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Discussions

Interactive comment on "Simulation of the radiative effect of haze on urban hydrological cycle using reanalysis data in Beijing" *by* Tom V. Kokkonen et al.

Anonymous Referee #2

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General comments By evaluating the impact of haze on urban hydrological cycle and limitation of the current modelling multi-scale approach, the paper addresses a relevant scientific issue that will help the scientific communities and decision makers worldwide. This research gains even more in importance in highly dense Asian megacities (China, India) that already suffer from aerosol pollution. By talking modelling approach and atmospheric chemical and physical processes, the reviewer agrees that the topics entirely fit with the concerns of the Atmospheric Chemistry and Physics journal. In general the manuscript is well written but effort can be make to simplify the sentences (sometime confusing) and on the abstract/introduction to clarify the aims (as it seems there are several) and take-out messages of the research. It seems that the paper questions

the modelling approach and particularly the quality of the global reanalysis data used to simulate the local urban hydrological cycles during haze episodes, the SUEWS urban land surface model performance as well as the interactions between the aerosols and the urban hydrological. This should be clearly stated from the abstract until the result sections. The novelty (the focus on the local scale), challenges, and operational urban water management implication raised in the paper should also be better justified in the introduction and generic terms should be avoid to go directly to the fact (aerosols instead of pollution) and determinant physical interactions treated by the papers. The introduction can be elaborated so as to immediately focus the reader on the nature of the pollution the authors are dealing with (aerosols and wet haze?) instead to use generic terms. It will help to strengthen the message of the introduction. Following are specific and some technical comments/corrections that will hopefully be helpful to the authors.

Specific comments Page 3, l.8. Is it possible to explain the specificity of the Murto (2017)'s methods. Murto (2017) does not detail enough the method behind the land cover model construction and how the various vegetation compositions are retrieved from the aerial photographs. âĂć What is the benefit of using the Murto's method and two source of spatial information? âĂć What is the resolution of the World imagery? Why a semi supervised classification was not able to distinguished evergreen from deciduous trees based on irradiance and trees from shrubs based on a structural geometry algorithm? âĂć What is the quality of the OSM data in the region? Page 4 Can you confirm that the model has been run for a time period of 3 years and a 5 min time step over a 1km2 simulation domain? Page 5 l.28. What was the nMBE before the correction? Page 8, l.1. "SUEWS model performance is relatively independent of haze level (. . .) in the model input variables". âĂć Is the precipitation not also an input variable affected by the haze levels? How the bias in the precipitation can impact the quality of the simulation with respect to the precipitation rates (p.8 l5.)? âĂć What about the influence of haze level on the longwave radiations, surface temperature and resulting QH and atmosphere stability? âĂć Should the model performance only

be evaluated with the evaporation? Evapotranspiration is the common term in the energy and precipitation budget but as the incoming energy is partitioned also amongst other terms (sensible, storage), does it worth it to also consider these variable in the evaluation of the simulations. A fortiori, aerosols have been proven to increase the contributions of the scattered radiation versus direct radiation in the solar energy budget, while they potentially absorb and emit longwave radiation resulting in heat retention in the atmosphere.

Table 2. What are the uncertainties associated with the temperature, humidity and wind speed sensors developed by the institute of Atmospheric Physics? As being nonstandard instruments, is it possible to have a description of these and know if they have been already tested against standard sensors? Page 10 l.11. Is surface runoff not diminished for small precipitation intensities compared to high precipitation intensity episodes? The infiltration capacity of the soil horizon is usually reduced during high precipitation intensity episodes due to the destruction of soil aggregates -> less porosity, and usually deeper wetting front in the soil resulting in higher surface resistance. Please clarify.

Technical corrections Abstract l. 5-6 please, rephrase. Additionally, it was not clearly stated before that the evaluation of the SUEWS performance is also part of the aim of the paper. It can be good either to neglect this aspect in the abstract or if crucial add this additional and somehow "hidden" aim in the abstract. l. 10-12 "induce" instead "induces" considering the plural "rates". Also the message of the sentence is a bit confused to figure in the abstract. Please simplify your message. l.11-12 this is a justification of the research, isn't it? It should maybe be placed before the general outcomes. Introduction Page 1, l. 17. Is "northeast China one of the most populated areas" a consequence of environmental problems?. Please rephrase. Page 2, l. 1-2. Please rephrase. The sentence is difficult to read in my opinion. Page 2. l 4-5. It can worth it to elaborate more the interactions between the aerosols, the solar radiation, and the boundary layer height and stability. How these elements interact? Further

Page 4 l.10. "as the main focus. . .balance". This information can be removed and is not so necessary here. Page 4 l.24 Please indicate where are the mentioned box-plots, RMSEs, etc. in the paper? Page 5 l-9-11. This is more appropriated in the introduction. Page 6 Table 3. Please modify the title to better explain what is presented in this table and which variables are there inter-compared. Page 11 l.11 –Page 12 l.11. This is an interesting discussion although not a result.