to the reference list.
This article is now published online and we add the correct reference.

- L339: Clarify if this all goes into sensible heating.
In Section 3.3.2, we describe how we spatially disaggregate the monthly energy consumption to calculate the inventory-based anthropogenic heat flux. The values calculated in this Section are not directly used in the model since it calculates the building energy consumption for air conditioning based on the prevailing meteorological conditions, the characteristics of the building envelope, and the setpoint temperature of air conditioning given in Kwok et al. (2020). The anthropogenic heat flux calculated by the model contains a sensible and a latent part. For the internal heat release it is considered that a part of it is latent (e.g. cooking, domestic hot water). The latent fraction of the internal heat release is specified as a function of the building type and is 0.05 for schools, 0.1 for university buildings, 0.2 for shopping malls, industrial buildings, and office buildings, and 0.3 for residential and public health buildings. For the energy consumption due to air conditioning, it is considered that there might be evaporative cooling towers on the building roofs. The fraction of buildings equipped with such cooling towers is specified as a function of the building type and is 0 for most buildings, except for schools and other Government, Institutional, and Community buildings (0.1), commercial and public health buildings (0.2), and office buildings (0.5). We now provide this information in Section 3.2.

- L357: Please clarify how zero-plane displacement is calculated as well.
We now provide the equation for the zero-plane displacement height (Equation 25) together with the more detailed description of the urban turbulent mixing length in Section 3.4.

- L359: Are the other four levels evenly spaced?
No, the depth of the SBL levels increases with height. This is now stated in the manuscript.

- L378: Please explain why this won't be viable when using larger time steps.
The reason is that the temperature and moisture increments would become too larger. We now mention this in the manuscript.

- L606: Please provide the prognostic equation, which can go into appendix.
We now provide the prognostic equation for potential temperature in the appendix.

Other technical comments:
- Figure 1: Better to align the basement levels of two approaches at the level: it is understandable that the new approach would apply for grids with much higher buildings.
We prefer to not align the basement levels of the two approaches since we want to highlight that, with the single-layer coupling, the urban canopy layer is located below the physical and atmospheric model surface. We change the figure and the caption slightly to make this more clear.

- Equation 3: Correct the less than or equal sign to "<=" here and other occurrences.
The proper Latex \leq command is now used in all equations.

- L181: please use scientific notation for the numbers.
Done.

- L185: "explicited" -> "explicitly given"
Done.

- Figure 4: Use dots to represent observations for better contrast and easier legibility.
We now use dots to represent the observations in all time series plots.

- Figure 13: correct the unit in y label to be consistent with main text.
Done.