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Geoscientific Model Development Discussions

Interactive comment on "Intercomparison between the Integrated Urban land Model and the Noah Urban Canopy Model" *by* Chunlei Meng and Junxia Dou

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General comments: The study compared the results from IUM and NoahUCM against the measurements in Beijing, China. The comparison is focused on the energy fluxes (upwelling components in radiation, Rn, H, LE, and G), via the discussion on the different algorithms used in the two models. Most time-invariant parameters were retrieved from the default values or look-up tables without specific calibration. The authors drew the conclusions based on the difference in model mechanisms. It is noteworthy that, however, neither model was capable of producing reasonably accurate estimation at the study site with the setting in the current study; this amounts to the main (and ma-

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jor) flaw of this manuscript. The conclusions are primarily on the suggestions for future studies and applications of the two models, including the use of remote sensing albedo in NoahUCM, considering of urban street geometry in IUM, parameterization of friction velocity, and the importance of urban hydrological models, etc. Since both NoahUCM and IUM showed significant errors on the considered energy fluxes (except for up-welling shortwave radiation), these suggestions, though applicable for urban studies in the broad sense, cannot be substantiated based on the results. The lack of model calibration against observational data in this study is hardly acceptable. It is recommended that the manuscript should be revised by including appropriate and careful calibration and evaluation of, at least one model, against quality observation and compare the other to the calibrated benchmark; or to calibrate both to the observation and compare the difference in model mechanisms. For both options, the inclusion of the observation data is essential. Overall, the results are not able to fully answer the study question raised in the Discuss stage. Both the technical merit and the quality of presentation (figures, typos, etc.) of this manuscript needs to be substantively improved before it is fitting for publication.

Answer: Model calibration was implemented for IUM. Firstly, we chose some key parameters in the urban radiation balance model and energy balance model. Then we adjusted the values of these parameters to calibrate the IUM. The criterion for the calibration is the minimum of the aggregate root mean square error and bias of the six radiative and energy fluxes, i. e. upward solar radiation, upward longwave radiation, net radiation, sensible heat flux, latent heat flux and ground heat flux. Lastly, we used some of these parameters to Noah/SLUCM. Apparently, the key parameters in urban radiation balance model are albedos for visible and near infrared solar radiation. The key parameters selected in the urban energy balance model include surface thermal capacity, surface thermal conductivity, bulk urban roughness and number of impervious layers.

Specific comments are detailed below. Specific comments: 1) Detail information on

LULC is needed for readers, such as the average building height, canyon aspect ratio, fractions for each LULC category, etc. Answer: The average building height is 40m. The canyon height-to-width ratio is approximately 1. The fractions for trees, other impervious surfaces, grass, parking lots, roads, water, and buildings are 0.1600, 0.3538, 0.0353, 0.0153, 0.1930, 0.0063 and 0.2363, respectively.

2) Much redundant but unnecessary information is provided, such as content in line 258-260, line 370-372 and line 388. Answer: These sentences were deleted.

3) Many vague descriptions in quantitative comparison: such as 'too high' (line 265, 295), 'little higher' (line 273), 'little lower' (line 273), 'apparently larger' (line 292, 302), etc. It is recommended to use percentage to show the difference accurately. Answer: These vague descriptions were replaced by quantitative percentage comparison.

4) The use of capitalization in figure labels needs to be consistent. It is recommend to capitalize all labels like Figure 4b. Answer: The capitalization in figure labels were corrected.

5) In Figure 8, it is necessary to explain the different (or relation) between '50% Urban' and '92.9% Urban' in the main text. Answer: This figure was redrawn.

6) Figure 9 shows in waterlogging day, IUM performs significantly better than NoahUCM in LE estimation, while both models are equally bad for non-waterlogging day (Figure 7b, Figure 10e). Does ISE only work in the event of precipitation? What caused this issue? Answer: ISE works in the event of waterlogging, not in the event of precipitation. For dry impervious surface days, the ISE is zero. The simulations for the LE are both these two models are bad when the impervious surface is dry because the LE simulation for pervious surface is still need to be improved.

7) In Figure 10, it is necessary to explain the difference (or relation) between 'Grass' and 'Urban' cases. Also, figure legends need to be consistent in the subfigures, i.e. use ONE of 'Noah Grass', 'Noah G', or 'Noah grass', not all of them in different subfigures.

Answer: This figure was redrawn.

8) Figure 10c has different colors from all other subfigures. It is recommend to keep color consistency in subfigures as well. Answer: This figure was redrawn.

9) It is recommended to show the comparison of simulated and observed ground temperature for its importance (line 265, 286, 311, 316-317, etc.). Answer: Ground temperature is important to the simulation of sensible heat flux. But unfortunately, no observed ground temperature is available. We compared the simulated ground temperature of these two models.

10) Check typos and gramma. Examples: Line 273: litter -> little; X-axis labels in Figure 3a, 3b, 4a: calenday -> calendar. Answer: The typos and gramma were checked carefully.

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